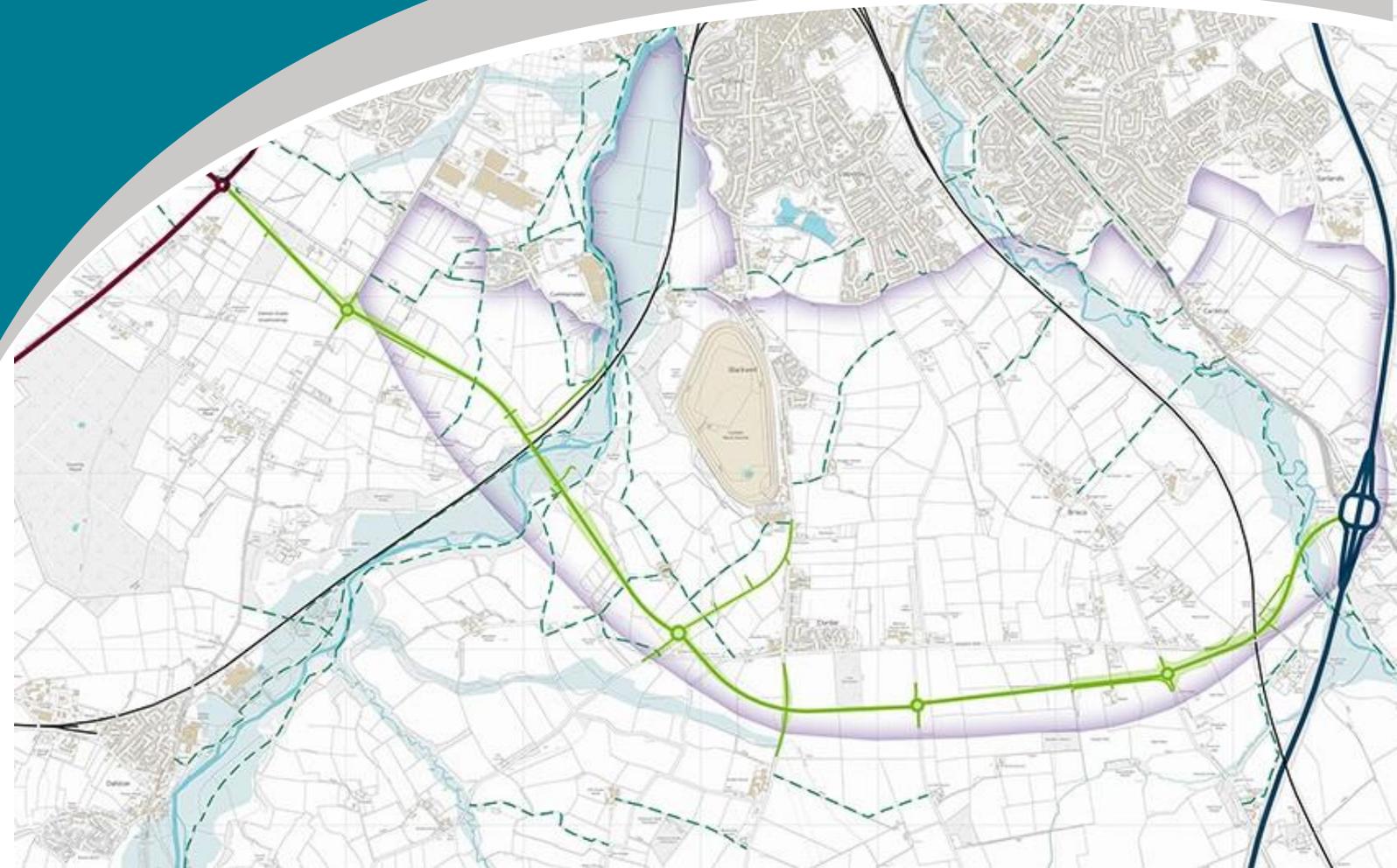


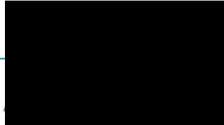
Carlisle Southern Link Road



DMRB Stage 3 Environmental Impact Assessment Volume 1 | Environmental Statement

October 2019

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Carlisle Southern Link Road

Environmental Impact Assessment – Volume 1: Environmental Statement

October 2019

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This document forms **Volume 1: Environmental Statement** of the Environmental Impact Assessment (EIA) for the Carlisle Southern Link Road. Other accompanying Volumes include:

Volume 2: Plans and Figures

Volume 3: Technical Appendices

Volume 4: Supporting Documents

Non-Technical Summary (NTS) to the Environmental Statement

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Part One Introduction

1 Introduction

1.1 Background to the Carlisle Southern Link Road

- 1.1.1 Cumbria County Council is proposing to construct a new Carlisle Southern Link Road (CSLR) (also referred to herein as ‘the Scheme’) between Junction 42 of the M6 and the A595 at Peter Lane, joining up with the Carlisle Northern Development Route (CNDR) – the A689 – that provides a northern and western bypass of Carlisle (opened to traffic in 2012) and joins back to the M6 at Junction 44. This will complete a modern highway network as an orbital route around Carlisle. CSLR will be 8.1 km long, passing to the south of the villages of Brisco, Durdar and Cummersdale, and also Carlisle Racecourse. Figure 1.1 in Volume 2 shows its location and the red line boundary for the planning application.
- 1.1.2 CSLR is being proposed to bring significant benefits; in particular, it would directly support delivery of a major mixed used development proposed to the south of Carlisle, referred to as St. Cuthbert’s Garden Village. When complete, St. Cuthbert’s will deliver up to 10,000 new homes together with community, employment, retail, and education facilities. CSLR would provide the increase in road capacity critical to unlocking and accelerating large-scale housing growth. The route would also support opportunities for walking, cycling, and public transport within the wider development which are important aspects of the Garden Village’s placemaking ‘vision’.
- 1.1.3 The Scheme would also improve access to West Cumbria and the North East by providing a high-quality east-west link between the A595, which serves the Port of Workington and Sellafield, and the A69 through to Newcastle. CSLR would significantly improve access for businesses and employees and would help to maximise the economic benefit to the county.
- 1.1.4 A third key driver for CSLR is to improve road transport resilience and local journeys, as there are a number of issues with the road network on the southern approaches to Carlisle. In particular, the A6 London Road faces congestion at busy times of the day. Any future growth of the city, including the Garden Village development, is likely to make congestion worse and increase journey times without the Scheme. In addition, the city only has two existing crossings of the River Caldew, and so any disruption to these routes can create severe problems. CSLR would provide a key remedy to both of these issues.
- 1.1.5 Along its 8.1 km length, the Scheme includes four new roundabouts, the tying into and upgrading of one existing roundabout (at the A595/A689 junction), three new road bridges for the main carriageway, one new road bridge for a side road over the Scheme, and four pedestrian / cyclist bridges. It will cross two railways, the West Coast Main Line and the Cumbrian Coast Line, and two rivers, the River Petteril and River Caldew. Further information about the Scheme can be found in Chapter 2.

1.2 The Purpose of this Environmental Statement

- 1.2.1 This document is an Environmental Statement (ES), which presents a description of the Scheme, the likely significant effects arising from its construction and operation, the measures to avoid or reduce such effects and the alternatives considered. The ES has been prepared by Capita Real Estate and Infrastructure Ltd., who fulfil the role of designer and environmental/technical consultants and are hereafter referred to as Capita. Capita is acting on behalf of Cumbria County Council, the applicant.

- 1.2.2 This ES is submitted as part of the application for planning permission for the Scheme and is produced in accordance with the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations).
- 1.2.3 EIA is a statutory process which is required for certain types of project that need planning permission. It provides a means of drawing together, in a systematic way, an assessment of a project's likely adverse or beneficial significant effects on the environment. It aims to protect the environment by ensuring that a consenting authority, when deciding whether to grant permission for a project, does so in the full knowledge of likely significant effects, and takes this information into account in the decision-making process. The ES is the formal output of the EIA that supports this process.
- 1.2.4 The ES takes account of the Scoping Opinions issued on the 14th January 2019 by the local planning authority (included as Appendix 1.1 of this ES) and other stakeholders.

The Applicant

- 1.2.5 Cumbria County Council is both applicant, (“the Applicant”) and determining authority for the planning application for the Scheme. Under Regulation 64 of the 2017 EIA Regulations *‘where an authority, or the Secretary of State, is bringing forward a proposal for development and that authority or the Secretary of State, as appropriate, will also be responsible for determining its own proposal, the relevant authority of the Secretary of State must make appropriate administrative arrangements to ensure that there is a functional separation, when performing any duty under these Regulations, between the persons bringing forward a proposal for development and the persons responsible for determining that proposal’*.
- 1.2.6 In accordance with Regulation 64, Cumbria County Council has taken appropriate measures to separate the persons bringing forward the Scheme and the persons responsible for determining the Scheme application to avoid any conflicts of interest.

1.3 Project Team

- 1.3.1 The project team for this ES is set out in Table 1.1.

Table 1.1 Project Team

Project Role	Company/Organisation
The Applicant	Cumbria County Council
Highway Design Town Planning EIA Management Nature Conservation Landscape Character Visual Impact Outdoor Access & Recreation Water Environment Geology & Soils	Capita
Air Quality Noise & Vibration	GL Hearn
Archaeology	Wardell Armstrong
Agricultural Land Use	Patrick Stephenson Ltd

1.4 Statement of Competence

1.4.1 The authors of this ES, along with a summary of their experience, are listed in Table 1.2.

Table 1.2: Competence and technical experience

Chapter/ Lead Author(s)	Experience
<p>Environmental Statement (ES) Coordination and Review</p> <p>Peter George BSc. Oceanography with Biology, HND Applied Biology, MEnvSc, CEnv</p> <p>Scott Johnson BSc. Environmental Sciences, MSc. Environmental Assessment & Management, MIEMA, CEnv</p>	<p>Peter is a Chartered Environmentalist with nearly 30 years' experience in environmental consultancy, specialising in EIAs for infrastructure projects and ES reviews. He is currently Capita's EIA technical lead and Environmental Planning Business Director.</p> <p>Scott is a Chartered Environmentalist with 14 years' experience of coordinating EIA work, mainly of highways development schemes. Scott's key skills include; project management, EIA coordination - including the Design Manual for Roads and Bridges and WebTAG, strategic environmental assessment, sustainability appraisals, health impact assessment, equalities impact assessment and integrated impact assessment.</p>
<p>Non-Technical Chapters</p> <p>Andrew Kenny BA Geography</p>	<p>Andrew has 5 years' experience in environmental assessment. Andrew's experience includes coordination of EIAs, compiling ESs and addenda, contributions to SEAs, Habitats Regulations Assessments, assessment of planning applications and sub-contractor management as well as the planning coordination and delivery of ecology surveys.</p>
<p>Air Quality</p> <p>Xiangyu Sheng BSc Applied Physics, BEng, MSc, MPhil, PhD</p>	<p>Sian has over 25 years' experience in air quality with a wide range of expertise in air quality emission, assessment and monitoring, dust monitoring and management, air dispersion and odour modelling, emission inventory, environmental impact assessment and climate change, using a range of modelling tools, including ADMS, Aermol, Webtag and DMRB. She has provided formal technical evidence for planning meetings and at public inquiries.</p>
<p>Cultural Heritage</p> <p>Cat Peters BA (Hons) (Ancient History and Archaeology) MLitt (Archaeology) ACIfA</p>	<p>Cat has 15 years' experience as an archaeologist covering large- and small-scale projects in both rural and urban environments. She also has extensive experience as an archaeological researcher. Cat has led on desk-based assessments, heritage impact assessments, EIA, landscape surveys, archaeological watching briefs, archaeological evaluations and archaeological building recordings. Most recently she has taken the lead on Wardell Armstrong's non-intrusive archaeological input for parts of the HS2 scheme.</p>
<p>Nature Conservation</p> <p>Tabatha Boniface BSc.(Hons) Ecology, MIEEM, CEnv</p>	<p>Tabatha is a professional ecologist, with 17 years' experience carrying out habitat and protected species surveys across the country. She is a Chartered Environmentalist and Full Member of the Chartered Institute of Ecology & Environmental Management.</p> <p>She has previously worked for Natural England where she oversaw the conservation and management of all SSSIs in the Wirral and South Lancashire areas. She also responded to planning applications and advised on Appropriate Assessments under the Habitats Regulations.</p>

Chapter/ Lead Author(s)	Experience
<p>Landscape Character</p> <p>Rosie Place BA(Hons) Landscape Architecture, PGDip Landscape Architecture, CMLI</p>	<p>Rosie is a Chartered Landscape Architect with 7 years' experience in landscape design and landscape visual impact assessment. Her experience covers transport infrastructure schemes, sustainable transport initiatives and large flood defense schemes amongst others. She led the landscape assessment work on the Stage 2 design development for CSLR.</p>
<p>Landscape Visual Impact</p> <p>Timothy Cousins BA(Hons) Landscape Architecture CMLI</p>	<p>With 8 years' experience Timothy is a Chartered Landscape Architect with experience in landscape design, assessment, construction and environmental/ conservation contracting. He also has experience in environmental assessments, road restraint systems (RRS), engineering and specialises in the application of Auto CAD, Civil 3D and Revit.</p>
<p>Agricultural Land Use</p> <p>Patrick Stephenson BSc.(Hons) Agriculture</p>	<p>With over 35 years' experience in agricultural consultancy. Patrick has advised on all aspects of agriculture for numerous projects. Work includes, full agronomy service; including waste management plans, fertilizer regimes, soil assessments, whole business management, business appraisals, farm management work on behalf of banks and individuals, trial results interpretation, and telephone advice. He has been responsible for agricultural assessment work undertaken as part of the EIAs for major road improvement schemes, planning developments, carbon capture scheme Yorkshire, and national utilities improvements.</p>
<p>Noise & Vibration</p> <p>Josep Simona BEng Environmental Chemistry MSc Natural Resources Engineering MloA, Associate IAQM, CEnv, MIEEnvSc</p>	<p>Josep has over 15 years' experience in environmental noise and vibration, and has undertaken transport related noise assessments for numerous projects such as new and altered roads, railway lines, high speed rail, park and share facilities, construction compounds, industrial facilities, urban redevelopment and residential development. Josep previously led the noise element in the smart motorway projects for the M1 J23a-25 and at the M1 J13-16 and in the A47 Improvements within Highways England's Collaborative Delivery Framework.</p>
<p>Outdoor Access & Recreation</p> <p>David Carr BA(Hons) Urban Studies & Planning, Diploma Town & Regional Planning, MRTPI</p>	<p>David is a Senior Transport Planner with over 17 years' experience transport planning. His experience spans sustainable transport studies, travel plans, WCHAR audits, cycle audits, active travel / cycle strategies, feasibility studies and stakeholder consultation.</p>
<p>Water Environment</p> <p>Robin Chase BA(Hons) Engineering Mechanics, MSc Project Management, PGDip Agricultural Engineering (Soil & Water), CEnv</p>	<p>Robin has over 30 years' experience in river management, river restoration, land drainage and flood risk engineering for both fluvial and coastal works. He has assessed, designed and managed flood defence infrastructure, Natural Flood Management potential in river catchments, WFD assessment for flood defence and infrastructure projects and the selection of mitigation measures for Heavily Modified Water Bodies.</p>

Chapter/ Lead Author(s)	Experience
<p>Geology & Soils</p> <p>Martin Penny BEng Civil Engineering, FGS GMICE</p>	<p>Martin is an engineer with 28 years' highways, geotechnical and geo-environmental engineering experience, focussing on preliminary sources (desk-based) studies, design and supervision of ground investigations and production of interpretative reports, all in accordance with the principles set out in HD22/08 Managing Geotechnical Risk. Martin has recently been involved in the design, site supervision and project management of two sizeable ground investigations and associated reporting for a strategic highway improvement scheme in central Sunderland and the second stage investigation for Carlisle Southern Link Road.</p>
<p>Cumulative Impacts</p> <p>Andrew Kenny</p> <p>James Lumsdon MSc Environmental Protection and Management BSc (Hons) Sustainable Environmental Management PIEMA</p>	<p>Andrew has 5 years' experience in environmental assessment. Andrew's experience includes coordination of EIAs, compiling ESs and addenda, contributions to SEAs, Habitats Regulations Assessments, assessment of planning applications and sub-contractor management as well as the planning coordination and delivery of ecology surveys.</p> <p>James has 5 years' experience in environmental assessment. James' key skills include; EIA, cumulative impact assessment, environmental permitting, agricultural land-use impacts assessment, assistance with ecological surveys and public consultation.</p>

1.5 Standards and Certifications

- 1.5.1 Whilst adopting a proportionate approach to EIA, this ES meets statutory requirements and best practice guidance from relevant professional Institutes. It has also been prepared in accordance with the key principles of the Institute of Environmental Management and Assessment (IEMA) Quality Mark.
- 1.5.2 The EIA has been undertaken in compliance with The Town and Country Planning (Environmental Impact Assessment) Regulations 2017, hereafter referred to as the EIA Regulations, with the core of the assessment undertaken in accordance to the Design Manual for Roads and Bridges (DMRB) and additional, discipline-specific, guidance and best practice used where appropriate.
- 1.5.3 The EIA process has been an integrated and iterative part of Scheme design. It has been employed as a tool at key points in the design process to improve the design for the environment, and in order to achieve environmental enhancement where feasible.
- 1.5.4 A staged EIA review process has been followed to ensure key stakeholders have had adequate opportunity to input to the approach, the assessment and its reporting. Their input has also used to inform the scheme design. This collaborative approach has ensured key stakeholders are engaged and that their input has been reflected in the assessment prior to publication of this ES, in line with EIA best practice.
- 1.5.5 Each technical chapter is based on the Scoping Opinion and has been produced by competent specialists and subject to appropriate technical and peer review.

1.6 Environmental Impact Assessment for Development

1.6.1 The term ‘Environmental Impact Assessment’ (EIA) encompasses a process that must be followed for certain types of project requiring development consent. It provides a means of drawing together, in a systematic way, an assessment of a project’s likely significant effects on the environment. It aims to protect the environment by ensuring that a consenting authority, when deciding whether to grant permission for a project, does so in the full knowledge of likely significant effects, and is able to take this information into account in the decision-making process.

1.7 Objectives and Principles

1.7.1 The main objectives of the environmental impact assessment process are to:

- ensure reporting of the likely significant environmental effects is undertaken so that planning and design decisions can be fully informed;
- ensure that the relative importance of the likely impacts is properly evaluated;
- aid the identification of measures that could reduce the magnitude of potentially negative impacts and the scope for such mitigation; and
- provide opportunities for stakeholders, including the public and statutory environmental bodies to comment on proposals.

1.7.2 A key principal of EIA is that it should be part of an iterative process for developing the scheme design; each running concurrently and having the ability to directly influence the other. As the environmental effects of the developing design are identified, the design can be adjusted to avoid or mitigate them. Similarly, as the design evolves the scope of assessment may change thereby ensuring that all likely significant effects are properly identified, assessed and where appropriate, mitigated.

1.8 Legislative Framework for the Assessment

1.8.1 In the context of town and country planning in England, the process of EIA is governed by The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (Statutory Instrument 2017 No. 571), (hereafter referred to as the ‘EIA Regulations’). These regulations apply to developments which seek planning permission under Part III of the Town and Country Planning Act 1990.

1.8.2 The EIA Regulations transpose into UK law the requirements of European Council Directive 2014/52/EU on “the assessment of effects of certain public and private projects on the environment” (amending Directive 2011/92/EU) (hereafter referred to as the ‘EIA Directive’);

1.8.3 At the time of writing the UK intends to leave the European Union on 31st October 2019 (a process commonly known as ‘Brexit’) although the UK may leave earlier if the withdrawal agreement between the UK and the EU is ratified before then. At this point a new statutory instrument, the Environmental Assessments and Miscellaneous Planning (Amendment) (EU Exit) Regulations 2018, is expected to come into force enabling the process of EIA to continue to operate with no substantive changes to the current legal framework. The amendments made through the statutory instrument will remove, where appropriate, references to obligations to EU law and will remove the need to re-examine any decision made prior to the UK leaving the EU as a result of the changes.

Screening (Regulation 5)

- 1.8.4 The EIA Regulations require that prior to consent being granted, an EIA must be undertaken for certain types of development. Those developments meeting the descriptions provided in Schedule 1 of the EIA Regulations must always be subject to an EIA (Schedule 1 development). Those projects meeting or exceeding the thresholds listed in Schedule 2, and/or are located in, or partly in a 'sensitive area' (as defined in regulation 2(1)), may require assessment if they give rise to potentially significant environmental effects (Schedule 2 development). A developer may seek a Screening Opinion from either the LPA or Secretary of State, as appropriate.
- 1.8.5 The Scheme meets the relevant criteria and in Schedule 2 and the Screening Opinion issued by the LPA on the 2nd August 2018 (Ref. SCR-1/18/03) considered the Scheme to fall under Schedule 2, Part 10.(f) '*Infrastructure projects – Construction of roads*' of the EIA Regulations, on the basis that that the applicable thresholds and criteria (i.e. an area of works over 1 hectare) will be exceeded. It was also considered that '*having had regard to the characteristics of the development, the environmental sensitivity of geographical areas likely to be affected by it and the characteristics of potential impact and their significance... the proposed project constitutes EIA development*'.

Scoping (Regulation 15)

- 1.8.6 An applicant minded to submit a planning application that constitutes EIA development may request a 'Scoping Opinion' from the LPA, setting out the scope and level of detail of the information to be provided in the ES to support an application.
- 1.8.7 A Scoping Report (Appendix 5.1) was submitted to the LPA on 29th November 2018 providing:
- a summary of the proposed Scheme and alternatives considered;
 - a description the baseline conditions of the environment, its sensitivities or constraints (as known);
 - an initial understanding of potential impacts and effects (including cumulative effects);
 - the proposed scope of work and methodologies to be applied under each environmental discipline in carrying out the EIA; and
 - the proposed structure of the ES to be submitted with any future planning application for the Scheme.
- 1.8.8 A Scoping Opinion (Ref. SCO-1/18/02) was subsequently adopted on 14th January 2019, establishing in writing the LPA's view as to the information that would need to be included within an ES. A copy of the Scoping Opinion is provided in Appendix 1.1.
- 1.8.9 Further details of the topics/elements 'scoped in' and 'scoped out' of the EIA are detailed below in Section 5.2 of this ES (*General Approach to Assessment*).

Environmental Statement

- 1.8.10 An EIA application must be accompanied by an ES. This ES represents the findings of the EIA process in relation to the Scheme and includes (in accordance with Schedule 4 of the EIA Regulations) the following information:
- a description of the proposed development comprising information on the site, design, size and other relevant features of the development;

- a description of the likely significant effects of the proposed development on the environment;
- a description of any features of the proposed development, or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment;
- a description of the reasonable alternatives studied by the developer, which are relevant to the proposed development and its specific characteristics and an indication of the main reasons for the option chosen;
- a non-technical summary; and
- any additional information relevant to the specific characteristics of the particular development or type of development and to the environmental features likely to be significantly affected.

1.9 Associated Assessments

- 1.9.1 Under the 2017 EIA Regulations there is a new requirement for the consenting authority to ensure that a coordinated approach is taken for EIA projects that are also subject to assessment under the Habitats Directive. For the CSLR scheme it has been necessary to undertake both a Water Framework Directive (WFD) assessment and a Habitat Regulations Assessment (HRA). These are presented as appendices in this ES (Appendices 14.1 and 8.17 respectively).
- 1.9.2 Where it has been appropriate to do so, the information on which these assessments are based has been taken or derived from the assessments of nature conservation and water resources respectively. However, they are also supplemented by additional data as necessary to enable the fulfill the assessment requirements.
- 1.9.3 Whilst meeting the separate legal requirements, the two assessments should be read in conjunction with the relevant chapters of this ES.

1.10 Presentation of Findings: Content of the Environmental Statement

Report Structure

- 1.10.1 The ES is presented in four volumes, together with a non-technical summary, as outlined below:
- **Volume 1 – Environmental Statement:** containing the introduction, detailed impact assessments for individual environmental topic chapters and a summary of the key findings. The volume is divided into three parts:
 - Part 1: Introduction
 - Part 2: Environmental Assessments
 - Part 3: Summary and Conclusions
 - **Volume 2 – Plans:** a plan series illustrating baseline conditions, key constraints, impacts and mitigation proposals.
 - **Volume 3 – Technical Appendices:** comprising all technical appendices which have been referred to in Volume 1 including, but not limited to, calculations, statistical analyses, field notes, site photographs and data records as appropriate.

- **Volume 4** – Supporting Documents: technical notes and other supporting documents
- **Non-Technical Summary:** a summary of the findings of the EIA as reported in the ES, written in non-technical language to facilitate easy understanding by those who may not have a knowledge of technical matters.

1.10.2 To assist with navigation of the volumes, the chapter numbers for the specific environmental topic areas covered in Volume 1, Part 2 correspond throughout Volumes 2 and 3.

Individual Assessment Topic Chapter Structure

1.10.3 For consistency, each topic area covered in Volume 1, Part 2 of the ES is structured as follows, with some variation to allow for the assessment and reporting requirements of individual topics:

- **Introduction:** defining the topic and its broad scope.
- **Assessment Methodology:** summarising the methodologies applied to gather baseline information, identify potential impacts and their effects and how the significance of these effects have been assessed. Reference is made to any guidelines or best practice followed and topic specific descriptors for determining the sensitivity of receptors and the magnitude of impacts are provided where available. Any important limitations or assumptions of the assessment process are highlighted as well as any consultation that has been undertaken to inform the assessment.
- **Baseline Conditions:** describing the current environmental condition pertinent to the topic being assessed and within the defined study area. Findings from desktop and field surveys are provided here.
- **Impact Assessment:** summarising potential impacts and effects of the proposed scheme, beneficial or adverse, permanent or temporary with an assessment of their significance without mitigation.
- **Mitigation, Monitoring and Enhancement:** describing proposed measures to avoid, reduce, restore or compensate for effects identified as significant. Opportunities for enhancement may also be considered.
- **Residual Impact Assessment:** summarising the potential residual impacts and effects of the proposed scheme, beneficial or adverse, permanent or temporary with mitigation included together with an assessment of their significance.
- **Cumulative Effects:** a consideration of the interaction of all environmental effects. These can be from a single project where the combined action of several different topic specific impacts cause an effect on a single receptor/resource or from different projects where the combined action of several different proposed projects cause an effect.
- **Summary:** providing a brief summary of the outcome of the assessment and recommendations.

1.10.4 Table 1.3 sets out the information required under Schedule 4 of the EIA Regulations and where this can be found in this ES.

Table 1.3 Location of information in the ES

Specified Information		Location within the ES
1	Description of the development, including in particular:	
(a)	a description of the location of the development	Volume 1, Chapter 2 – Scheme Description
(b)	a description of the physical characteristics of the whole development, including, where relevant, requisite demolition works, and the land-use requirements during the construction and operational phases.	Volume 1, Chapter 2, Topic Chapters 6-16
(c)	a description of the main characteristics of the operational phase of the development (in particular any production process), for instance, energy demand and energy used, nature and quantity of the materials and natural resources (including water, land, soil and biodiversity) used.	Volume 1, Chapter 2, Topic Chapters 6-16
(d)	an estimate, by type and quantity, of expected residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation and quantities and types of waste produced during the construction and operation phases.	Volume 1, Topic Chapters 6-16 Volume 3 – Technical Appendices
2	A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.	Volume 1, Chapter 3
3	A description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge.	Volume 1, Chapter 2, Topic Chapters 6-16 Volume 3 – Technical Appendices
4	A description of the factors specified in regulation 4(2) likely to be significantly affected by the development: population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape.	Volume 1, Topic Chapters 6-16 Volume 2 – Figures Volume 3 – Technical Appendices
5	A description of the likely significant effects of the development on the environment resulting from, inter alia:	

Specified Information		Location within the ES
(a)	the construction and existence of the development, including, where relevant, demolition works;	Volume 1, Chapter 2
(b)	the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources;	Volume 1, Chapter 8 – Nature Conservation Chapter 14 – Water Environment Chapter 15 – Geology & Soils Volume 3 – Technical Appendices
(c)	the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste;	Volume 1, Chapter 12 – Noise & Vibration Chapter 10 – Visual Impact
(d)	the risks to human health, cultural heritage or the environment (for example due to accidents or disasters);	Volume 1, Chapter 7 - Archaeology Volume 4 – Supporting Documents (Health Impact Assessment)
(e)	the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources;	Volume 1, Chapter 16, Topic Chapters 6-15
(f)	the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change;	Volume 1, Chapter 6 – Air Quality, Chapter 14 – Water Environment.
(g)	the technologies and the substances used.	Volume 1, Topic Chapters 6-15
5 (cont.)	The description of the likely significant effects on the factors specified in regulation 4(2) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development. This description should take into account the environmental protection objectives established at Union or Member State level which are relevant to the project, including in particular those established under Council Directive 92/43/EEC(a) and Directive 2009/147/EC(b).	Volume 1, Topic Chapters 6-16
6	A description of the forecasting methods or evidence, used to identify and assess the significant effects on the environment, including details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved.	Volume 1, Chapter 4 – Approach to the Assessment, Topic Chapters 6-16 Volume 3 – Technical Appendices

Specified Information		Location within the ES
7	A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of a post-project analysis). That description should explain the extent, to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover both the construction and operational phases.	Volume 1, Topic Chapters 6-16 Volume 2 - Figures Volume 3 – Technical Appendices
8	A description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters which are relevant to the project concerned. Relevant information available and obtained through risk assessments pursuant to EU legislation such as Directive 2012/18/EU(c) of the European Parliament and of the Council or Council Directive 2009/71/Euratom(d) or UK environmental assessments may be used for this purpose provided that the requirements of this Directive are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies.	Volume 1, Chapter 4
9	A non-technical summary of the information provided under paragraphs 1 to 8.	Non-Technical Summary (NTS)
10	A reference list detailing the sources used for the descriptions and assessments included in the environmental statement	Volume 1, Chapter 1 Introduction, Topic Chapters 6-16 and Volume 3 – Technical Appendices

1.10.5 This ES has been prepared in compliance with relevant legislation, and therefore:

- is based on Scoping Opinion (Ref. SCO-1/18/02), which is the most recent Scoping Opinion issued;
- includes the information reasonably required for reaching a reasoned conclusion on the likely significant effects of the development on the environment, taking into account current knowledge and methods of assessment;
- takes into account the results of relevant UK environmental assessments, which were reasonably available at the time of preparation, with a view to avoiding duplication of assessment;
- has been prepared by ‘competent experts’; and
- includes a statement from the developer outlining the relevant expertise or qualifications of such individuals – see Section 1.3.

2 Scheme Description

2.1 Overview and Site Description

- 2.1.1 The proposed Scheme is an 8.1 km single carriageway link road between the A595 at Newby West and the M6 at Junction 42, to the south of the main conurbation of Carlisle City. The planning boundary ('red line boundary') (see Figure 1.1 in Volume 2) includes also existing roads for which 'through traffic' is being removed and displaced onto CSLR for minor works (discussed below), as well as cycle path extensions beyond the proposed new road (see Section 2.3).
- 2.1.2 This route will include new junctions linking existing radial routes into Carlisle and St Cuthbert's Garden Village. The route will include bridges over two main railway lines and the Caldew and Petteril rivers, a network of footways and cycleways and an extensive programme of landscaping and environmental mitigation.
- 2.1.3 The route of the Scheme passes through predominantly agricultural land interspersed with small woodland areas, on a generally flat topography, while slightly more undulating in the east. The topography broadly varies from approximately 45 mAOD at its western end, increasing gradually in elevation to approximately 70 mAOD west and south of Durdar at the centre of the route, to 55 mAOD at its eastern end where it meets the M6. There are low points at the River Caldew (passing through the area at 25-30 mAOD) and River Petteril (c.40 mAOD). The topography is shown in Figure 9.2 of Volume 2 of this ES.
- 2.1.4 Settlements in the area comprise mainly isolated farmsteads or individual properties, plus villages or discreet suburbs to the north of the proposed route that are separated by agricultural fields. These settlements include (from west to east) the ward and Carlisle city suburb of Morton, and the villages of Cummersdale, Durdar and Brisco.
- 2.1.5 The route will cross two railways, the West Coast Main Line and the Cumbrian Coast Line, and two rivers and their floodplains, the River Caldew and River Petteril. The hillier area lies between the West Coast Main Line and the M6. The Scheme passes across and within the valley containing the River Eden Special Area of Conservation (SAC) and River Eden and Tributaries Site of Special Scientific Interest (SSSI) at the crossing of the River Caldew.
- 2.1.6 Relative to ground level, the road itself would vary from being in low cutting to being on embankment. It would be up to 10.5 m below ground level to the east of the River Caldew, 1 – 2.5 m below ground level near the A595 in the west and from Durdar Bridge to Brisco and up to 5 m below ground level on the approach to Brisco Roundabout. Generally, where the road is on embankment, it would be up to 3 m above ground level, such as in places between Durdar and Brisco and approaching the West Coast Main Line. The road would be higher in the Caldew Valley (embankment section 10 – 14 m above ground level) and east of the River Petteril approaching the M6 (6 – 12.5 m), owing to the existing topography. Other parts of the Scheme would rise above ground level, such as cycle bridges (up to 9 m above ground level), Durdar Bridge (7 m) and other earthworks, including noise and visual screening.
- 2.1.7 The road width would vary from 9.3 to 16.5 m, with an additional 10 m for verges and the multi-user path. Roundabouts would be wider within the corridor, generally being approximately 150 m wide.
- 2.1.8 The Scheme includes four new roundabouts where the new road connects with the existing road network, as well as enlargement of the existing A595 Newby West

roundabout. The Scheme has four road bridges, an accommodation overbridge, and four shared use bridges which facilitate the multi-user pathway. The roundabouts are:

- Newby West Roundabout (existing) – CSLR junction with the A595 Wigton Road and A689 (CNDR);
- Cummersdale Roundabout (new) – CSLR junction with the B5299 Dalston Road;
- Durdar Roundabout (new) – CSLR junction with Buckabank Road, with addition of a new spur that will support a part of the future St. Cuthbert's Garden Village development, linking the CSLR with Durdar Road;
- Redcat Roundabout (new) – CSLR junction with Burthwaite Road; and
- Brisco Roundabout (new) – CSLR junction with Brisco Road / Wreay Road.

2.1.9 The road bridges comprise, from west to east:

- a three-span bridge that crosses the Cumbrian Coast Line Railway and the River Caldew towards the western side of the Scheme;
- a single-span bridge allowing Durdar Road, with pedestrian and cyclist provision, to cross over the Scheme;
- a single-span bridge crossing the West Coast Main Line; and
- a single-span bridge carrying the Scheme over the River Petteril towards the eastern side of the Scheme.

2.1.10 The other bridges comprise:

- three pedestrian and cyclist 'shared use' bridges running east-west, parallel to the Scheme that cross over:
 - the A595 Wigton Road,
 - the B5299 Dalston Road, and
 - the new Durdar Link Road.
- one pedestrian and cyclist 'shared use' bridge running north-south, crossing the Scheme at Brisco Road / Wreay Road; and
- an accommodation overbridge between the River Caldew and Durdar Roundabout to provide access for agricultural activity at Peastree Farm.

2.1.11 Elevations of the road bridges and A595 footbridge are shown on Figure 2.1.

2.1.12 Additionally, works will be undertaken on Peter Lane, at the western extent of the Scheme, and Newbiggin Road, to which the Scheme runs parallel for a significant length, to improve cycle infrastructure and reduce vehicle speeds. Tracks from the Scheme will also be provided to access farmland and buildings.

2.2 Scheme Objectives

2.2.1 The current Strategic, Transport, Economic and Environmental objectives for the Scheme are summarised in Table 2.1. These objectives have been refined as the scheme has progressed through different stages of development, with the initial objectives being the delivery of major mixed-use development at Carlisle South, to reduce congestion on southern radial routes and in city centre and assist east/west movement in Cumbria.

Table 2.1: Objectives for the Scheme

Theme	Objective
<u>Strategic Objectives</u>	
Strategic Context	Enable the delivery of St Cuthbert's Garden Village through the construction of the Carlisle Southern Link Road (CSLR) by 2023.
Infrastructure	Improve access to South Carlisle and improve connectivity from the M6 to the A595 as identified in the LEP's Cumbria Infrastructure Plan (2016)
Flood Risk Management	Maximise opportunities for the attenuation of flood risk from increased surface water runoff from the CSLR through integration of sustainable drainage measures to mitigate increases in surface water flows.
<u>Transport Objectives</u>	
Strategic Route	Make a significant contribution to the transport network in the North-West region, creating a new high quality link between the A595 from the west and the M6 Junction 42.
Connectivity	Provide a corridor for the movement of people and goods between destinations including St Cuthbert's Garden Village and West Cumbria to connect communities.
Journey Time	Reduce traffic congestion and improve the reliability of transport links by increasing highway capacity in South Carlisle, and between the M6 and A595 strategic corridors.
Road Safety	Improve road safety on the existing network for all road users.
Resilience	Improve transport resilience in Carlisle by providing additional crossings of the River Caldew and River Petteril.
<u>Economic Objectives</u>	
Economic Growth	Enable economic development along the strategic M6 corridor and as part of St Cuthbert's Garden Village. Enable growth at existing and new business and employment sites by improving access and allowing better connections with markets, supply chains and workforces.
Education and Training	Improve access to training and employment opportunities by providing better connectivity between major employment sites, future residential areas and education providers.
Placemaking	Enable placemaking as part of the master planning process which aligns with the aspirations for St Cuthbert's Garden Village.
<u>Environmental Objectives</u>	
Urban and Natural Environment	Minimise impacts on the environment along the scheme corridor, seeking enhancements, and where practical include measures to allow future integration of a garden village.
Emissions	Reduce road vehicle emissions of air pollutants in areas of Carlisle that are currently adversely affected by traffic congestion.

Theme	Objective
Sustainable Travel	Improve accessibility for non-car users by providing new routes for sustainable travel and creating opportunities to support active lifestyles.
Biodiversity	Minimise, where practical, the impacts of the scheme on ecology, nature conservation receptors and achieve a biodiversity net gain.

2.3 Scheme Alignment

2.3.1 The proposed Scheme alignment is shown in Figure 1.1. As stated previously, the Scheme would provide a link from the A595 at Newby West Roundabout to the M6 at Junction 42 (Golden Fleece Roundabout). A more detailed description from west to east is provided in Table 2.2, divided by chainage (distance along the road), with the height above or below existing ground level and as shown in Figure 2.2 to 2.6.

Multi-User Path

2.3.2 A 3 m-wide pedestrian and cyclist ‘shared use’ path will run along the northern edge of the Scheme. As described in Section 2.1 above, there will be east-west overbridges provided that create a continuous link without crossings for most of this length, from Scalegate Roundabout south-east of Durdar to the A689, linking up to an existing multi-user path that parallels the A689 up to the M6. The multi-user path will cross Brisco Road and Burthwaite Road at-grade.

2.3.3 The multi-user path will also include a new connection along the A6 to the north, up to the petrol station approximately 600 m north of Junction 42. It will also connect to a north-south pedestrian / cyclist overbridge over the CSLR at Brisco Road, and include a 500 m long shared use path to connect with the Cumbria Way / National Cycle Route 7 at a point to the north of the road, in the Caldew Valley.

Materials

2.3.4 The Scheme seeks to achieve a net materials balance, whereby the material generated from cuttings would supply the material required to create embankments, landscape bunds and any other earthworks required. This will avoid the need to import or any new material, thus minimising construction transport to the site, as well as avoiding the need for bulk off-site disposal.

2.3.5 Other materials needed for construction will be those typical for a road project, including concrete, asphalt concrete, stone, timber, and steel.

Road surface

2.3.6 The new road surface will consist of flexible asphalt surfacing, designed in accordance with HD26 from the Design manual for Road and Bridges. It can be laid to a depth of 45 mm (total thickness, including binder course and base thickness is 300 mm).

Cuttings

2.3.7 Cuttings will generally be constructed with a 1:3 gradient, and where possible these have been slackened to 1:10 and the land will be handed back for agricultural use.

Table 2.2: Scheme description by chainage

Chainage	Scheme description	Vertical Alignment
0-150	No changes are anticipated on this section of the A689.	At-grade.
150-800	<p>The A689 will be widened and realigned slightly south on its approach to the A595 Newby West roundabout.</p> <p>Newby West roundabout will be enlarged to accommodate additional traffic flows.</p> <p>Peter Lane will be stopped up at its western end, with the exception of providing cycling infrastructure linking the Scheme and Peter Lane.</p> <p>A shared use (walking and cycling) bridge will be provided over the A595 on the northern side of the roundabout.</p>	<p>Road: at-grade to cutting up to 1 m below ground level.</p> <p>Pedestrian / cycle bridge: 7 m above ground level.</p> <p>Earthworks / verges: bund up to 3 m above ground level north of the road.</p>
800-1900	<p>From the A595 roundabout, the route runs in a small cutting in a south-easterly direction through agricultural land and woodland.</p> <p>At chainage 1600, a new, four-arm Cummersdale Roundabout will accommodate the junction with the B5299 Dalston Road.</p> <p>A shared use bridge will be provided over Dalston Road on the northern side of the roundabout.</p>	<p>Road: cutting up to 2.5 m below ground level.</p> <p>Pedestrian / cycle bridge: 8 m above ground level.</p> <p>Earthworks / verges: bund up to 2.5 m above ground level north of the road.</p>
1900-2900	<p>The Scheme continues in a cutting in a south-easterly direction, crossing predominantly agricultural land. The depth of this cutting increases as the Scheme drops towards the River Caldew.</p> <p>At chainage 2900, a 500 m long shared use path travels in a north-easterly direction to connect with the Cumbria Way / National Cycle Route 7.</p>	<p>Road: cutting up to 5 m below ground level.</p> <p>Earthworks / verges: no bunds, verges below ground level.</p>
2900-3400	A large three-span bridge will cross both the River Caldew and the Cumbrian Coast Line Railway, with a total span of approximately 180 m. Beyond this, the CSLR continues on an embankment to the southern edge of the River Caldew valley up to chainage 3400.	<p>Road: on bridge 18.5 m above the river.</p> <p>Earthworks / verges: 10 to 12.5 m bund within river valley for approximately 200 m of road length.</p>

Chainage	Scheme description	Vertical Alignment
3400-4100	<p>Remaining on a south-easterly direction, the Scheme is in a deep cutting which becomes shallower towards chainage 4100. The Scheme passes through predominantly agricultural land.</p> <p>Peastree accommodation overbridge will be provided at chainage 3950 to provide access for agriculture.</p>	<p>Road: cutting up to 10.5 m below ground level.</p> <p>Accommodation overbridge: up to 4.7 m above ground level to the proposed deck.</p> <p>Earthworks / verges: no bunds, verges below ground level.</p>
4100-5900	<p>The Scheme remains in a cutting for a further 200 m and sweeps left (easterly direction) to accommodate a new four-armed Durdar roundabout onto Buckabank Road (chainage 4300).</p> <p>From the north eastern arm of the roundabout, a new link road will pass through agricultural land for approximately 1000 m before joining onto Durdar Road.</p> <p>The Scheme continues in a southerly direction in a cutting, before tuning east to cross the existing Durdar Road at chainage 5100.</p> <p>The Scheme then carries on nominally at ground level, surrounding by a mixture of agricultural land and woodland.</p> <p>A shared use bridge will cross over this new link road immediately north of the roundabout.</p> <p>The existing Buckabank Road will be stopped up where it crosses the Scheme between Oak Dean and Beech House with no direct connection to the new road provided at this point.</p> <p>A new bridge will carry the existing Durdar Road over the CSLR.</p>	<p>Road: from c.5 m below ground level to 2 m below ground level, with a short section up to 2 m above ground level east of Durdar road (low point in existing ground level).</p> <p>Pedestrian / cycle bridge: up to 4.8 m above ground level.</p> <p>Durdar Road bridge: up to 7.8 m above ground level.</p> <p>Earthworks / verges: no bunds, verges below ground level.</p>
5900-7300	<p>A new four-arm Redcat Roundabout will provide the junction with Scalegate Road at chainage 5900. The Scheme continues in an easterly direction on a small embankment for approximately 1400 m.</p> <p>A new four-arm Brisco roundabout will be provided at the junction with Brisco Road (chainage 7300).</p>	<p>Road: falls at shallow grade on embankment up to 2.5 m below ground level then also rises at shallow grade to Brisco Roundabout.</p> <p>Pedestrian / cycle bridge: 8 m above ground level.</p>

Chainage	Scheme description	Vertical Alignment
	<p>A shared use bridge will be provided over the CSLR at chainage 7150 to link onto the north and south of Brisco Road.</p> <p>The priority of the Brisco and Newbiggin crossroads will be changed. Newbiggin Road will be stopped up to vehicle traffic between Scalegate Road and Brisco Road. Access to properties will be retained.</p>	<p>Earthworks / verges: rising to road on embankment, with also a 4 m high noise bund south of Langdale to the north of the road, west of Brisco Roundabout.</p>
7300-8700	<p>The Scheme continues on a small embankment for a further 500 m, crossing the West Coast Main Line Railway (which is in a cutting) via a new structure at chainage 7850. The existing railway bridge carrying Newbiggin Road will be retained for maintenance access only.</p> <p>The CSLR continues to descend for a further 300m on embankment leading to a low point near the Petteril Bridge at chainage 8400, then rises on an embankment at similar grade, turning eastwards to connect with Junction 42 of the M6</p> <p>A link to Newbiggin Hall and Wreay Woods will be provided from chainage 8230.</p> <p>Sections of Newbiggin Road west and East of the West Coast Main Line Railway to be used for local access only.</p> <p>Newbiggin View and Station House are to be demolished.</p> <p>The car park at Wreay Woods will be relocated to the west side of the River Petteril.</p>	<p>Road: rises from 3 m above ground level to up to 12 m on the approach to the existing hill at M6 Junction 42.</p> <p>Earthworks / verges: rising to road on embankment.</p>
M6 J42	<p>A segregated left turn will be added to the northbound off-slip at M6 Junction 42. The A6 London Road north to Carlisle will be reduced from two lanes to one lane and the hard shoulder removed. A shared path will be provided on the southern side as far as the petrol station.</p>	<p>At-grade.</p>

Embankments and bunds

- 2.3.8 Embankments and bunds will generally be constructed with 1:2.5 slopes, and where the embankments are small, the slopes have been slackened to 1:10 where the land will be handed back agricultural use.

Bridge design

A595, Dalston, Buckabank and Brisco Road footbridges

- 2.3.9 These footbridges will all be of the same structural design and carry the 3 m wide shared use path over the new road. In elevation the deck follows a vertical curve that has its highpoint at approximately midspan of the bridge which provides continuous falls along the bridge deck. The structure comprises a single span concrete portal with weathering steel girders acting compositely with a reinforced concrete deck slab and in-situ reinforced concrete abutments. The abutments will be sandstone masonry faced, with a span between abutments of approximately 32 m.

Caldew bridge

- 2.3.10 This bridge will carry the new road over the River Caldew and Cumbrian Coast Line. It will be a three span structure accommodating a 2.5 m wide raised hardened verge, a 9.3 m wide carriageway and a 4.5 m wide raised hardened verge containing a 1 m wide separation strip and a 3.5 m wide shared use path, giving a width of 16.3 m between parapets. The two intermediate sandstone masonry faced support piers are situated in the river channel to give two side spans of approximately 54.5 m and a centre span of 70 m.

Peastree accommodation bridge

- 2.3.11 This is a single span bridge carrying an accommodation road over the new road. The structure accommodates a 4.5 m wide carriageway and a 1 m raised hardened verge on both sides of the carriageway, giving a width of 6.5 m between parapets.

Durdar Road bridge

- 2.3.12 This bridge carries Durdar Road over the new road. It is a single span bridge, and accommodates a 7.3 m wide carriageway, a 5 m shared use path and a 2 m raised hardened verge, giving an overall width of 14.3 m between parapets.

Brisco railway bridge

- 2.3.13 This bridge will carry the new 12 m wide carriageway, including the shared use path, over the West Coast Main Line, and comprises a single span concrete portal with contiguous precast prestressed beams and reinforced concrete deck slab and in-situ reinforced concrete abutments supported on in-situ reinforced concrete bored piles. There will be buffer strips adjacent to the carriageway and shared use path.

River Petteril bridge

- 2.3.14 This single span bridge will carry the new road over the River Petteril. The structure is a single span concrete portal with precast prestressed beams supporting reinforced concrete deck slab in a beam and deck configuration. The structure accommodates a 13.6 m wide carriageway, with a 1.5 m wide buffer zone to the north separating the carriageway from the 3 m wide shared use path. There is a varying width hardened verge to the south of the carriageway. The overall width of the bridge is a constant 31.4 m between parapets.

Barriers and fencing

- 2.3.15 The highway boundary fencing will generally be post and wire, stockproof where necessary and approximately 1.2 m high. There will be sections of badger and otter fencing as required. Road restraint / safety barriers will be metal up to about 0.8 m, bridges will have parapets approximately 1.5 m high with 1.8 m high parapets with solid infill panels over the railways.

Lighting and cabling

- 2.3.16 The Scheme will be lit from the A595 Newby West roundabout up to and including 150 m beyond Dalston roundabout. Additionally, it will be lit for 150 m prior to Durdar roundabout to Junction 42 of the M6. The lighting columns will be approximately 10 m in height on the main route, with approximately 35 m spacing in a nominally single sided arrangement. There will be additional lighting where the cycle route diverts from the CSLR, however, the columns will be 6 m in height and have a much lower lumen output.
- 2.3.17 To minimise light spill and the impact on protected species, adjacent properties and the landscape the street lighting will comply with the current design standard BS 5489-1:2013 '*Code of practice for the design of road lighting. Lighting of roads and public amenity areas*', the performance standard EN 13201-2:2015 '*Road lighting. Performance requirements*', and the use of full cut-off lanterns mounted horizontally with a 0° bracket arm inclination will be installed. The specification of LED light sources will also help reduce energy consumption, carbon dioxide emissions and maintenance visits. At the Scheme's junctions a higher level of illuminance is required to improve the visual task for road users negotiating the 'conflict areas', as defined in the British Standard.
- 2.3.18 The proposed luminaire is the Thorn R2I2-M LED model, which offers low energy lighting only requiring planned maintenance every six years for electrical testing, in line with the Overseeing Organisation's specification. The LEDs will be warm white, 3000°K colour temperature with no UV and a lower blue light content to which species such as bats are more sensitive. LED light source and flat lens ensures that light is directed towards the carriageway and shared use pathway with no light spill above the horizontal.
- 2.3.19 While traditional street lighting operates from dusk until dawn, the proposed lighting scheme will operate at 100% from dusk until 21:00 and then dimmed by 50% until 06:00 hours, reducing environmental impact, carbon emissions and energy consumption. If necessary, rear shield may be specified to minimise the backspill of light in sensitive areas.

Drainage and Water Management

- 2.3.20 The Scheme is divided into a number of catchments based on topography and the proposed vertical alignment of the carriageway. The basic drainage and water management strategy for each catchment will be the same.
- 2.3.21 For most of its length the Scheme will feature over the edge drainage to under-drained grass channels located in both verges. The resulting filtration will provide the first level of Sustainable Drainage System (SuDS) treatment and the channels and filter trench volume will provide additional capacity to manage exceedance.
- 2.3.22 Where grass channels cannot be accommodated (primarily at roundabouts and bridges although there may be other localised areas) the drainage will be via gullies or kerb/deck

drainage units which will then discharge to the filter drainage system. Access chambers will be specified as catchpits to provide additional silt removal throughout the system.

- 2.3.23 From the filter drains the flows will discharge to eight detention ponds within each catchment. These will incorporate permanent water storage and boundary reed planting to provide a secondary level of SuDS treatment via a mix of settlement and adsorption. Ponds will also incorporate flow controls (vortex or similar) to provide attenuation and limit discharge to greenfield equivalent rates.
- 2.3.24 The ponds will be from approximately 47 m to 144 m in length and will discharge into existing watercourses with permanent water for ecological benefits.

Services

- 2.3.25 Significant diversion will be required for the Northern Gas Networks (NGN), which is a 450 mm steel high pressure pipeline that intersects the Scheme at an oblique angle south of Cummersdale. Approximately 300 m of the pipeline will need to be lowered by approximately 5 m south of Cummersdale. It is unlikely that a diversion will be required where the high pressure main intersects the shared use path between the Scheme and Cummersdale or at Durdar Road south of Carlisle Racecourse, due to the depth and pipe wall thickness of the main.
- 2.3.26 There are also diversions required on the medium pressure gas network.

Electricity

- 2.3.27 The Scheme's route has been designed to avoid the need to divert horizontal alignment of the Electricity North West (ENW) 133 kV and 33 kV overhead transmissions lines which run parallel along the south western edge of the Scheme area. A significant number of underground and overhead high voltage (HV) and low voltage (LV) distribution cables would be affected. Diversion of cables is likely at the following locations:
- Peter Lane – 11 and 33 kV overhead lines will need to be moved underground.
 - A595 roundabout existing sub-station will be relocated.
 - Dalston Road – diversion of existing LV and 11 kV underground cables into the proposed roundabout.
 - Cumbrian Coast Line Railway – diversion of 11 kV overhead line to underground route adjacent to the proposed shared use path.
 - Peastree Farm - Existing HV and LV buried cables in the vicinity of Peastree Farm and Buckabank Road leads to a potential opportunity for possible rationalisation of the existing network.
 - Brisco Road – existing buried LV and 11 kV cables to be diverted into proposed roundabout service verges.
 - M6 Junction 42 – existing buried 11 kV cables to be diverted into proposed roundabout arm service verges.

Water

- 2.3.28 United Utilities water mains will be affected by the Scheme, both the trunk main and water supply.

Communications

- 2.3.29 Existing BT copper and fibre cables laid in underground ducts or on overhead poles will be diverted to accommodate the proposed scheme in seven separate locations:
- A595 roundabout (BT Location 1) – fibre optic cable can remain in site, the existing overhead lines north of the A689 CNDR arm will need to be diverted.
 - Dalston Road (BT Location 2) – diversion of existing copper cable duct into proposed roundabout.
 - Durdar to Buckabank Road (BT Location 3) – advance diversion of existing ducts under the proposed CSLR cutting
 - Durdar Road (BT Location 4) – advance diversion of existing ducts under the proposed CSLR
 - Scalegate Road (BT Location 5) – Diversion of ducts into the proposed roundabout and link road.
 - Brisco Road (BT Location 6) – existing buried copper cables diverted into proposed roundabout service verges.
 - Newbiggin View and M6 Junction 42 (BT Location 7) – existing overhead connection to Newbiggin View and Station House is to be diverted underground prior to new embankment construction. The existing duct in Newbiggin Road arm of J42 roundabout is to be diverted into the service verge of the Scheme at this location, during the construction stage.
- 2.3.30 Virgin Media fibre cables will need diverting to accommodate the Scheme at M6 Junction 42.
- 2.3.31 Vodafone fibre cables laid in underground ducts at the A595 / Peter Lane junction and M6 Junction 42 will be diverted to accommodate the Scheme.

Gantries and signs

- 2.3.32 The Scheme will not have any gantries along its length. Each roundabout (Newby West, Cummersdale, Durdar, Redcat, Brisco and Golden Fleece), will have a direction sign on each approach. These are generally 5 m by 5 m, but up to 7 m by 7 m. Areas of these signs will be between 13.88 m² and 55.95 m². On the roundabouts themselves will be four warning chevron directional signs, with a turn left blue sign giving orders above facing each approach. There will also be the relevant merging signs on some arms of the roundabouts. Speed limit signs will be placed where required, generally on the entrance or exit from roundabouts.

2.4 Construction Programme

- 2.4.1 A preliminary construction programme has been developed with input from a contractor. This indicates that the Scheme will take approximately 24 months to construct, with site preparation, earthworks and construction commencing in April 2021 and the Scheme being opened for use in March 2023.
- 2.4.2 A principal contractor has not yet been appointed, and therefore at the time of writing exact details of the site preparation, earthworks and construction methods have not been finalised. To assess any potentially significant environmental effects of the construction phase, a number of assumptions have been made, based on industry standard/best practice, design team engineering experience and following advice from a contractor, in relation to the following:

- Haulage routes;
- Site working hours and days;
- Construction compound location;
- Temporary drainage solution;
- Foundation solutions; and
- Construction plant and equipment.

2.4.3 The construction phase will require a number of key activities. These are likely to be undertaken in the order below, with potential for these activities to overlap: site clearance and hedgerow removal, protection of sensitive ecological receptors such as tree roots, movement of construction vehicles, excavation, earthworks, material handling and storage, drainage works, construction of the Scheme with foundations and structures, and landscaping.

Haulage routes

2.4.4 The location of haulage routes is dependent on the construction start date. If construction commences in Spring, there is a full season for earthworks, and therefore the main haul routes will be on existing routes. If construction commences at a time of year when a full earthworks season cannot be utilised, then haulage routes will be required for construction of the structures, and general access to the roundabouts. These have been allowed for in the temporary land take and used in the assessment.

2.4.5 Haulage routes will primarily be on main line, however a 4 m wide haulage route may be required along the length of the main line between River Caldew and Dalston Road and Buckabank and River Caldew.

2.4.6 It is anticipated that construction traffic will access the Scheme at different locations dependent on the location of construction works. There are anticipated to be up to 200 HGV movements per day during the peak period to move 30,000 m³ of soil to fill areas at the eastern end of the Scheme. The HGVs will need to use Newbiggin Road, and this activity is anticipated to occur between June and November 2021, with a small amount of movement in early 2022 near the Junction 42 Golden Fleece roundabout.

Site working hours and days

2.4.7 Site hours are to be finalised, therefore for the purposes of this ES, the following will apply during construction:

- 0700hrs to 1900hrs Monday to Friday;
- 0700hrs to 1300hrs on Saturdays;
- No construction activities will take place on Sundays or Bank Holidays other than works necessitated by railway possession restrictions or emergency works; and
- It is assumed that railway possessions will be required to construct the bridges over the WCML and CCL, as well as maintenance works to the structure over the WCML. Possessions will be at night time, weekends and / or Bank Holidays only. No information is currently available as to the number of possessions that are likely to be required.

2.4.8 It is assumed that there will be 80 to 150 workers per day, which will peak in the summer months resulting in approximately 120 trips in the morning peak hour.

Construction compounds

2.4.9 Locations of the construction compounds have been included in temporary land requirements, with contractor input, with the following considerations taken:

- Appropriate access points to minimise traffic disruption;
- Safe area for storage of plant and materials;
- Sufficient working area to ensure good people to plant interface;
- Topography;
- Existing vegetation – selecting areas that require minimum clearance; and
- Minimising land take.

2.4.10 There are likely to be eight construction compounds along the Scheme, covering a total area of 10.8 ha. These are as follows:

- Newby West roundabout, 20,000 m² set up for approximately six personnel, welfare and stores etc. Generator prior to permanent power connection;
- Dalston roundabout, on line, 15,000 m², welfare facilities, storage, generator;
- Construction of west pier and span 1 of the River Caldew bridge, 5,000 m², small office set up, welfare, generator;
- Construction of east pier and spans 2 and 3 of River Caldew bridge, 10,000 m², small office set up, welfare, stores, lay down, generator;
- Middle compound at Durdar roundabout, 3,000 m², small office set up, welfare, stores, lay down, generator;
- Construction of Durdar Bridge, 12,000 m², combined office and welfare facilities and stores;
- Main compound, east of Brisco roundabout, 30,000 to 50,000 m² depending on land availability. Office set up for 40-50 personnel, main canteen and welfare facilities, briefing room, first aid etc. Temporary generator until permanent supply established. Tarmacked hardstand throughout.
- Construction of River Petteril bridge, 4,000 m², combined office and welfare facilities and stores.

2.4.11 Many of these construction compound areas will be within the permanent scheme area. It is assumed that these compounds will be created as required, according to the phasing of the works.

Lighting strategy

2.4.12 Artificial lighting sources will be required during the construction phase. This will include:

- Flood and security lighting to illuminate construction compounds, including temporary car parking areas and site offices. This will be primarily for health and safety purposes.
- Lighting for working areas, where required, for example where equipment is stored and any safety hazards present.

Temporary drainage

- 2.4.13 Prior to the commencement of works it is assumed that a temporary drainage strategy will be implemented to mitigate flood risk and sediment loading. Surface water from the Scheme's construction will be collected either by gullies, combined kerb drains and carrier drains or filter drains. These will flow to either the proposed attenuation pipes or the five proposed attenuation ponds. The runoff will then be released at a reduced flow rate into the nearby watercourses. While new connections are proposed at the existing drainage around the junctions, no new drainage outfalls have been proposed in the watercourses.
- 2.4.14 It is assumed that the temporary drainage strategy will include measures to remove silt, sediment, oil and grease, debris and to attenuate surface water runoff prior to controlled discharge. The measures will include Sustainable Drainage Systems (SuDS), and surface water will discharge into existing watercourses onsite at the existing greenfield runoff rate. Where permanent drainage components are used during the construction phase, all silt and debris build-up is assumed to be removed regularly and the permanent components fully reinstated on completion of construction activities.

Construction plant and equipment

- 2.4.15 The construction phase, including site preparation and earthworks will require a variety of different plant and equipment. The exact plant and equipment is as yet undetermined, however is expected to include the following:
- Dump trucks;
 - Excavators;
 - Tracked excavators;
 - Compaction plant;
 - Lorries;
 - Piling plant;
 - Concrete pumps;
 - HGVs;
 - Cranes;
 - Asphalt spreaders with support lorries;
 - 360° excavators;
 - Diesel generators;
 - Road rollers;
 - Truck mixer with pumps;
 - Compressors;
 - Poker vibrator;
 - Formworks (banging and hammering);
 - Formworks (hand tools / drills / winches);
 - Fork lift trucks; and
 - Scaffolding.

Demolition

- 2.4.16 Newbiggin View and Station House are to be demolished. Standard demolition techniques will be used with measures to prevent excessive dust generation put in place. These measures will be defined in a Construction Environmental Management Plan (see Volume 3 – Supporting Documents).

Piling

- 2.4.17 The type and location of piling for the Scheme has not been finalised, however it is considered likely that a continuous flight auger piling method will be used for the bridge foundations for the West Coast Main Line Railway crossing. Some sheet piling will be required for temporary works at the River Petteril.

Foundations

- 2.4.18 It is assumed there will be a temporary crane platform location for bridge deck construction over the WCML and River Caldeu. Approximately 5,000 m³ of stone is required to create a level platform.

Construction practice

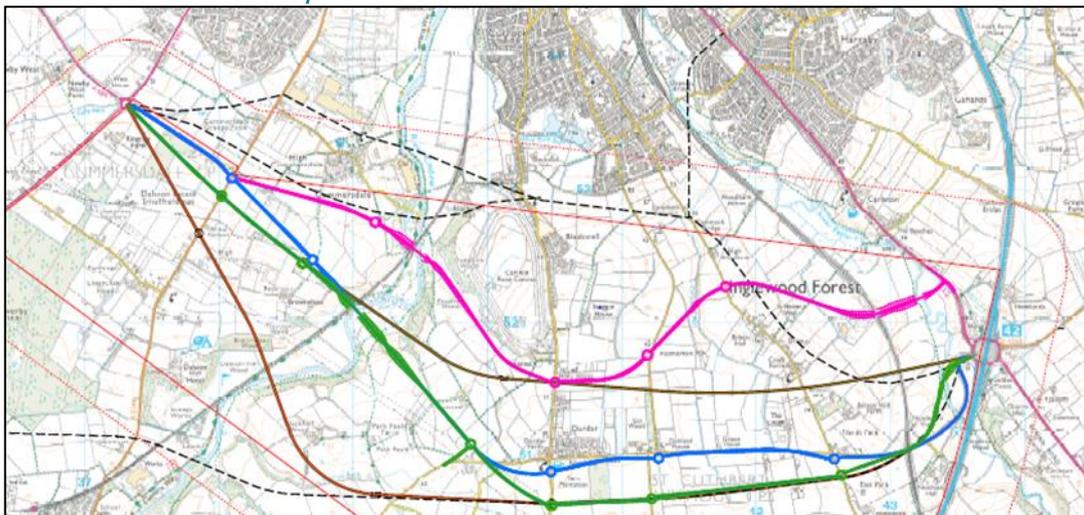
- 2.4.19 An outline Construction Environmental Management Plan (CEMP) has been prepared alongside the development of this ES (see Volume 3 – Supporting Documents). This includes information about the proposed approach to construction environmental management and good construction practice to be used on the Scheme. The CEMP will be secured by condition.

3 Alternatives Considered

3.1 Scheme History

- 3.1.1 At an early stage, a need was identified by both Carlisle City Council and Cumbria County Council to enable the continued economic growth of Carlisle into the future. Towards this end, improvements to both the road and rail network around the city and within Cumbria were considered as options for investment, to improve access to, and reduce pressure on, the local road networks in and around Carlisle.
- 3.1.2 The CSLR was identified as most appropriate for the developing needs of the city and surrounding area, due to the projected increase in population and subsequent requirement for new homes and jobs. A new highway would allow access to new housing and mixed-use developments such as the St. Cuthbert's Garden Village and provide opportunity for further development in the future.
- 3.1.3 The proposal for a link road/bypass to the south of Carlisle has a long history of feasibility considerations, including a study conducted by the Highways Agency in the early 1990s. In 2015, Cumbria County Council revived the proposals by commissioning a Stage 1 appraisal of possible options. This work was, in part, responding to details of an emerging Local Plan for Carlisle District which identified a major mixed-use urban extension to the south of the city. It was recognised that to accommodate the levels of traffic generation from 'Carlisle South' (now referred to as 'St. Cuthbert's Garden Village') as well as improving strategic east-to-west connectivity, a new link road connecting Junction 42 of the M6 to the A595 offered a potential solution.
- 3.1.4 A DMRB Stage 1 assessment, completed in 2016¹, developed and assessed seven potential routes within broad corridor to the south of the city, three of which were shortlisted for further appraisal (see Plan 3.1).

Plan 3.1 Initial Route Options Considered



- 3.1.5 The Stage 1 assessment was subsequently reviewed in 2017² taking into account revised objectives for the Scheme (see paragraph 2.2 for details). As part of the review, the initial 2016 route options sift was also repeated using the new project objectives to identify any 'showstoppers' which are likely to prevent a route option progressing at a subsequent

¹ Capita Property and Infrastructure Ltd, June 2016. *Carlisle Southern Link Road TAG Part 1 / DMRB Stage 1 Report.*

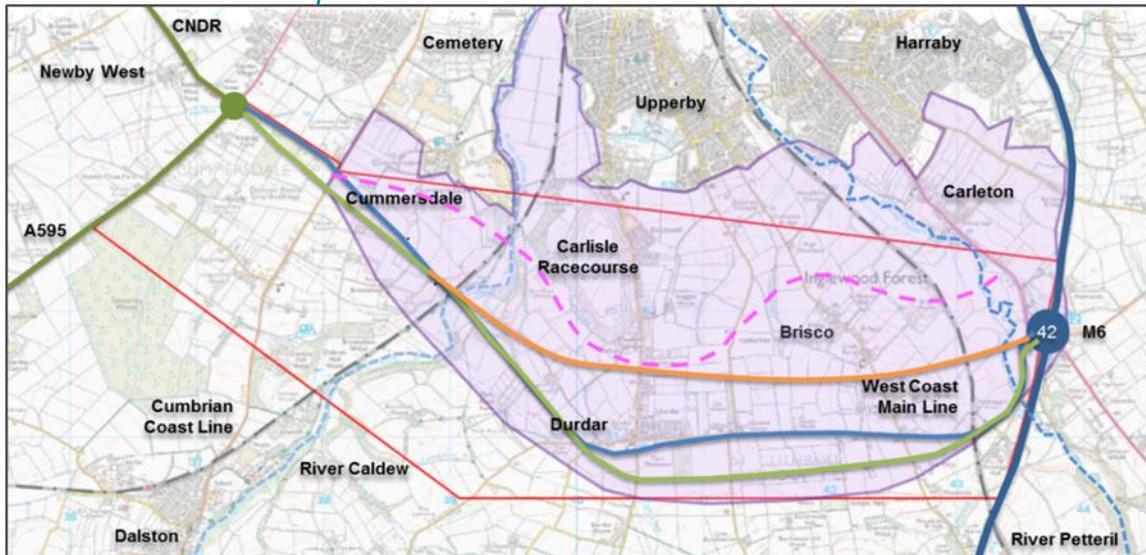
² Capita Property and Infrastructure Ltd, September 2017. *Carlisle Southern Link Road Stage 1 Report Addendum.*

stage in the process. The review involved an assessment to identify options to be discounted that:

- would clearly fail to meet the key objectives identified for intervention,
- did not fit with existing local, regional and national programmes and strategies, and do not fit with wider government priorities, and
- would be unlikely to pass key viability and acceptability criteria (or represent significant risk) in that they are unlikely to be:
 - deliverable in a particular economic, environmental, geographical or social context e.g. options which would result in severe adverse environmental impacts which cannot be mitigated against or where the cost of doing so is too high,
 - technically sound,
 - financially affordable, and
 - acceptable to stakeholders and the public.

3.1.6 The conclusion of the Stage 1 assessment was to carry forward three routes for further development work, these were described at that time as the Green, Blue and Orange Route (See Plan 3.2).

Plan 3.2 Routes Developed further



3.1.7 Orange Route. This route was developed to connect the M6 at Junction 42 to the Carlisle Northern Development Route using the most direct alignment possible without crossing the Carlisle Racecourse.

3.1.8 Green Route. This route was developed to reduce the environmental impact of a green/red route over its westerly section by avoiding the deep cuttings required by the latter as it crosses the high ground at Blackhall Wood and High Brownelson.

3.1.9 Blue Route. This route was developed to maximise the reuse of existing infrastructure as specifically requested in the Client's Brief.

3.1.10 On 5th December 2017, a recommendation was passed not to progress further development of Option A (Blue) as the proposed alignment would not satisfy current standards. Option A (Blue) had aimed to maximise the reuse of existing infrastructure,

following the alignment of Newbiggin Road and Peter Lane where possible. These roads were originally designed as minor county roads and as such, have a number of direct access and sections of limited visibility and tight curvatures. Of particular note is the section of Newbiggin Road adjacent to the M6 Junction 42. Due to the number and severity of departures, it was recommended that development and assessment of the route should not progress any further within Stage 2.

- 3.1.11 Designs for the remaining two options (Option B (Orange) and Option C (Green)), were progressed and assessed in more detail during Stage 2. The findings of the environmental assessment³ were then used alongside other technical assessments and feedback from a public consultation exercise, to inform the selection of a preferred route. The route descriptions follow.
- 3.1.12 The Orange Route left the M6 at Junction 42 on a new westerly alignment with new crossings of the River Petteril and the West Coast Main Line Railway. The route then ran immediately south of Brisco before crossing Durdar Road at Holly House. It passed south of the Carlisle Racecourse as it ran through open countryside to cross the River Caldew slightly further downstream than the Green Route. It crossed the Cumbrian Coast Line Railway before continuing in a north-westerly direction through open country side over the remaining 2.2 km to join the A595.
- 3.1.13 This route was developed to connect the M6 at Junction 42 to the CNDR (A689) using the most direct alignment possible without crossing the Carlisle Racecourse. This route was 7.1 km long.
- 3.1.14 The Green Route left the M6 at Junction 42 on a new westerly alignment with new crossings over the River Petteril and West Coast Main Line Railway. The route then ran through open countryside parallel to Newbiggin Road and offset to the south by approximately 300m. Once the route reached Buckabank Road it used a proposed roundabout to allow it to change direction and run through open countryside to the most optimum crossing point of the River Caldew. It also crossed the Cumbrian Coast Line Railway at the same location before following the Orange Route over its remaining 2.2 km to join the A595.
- 3.1.15 This route was developed to reduce the environmental impact over its westerly section by avoiding the deep cuttings at Blackhall Wood and High Brownelson. This route was 8.0 km long.
- 3.1.16 The main difference between the Green and Orange routes were due to the horizontal alignments, with the Orange route being shorter but resulting in greater environmental impact. They both had similar provision for pedestrian/cycling facilities. Both routes connected to existing road networks and had roundabouts at major junctions. Both routes required major bridge structures over two railways and two rivers. The structures were expected to be integral bridges. The form of the structures was the same for both routes, but the length and skew angles varied slightly. There was a large embankment on the Orange Route between the West Coast Main Line and the connection onto Junction 42 of the M6 which would require light-weight fill due the embankment weight affecting the railway line.
- 3.1.17 A decision-making exercise was undertaken on the two route options following completion of a Stage 2 environmental assessment. Although the Orange route performed slightly better for air quality (greater reduction in pollution), agriculture (less land take and fewer affected landowners), use of materials (shorter route, fewer new structures etc), and geology/soils, the Green option performed much better in terms of noise/vibration, loss of

³ Capita Property and Infrastructure Ltd, June 2018. *Carlisle Southern Link Road Stage 2 EIA: Environmental Report.*

development land, visual impact, water quality and flood risk, ecology, cultural heritage, landscape and outdoor access/recreation.

3.1.18 As a result, on 23rd June 2018, Cumbria County Council announced that the preferred route for the Scheme was Option C (the 'Green Route').

3.1.19 Table 3.1 summaries the alternatives considered at each stage, and the option(s) taken forward to the next stage.

Table 3.1 Alternatives Considered

DMRB Stage	Options Considered	Options Taken Forward to Next Stage
<p>Stage 1</p>	<p>Seven route options were considered, two of which were previously identified in a study conducted by the Highway's Agency (now Highways England) in 1994:</p> <ul style="list-style-type: none"> • Red Route – 8.5 km, runs through open countryside 300 m south of Newbiggin Road and south of Blackhall Wood, crossing the River Caldew to the north of Dalston Hall. • Green Route – 7.9 km, follows a similar alignment to the red route to Durdar before heading in a more north-westerly direction, north of Park Fauld, crossing the River Caldew near to Brownelson. • Blue Route – 7.8 km, maximises reuse of existing infrastructure, following the alignment of Newbiggin Road and Peter Lane where possible. Crosses the River Caldew near to Brownelson. • Orange Route – 7 km, follows the most direct route on a westerly alignment, with new crossings over the River Petteril and West Coast Mainline. Runs to the north of Durdar and to the south of the racecourse before crossing the River Caldew slightly to the north of the Blue/Green routes. • Pink Route – 6.9 km, proposes a new junction off the A6, new crossings over the River Petteril and West Coast Mainline and runs to the north of Brisco and Durdar. Crosses the River Caldew at a similar point to the Cumbria Coast railway line. • 1990s Northern Route – runs along the edge of the city urban area with spur options to the north and south of Cummersdale • 1990s Southern Route – runs on a similar alignment to the red route but continues in a westerly direction south of Blackhall Wood, crossing the River Caldew north of Dalston and joining the A595 south of Orton Grange. 	<ul style="list-style-type: none"> • Blue Route • Orange Route • Green Route
<p>Stage 2</p>	<ul style="list-style-type: none"> • Blue Route (Option A) – alignment updated to improve curvature and incorporate new junctions. Several departures from standards unable to be improved. • Orange Route (Option B) – alignment updated to include 4 junctions, outline designs for embankments and cuttings incorporated, multiuser paths on both sides of the route, single span river crossings, now 7.1 km. • Green Route (Option C) - alignment updated to include 4 junctions, an overbridge included for Ivegill Road, outline designs for embankments and cuttings incorporated, multiuser path on the city side of the route, single span river crossings, now 8 km. 	<ul style="list-style-type: none"> • Green Route
<p>Stage 3</p>	<p>The route has continued to be developed following announcement of the preferred route in June 2018.</p>	<p>N/A</p>

The Preferred Route

- 3.1.20 The preferred route is the Scheme described in Section 2 and assessed within the environmental topic chapters within this ES. It was taken forward as it was considered to represent the best option overall for delivering the strategic, transport, economic and environmental objectives. The design has evolved throughout Stage 3 taking into account issues around constructability, cost, environmental impact and stakeholder consultation responses.

4 Consultation

Public Consultation 2018

- 4.1.1 Public consultation has been integral to the Scheme's development. Early and ongoing engagement has informed and influenced the Scheme development process. Key objectives of the engagement have been to:
- seek an appropriate level of feedback at each stage in the iterative design process and ensuring that comments received have been taken into consideration;
 - build long-term relationships with key stakeholders throughout the different stages of the Scheme to help better understand their views;
 - address concerns, where possible and practicable; and
 - ensure appropriate statutory consultation has been undertaken.
- 4.1.2 Initial public consultation for two of the Scheme's route options ('orange route' and 'green route') occurred between the 26th January and the 9th March 2018.

Methods

- 4.1.3 Four main groups of stakeholders were identified in the Communication Management Plan for the project. These were:
- project delivery team;
 - statutory consultees;
 - landowners and those affected by the Scheme;
 - interested organisations; and
 - the general public.
- 4.1.4 All the above groups were invited to engage in consultation.
- 4.1.5 During the consultation period stakeholders responded by a variety of means including online, via a paper questionnaire with free postage or by attending a public drop-in consultation. The drop-in consultation events were held at:
- Carlisle Racecourse 2nd - 3rd February 2018; and
 - The Lanes Shopping Centre, central Carlisle 9th – 10th February 2018.
- 4.1.6 Stakeholders were also engaged through public exhibitions, briefings to MPs, councillors, businesses and committees, meetings with local land owners, local press releases, letters, leaflets, posters, development of a dedicated project website and social media posts, and the availability of a dedicated project email address.

Response

- 4.1.7 There were approximately 1,000 attendees predominantly from Carlisle and the surrounding villages at the drop-in consultations and 1,025 respondents to the questionnaire from the wider Cumbria area.
- 4.1.8 In total, 74% of questionnaire respondents supported the concept of the Carlisle Southern Link Road and 60% of people expressed a preference for the 'green route' over the 'orange route'.

Affected landowners

- 4.1.9 All affected landowners within 250 m of the proposed route were contacted directly by letter. A buffer of 250 m buffer was used as noise and visual impacts from new road schemes generally reduce to a negligible level past this distance.
- 4.1.10 A large number of responses from affected landowners expressed concerns about the Scheme, primarily around the potential disruption the road would cause to their farms and businesses, and the environmental impact of the Scheme on residential properties nearby.
- 4.1.11 However, at the same time, there were positive comments made about the potential benefits from the Scheme in terms of reducing traffic and accidents in local villages.
- 4.1.12 Overall, affected landowners expressed a preference for the 'green route'.

Statutory Agencies

- 4.1.13 Parish councils, statutory consultees and other representatives were sent letters regarding the proposed Scheme. Carlisle City Council and Cumbria County Council as planning authorities and Cumbria County Council as highway authority were also engaged throughout the development of the scheme.
- 4.1.14 Comments of support for the Scheme included recognising the benefit to the growth of Carlisle but there was a focus on the need for more consideration of impacts on the environment and heritage of the area and the potential impact on local villages such as Brisco, Durdar and Cummersdale. Many statutory agencies reserved their judgment until the availability of further information.
- 4.1.15 Overall, statutory agencies also preferred the 'green route'.

Public Consultation 2019

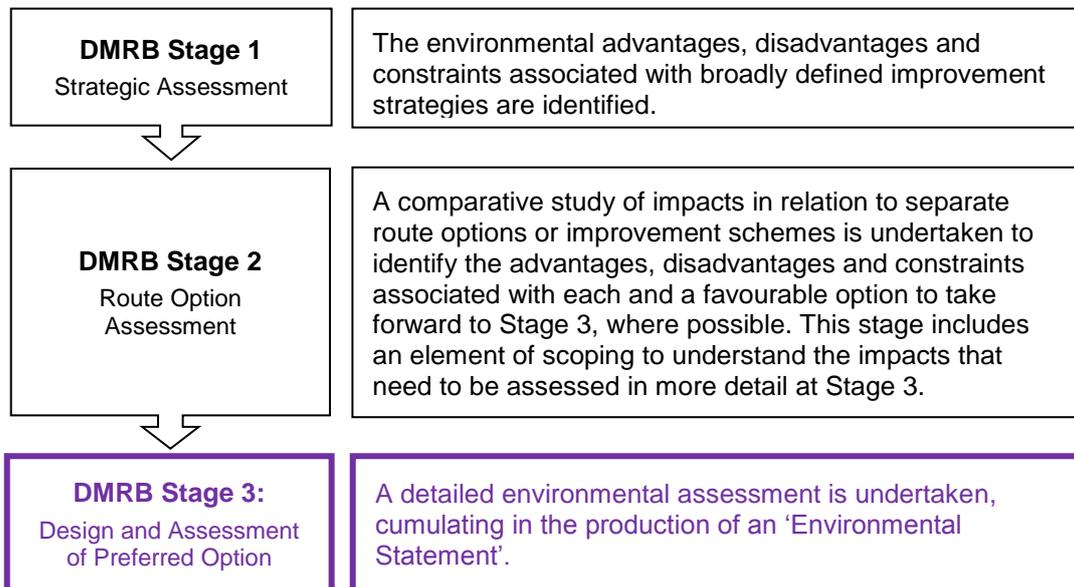
- 4.1.16 A second round of consultation occurred in June 2019 after the government announced in February that they would grant £102 million from the Housing Infrastructure Fund towards the Scheme. Since this announcement, further development of the design has occurred. In 2019 there were drop-in consultation events at:
- Carlisle Racecourse 3rd – 4th June;
 - The Lanes Shopping Centre 21st – 22nd June; and
 - Upperby Social Club, Lamb Street 24th June.
- 4.1.17 Online consultation was undertaken between 31st May and 12th July 2019.
- 4.1.18 This consultation period was to allow the public to express opinions on the preferred 'green route' and suggest improvements prior to the submission of the Planning Application in Autumn 2019.

5 Approach to the Assessment

5.1 Best Practice Guidance and EIA

The Stages of Assessment for Road Schemes

- 5.1.1 Guidance published by the Government for the preparation of environmental assessments of proposed road schemes is contained in the Design Manual for Roads and Bridges (DMRB) Volume 11 (Ref TBC). This sets out both the general process and methods for assessing individual environmental topics. This ES adheres to Interim Advice Note (IAN) 125/15 Environmental Assessment Update which provides a new structure of DMRB Volume 11.
- 5.1.2 DMRB Volume 11 advises on the environmental topics to be included in an EIA and the methods to be used in the assessment for each of those topics. The topics identified in Chapters 6 to 15 of this ES are those required by DMRB and by the EIA Regulations, subject to the Local Planning Authority's Scoping Opinion.
- 5.1.3 The design and development of major road schemes in the UK is carried out in accordance with legislative and best practice guidelines outlined in the DMRB. Volume 5, Section 1, Part 2 of the DMRB outlines a three-stage process to scheme assessment with information from the previous stage used to inform the next. The objectives of the assessment at each stage are as shown below. The current stage, Stage 3, is outlined in purple.



- 5.1.4 A Stage 1 assessment was completed for the Scheme in 2015/16⁴ and recommendations for shortlisted options to be taken forward for further assessment at Stage 2 were made. The Stage 1 assessment was subsequently reviewed in 2017 taking into account revised objectives for the Scheme and an addendum to the Stage 1 report was produced⁵.
- 5.1.5 A Stage 2 assessment was completed in June 2018 to compare two shortlisted options. The findings of the EIA⁶ were used alongside other technical assessments to inform the

⁴ Capita Property and Infrastructure Ltd, June 2016. *Carlisle Southern Link Road TAG Part 1 / DMRB Stage 1 Report.*

⁵ Capita Property and Infrastructure Ltd, September 2017. *Carlisle Southern Link Road Stage 1 Report Addendum.*

⁶ Capita Property and Infrastructure Ltd, June 2018. *Carlisle Southern Link Road Stage 2 EIA: Environmental Report.*

selection of a preferred route. On 23rd June 2018 Cumbria County Council announced that the preferred route for the Scheme was Option C (the 'Green Route').

- 5.1.6 Since its initial publication, Volume 11 of DMRB has been progressively updated, with new guidance typically published first in the form of 'Interim Advice Notes' (IANs) and subsequently incorporated into the relevant sections of DMRB. Since April 2017 Highways England began updating the complete suite of documents making up the manual with the review due for completion by March 2020.
- 5.1.7 The EIA undertaken adheres to the up-to-date guidance contained in DMRB and Highways England's IANs. The methodologies used for the assessments for individual topics in the ES are based on those set out in the EIA Scoping Report and Opinion and discussions with relevant statutory bodies.
- 5.1.8 At the time of preparing this ES, planned updates to Volume 11 have not been released. The methodologies applied are therefore based on the most up-to-date published guidance for each topic available. Where appropriate, supplementary best practice guidance has also been consulted in the assessment of specific environmental topics. Reference to these guidance documents is provided in the individual topic assessment chapters.

5.2 General Approach to Assessment

Environmental Topics

- 5.2.1 DMRB Volume 11 advises on the environmental topics to be included in an EIA in relation to road schemes and sets out both the general process and the methods for assessing these individual topics. The volume has been subsequently updated by Interim Advice Note (IAN) 125/15 Environmental Assessment Update, which provides a new structure for the reporting of environmental topics covered in Volume 11.
- 5.2.2 The topics identified in Volume 11 and confirmed as requiring assessment in the LPA's Scoping Opinion are:
- Air Quality (Chapter 6)
 - Archaeology (Chapter 7)
 - Nature Conservation (Chapter 8)
 - Landscape Character (Chapter 9)
 - Visual Impact (Chapter 10)
 - Agricultural Land Use (Chapter 11)
 - Noise and Vibration (Chapter 12)
 - Outdoor Access and Recreation (Chapter 13)
 - Water Environment (Chapter 14)
 - Geology and Soils (Chapter 15)
 - Cumulative Effects (Chapter 16)
- 5.2.3 A number of topics/elements were 'scoped out' due to the likely effects on the environment identified, being considered insignificant. A summary of the justifications for scoping these elements out of the assessment is provided below.

- 5.2.4 The consideration of effects on population, human health and climate will be embedded within the appropriate topic areas.

Cultural Heritage (Historic Buildings and Historic Landscapes)

- 5.2.5 Although archaeology is scoped in, historic buildings and historic landscapes have been scoped out as these are unlikely to be affected significantly. For the Scoping Report assessment, historic buildings were defined as standing historic structures that are usually formally designated or have some architectural presence (i.e. Listed Buildings). There are 10 Listed Buildings within 500 m of the Scheme. These are described in Chapter 7. There are no non-designated historic buildings, structures or designated historic landscapes within proximity to the Scheme.
- 5.2.6 Impacts on setting have been reduced through minor adjustments to the vertical/horizontal alignment of the Scheme (i.e. moving it further away, deepening cuttings) and landscaping (i.e. tree planting, earth mounds). With mitigation in place, no effects of more than slight adverse significance are anticipated on any historic buildings within 500 m of the Scheme.
- 5.2.7 Effects on historic landscapes will be mitigated through sensitive design, landscape planting and translocation of historic landscape elements. With mitigation in place, no effects of more than slight adverse significance are anticipated on historic landscape.
- 5.2.8 Archaeological remains will be assessed in Chapter 7 as there is a high likelihood that currently unknown archaeological assets will be disturbed during the construction of the Scheme, due to the proximity to nearby prehistoric and Roman assets.
- 5.2.9 A Heritage Statement will be submitted to support the planning application for this proposal, which will assess the potential impacts of the Scheme on the setting of listed buildings within 500 m of the Scheme and the Holme Head Conservation Area.

Land Use: Effects on Development Land

- 5.2.10 There are a number of development sites within the vicinity of the Scheme, which were established through a review of the Carlisle District Local Plan 2015-2030, the emerging St. Cuthbert's Garden Village Masterplan, the Morton Masterplan SPD, approved extant planning applications and current undetermined applications above certain thresholds. With the exception of St. Cuthbert's, no sites have been identified will be directly affected by the Scheme eg. land take. Currently, the effects of the Scheme on land allocated for and undergoing development does not need to be included in the ES.
- 5.2.11 Potential effects on amenity of developed land will be addressed in the air quality, noise and visual assessments.

Outdoor Access and Recreation (Land Used by the Community)

- 5.2.12 No areas of community land (i.e. parks, village greens, common land) are located within proximity to the Scheme. Therefore, there are no anticipated likely significant effects of the Scheme on the land used by the community.

Vehicle Travellers (Driver Views and Driver Stress)

- 5.2.13 The assessment would consider the views from the road experienced by drivers and any impact on adjacent landscape character areas. Views from the road are defined as the extent to which vehicle travellers are exposed to different types of scenery. The Landscape Character and Visual Impact chapters of this ES address views from public vantage points.

- 5.2.14 Generally, the views experienced by vehicle travellers in the vicinity of the Scheme are open and of long distance towards the Pennines, the Lake District fells and the Solway Coast. Vegetation, such as hedgerows and occasional woodland, intermittently limits the extent of these views. Driver views have been scoped out as views introduced by the Scheme are largely consistent with those already available as a baseline across the surrounding road network. Changes to views as a result of the Scheme on the surrounding network are predominantly assessed as slight adverse and not significant.
- 5.2.15 The Scheme in operation is predicted to significantly improve driver stress. The disruption caused by the construction phase is considered minimal and will only affect one road at any given time. Therefore, driver stress has been scoped out. The impacts of traffic flow on human behaviour and health was largely based on traffic modelling data. The traffic flow scenarios will be incorporated into the Transport Assessment that will be submitted in support of the planning application.

Geology and Soils (Topsoils, Superficial Deposits, Solid Deposits and Made Ground)

- 5.2.16 There is a limited amount of Made Ground within proximity to the Scheme. Any Made Ground encountered within the works will be dealt with according to current best practices and in the majority of cases this will lead to an improvement of the condition on the site.
- 5.2.17 There are several former landfill sites within the wider area surrounding the Scheme. One site, related to Durdar Farm, is located along the route corridor.
- 5.2.18 The majority of the Scheme is within agricultural land, with soils in this area classified as slowly permeable seasonally wet slightly acidic base-rich loamy and clayey soils. Effects to agricultural land are assessed in Chapter 10. Whilst a significant quantity of topsoil will be removed as part of the works, it is expected that the majority of this will be reused and as such the long-term effects will be minimal.
- 5.2.19 Excavations of cuttings is likely to reduce the superficial deposits and may expose small areas of rock. The superficial and solid deposits present have limited significance and therefore any effects are expected to be negligible.
- 5.2.20 Effects on geology have been scoped out as no Geo-conservation sites are present and geological conditions are commonplace within the county.
- 5.2.21 Soil related impacts (i.e. soil contamination and soil condition impacts from construction phase) are included within Chapter 15.

Materials

- 5.2.22 Potential impacts and effects related to materials and waste are largely limited to the construction phase. Existing mineral extraction, waste recycling and landfill infrastructure have, where necessary been subject to EIA process. There is also a number and diversity of such facilities within a 25 km radius of the Scheme. The implementation of a Construction Environmental Management Plan (CEMP) and Site Waste Management Plan (SWMP) will encourage the contractor to reduce and reuse materials on site, which will reduce the limited impacts identified.
- 5.2.23 There are not likely to be any significant effects related to material usage and waste generation that are not already considered by other ES Chapters, and therefore it can be scoped out.

Major Accidents and Disasters

- 5.2.24 Schedule 3 of the EIA Regulations requires the risks of major accidents and natural disasters relevant to the Scheme to be considered. The proposed Scheme would introduce a new road and associated infrastructure into a largely rural area which currently supports farmland and small-scale residential land uses.
- 5.2.25 The Scheme site is not in an area that could be affected by coal or metalliferous mining activity and there are no Health and Safety Executive (HSE) Control of Major Accident Hazards (COMAH) sites in close proximity. Therefore, the Scheme is not likely to produce an elevated risk of accidents or natural disasters.
- 5.2.26 A detailed Construction Environmental Management Plan (CEMP) will be prepared by the appointed Contractor prior to the construction stage of the Scheme (an outline CEMP is provided in Volume 4 of this ES), which will include all proposed construction mitigation measures.
- 5.2.27 The Scheme has been designed in accordance with industry standards including highway and drainage regulations to reduce the potential for accidents and natural disasters to impact the Scheme. The potential for accidents and disasters has been addressed in the following chapters of this ES:
- Construction: Volume 1, Chapter 2 – Scheme Description
 - Flood Risk/Water Pollution: Volume 1, Chapter 14 – Water Environment
 - Contaminated Land: Volume 1, Chapter 15 – Geology and Soils
- 5.2.28 On the basis of the above, it is considered that the likely effects on major accidents and/or disasters is adequately assessed within other parts of the ES and has therefore been scoped out of the ES.

Study Areas

- 5.2.29 Typically, no single study area is applicable to all topics. Instead, the study areas vary according to: the geographical scope of the potential effects relevant to each topic; the information required to make an appropriate assessment of these effects; any topic specific best practice guidance; and any feedback received through consultation activities.
- 5.2.30 A description of the study area applied in the assessment of the different environmental topics along with a justification for its use is provided within each topic chapter.

Baseline Data

- 5.2.31 Establishing the baseline environmental conditions (i.e. the environment without the Scheme) is a necessary starting point to enable any assessment of potential change resulting from the proposals. The description of the baseline accounts for any changes likely to occur before scheme construction and operation commences. This includes any independent changes that can be predicted including, changes to legislation, regulations and policy, traffic growth and other community developments with a level of commitment established, such as planning consent gained.
- 5.2.32 The baseline therefore requires first the identification of the existing situation and then the prediction of any likely changes to occur between the date of assessment and project commencement and operation.

- 5.2.33 Baseline conditions have been established by desk-based study and/or survey, and/or calculated by modelling where appropriate.
- 5.2.34 For some topics (i.e. Noise and Vibration, Air Quality, Visual Impact and Landscape Character), it will also be necessary to account for a baseline situation (or a ‘do-minimum’ scenario) +15 years after scheme opening. This allows for longer term impacts to be understood and for mitigation (i.e. planting) to become established.
- 5.2.35 Baselines will therefore be taken at:
- the time prior to when construction is expected to start for effects arising from construction (originally assumed to be 2020 but now **early 2021**, however, does not materially affect the assessments) [all topics];
 - the time that the scheme is expected to open to traffic for impacts arising from its operation on opening (the Opening Year for this scheme being **2023**) [all topics];
 - a period after the scheme opens for traffic (usually taken at 15 years after opening) for impacts arising from its operation in the longer term (the Design Year for this scheme being **2038**) [Air Quality, Noise and Vibration, Visual Impact, and Landscape Character].
- 5.2.36 The description of the baseline and future baseline conditions will identify receptors that may be affected by the proposals. As some receptors can be more sensitive to certain impacts or can be considered to be more valuable, each identified receptor will be assigned a ‘value’ (or ‘sensitivity’) rating which, is defined in general on a five-point scale with descriptors for; *very high, high, medium, low, and negligible* values. Reference should be made to the ‘Assessment Methodology’ sections within each topic chapter for the relevant ‘value’ (or ‘sensitivity’) ratings and descriptors to be applied, if applicable.

Defining Assessment Years and Scenarios

- 5.2.37 The assessment of effects compares a scenario with the Scheme against one without a scheme over time. The absence and presence of the Scheme are referred to as the ‘do minimum’ and ‘do something’ scenarios respectfully. The ‘do minimum’ scenario represents the future baseline with minimal interventions and without new infrastructure such as the proposed Scheme or any alternatives. The ‘do something’ scenario represents the situation if the Scheme is progressed.
- 5.2.38 Depending on the environmental topic, the effects will be assessed for the ‘do minimum’ and ‘do something’ scenarios in the baseline years for construction and opening. Some topics will also make an assessment in a future year which is usually taken at 15 years after opening but may be taken in the worst year within 15 years of operation. It should be noted that in some cases the worst year in the first 15 years of operation can be the opening year. In such instances, no future year assessment will be made. Table 5.1 summarises the assessment years and scenarios.

Table 5.1 General assessment years and scenarios to be used

Assessment Years	Year	Assessment Scenarios
Baseline (<i>immediately prior to construction</i>)	2020	N/A
Opening	2023	do minimum / do something
Future (+15 years or <i>*worst year in the 15 years following construction</i>)	2038 (*2023-2038)	do minimum / do something

Identifying Potential Impacts and Effects

- 5.2.39 Following a review of the baseline information, likely '*impacts*' on the environment (i.e. the changes resulting from an action) and their '*effects*' (i.e. the consequences of those impacts) are updated/identified. This forms the basis of the '*Impact Assessment*' which identifies potential impacts and effects without mitigation measures or enhancements in place.
- 5.2.40 The impacts and their associated effects identified will include those that are: direct, indirect or cumulative; permanent or temporary; positive (beneficial) or negative (adverse); and, short, medium or long term in nature. They may result from:
- the existence of the development;
 - the use of natural resources;
 - the emission of pollutants, the creation of nuisances and the elimination of waste; and,
 - forecasting methods used to assess the effects on the environment.
- 5.2.41 Where possible each identified impact will then be assigned a value for '*magnitude*' (or extent) of change, defined in general on a four-point scale with descriptors for; *major*, *moderate*, *minor*, and *no change*. Reference should be made to the '*Assessment Methodology*' sections within each topic chapter for the relevant '*magnitude*' of change ratings and descriptors to be applied, if applicable.

Assessing Significance

- 5.2.42 The significance of an environmental effect is typically a function of the '*value*' (or '*sensitivity*') of a receptor and the '*magnitude*' (or extent) of impact. Combining the environmental value of the receptor with the magnitude of impact produces a significance of effect category.
- 5.2.43 DMRB Volume 11, Section 2, Part 5 '*Assessment and Management of Environmental Effects*' provides generic terminology and criteria for the assignment of environmental value, magnitude of impact and significance of effects. In assigning a significance category to the effect, DMRB recognises that the approach relies on reasoned argument, professional judgement and the need to take on board the advice and views of appropriate organisations.
- 5.2.44 By assigning each effect to one of five significance categories (*very large*, *large*, *moderate*, *slight*, or *neutral*) different topic issues can be placed on the same scale thus assisting the decision-making process by being comparable at whatever stage the project is at within that process. Typical descriptors for the significance of effect are provided in Table 2.2
- 5.2.45 DMRB advocates applying the formula: the greater the environmental value (or sensitivity) of the receptor, and the greater the magnitude (or extent) of the impact, then the more significant the effect. This can be aided by use of a matrix, such as that shown in DMRB Volume 11, Section 2, Chapter 2.
- 5.2.46 In general, those effects assessed as moderate, large, or very large are considered '*significant*' and are taken forward to the residual assessment once mitigation measures are applied.

Not all the environmental topics will use the matrix based approach as described above, but will instead use numerical values to identify significance of effects (i.e. Noise and Vibration). Furthermore, some topics do not have agreed or standard methods of assessment or scales of measurement for either 'value' (or sensitivity) of a receptor or 'magnitude' (or extent) of change to assist with the matrix based approach. Where alternative bases of assessment apply, details are provided within the 'Assessment Methodology' sections within each topic chapter. Table 5.2 summarises the typical descriptors for assessing the significance of effects, whilst

5.2.47 Table 5.3 sets out the typical significance matrix.

Table 5.2 Typical descriptors for the significance of effect categories

Significance category	Typical descriptors of effect
Very Large	Only adverse effects are normally assigned this level of significance. They represent key factors in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category.
Large	These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process.
Moderate	These beneficial or adverse effects may be important, but are not likely to be key decision-making factors. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse effect on a particular resource or receptor.
Slight	These beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision-making process, but are important in enhancing the subsequent design of the project.
Neutral	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

Table 5.3 Typical matrix for determining significance of effect category

		Magnitude of Impact (Degree of Change)				
		No change	Negligible	Minor	Moderate	Major
Environmental Value (Sensitivity)	Very High	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large
	High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
	Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
	Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
	Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight

Mitigation Measures, Enhancements, and Residual Effects

- 5.2.48 Where potentially significant adverse environmental effects have been identified during the impact assessment, appropriate mitigation has been developed as an iterative part of scheme development following the mitigation hierarchy of: avoidance, reduction, remediation, compensation.
- 5.2.49 The term 'enhancement' typically refers to providing measures over and above those needed to mitigate the adverse effect, and/or maximising the opportunity for beneficial effects of the scheme. Enhancement opportunities have been identified where appropriate.
- 5.2.50 Effects that remain after mitigation are referred to as 'residual effects'. Following agreement of the mitigation and enhancement measures to be applied, environmental impact assessments have been repeated for those impacts with a significant effect, this time accounting for all agreed mitigation measures being in place. The significance of any 'residual effects' has then been reported in the ES.

Assessment of Cumulative Effects

- 5.2.51 The EIA Regulations require an assessment of cumulative effects; those that are the result of multiple actions on environmental receptors and resources. There are two types of cumulative effect:
- The combined action of a number of different environmental topic-specific effects upon a single receptor within a single project ('in combination'); and
 - The combined action of a number of different projects, cumulatively with the scheme being assessed, on a single resource/receptor ('cumulative').
- 5.2.52 With reference to point b) above, the EIA Regulations do not provide a detailed description of the projects that should be considered within a cumulative assessment. However, Schedule 4, Part 5(e) states an assessment should consider '*the cumulation of effects with other existing and/or approved projects*'. This is interpreted in DMRB to include developments with '*valid planning permissions as granted by the LPA, and for which formal EIA is a requirement or for which non-statutory EIA has been undertaken.*'
- 5.2.53 As such, only projects meeting the description as provided in DMRB will be included in the assessment of cumulative effects and/or incorporated into the baseline and future baseline assessment scenarios where details permit. Consultation has been undertaken with the LPA to determine an appropriate cut-off date for consented projects. The assessment of cumulative effects is addressed within each of the topic chapters of this ES and brought together in Chapter 16.
- 5.2.54 A major mixed-use development identified in Carlisle City Council's Local Development Plan 2015-2030, known as St. Cuthbert's Garden Village (formerly referred to as 'Carlisle South') is identified as a broad location for ambitious levels of future housing growth. This is currently being developed in parallel with CSLR. At this time, the exact layout of the Garden Village is not known. As a result, a detailed assessment of the potential interactions with the CSLR Scheme is not possible. Therefore, the inter-project cumulative effects have been assessed at a high level using professional judgement and only where the assessment topic has been determined to have clear relevance to the proposed Garden Village development.

5.3 Limitations and Uncertainties

5.3.1 Notwithstanding any specific limitations and assumptions stated in each of the topic chapters, the EIA is based on the following general assumptions:

- Current surrounding land uses do not change, with the exception of the cumulative developments identified and reported in Chapter 16;
- assessments are based on published sources of information and primary data collection, where relevant. Sources are cited within each chapter;
- assessments are based on the description of the Scheme and the expected construction methodology and programme summarised in Chapter 2;
- the design, construction and operation phases of the Scheme will satisfy minimum environmental standards, consistent with contemporary legislation, practice and knowledge;
- planning permission, when granted, will contain conditions that will control disturbance during construction and operation, and be sufficient to limit the development to that which has been assessed in the EIA; and
- the construction information on which the assessments have been undertaken, are based on the best information available at the time of writing and represent a reasonable scenario of how the Scheme will be constructed.

Part Two Environmental Impact Assessments

6 Air Quality

6.1 Introduction

- 6.1.1 This chapter assesses the baseline current and future local air quality both with and without the Scheme. The Scheme has the potential to lead to short-term dust and vehicle emissions during the construction phase, and long-term air quality impacts during the operational phase through changes in road routes and traffic.
- 6.1.2 As such, a dust risk assessment has been undertaken to determine the potential impact of fugitive emissions of dust and PM₁₀ on local receptors during the construction phase.
- 6.1.3 In addition, a detailed air quality assessment has been undertaken to assess the potential impact of the Scheme on local sensitive receptors during operation. The assessment focuses on concentrations of nitrogen dioxide (NO₂) and inhalable particulate matter (PM₁₀ and PM_{2.5}) predicted using detailed modelling software.
- 6.1.4 The air quality assessment is based on details of the Scheme as set out in Chapter 2 of this ES; and traffic data provided by Capita's Transport Planning Team.

6.2 Assessment Methodology

Guidelines

- 6.2.1 The following guidance documents have been referred to and used within this chapter:
- National Planning Practice Guidance – Air Quality⁷;
 - Local Air Quality Management Technical Guidance (LAQM.TG(16))⁸;
 - Guidance on the Assessment of Dust from Demolition and Construction⁹;
 - Land-Use Planning & Development Control: Planning for Air Quality¹⁰; and
 - DMRB Volume 11, Section 3, Part 1 (HA 207/07) and associated Interim Advice Notes (IAN) 170/12; 174/13; 175/13; 185/15¹¹.
- 6.2.2 A summary of these documents can be seen in Appendix 6.1.

Methodology

Assessment of Short-Term Impacts

Construction Dust

- 6.2.3 The institute of Air Quality Management (IAQM) guidance for the control of demolition and construction sites includes criteria to determine the potential for air quality impacts at four activities associated with the Scheme:

⁷ Department of Communities and Local Government (July 2018)

⁸ Defra (February 2018) Local Air Quality Management Technical Guidance

⁹ IAQM (June 2016) Guidance on the Assessment of Dust from Demolition and Construction v1.1

¹⁰ EPUK & IAQM (January 2017) Land-Use Planning & Development Control: Planning for Air Quality v1.2

¹¹ Standards for Highways (May 2007) Design Manual for Roads and Bridges

- Demolition;
 - Earthworks;
 - Construction; and
 - Trackout¹² (transport of dust and dirt from construction/demolition site onto the public road network).
- 6.2.4 In accordance with IAQM guidance, the construction dust study area is defined as follows:
- 6.2.5 For a human receptor:
- 350m from the site boundary; and/or
 - 50m of the routes used by construction vehicles up to 500m from the site entrance.
- 6.2.6 For an ecological receptor:
- 50m from the site boundary; and/or
 - 50m of the routes used by construction vehicles up to 500m from the site entrance.
- 6.2.7 The construction dust study area is shown in Figure 6.1 in Volume 2.
- 6.2.8 The assessment considers the effects of local meteorological conditions on the dispersion of fugitive emissions of dust, the sensitivity and proximity of surrounding receptors to construction activities, and the scale of construction activities. The risk of dust soiling and PM₁₀ impacts is determined by taking all these factors into consideration.
- 6.2.9 Based on the outcome of the assessment, the IAQM guidance recommends certain mitigation measures to be implemented. Any other mitigation measures issued in local authority / national government guidance should also be considered. Mitigation measures stipulated within the IAQM guidance have been recommended if deemed necessary, based on the conclusions of the assessment.
- 6.2.10 The full IAQM methodology followed can be found in Appendix 6.2.

Assessment of Long-Term Impacts

Roads Modelling Assessment

- 6.2.11 In response to the key policies detailed in Appendix 6.1, dispersion modelling studies have been carried out to assess the potential effects of NO₂, PM₁₀ and PM_{2.5} road traffic emissions on sensitive receptors.
- 6.2.12 Baseline concentrations are derived from CCC LAQM reports and the Department for Environment, Food and Rural Affairs (Defra) modelled background air quality for the area.

¹² Trackout is the transport of dust and dirt from the construction/demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. This arises when heavy duty vehicles (HDVs) leave the construction/demolition site with dusty materials, which may then spill onto the road, and/or when HDVs transfer dust and dirt onto the road having travelled over muddy ground on site.

- 6.2.13 The study area has been defined using DMRB criteria which includes those roads that can expect a change of 1000 Annual Average Daily Traffic (AADT) or 200 HGV per day as a consequence of the Scheme. Receptors within 200m of these roads which are sensitive to changes in NO₂, PM₁₀ and PM_{2.5} concentrations have been included within the modelling. Particular attention has been paid to areas where the annual mean NAQO's are either already exceeding or are likely to exceed. All receptors assessed are considered to be highly sensitive.
- 6.2.14 The operational road traffic study area is shown in Figure 6.2 in Volume 2.
- 6.2.15 The ADMS-Roads (v4.1.1.0) model¹³ has been used to determine the concentrations of NO₂, PM₁₀ and PM_{2.5} at the nearest sensitive receptors as a result of road traffic emissions. This model is widely used in the UK for this type of assessment. It applies specified emission parameters for road traffic sources, in conjunction with the building massing (where appropriate) and meteorological statistics applicable to the site, to predict resulting concentrations at key receptors under different assessment scenarios.
- 6.2.16 The assessment scenarios are as follows:
- Model Verification (2017);
 - Baseline (2020);
 - Completion year assessment (2023) 'Do Minimum' (DM);
 - Completion year assessment (2023) 'Do Something' (DS);
 - 15 years plus completion (2038) DM with Garden Village (GV); and
 - 15 years plus completion (2038) DS with GV.
- 6.2.17 Full details of the modelling methodology and data used can be seen in Appendix 6.3.
- 6.2.18 LAQM.TG (16) recommends using a combination of automatic and diffusion tube monitoring data to verify predictions of NO_x concentrations. CCC currently monitors annual mean NO₂ concentrations using passive diffusion tubes at 50 locations across the city. CCC also has one automatic monitoring site, which measures concentrations of NO₂, PM₁₀ and PM_{2.5}.
- 6.2.19 The results from one automatic station and 10 local diffusion tubes were used to verify the model. The verification process can be found in Appendix 6.4. The model verification concluded that modelled predictions of the road traffic contribution to concentrations of overall NO_x are under-predicting at the majority of the monitoring locations by a factor of 1.85. An adjustment factor of 1.85 has therefore been applied to modelled road contributions.
- 6.2.20 In the absence of applicable monitoring data to verify PM₁₀ and PM_{2.5} results, modelled road contributions of PM₁₀ and PM_{2.5} concentrations are adjusted by the same verification factor as used for NO_x, following guidance in LAQM TG (16).
- 6.2.21 The predicted NO₂, PM₁₀ and PM_{2.5} concentrations were assessed against the National Air Quality Objectives (NAQOs).

¹³ CERC –ADMS-Roads User Guide

- 6.2.22 The predicted annual mean concentrations for NO₂ were used to determine whether the 1-hour NO₂ NAQO is likely to be breached. Data from a large number of monitoring sites, where road transport is the predominant emission source, show that the short-term objective is generally not exceeded when the annual mean concentrations of NO₂ are below 60 µg/m³.
- 6.2.23 The predicted number of days when the PM₁₀ concentration exceeds 50 µg/m³ has been calculated from the annual mean concentration using the methodology in LAQM.TG (16).

$$\text{No. of Exceedances} = -18.5 + 0.00145 \times \text{AM}^3 + (206/\text{AM})$$

AM = Annual Mean PM₁₀ concentration

Impact Significance

- 6.2.24 The magnitude of impacts on individual receptors on annual mean concentrations of NO₂, PM₁₀ and PM_{2.5} is defined in the IAQM and Environmental Protection UK (EPUK) Guidance, 2017¹⁴. These definitions are applied to the results of this assessment.
- 6.2.25 Table 6.1 presents the IAQM's impact descriptors for the significance of changes in annual mean NO₂, PM₁₀ and PM_{2.5} concentrations. It should be noted that there are no criteria to describe the significance of changes in the number of hours where mean NO₂, PM₁₀ and PM_{2.5} concentrations exceed relevant NAQOs. The guidance states that this magnitude and significance criteria should not be used to evaluate the overall air quality impact of a scheme but should be used to inform it.
- 6.2.26 Substantial and moderate air quality impact descriptors are considered significant.

Table 6.1 IAQM's Air Quality Impact Descriptors for Changes to Annual Mean NO₂, PM₁₀ and PM_{2.5} Concentrations at Receptors

Long term average concentration at receptor in assessment year	% Change in concentration relative to NAQO			
	1	2-5	6-10	>10
75% or less of NAQO	Negligible	Negligible	Slight	Moderate
76-94% of NAQO	Negligible	Slight	Moderate	Moderate
95-102% of NAQO	Slight	Moderate	Moderate	Substantial
103-109% of NAQO	Moderate	Moderate	Substantial	Substantial
110% or more of NAQO	Moderate	Substantial	Substantial	Substantial

Source: EPUK & IAQM (2017)

¹⁴ IAQM (January 2017) Guidance on land-use planning and development control: Planning for air quality v1.2

Ecological Impacts

- 6.2.27 The Scheme is anticipated to change traffic flows within 200m of the River Eden Special Area of Conservation (SAC), the Cummersdale Shingle Banks Site of Invertebrate Significance (SIS) and the Peasetree Ancient Semi Natural Woodland (ASNW), by more than 1,000 AADT or 200 HDV AADT. Therefore, as per the criteria detailed in the DMRB, an assessment of the air quality impacts was undertaken at these ecological receptors.
- 6.2.28 The River Eden SAC crosses three roads within the study areas which meet the DMRB criteria - Bridge Street, Charlotte Street and the Scheme itself. In accordance with DMRB, concentrations of NO_x, has been modelled at transects at varying distances from the affected roads (10m, 20m, 30m, 40m, 50m, 75m, 100m, 150m and 200m).
- 6.2.29 The Cummersdale Shingle Banks SIS crosses the Scheme itself. In accordance with DMRB, concentrations of NO_x, has been modelled at transects at varying distances from the Scheme (10m, 20m, 30m, 40m, 50m, 75m, 100m, 150m and 200m).
- 6.2.30 The Peasetree ASNW lies adjacent to the Scheme. In accordance with DMRB, concentrations of NO_x, has been modelled at transects at varying distances from the affected roads (10m, 20m, 30m, 40m, 50m and 75m)

Cumulative Impacts

- 6.2.31 Cumulative construction dust impacts have been considered in the construction dust assessment by considering any nearby construction activities and ensuring that any cumulative impacts are mitigated against effectively.
- 6.2.32 The traffic model used to derive the traffic data in the air quality modelling assessment includes committed development, therefore, the cumulative impacts of agreed developments have been considered within the modelling results.

6.3 Limitations and Assumptions

- 6.3.1 Where data required to undertake the construction phase assessment were not available, assumptions have been made using available data and professional judgement.

6.4 Consultations

- 6.4.1 A Draft Scoping Opinion was issued by Cumbria County Council in January 2019. With regards to air quality, a detailed assessment of the operational impacts of the Scheme on residential and ecological receptors using ADMS was agreed. The assessment is expected to consider the impact of NO₂, PM₁₀ and PM_{2.5} associated with the Scheme at sensitive receptors and within the nearby AQMAs. Particular attention should be given to areas where changes are sufficient to bring about the need for a new AQMA; or change the size of an existing AQMA. In light of the St Cuthbert's Garden Village proposals, a number of scenarios should be modelled.

6.5 Regulatory and Policy Framework

- 6.5.1 Air quality is governed by a series of local, regional and national legislation and policies. A detailed review of relevant legislation and policies is presented in Appendix 6.1.
- 6.5.2 With regards to the potential effect of the Scheme, the legislation is the National Air Quality Objectives (NAQOs), as set out in the Air Quality Strategy¹⁵ (2015) and the Air Quality Standards (England) Regulations¹⁶ (2010). The 2010 regulations are the latest update to the legislation which transposes into UK law the requirements of European Directives 2008/50/EC and 2004/107/EC, which apply legal responsibility to the NAQOs. The NAQOs include targets for NO₂, PM₁₀ and PM_{2.5} concentrations, as presented in Table 6.2.

Table 6.2 National Air Quality Objectives (NAQO)

Pollutant	Objective
Nitrogen dioxide (NO ₂)	200 µg/m ³ measured as a 1-hour mean, not to be exceeded more than 18 times a year
	40 µg/m ³ measured as an annual mean
Particles (PM ₁₀) (gravimetric)	50 µg/m ³ measured as a 24-hour mean, not to be exceeded more than 35 times a year
	40 µg/m ³ measured as an annual mean
Particles (PM _{2.5})	25 µg/m ³ measured as an annual mean. Target of 15% reduction in concentrations at urban background between 2010 and 2020

Source: Air Quality Strategy 2015

- 6.5.3 These air quality objectives are aimed at the protection of human health. The annual mean NAQOs apply at locations where the public may be regularly exposed, such as building facades of residential properties, schools, hospitals and care homes. The 1-hour mean NAQOs apply at all locations where it would be reasonable to expect members of the public to spend at least this period of time, for example busy shopping streets, car parks, bus stations, railway stations, school playgrounds, etc. The 24-hour mean PM₁₀ NAQO applies at all locations where the annual mean objective would apply, together with hotels and gardens of residential properties where relevant public exposure is likely. For full details, see Box 1.1 of LAQM.TG(16)¹⁷.
- 6.5.4 Air Quality Standards are concentrations recorded over a given time period, which are considered to be acceptable in terms of what is scientifically known about the effects of each pollutant on health and on the environment. They can also be used as a benchmark to indicate whether air pollution is getting better or worse.
- 6.5.5 An exceedance is a period of time (defined for each standard) where the concentration is higher than that set out in the Standard. In order to make useful comparisons between pollutants, (the Standards may be expressed in terms of different averaging times), the number of days on which an exceedance has been recorded is often reported.

¹⁵ Department for Environment, Food and Rural Affairs (Defra) (2015). *The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volumes 1 and 2)*

¹⁶ Defra (2015) *Air Quality (England) Regulations*

¹⁷ Defra (February 2018) *Local Air Quality Management Technical Guidance (TG16)*

- 6.5.6 Planning policy in the UK is governed by the National Planning Policy Framework, published in 2012 and revised in February 2019¹⁸. It advises that planning considerations should prevent:

“Both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans;”

- 6.5.7 The Clean Air Strategy¹⁹ (January 2019) sets out a plan for Government and society to tackle all sources of air pollution. The government plan on working with local authorities and public health sectors to enable them to make more informed decisions to improve air quality.
- 6.5.8 Local policy has also been considered in this assessment. Carlisle District Local Plan²⁰ was adopted in September 2015 and sets out the spatial vision, objectives, development strategy and a series of over-arching policies to influence development within the city. Policy SP9 outlines that the Council will ensure development minimise and mitigate against potential harm from pollution.

6.6 Baseline Conditions

Local Air Quality Management

- 6.6.1 Cumbria County Council (CCC) have declared six Air Quality Management Areas (AQMAs) at the following locations, all for the exceedance of the annual mean NO₂ NAQO :

- AQMA 1 (A7);
- AQMA 2 (Currock Street);
- AQMA 3 (Wigton Road);
- AQMA 4 (Bridge Street);
- AQMA 5 (Dalston Road); and
- AQMA 6 (London Road).

- 6.6.2 Orders to revoke AQMA 3 and AQMA 6 will be submitted in 2019 as monitored/modelled 2017 concentrations were measured/predicted to be well below the NAQO. AQMA 2, 3, 5 and 6 are all located approximately 2.5 km to the north of the scheme and AQMA 4 and 7 are located 3 km and 4 km north of the scheme, respectively.

Automatic Monitoring

- 6.6.3 CCC currently operates one automatic monitoring station at Paddy's Market (PM1) (GR:339467,555974), a roadside site which measures NO₂, PM₁₀ and PM_{2.5} and is located 3 km north of the Scheme.

¹⁸ Department for Communities and Local Government (2019), *National Planning Policy Framework*

¹⁹ Defra (January 2019) *Clean Air Strategy 2019*

²⁰ CCC (November 2016) *Carlisle District Local Plan 2015-2030*

6.6.4 Monitored NO₂, PM₁₀ and PM_{2.5} for 2013 to 2017 at PM1 are presented in Table 6.3.

Table 6.3 CCC Automatic Monitoring Data for (PM1-Roadside), 2013 – 2017

	2013	2014	2015	2016	2017
Annual Mean NO ₂ Concentration (µg/m ³)	26.3	26.9	25.1	27.6	23.3
No. of hourly Mean NO ₂ Concentration >200 µg/m ³	0	0	0	0	0
Annual Mean PM ₁₀ Concentration (µg/m ³)	13.9	15.0	17.3	13.6	14.6
No. of 24 hour means PM ₁₀ Concentration >50 µg/m ³	1	2	5	0	1
Annual Mean PM _{2.5} Concentration (µg/m ³)	12	11	10	10	9

Source: CCC ASR 2018

6.6.5 Roadside monitoring data at PM1 shows no exceedances of the NAQOs.

Diffusion Tube Monitoring

6.6.6 CCC currently monitors annual mean NO₂ concentrations using passive diffusion tubes at 50 locations across the city. Table 6.4 presents NO₂ monitoring data from 22 diffusion tube sites within the study area.

Table 6.4 CCC NO₂ Diffusion tube Monitoring Data Annual Mean 2013 – 2017

Monitoring Site	Grid Location	Site Type	Annual Mean NO ₂ Concentration (µg/m ³)				
			2013	2014	2015	2016	2017
G4	336905, 554036	Ru	14.1	14.6	12.5	13.0	12.0
H5	337643, 554100	Ro	16.8	17.5	15.7	16.1	16.6
H6	337962, 553220	Ro	12.3	11.4	9.8	12.0	9.4
H7	338282, 553396	Ro	18.1	16.8	15.4	17.0	15.1
B12	339921, 555406	Ke	37.3	33.5	30.3	31.6	26.2
B4	339434, 555638	Ro	43.6	44.8	41.0	40.0	39.9
B5	339613, 555587	Ro	28.4	29.0	27.3	28.6	24.3
B6	339731, 555526	Ro	32.2	30.8	29.9	30.9	27.3
B7	340205, 555198	Ro	32.2	30.8	29.9	30.9	27.3
E12	339225, 555821	Ro	37.1	36.1	34.0	35.7	33.5
E15	339091, 555736	Ro	33.1	31.0	29.8	32.0	30.2
E16	339141, 555900	Ro	35.0	34.9	30.4	32.7	31.4
E19	338953, 555610	Ro	39.7	38.2	33.0	34.8	31.5
E20	339023, 555692	Ro	33.2	32	28.8	29.9	28.6
E4	339396, 555947	Ro	36.9	37.7	34.2	33.5	29.0
E6	339467, 555974	Ro	29.8	31.3	29.3	29.3	28.0

Monitoring Site	Grid Location	Site Type	Annual Mean NO ₂ Concentration (µg/m ³)				
			2013	2014	2015	2016	2017
E8	339516, 556024	Ro	44.3	44.5	41.2	41.5	44.9
E21	337730, 556118	Ro	18.4	18.3	15.5	17.5	16.4
F1	340482, 555489	Ro	30.3	29.1	30.1	27.5	25.3
F5	340534, 555409	Ro	32.5	33.4	29.2	33.1	26
F7	340708, 555240	Ro	37.8	35.3	35.5	34.1	33.8
F9	341099, 554931	K	33.4	32.1	29.0	32.4	30.4

Source: CCC ASR 2017 & EHO, Ru = Rural, Ro= Roadside, K= Kerbside

- 6.6.7 Annual mean NO₂ concentrations over the last five years have been well below the NAQO of 40 µg/m³ at all monitoring locations except B4 and E8 where the NAQO has been exceeded., therefore, air quality is expected to be good in the vicinity of the Scheme.

Defra Background Maps

- 6.6.8 Defra provides modelled background concentrations for each 1 x 1 km grid across all local authority areas from a base year of 2015²¹ up to 2030. Table 6.5 presents the average estimated background concentrations within the study area used in the assessment. 2017, 2020 and 2023 concentrations were taken from the 2015-based background maps. The background concentrations for each 1 x 1 km grid square across the study area are shown in Appendix 6.3. As the background maps only project concentrations up to 2030, concentrations for 2030 have been used to represent 2038 concentrations and, as such, will produce a robust assessment as background concentrations will be expected to drop between 2030 and 2038.

Table 6.5 Defra Modelled Background Annual Mean NO_x, NO₂, PM₁₀ and PM_{2.5} Concentrations

Grid Square	Year	NO _x (µg/m ³)	NO ₂ (µg/m ³)	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)
337500,553500	2017	7.7	5.9	9.2	6.2
	2020	6.7	5.2	9.0	6.0
	2023	6.0	4.7	8.9	6.0
	2030	5.0	3.9	8.8	5.9
338500,552500	2017	6.8	5.3	9.6	6.4
	2020	6.0	4.7	9.5	6.2
	2023	5.5	4.3	9.4	6.2
	2030	4.8	3.8	9.3	6.1
339500,552500	2017	7.0	5.4	10.0	6.6
	2020	6.1	4.8	9.8	6.5
	2023	5.6	4.4	9.7	6.4
	2030	4.8	3.8	9.6	6.3

²¹ <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2015>

Grid Square	Year	NO _x (µg/m ³)	NO ₂ (µg/m ³)	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)
339200,551500	2017	6.2	4.8	9.2	6.1
	2020	5.4	4.3	9.0	6.0
	2023	4.9	3.9	8.9	5.9
	2030	4.2	3.3	8.8	5.8
340500,551500	2017	6.4	5.0	8.9	6.1
	2020	5.6	4.4	8.7	5.9
	2023	5.1	4.0	8.6	5.9
	2030	4.3	3.4	8.5	5.8
341500,551500	2017	6.5	5.1	9.3	6.3
	2020	5.7	4.5	9.1	6.2
	2023	5.1	4.0	9.0	6.1
	2030	4.3	3.4	8.9	6.0
342500,551500	2017	7.3	5.7	9.6	6.6
	2020	6.3	5.0	9.4	6.5
	2023	5.6	4.4	9.3	6.4
	2030	4.6	3.6	9.2	6.3
343500,551500	2017	12.5	9.5	12.3	7.9
	2020	10.4	8.0	12.0	7.7
	2023	8.8	6.8	12.0	7.6
	2030	6.7	5.2	11.8	7.5
340500,550500	2017	5.9	4.6	10.1	6.6
	2020	5.2	4.1	9.9	6.5
	2023	4.7	3.7	9.9	6.4
	2030	3.9	3.1	9.7	6.3
341500,550500	2017	6.1	4.8	9.5	6.3
	2020	5.3	4.2	9.3	6.1
	2023	4.7	3.7	9.3	6.1
	2030	3.9	3.1	9.1	6.0
342500,550500	2017	6.8	5.3	9.9	6.5
	2020	5.9	4.6	9.8	6.4
	2023	5.2	4.1	9.7	6.3
	2030	4.2	3.4	9.6	6.2

Receptors

6.6.9 Worst case locations within 200m of the affected road network (ARN) have been chosen as sensitive receptor locations. Given the nature of the receptors, all receptors are classed as highly sensitive. Table C.1 in Appendix 6.3 outlines the

locations of each receptor location assessed and the modelled 2020 baseline concentration for NO₂, PM₁₀ and PM_{2.5}.

Ecological Receptors

- 6.6.10 The nearest designated ecological habitats to the site are the River Eden SAC, the Cummersdale Shingle Banks SIS, both of which pass through the Scheme, and the Peasetree ASNW which lies adjacent to the Scheme. The ecological impacts of the Scheme at these designated locations have therefore been considered, in line with the requirements of DMRB.

6.7 Impact Assessment

Construction Phase

Construction Dust Assessment

Assessment of Potential Dust Emission Magnitude

- 6.7.1 The potential dust emission magnitude has been determined based on information provided by the project team, and (where data is not available) assumptions have been based on projects of similar size and nature.
- 6.7.2 It is anticipated that the total volume of buildings to be demolished is less than 20,000m³, with the majority of demolition activities occurring below 10m above ground. Therefore, the overall potential dust emission magnitude is considered to be **Small** for **Demolition**.
- 6.7.3 The site area is above 10,000m² on a loamy and clayey soil type²² with the potential for dust generation. It is estimated that more than 10 heavy earth moving vehicles will be active at any one time causing the construction material to be concrete and thus dusty, with some crushing and screening on site. Furthermore, the total material moved is estimated to be above 100,000 tonnes. Therefore, the dust emission magnitude for earthworks is considered to be **Large** for **Earthworks**.
- 6.7.4 The total volume of construction works is estimated to be less than 25,000m³, with construction materials with potential for dust release being used. Therefore, the dust emission magnitude for **Construction** activities is **Medium**.
- 6.7.5 It is anticipated that there will be more than 50 HGV outward movements per day. The surface material has the potential for dust release, and it is assumed that there will be an unpaved road length between 50m and 100m within the Scheme. Therefore, the dust emission magnitude is **Large** for **Trackout**.

Sensitivity of the Area

- 6.7.6 There are 1-10 residential receptors within 20m of the Scheme, and 1 to 10 residential receptors within 50 m of the roads used by construction vehicles, up to 500m from the site boundary. Based on the information set out in Appendix 6.5, the area is considered to be of **Medium** sensitivity to dust soiling effects from construction, demolition and earthworks and trackout activities.
- 6.7.7 As presented in

²² Cranfield Soil and Agrifood Institute, Cranfield University. Available online: <http://www.landis.org.uk/soilscapes/>

- 6.7.8 Table 6.5, Defra background mapping indicates that annual mean PM₁₀ concentrations in the vicinity of the Scheme are likely to be below 24µg/m³. As there are 1 to 10 sensitive receptors within 20m from the site, and 10 to 100 residential receptors within 50 m of the roads used by construction vehicles, up to 500m from the site boundary, based on the criteria set out in IAQM Guidance²³, the area is considered to be of **Low** sensitivity to human health impacts from construction, demolition, earthworks and trackout activities.
- 6.7.9 There are three ecological receptors within 50m of the Scheme boundary, and along the likely routes of construction vehicles up to 500m from the Scheme entrance. Consequently, further consideration of the impact of the Scheme on sensitive ecological receptors has been considered. The ecological receptors are, therefore considered to be of **High** sensitivity.

Risk of Impacts

- 6.7.10 Step 2C in Appendix 6.2 has been followed using the above designations of dust emission magnitude and area sensitivity. The risks have been summarised in Table 6.6 below.

Table 6.6 Summary Dust Table

Activity	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Low Risk	Medium Risk	Medium Risk	Medium Risk
Human Health	Negligible Risk	Low Risk	Low Risk	Low Risk
Ecological	Medium Risk	High Risk	Medium Risk	High Risk

Operational Phase

- 6.7.11 Annual mean concentrations of NO₂, PM₁₀ and PM_{2.5} have been modelled at 72 residential receptors and three ecological receptors, the River Eden SAC, the Cummersdale Shingle Banks SIS and the Peasetree ASNW. The River Eden SAC has been assessed at three different locations where the DMRB criteria are met; the Scheme itself, Bridge Street and Charlotte Street.

Year 2023 – Completion Year Assessment

Modelled NO₂ Concentrations

- 6.7.12 Table E.1 in Appendix 6.5 presents the modelled annual mean NO₂ concentrations at the worst-case facades of considered receptors, for the 2023 DM and DS scenario. Defra mapped background concentrations, as shown in
- 6.7.13 Table 6.5 have been combined with road contributions to obtain total concentrations.
- 6.7.14 As seen in Table E.1, there are no residential receptors with modelled annual mean NO₂ concentrations above the relevant NAQO during the DM and DS year. Modelled annual mean NO₂ concentrations for all receptors do not exceed 60µg/m³, suggesting the 1-hour NAQO will be achieved in all cases. The EPUK impact (the difference between the DM and DS scenario) varies from Moderate Beneficial to a Negligible impact. As the modelled traffic data includes other committed

²³ IAQM Guidance on the Assessment of Dust from Demolition and Construction

developments, all impacts are cumulative impacts and are considered long term impacts.

Modelled PM₁₀ Concentrations

- 6.7.15 Table E.2 in Appendix 6.5 presents the modelled annual mean PM₁₀ concentrations at the worst-case facades of considered receptors, for the 2023 DM and DS opening year scenario. Also presented are the number of days the daily mean PM₁₀ concentrations exceed 50µg/m³ at the same locations. Defra mapped background concentrations, as shown in
- 6.7.16 Table 6.5 have been combined with road contributions to obtain the total concentrations.
- 6.7.17 Modelled annual mean PM₁₀ concentrations for all sensitive residential receptors are anticipated to be well below (IAQM descriptor, <75%) the relevant NAQO during the DM and DS year. The number of days the daily mean PM₁₀ concentrations exceed 50µg/m³ is well below 35 days at all receptors. The EPUK impact (the difference between the DM and DS scenario) is negligible at all receptors.

Modelled PM_{2.5} Concentrations

- 6.7.18 Table E.3 in Appendix 6.5 presents the modelled annual mean PM_{2.5} concentrations at the worst-case facades of considered receptors, for the 2023 DM and DS opening year scenario. Defra mapped background concentrations, as shown in
- 6.7.19 Table 6.5 have been combined with road contributions to obtain the total concentrations.
- 6.7.20 Modelled annual mean PM_{2.5} concentrations for all sensitive residential receptors are anticipated to be well below (IAQM descriptor, <75%) the relevant NAQO during the DM and DS year. The EPUK impact (the difference between the DM and DS scenario) is negligible at all receptors.

Ecological Receptors

- 6.7.21 The modelled NO_x concentrations at the River Eden SAC, the Cummersdale Shingle Banks SIS and the Peastree ASNW ecological receptors do not exceed 30µg/m³ as noted in Table E.4 in Appendix 6.5, therefore, the impact of the Scheme is not significant.

Year 2038 – 15 years plus completion with Garden Village

Modelled NO₂ Concentrations

- 6.7.22 Table E.5 in Appendix 6.5 presents the modelled annual NO₂ concentrations at the worst-case facades of considered receptors, for the 2038 DM and DS scenario. Defra mapped background concentrations, as shown in Table 6.5 have been combined with road contributions to obtain total concentrations.
- 6.7.23 There are no residential receptors with modelled annual mean NO₂ concentrations above the relevant NAQO during the DM and DS year. Modelled annual mean NO₂ concentrations for all receptors do not exceed 60µg/m³, suggesting the 1-hour NAQO will be achieved in all cases. The EPUK impact (the difference between the DM and DS scenario) varies from Moderate Beneficial to a Negligible impact. There is a Negligible impact at all receptors, apart from the receptor 23, which lies on the

corner of Peter Lane and A595 Wigton Road, which has a Moderate Beneficial impact.

Modelled PM₁₀ Concentrations

- 6.7.24 Table E.6 in Appendix 6.5 presents the modelled annual mean PM₁₀ concentrations at the worst-case facades of considered receptors, for the 2038 DM and DS opening year scenario. Also presented are the number of days the daily mean PM₁₀ concentrations exceed 50µg/m³ at the same locations. Defra mapped background concentrations, as shown in Table 6.5 have been combined with road contributions to obtain the total concentrations.
- 6.7.25 Modelled annual mean PM₁₀ concentrations for all sensitive residential receptors are anticipated to be well below (IAQM descriptor, <75%) the relevant NAQO during the Do Minimum and Do Something year. The number of days the daily mean PM₁₀ concentrations exceed 50µg/m³ is well below 35 days at all receptors.

Modelled PM_{2.5} Concentrations

- 6.7.26 Table E.7 in Appendix 6.5 presents the modelled annual mean PM_{2.5} concentrations at the worst-case facades of considered receptors, for the 2038 DM and DS opening year scenario. Defra mapped background concentrations, as shown in Table 6.5 have been combined with road contributions to obtain the total concentrations.
- 6.7.27 Modelled annual mean PM_{2.5} concentrations for all sensitive residential receptors are anticipated to be well below (IAQM descriptor, <75%) the relevant NAQO during the DM and DS year. The EPUK impact (the difference between the DM and DS scenario) is negligible at all receptors.

Ecological Receptors

- 6.7.28 The modelled NO_x concentrations at the River Eden SAC, the Cummersdale Shingle Banks SIS and the Peasetree ASNW ecological receptors do not exceed 30µg/m³ as noted in Table E.8 in Appendix 6.5, therefore, the impact of the Scheme is not significant.

6.8 Mitigation, Enhancement and Monitoring

Mitigation of Short-Term Impacts

- 6.8.1 The risk assessment of dust from the demolition and construction phases of the Scheme concluded that there is a negligible to medium risk of dust soiling effects and to human health effects and a medium to high risk to ecological receptors. As a result of this, certain mitigation measures from the IAQM guidance documents, are recommended to remove the potential for any significant impacts.
- 6.8.2 Using the results from the dust and construction assessment, mitigation measures are decided generally for example if “and the highest risk category should be applied. For example, if the site is medium risk for earthworks and construction, but a high risk for demolition and track-out, the general measures applicable to a high-risk site should be applied”.
- 6.8.3 In this instance for the Scheme, as there is a negligible to medium risk of dust soiling to human health effects and a medium to high risk to ecological receptors,

the general measures applicable to a high-risk site should be applied. The high-risk mitigation measures are located in 'Step 5' of Appendix 6.2 and are summarised below.

Mitigation of Long-Term Impacts

- 6.8.4 There are no significant impacts predicted, therefore, no additional mitigation is to be implemented.

6.9 Residual Impact Assessment

- 6.9.1 In line with IAQM guidance, the implementation of any recommended mitigation measures will reduce any significant impacts to negligible and, therefore, the residual impacts are not significant.

6.10 Cumulative Effects

- 6.10.1 The traffic data used in the modelling assessment considers any committed developments, therefore, the modelled results include cumulative effects. This includes the impact of the Garden Village in the 2038 scenario.
- 6.10.2 At this time the exact layout of St Cuthbert's Garden Village is not known. As a result, a detailed assessment of the potential interactions with the Scheme is not possible. Therefore, the inter-project cumulative effects have been assessed at a high level using professional judgement and only where the assessment topic has been determined to have clear relevance to the proposed Garden Village development.

6.11 Summary

- 6.11.1 The Scheme includes a new road link as well as serving as a replacement for existing routes (e.g. Newbiggin Road), and in both regards it has the potential to both reduce traffic on existing roads, and to increase the traffic source of emissions near to receptors (e.g. properties or sensitive habitats). Likewise, construction of this major new road scheme will include certain emissions sources, such as vehicles and dust. Therefore, the Scheme was assessed for potential adverse and beneficial air quality impacts on local sensitive receptors.
- 6.11.2 The risk assessment for potential dust impacts during construction of the Scheme has resulted in the recommendation of mitigation measures commensurate with the level of risk. This includes, for example, good site management and dust inspections, planning the site layout in an effective way and keeping materials stored in such a way as to reduce dust impacts and adequate dust suppression included wheel washes. On the basis of the correct implementation of the mitigation measures, construction activities are predicted to have negligible dust impacts at sensitive receptor locations.
- 6.11.3 In the 2023 'Do Something' (DS) scenario (i.e. the assessment of the Scheme in the year 2023), the assessment indicates that the Scheme will have a Moderate Beneficial to Negligible impact on NO₂ annual mean concentrations at individual receptor locations assessed, and a Negligible impact on annual mean PM₁₀ and PM_{2.5} concentrations at individual receptor locations assessed. It is not predicted that the Scheme will cause any exceedances of the short-term National Air Quality Objectives (NAQOs).

- 6.11.4 Assessment of ecological receptors in the 2023 DS scenario indicates that the Scheme will not have a significant impact on either the River Eden Special Area of Conservation (SAC), the Cummersdale Shingle Banks Site of Invertebrate Significance (SIS) or the Peasetree Ancient Semi Natural Woodland (ASNW).
- 6.11.5 In the 2038 DS scenario (i.e. the assessment in the year 2038), the assessment indicates that the Scheme will have a Moderate Beneficial to Negligible impact on annual mean NO₂ concentrations at individual receptor locations assessed, and a Negligible impact on annual mean PM₁₀ and PM_{2.5} concentrations at individual receptor locations assessed. It is not predicted that the Scheme will cause any exceedances of the short-term NAQOs.
- 6.11.6 Assessment of ecological receptors in the 2038 DS scenario indicate that the Scheme will not have a significant impact on either the River Eden SAC, the Cummersdale Shingle Banks SIS or the Peasetree. Ancient Semi Natural Woodland (ASNW).
- 6.11.7 Cumulatively, the overall air quality effect of the Scheme is deemed to have a beneficial impact across the study area.

7 Archaeology

7.1 Introduction

- 7.1.1 This chapter assesses the potential impacts on archaeological remains. Archaeological remains are one component of cultural heritage, a term which typically addresses three components. Other components include historic buildings and historic landscapes, which have been scoped out from this EIA on the basis of the Scoping Opinion, provided by Cumbria County Council in consultation with Historic England and other key stakeholders. These elements will be considered within a Heritage Statement, to be submitted as a separate document with the planning application for the Scheme.
- 7.1.2 The visual impacts of the Scheme, including on upstanding heritage receptors, are considered within Chapter 10 of this ES. The focus of this chapter is therefore exclusively archaeological remains (i.e. archaeological deposits or features) which are located within areas likely to be directly impacted by the Scheme i.e. the extent of the road, its earthworks and any temporary or permanent compound areas.

7.2 Assessment Methodology

Guidelines

- 7.2.1 The assessment of impact on archaeological remains has been principally carried out in accordance with guidance contained in the DMRB²⁴, the steps of which are indicated below. Additional guidance is drawn from Historic England's guidance on 'understanding place'²⁵ and the 'setting of heritage assets'²⁶ and their 'Good Practice in Planning Notes'²⁷, the Chartered Institute for Archaeologists' (CIfA) Code of Conduct²⁸ and CIfA's Standard and Guidance for historic environment desk-based assessment²⁹. These documents have helped in establishing the baseline through identifying all sensitive receptors likely to be impacted by the Scheme (see 7.2.4.-7.2.7).

Methodology

- 7.2.2 As outlined in the DMRB, the steps taken to assess impacts on cultural heritage assets are:
- establish the cultural heritage baseline within the defined study area;
 - consider the proposed development in terms of its archaeological and historic environment potential and assess its value (or 'sensitivity');

24 Highways Agency 2017. The Design Manual for Roads and Bridges (DMRB)

25 Historic England 2017. Understanding Place: historic area assessments in a planning and development context. Historic England: Swindon

26 Historic England 2015. The Setting of Heritage Assets. Historic England: Swindon

27 Historic England 2015. Historic Environment: Good Practice Advice in Planning Note 2. Managing Significance in Decision Taking in the Historic Environment

28 Chartered Institute for Archaeologists (CIfA) 2017. Code of Conduct

29 CIfA 2017. Standard and guidance for historic environment desk based assessment

- identify the potential impacts resulting from the Scheme and their effects on cultural heritage assets and assess the magnitude and significance of any change; and
- propose mitigation measures where appropriate to mitigate any predicted significant adverse effects.

7.2.3 The study area comprises the extent of the Scheme, i.e. the extent of the road, its earthworks and any associated temporary or permanent compound areas, which have been anticipated to occur within a 100m buffer zone from the centreline of the Scheme (Figure 1.1).

Establishing the Baseline

7.2.4 The Archaeological Study compiled for Stage 2³⁰ has been reviewed to incorporate any new archaeological field studies or secondary sources of data released in the interim. This has comprised the compilation of data held within Cumbria County Council's Historic Environment Record, the Archaeological Data Service online repository, Historic England's National Heritage List and PastScape databases and from primary sources held at Cumbria Archive Centre in Carlisle.

7.2.5 Additionally, a detailed walkover survey of the site was undertaken in February 2019, covering known archaeological sites within the footprint of the Scheme and an additional 100m wide buffer zone (Appendix 7.1). This aimed to assess all known assets/receptors and to identify and record any new archaeological assets, such as earthworks or historic structures, and other heritage assets, using GPS and scaled photography to record their location and condition.

7.2.6 This assessment is further supported by two phases of non-intrusive geophysical survey, undertaken in February 2019 (Appendix 7.2) along the proposed route of the scheme and in September 2019 targeting confirmed compound areas (Wardell Armstrong 2019a forthcoming³¹), and by a targeted trial trench evaluation in September 2019 (Wardell Armstrong 2019b forthcoming³²), due to the moderate to high archaeological potential identified within the Scheme area to help to further define and characterise sensitive receptors.

7.2.7 The dataset resulting from all of the works outlined above has been analysed, and the locations of individual archaeological remains have been assessed against the Scheme and its associated areas of likely direct impact. This has resulted in the identification of a total of 165 sensitive receptors which are at risk as a direct result of the implementation of the Scheme.

Identification of Impacts and their Effects

7.2.8 Table 7.1 sets out the measures of value (or sensitivity) which have been assigned as appropriate to the archaeological remains identified in the baseline. This table is based on tables provided in the DMRB³³.

³⁰ Wardell Armstrong 2017. Carlisle Southern Link Route, Archaeological Study.

³¹ Wardell Armstrong 2019a. Carlisle Southern Link Road. Phase 2 Geophysical Survey Report, forthcoming

³² Wardell Armstrong 2019b. Carlisle Southern Link Road. Phase 1 Archaeological Evaluation Report, forthcoming

³³ Highways Agency 2017. The Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 2

Table 7.1 Environmental value descriptors for archaeological remains

Value	Descriptor
Archaeological Remains	
Very High	<ul style="list-style-type: none"> • World Heritage Site (including nominated sites). • Assets of acknowledged international importance. • Assets contributing significantly to acknowledged international research objectives.
High	<ul style="list-style-type: none"> • Scheduled Ancient Monuments (including proposed sites). • Undesignated assets of schedule quality and importance., • Assets that can contribute significantly to international research objectives.
Medium	<ul style="list-style-type: none"> • Designated or undesignated assets that contribute to regional research objectives.
Low	<ul style="list-style-type: none"> • Designated and undesignated assets of local importance. • Assets compromised by poor preservation or poor survival of context. • Assets of limited value, but with potential to contribute to local research objectives.
Negligible	<ul style="list-style-type: none"> • Assets with very little or no serving archaeological interest.
Unknown	<ul style="list-style-type: none"> • The importance has not been ascertained.

7.2.9 This chapter includes a thorough assessment of the likely effects of the Scheme (both during construction and following completion) upon the significance of archaeological remains/heritage assets. This includes the potential impact which the construction and operation might have upon the condition, perceptions, understanding and appreciation of each sensitive receptor.

7.2.10 For archaeological remains, the key impacts will result from groundworks undertaken during the construction phase of the Scheme. Such impacts of the Scheme and effects on archaeological remains/heritage assets have been measured by comparing the amount of change an asset is likely to experience from the baseline. Table 7.2 sets out the measures for magnitude of impact (degree of change) which have been applied. Table 7.3 assesses the value of an individual receptor against the magnitude of impact to provide a significance of effect³⁴. For significance of effect, in cases where there are two options for significance, '*a single description should be decided upon with reasoned judgement for that level of significance chosen*' (*ibid*³⁵). Both tables are based on tables provided in the DMRB.

³⁴ Highways Agency 2017. The Design Manual for Roads and Bridges (DMRB) Volume 11, Section 2, Part 5

³⁵ Highways Agency 2017. The Design Manual for Roads and Bridges (DMRB) Volume 11, Section 2, Part 5

Table 7.2 Magnitude of impact descriptors for archaeological remains

Magnitude of Impact	Descriptor
Archaeological Remains	
Major	<ul style="list-style-type: none"> • Change to most or all archaeological materials, the resource is totally altered. • Comprehensive changes to setting.
Moderate	<ul style="list-style-type: none"> • Changes to many key archaeological materials, the resources is clearly modified. • Considerable changes to setting that affect the character of the asset.
Minor	<ul style="list-style-type: none"> • Changes to key archaeological materials, the resource is clearly modified. • Slight changes to setting.
Negligible	<ul style="list-style-type: none"> • Very minor changes to archaeological materials and/or setting.
No Change	<ul style="list-style-type: none"> • No change.

Table 7.3 Significance of effect categories

Magnitude of Impact		No Change	Negligible	Minor	Moderate	Major
Value of Receptor	Very High	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large
	High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
	Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
	Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
	Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight

7.2.11 This matrix-based approach has been applied to assess the significance of effects based on the combined value of the asset and the magnitude of the impact. As the table above shows, the significance of effect is reported on a five-point scale: 'Very Large', 'Large', 'Moderate', 'Slight' and 'Neutral'.

Identification of Cumulative Effects

- 7.2.12 The cumulative effects of the Scheme and approved developments within the area, including the forthcoming St Cuthbert's Garden Village, have been assessed qualitatively following the DMRB guidelines³⁶. The cumulative effects of climate change upon archaeological remains within the assessment area is also considered. When '*considered in isolation, the environmental effects of any single project upon any single receptor/resource may not be significant. However, when individual effects are considered in combination, the resulting cumulative effect may be more significant*'³⁷. For determining cumulative effects and their significance, Table 7.4 is used as a framework. This is based on tables provided in the DMRB.

Table 7.4 Significance of effects for archaeological remains

Significance	Effect
Archaeological Remains	
Very large	Effects that the decision-maker must take into account as the receptor/resource is irretrievably compromised.
Large	Effects that may become key decision-making issue.
Moderate	Effects that are unlikely to become issues on whether the project design should be selected, but where future work may be needed to improve on current performance.
Slight	Effects that are locally significant.
Neutral	Effects that are beyond the current forecasting ability or are within the ability of the resource to absorb such change.

Mitigation Measures

- 7.2.13 Following the assessment of the value against the magnitude of impact upon a heritage asset, a series of mitigation measures have been identified. For **slight** impact and below, a low level of mitigation is anticipated. For **moderate** impact and above, a higher level of mitigation would be appropriate. In cases of a **very large** impact, development may not be agreed on, and a very high level of mitigation may have been required, though this level has not been reached in relation to the Scheme. A total of seven mitigation measures have been proposed, based on industry best-practice, and further defined following consultation with Jeremy Parsons, Cumbria County Council's Planning Archaeologist (Table 7.5).

³⁶ Highways Agency 2017. The Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 2

³⁷ Highways Agency 2017. The Design Manual for Roads and Bridges (DMRB) Volume 11, Section 2, Part 5

Table 7.5 Mitigation measures for archaeological remains

Identifier	Measure
Archaeological Remains	
CH01	Trial trench evaluation pre-construction phase
CH02	Topographic survey pre-construction phase
CH03	Archaeological recording pre-construction phase
CH04	Archaeological recording prior to demolition of receptor, pre-construction phase
CH05	Archaeological recording prior to demolition/relocation of receptor, pre-construction phase and archaeological monitoring to occur during demolition/relocation
CH06	Archaeological recording prior to demolition/relocation of receptor, pre-construction phase followed by archaeological recording during construction phase once vegetation has been removed and before demolition/relocation
CH07	Archaeological recording prior to demolition/relocation of receptor, pre-construction phase followed by archaeological recording during construction phase once vegetation has been removed and archaeological monitoring to occur during demolition/relocation

7.3 Limitations and Assumptions

- 7.3.1 The potential impacts and effects as reported are reliant on the quality of baseline information data obtained during Stage 2 (Wardell Armstrong 2017³⁸) and the nature of the datasets accessed to update this baseline during the research exercise undertaken during the Stage 3 assessment.
- 7.3.2 A programme of archaeological field investigations comprising detailed walkover surveys geophysical surveys and a trial trench evaluation has been undertaken to further inform the baseline. These surveys were dependant on land access and ground conditions in February 2019 and in September 2019. For the walkover survey, this included a buffer zone of 100m centred on the Scheme itself, and thus was able to incorporate compound and utility areas not confirmed in February 2019 (Appendix 7.1).
- 7.3.3 The geophysical surveys, as more intense, time-consuming works, were subject to tighter access restrictions and initially focused on the Scheme itself (Appendix 7.2). An additional phase was able to target some of the compound areas with highest archaeological potential in September 2019 but did not include all compound and utility areas (Wardell Armstrong 2019a forthcoming³⁹). Similarly, the trial trench evaluation only targeted certain areas identified of potential archaeological interest from the geophysical survey results of February 2019 (Wardell Armstrong 2019b forthcoming⁴⁰). As such, there is an information gap, and thus there is the potential for sensitive receptors to be present within the compound and utility areas. Furthermore, there remains the potential that additional sensitive receptors/heritage

³⁸ Wardell Armstrong 2017, Carlisle Southern Link Road, Cumbria: Archaeological Study

³⁹ Wardell Armstrong 2019a. Carlisle Southern Link Road. Phase 2 Geophysical Survey Report, forthcoming

⁴⁰ Wardell Armstrong 2019b. Carlisle Southern Link Road. Phase 1 Archaeological Evaluation Report, forthcoming

assets exist within other areas to be affected by the Scheme that are as yet unknown and that, dependent on type, depth and geology, may not have been identified by the programme of archaeological field investigations.

7.4 Consultations

- 7.4.1 Following on from Stage 2, advice has been sought from Jeremy Parsons, Cumbria County Council's Planning Archaeologist, and Historic England. This consultation resulted in the scoping out of the Historic Buildings and Historic Landscape assessment from the Environmental Statement and a total of seven mitigation measures. Indirect impacts and effects of the Scheme on setting, relevant to cultural heritage, are partially addressed in the Landscape and Visual Impacts chapters and addressed more fully in a separate Heritage Statement document (Wardell Armstrong forthcoming⁴¹).
- 7.4.2 Monthly workshops and meetings with all parties involved were undertaken to establish a general baseline and cohesive approach to the EIA.

7.5 Regulatory and Policy Framework

- 7.5.1 The National Planning Policy Framework (NPPF) was updated in February 2019. This defines the range of heritage assets from those of local historic value to assets of international significance. It states that these

'assets are an irreplaceable resource and should be conserved in a manner appropriate to their significance.'⁴² The section advises that: 'in determining applications, local planning authorities should require an applicant to describe the significance of any heritage assets affected... The level of detail should be proportionate to the assets' importance and no more than is sufficient to understand the potential impact of the proposal on their significance'.⁴³ 'The effect of an application on the significance of a non-designated heritage asset should be taken into account in determining the application. In weighing applications that directly or indirectly affect non-designated heritage assets, a balanced judgement will be required having regard to the scale of any harm or loss and the significance of the heritage asset.'⁴⁴ 'Local planning authorities should require developers to record and advance understanding of the significance of any heritage assets to be lost (wholly or in part) in a manner proportionate to their importance and the impact, and to make this evidence (and any archive generated) publicly accessible. However, the ability to record evidence of our past should not be a factor in deciding whether such a loss should be permitted.'⁴⁵

- 7.5.2 The Carlisle Local Plan, adopted in 2016, states that: 'proposals that affect non-designated assets will be judged on the significance of the assets and the scale of likely harm to establish whether the development is acceptable in principle'⁴⁶. The

⁴¹ Wardell Armstrong forthcoming, Carlisle Southern Link Road: Heritage Statement

⁴² National Planning Policy Framework (NPPF) 2019. Section 16: Conserving and Enhancing the Historic Environment, para 184

⁴³ National Planning Policy Framework (NPPF) 2019. Section 16: Conserving and Enhancing the Historic Environment, para 189

⁴⁴ National Planning Policy Framework (NPPF) 2019. Section 16: Conserving and Enhancing the Historic Environment, para 197

⁴⁵ National Planning Policy Framework (NPPF) 2019. Section 16: Conserving and Enhancing the Historic Environment, para 199

⁴⁶ Carlisle City Council 2016. The Carlisle Local Plan, 2015-2030, Policy HE2, p182

policy further advises on the level of information required to mitigate proposed developments.

7.6 Baseline Conditions

- 7.6.1 A more general historic baseline appraisal is included in the Stage 2 archaeological study (Wardell Armstrong 2017⁴⁷) and thus is not repeated here. A summary of all relevant sensitive receptors comprising the present baseline is included as Table 6, and their locations included in Figure 7.1. The baseline includes a total of 25 sensitive receptors of medium value. These are exclusively important historic hedgerows, as defined by Hedgerow Regulations 1997⁴⁸ (HA38, HA41-HA45, HA47-HA50, HA52, HA56-HA62, HA65- HA67 and HA69- HA72), identified as such from their presence on pre-1850 maps and confirmed as meeting survival levels during the walkover surveys⁴⁹ (Appendix 7.1). Many of these will be the result of parliamentary acts of enclosure of the 17th century and onwards which exacerbated the rate of landscape change and produced larger, more regular fields with fewer landholders⁵⁰. These landscape alterations also resulted in the creation of a number of additional field boundaries, some presently surviving (HA39, HA40, HA46, HA51, HA53- HA55, HA63, HA64 and HA68), one not (HA37), none meriting consideration under Hedgerow Regulations 1997, and therefore all of low value.
- 7.6.2 Other sensitive receptors, likely to be of agricultural origin and which reflect the use of the landscape for such purposes throughout the medieval and post medieval periods, include boundary ditches and banks (HA02, HA04, HA05, HA09, HA11, HA13, HA27, HA28, HA31, HA33, HA76, HA77, HA85, HA147, HA148 and HA151), areas of ridge and furrow (HA06, HA07, HA22, HA30, HA32 and HA150), former green lanes, drove roads and trackways (HA14, HA20, HA21, HA26, HA34, HA35, HA86, HA87, HA157 and HA158), a probable cow or horse burial (HA75), a probable agricultural outbuilding (HA17) and probable ploughmarks and agricultural features revealed by geophysical survey (Appendix 7.2; HA79, HA82, HA83, HA89, HA90, HA92, HA93, HA97, HA99, HA100, HA101, HA103, HA104, HA105, HA107, HA108, HA111-HA114, HA117-HA121, HA123, HA125, HA126, HA127, HA133, HA134, HA136-HA141, HA143, HA144 and HA146). The research and surveys also revealed a number of additional anomalies, impossible to define definitively, but unlikely to represent sensitive receptors of higher than low value (HA29, HA73, HA79-81, HA84, HA88, HA91, HA94-96, HA98, HA102, HA106, HA109-110, HA115-116, HA122, HA124, HA127-132, HA135, HA142, HA145, HA147, HA152, HA155-156 and HA160-165).
- 7.6.3 Although predominantly agricultural in nature, the landscape to be affected by the Scheme has also historically been utilised for small scale industrial processes, represented by a number of sensitive receptors of low value which include a likely sawpit site (HA08) and a millrace (HA15), with probable associated building (HA19), which utilised the River Caldew, all three likely relating to post medieval activity. A rifle range was also established by the Caldew in the 19th century (HA16).
- 7.6.4 Other post medieval developments represented in the landscape to be affected by the Scheme include the formalisation and development of transport links and road networks, with cottages and public houses constructed along the former drove roads (HA153), and, initialising the first significant incursion south of Carlisle, the

⁴⁷ Wardell Armstrong 2017, Carlisle Southern Link Road, Cumbria: Archaeological Study

⁴⁸ Hedgerow Regulations 1997

⁴⁹ Wardell Armstrong 2019. Carlisle Southern Link Route, Walkover Survey.

⁵⁰ Wardell Armstrong 2017. Carlisle Southern Link Route, Archaeological Study, p14-15

introduction of the railway. Two railway lines are crossed by the Scheme, the Maryport and Carlisle Railway (1836-1845), to the west and the Lancaster and Carlisle Railway (1844-47) to the east, both still in use. Both had stations (HA18 and HA151) provided within the area to be affected by the Scheme. One of these, Brisco Railway Station (HA151), survives, though has since been converted to residential use. Another sensitive receptor, likely of post-medieval origin, is the location of two gravestones observed during the walkover survey in-use as gateposts (HA36). All of these post medieval sensitive receptors are likely to be of low value.

- 7.6.5 Though the Scheme affects a landscape which, during the medieval period, lay within the Forest of Inglewood where settlement was discouraged, grazing was encouraged and encroachment did occur⁵¹. A number of sensitive receptors may relate to such activity, including a farmstead (HA24) and associated field systems (HA25); and a medieval deer park is also known to have once occupied part of the study area (HA23). Additional sensitive receptors, surviving as cropmarks or revealed by geophysical survey (HA01, HA10, HA12, HA80), and therefore of uncertain origin, may represent the archaeological remains of settlement sites or enclosures of the medieval, or much earlier, periods. The only other sensitive receptors comprising the baseline representing early activity are the known routes of two Roman roads (HA03 and HA154), though associated occupation-relation features are less likely to lie in the vicinity as the Scheme is located some distance from known Roman settlements. All of these sensitive receptors of medieval and earlier origin are unlikely to be of higher value than low, although the potential that some may be found to be of higher significance at a later date once a fuller understanding of the resource can be achieved through excavation, cannot be ruled out. Similarly, there remains the potential for as-yet unknown sensitive receptors, not encountered during the surveys, to survive, that may also be detrimentally affected by the Scheme.
- 7.6.6 The baseline comprising archaeological remains is unlikely to be altered in the absence of the Scheme. Instead, these sensitive receptors would be preserved in the landscape, along with any additional sensitive receptors, as yet unknown, which may be revealed through future archaeological assessment research or survey.

Table 7.6 Summary of sensitive receptors forming baseline and their values

Receptor No.	Receptor Name	Value
HA01	Probable settlement	Low
HA02	Flood defences	Low
HA03	Roman road	Low
HA04	Boundary ditch	Low
HA05	Ditch	Low
HA06	Ridge and furrow and bank	Low
HA07	Ridge and furrow; findspot	Low
HA08	Sawpit site	Low

⁵¹ Wardell Armstrong 2017. Carlisle Southern Link Route, Archaeological Study, p10

Receptor No.	Receptor Name	Value
HA09	Linear cropmark	Low
HA10	Enclosure	Low
HA11	Ditch	Low
HA12	Enclosure and trackway	Low
HA13	Ditch	Low
HA14	Former green lane	Low
HA15	Site of millrace	Low
HA16	Site of rifle range	Low
HA17	Site of outbuilding	Low
HA18	Site of railway station	Low
HA19	Site of T-shaped building	Low
HA20	Drove road	Low
HA21	Drove road	Low
HA22	Ridge and furrow	Low
HA23	Site of deer park	Low
HA24	Farmstead and field system	Low
HA25	Features of possible medieval origin	Low
HA26	Trackway	Low
HA27	Ditch	Low
HA28	Bank	Low
HA29	Spoil heap/ dump	Low
HA30	Ridge and furrow	Low
HA31	Boundary	Low
HA32	Ridge and furrow	Low
HA33	Bank and ditch	Low
HA34	Track	Low
HA35	Track	Low
HA36	Gravestones	Low
HA37	Former field boundary	Low
HA38	Important Hedgerow	Medium
HA39	Historic Hedgerow	Low

Receptor No.	Receptor Name	Value
HA40	Historic Hedgerow	Low
HA41	Important Hedgerow	Medium
HA42	Important Hedgerow	Medium
HA43	Important Hedgerow	Medium
HA44	Important Hedgerow	Medium
HA45	Important Hedgerow	Medium
HA46	Historic Hedgerow	Low
HA47	Important Hedgerow	Medium
HA48	Important Hedgerow	Medium
HA49	Important Hedgerow	Medium
HA50	Important Hedgerow	Medium
HA51	Historic Hedgerow	Low
HA52	Important Hedgerow	Medium
HA53	Historic Hedgerow	Low
HA54	Historic Hedgerow	Low
HA55	Historic Hedgerow	Low
HA56	Important Hedgerow	Medium
HA57	Important Hedgerow	Medium
HA58	Important Hedgerow	Medium
HA59	Important Hedgerow	Medium
HA60	Important Hedgerow	Medium
HA61	Important Hedgerow	Medium
HA62	Important Hedgerow	Medium
HA63	Historic Hedgerow	Low
HA64	Historic Hedgerow	Low
HA65	Important Hedgerow	Medium
HA66	Important Hedgerow	Medium
HA67	Important Hedgerow	Medium
HA68	Historic Boundary	Low
HA69	Important Hedgerow	Medium
HA70	Important Hedgerow	Medium

Receptor No.	Receptor Name	Value
HA71	Important Hedgerow	Medium
HA72	Important Hedgerow	Medium
HA73	Soil filled feature	Low
HA74	Dipolar anomaly: paleoenvironmental	Low
HA75	Animal burial	Low
HA76	Former field burial	Low
HA77	Undated ditch	Low
HA78	Plough furrows	Low
HA79	Curvilinear feature	Low
HA80	Dipolar anomaly	Low
HA81	Dipolar anomaly	Low
HA82	Agricultural features	Low
HA83	Agricultural features	Low
HA84	Dipolar anomaly	Low
HA85	Probable former field boundary	Low
HA86	Probable former track	Low
HA87	Probable former track	Low
HA88	Linear and curvilinear features	Low
HA89	Agricultural features	Low
HA90	Agricultural features	Low
HA91	Soil filled feature	Low
HA92	Agricultural features	Low
HA93	Agricultural features	Low
HA94	Dipolar anomaly	Low
HA95	Dipolar anomaly	Low
HA96	Soil filled feature	Low
HA97	Agricultural features	Low
HA98	Soil filled feature	Low
HA99	Agricultural features	Low
HA100	Agricultural features	Low
HA101	Agricultural features	Low

Receptor No.	Receptor Name	Value
HA102	Dipolar anomaly	Low
HA103	Agricultural features	Low
HA104	Agricultural features	Low
HA105	Agricultural features	Low
HA106	Soil filled feature	Low
HA107	Agricultural features	Low
HA108	Agricultural features	Low
HA109	Probable former pylon site	Low
HA110	Probable former pylon site	Low
HA111	Agricultural features	Low
HA112	Soil filled features	Low
HA113	Agricultural features	Low
HA114	Agricultural features	Low
HA115	Dipolar anomaly	Low
HA116	Dipolar anomaly	Low
HA117	Agricultural features	Low
HA118	Agricultural features	Low
HA119	Agricultural features	Low
HA120	Agricultural feature	Low
HA121	Agricultural features	Low
HA122	Dipolar anomaly	Low
HA123	Agricultural features	Low
HA124	Dipolar anomaly	Low
HA125	Agricultural features	Low
HA126	Agricultural features	Low
HA127	Dipolar anomaly	Low
HA128	Soil filled features	Low
HA129	Dipolar anomaly	Low
HA130	Soil filled features	Low
HA131	Dipolar anomaly	Low
HA132	Soil filled features	Low

Receptor No.	Receptor Name	Value
HA133	Agricultural features	Low
HA134	Agricultural features	Low
HA135	Dipolar anomaly	Low
HA136	Agricultural features	Low
HA137	Agricultural feature	Low
HA138	Agricultural features	Low
HA139	Agricultural feature	Low
HA140	Agricultural features	Low
HA141	Agricultural feature	Low
HA142	Dipolar anomaly	Low
HA143	Agricultural features	Low
HA144	Agricultural features	Low
HA145	Dipolar anomaly	Low
HA146	Agricultural features	Low
HA147	Dipolar anomalies	Low
HA148	Bank	Low
HA149	Bank and ditch	Low
HA150	Ridge and furrow	Low
HA151	Brisco railway station	Low
HA152	Geophysical anomaly	Low
HA153	Former building	Low
HA154	Roman road at A6	Low
HA155	Soil filled feature	Low
HA156	Soil filled feature	Low
HA157	Possible former track	Low
HA158	Possible former road	Low
HA159	Former field boundary	Low
HA160	Soil filled feature	Low
HA161	Soil filled feature	Low
HA162	Soil filled feature	Low
HA163	Soil filled feature	Low

Receptor No.	Receptor Name	Value
HA164	Soil filled feature	Low
HA165	Soil filled feature	Low

7.7 Impact Assessment

7.7.1 As identified in Table 7.6, the majority of the 165 sensitive receptors are of low value, with 25 of the 157 of medium value. It must be assumed that any of these sensitive receptors are at risk due to the alignment of the Scheme, both in terms of the route of the road itself, and from associated works such as additional/alterations to cycle routes, agricultural access routes, utility services and from temporary compound areas. Any areas in which any groundworks will occur in relation to the Scheme have the potential to effect sensitive receptors. Such effects will have occurred during the construction phase and no additional effects are anticipated regarding archaeological remains during the operational phase. The impact of setting on non-designated archaeological remains is not yet a consideration for development.

Construction Phase

7.7.2 Table 7.7 summarises all of the potential impacts of the Scheme, beneficial or adverse, upon all 157 of the identified sensitive receptors. For all receptors, the impact is the same, and would result from any groundworks and ground-breaking excavations occurring in association with the Scheme, so no further detail of the individual impacts on receptors is included. In addition, for all receptors, the impact will be permanent and adverse, so no additional detail assessing this for each individual receptor is included.

Table 7.7 Impact assessment summary

Receptor No.	Receptor Name	Effect	Magnitude	Significance
HA01	Probable settlement	Loss/ totally altered	Major	Moderate
HA02	Flood defences	Loss/ totally altered	Major	Moderate
HA03	Roman road	Partial loss/ changes to key archaeological materials	Moderate	Slight
HA04	Boundary ditch	Loss/ totally altered	Major	Moderate
HA05	Ditch	Loss/ totally altered	Major	Moderate
HA06	Ridge and furrow; bank	Loss/ totally altered	Major	Moderate
HA07	Ridge and furrow; findspot	Loss/ totally altered	Major	Moderate
HA08	Sawpit site	Loss/ totally altered	Major	Moderate
HA09	Linear cropmark	Loss/ totally altered	Major	Moderate

Receptor No.	Receptor Name	Effect	Magnitude	Significance
HA10	Enclosure	Loss/ totally altered	Major	Moderate
HA11	Ditch	Loss/ totally altered	Major	Moderate
HA12	Enclosure and trackway	Loss/ totally altered	Major	Moderate
HA13	Ditch	Loss/ totally altered	Major	Moderate
HA14	Former green lane	Loss/ totally altered	Major	Moderate
HA15	Site of millrace	Loss/ totally altered	Major	Moderate
HA16	Site of rifle range	Loss/ totally altered	Major	Moderate
HA17	Site of outbuilding	Loss/ totally altered	Major	Moderate
HA18	Site of railway station	Loss/ totally altered	Major	Moderate
HA19	Site of T-shaped building	Loss/ totally altered	Major	Moderate
HA20	Drove road	Loss/ totally altered	Major	Moderate
HA21	Drove road	Loss/ totally altered	Major	Moderate
HA22	Ridge and furrow	Loss/ totally altered	Major	Moderate
HA23	Site of deer park	Loss/ totally altered	Major	Moderate
HA24	Farmstead and field system	Loss/ totally altered	Major	Moderate
HA25	Features of possible medieval origin	Loss/ totally altered	Major	Moderate
HA26	Trackway	Loss/ totally altered	Major	Moderate
HA27	Ditch	Loss/ totally altered	Major	Moderate
HA28	Bank	Loss/ totally altered	Major	Moderate
HA29	Spoil heap/ dump	Loss/ totally altered	Major	Moderate
HA30	Ridge and furrow	Loss/ totally altered	Major	Moderate
HA31	Boundary	Loss/ totally altered	Major	Moderate
HA32	Ridge and furrow	Loss/ totally altered	Major	Moderate
HA33	Bank and ditch	Loss/ totally altered	Major	Moderate
HA34	Track	Loss/ totally altered	Major	Moderate
HA35	Track	Loss/ totally altered	Major	Moderate
HA36	Gravestones	Loss/ totally altered	Major	Moderate
HA37	Former field boundary	Loss/ totally altered	Major	Moderate

Receptor No.	Receptor Name	Effect	Magnitude	Significance
HA38	Important Hedgerow	Loss/ totally altered	Major	Large
HA39	Historic Hedgerow	Loss/ totally altered	Major	Moderate
HA40	Historic Hedgerow	Loss/ totally altered	Major	Moderate
HA41	Important Hedgerow	Loss/ totally altered	Major	Large
HA42	Important Hedgerow	Loss/ totally altered	Major	Large
HA43	Important Hedgerow	Loss/ totally altered	Major	Large
HA44	Important Hedgerow	Loss/ totally altered	Major	Large
HA45	Important Hedgerow	Loss/ totally altered	Major	Large
HA46	Historic Hedgerow	Loss/ totally altered	Major	Moderate
HA47	Important Hedgerow	Loss/ totally altered	Major	Large
HA48	Important Hedgerow	Loss/ totally altered	Major	Large
HA49	Important Hedgerow	Loss/ totally altered	Major	Large
HA50	Important Hedgerow	Loss/ totally altered	Major	Large
HA51	Historic Hedgerow	Loss/ totally altered	Major	Moderate
HA52	Important Hedgerow	Loss/ totally altered	Major	Large
HA53	Historic Hedgerow	Loss/ totally altered	Major	Moderate
HA54	Historic Hedgerow	Loss/ totally altered	Major	Moderate
HA55	Historic Hedgerow	Loss/ totally altered	Major	Moderate
HA56	Important Hedgerow	Loss/ totally altered	Major	Large
HA57	Important Hedgerow	Loss/ totally altered	Major	Large
HA58	Important Hedgerow	Loss/ totally altered	Major	Large
HA59	Important Hedgerow	Loss/ totally altered	Major	Large

Receptor No.	Receptor Name	Effect	Magnitude	Significance
HA60	Important Hedgerow	Loss/ totally altered	Major	Large
HA61	Important Hedgerow	Loss/ totally altered	Major	Large
HA62	Important Hedgerow	Loss/ totally altered	Major	Large
HA63	Historic Hedgerow	Loss/ totally altered	Major	Moderate
HA64	Historic Hedgerow	Loss/ totally altered	Major	Moderate
HA65	Important Hedgerow	Loss/ totally altered	Major	Large
HA66	Important Hedgerow	Loss/ totally altered	Major	Large
HA67	Important Hedgerow	Loss/ totally altered	Major	Large
HA68	Historic Boundary	Loss/ totally altered	Major	Moderate
HA69	Important Hedgerow	Loss/ totally altered	Major	Large
HA70	Important Hedgerow	Loss/ totally altered	Major	Large
HA71	Important Hedgerow	Loss/ totally altered	Major	Large
HA72	Important Hedgerow	Loss/ totally altered	Major	Large
HA73	Soil filled feature	Loss/ totally altered	Major	Moderate
HA74	Dipolar anomaly-paleoenvironmental	Loss/ totally altered	Major	Moderate
HA75	Animal burial	Loss/ totally altered	Major	Moderate
HA76	Undated ditch	Loss/ totally altered	Major	Moderate
HA77	Remains of former field boundary	Loss/ totally altered	Major	Moderate
HA78	Plough furrows	Loss/ totally altered	Major	Moderate
HA79	Curvilinear feature	Loss/ totally altered	Major	Moderate
HA80	Dipolar anomaly	Loss/ totally altered	Major	Moderate
HA81	Dipolar anomaly	Loss/ totally altered	Major	Moderate
HA82	Agricultural features	Loss/ totally altered	Major	Moderate
HA83	Agricultural features	Loss/ totally altered	Major	Moderate

Receptor No.	Receptor Name	Effect	Magnitude	Significance
HA84	Dipolar anomaly	Loss/ totally altered	Major	Moderate
HA85	Probable former field boundary	Loss/ totally altered	Major	Moderate
HA86	Probable former track	Loss/ totally altered	Major	Moderate
HA87	Probable former track	Loss/ totally altered	Major	Moderate
HA88	Linear and curvilinear features	Loss/ totally altered	Major	Moderate
HA89	Agricultural features	Loss/ totally altered	Major	Moderate
HA90	Agricultural features	Loss/ totally altered	Major	Moderate
HA91	Soil filled feature	Loss/ totally altered	Major	Moderate
HA92	Agricultural features	Loss/ totally altered	Major	Moderate
HA93	Agricultural features	Loss/ totally altered	Major	Moderate
HA94	Dipolar anomaly	Loss/ totally altered	Major	Moderate
HA95	Dipolar anomaly	Loss/ totally altered	Major	Moderate
HA96	Soil filled feature	Loss/ totally altered	Major	Moderate
HA97	Agricultural features	Loss/ totally altered	Major	Moderate
HA98	Soil filled feature	Loss/ totally altered	Major	Moderate
HA99	Agricultural features	Loss/ totally altered	Major	Moderate
HA100	Agricultural features	Loss/ totally altered	Major	Moderate
HA101	Agricultural features	Loss/ totally altered	Major	Moderate
HA102	Dipolar anomaly	Loss/ totally altered	Major	Moderate
HA103	Agricultural features	Loss/ totally altered	Major	Moderate
HA104	Agricultural features	Loss/ totally altered	Major	Moderate
HA105	Agricultural features	Loss/ totally altered	Major	Moderate
HA106	Soil filled feature	Loss/ totally altered	Major	Moderate
HA107	Agricultural features	Loss/ totally altered	Major	Moderate
HA108	Agricultural features	Loss/ totally altered	Major	Moderate
HA109	Probable former pylon site	Loss/ totally altered	Major	Moderate
HA110	Probable former pylon site	Loss/ totally altered	Major	Moderate
HA111	Agricultural features	Loss/ totally altered	Major	Moderate

Receptor No.	Receptor Name	Effect	Magnitude	Significance
HA112	Soil filled features	Loss/ totally altered	Major	Moderate
HA113	Agricultural features	Loss/ totally altered	Major	Moderate
HA114	Agricultural features	Loss/ totally altered	Major	Moderate
HA115	Dipolar anomaly	Loss/ totally altered	Major	Moderate
HA116	Dipolar anomaly	Loss/ totally altered	Major	Moderate
HA117	Agricultural features	Loss/ totally altered	Major	Moderate
HA118	Agricultural features	Loss/ totally altered	Major	Moderate
HA119	Agricultural features	Loss/ totally altered	Major	Moderate
HA120	Agricultural feature	Loss/ totally altered	Major	Moderate
HA121	Agricultural features	Loss/ totally altered	Major	Moderate
HA122	Dipolar anomaly	Loss/ totally altered	Major	Moderate
HA123	Agricultural features	Loss/ totally altered	Major	Moderate
HA124	Dipolar anomaly	Loss/ totally altered	Major	Moderate
HA125	Agricultural features	Loss/ totally altered	Major	Moderate
HA126	Agricultural features	Loss/ totally altered	Major	Moderate
HA127	Dipolar anomaly	Loss/ totally altered	Major	Moderate
HA128	Soil filled features	Loss/ totally altered	Major	Moderate
HA129	Dipolar anomaly	Loss/ totally altered	Major	Moderate
HA130	Soil filled features	Loss/ totally altered	Major	Moderate
HA131	Dipolar anomaly	Loss/ totally altered	Major	Moderate
HA132	Soil filled features	Loss/ totally altered	Major	Moderate
HA133	Agricultural features	Loss/ totally altered	Major	Moderate
HA134	Agricultural features	Loss/ totally altered	Major	Moderate
HA135	Dipolar anomaly	Loss/ totally altered	Major	Moderate
HA136	Agricultural features	Loss/ totally altered	Major	Moderate
HA137	Agricultural feature	Loss/ totally altered	Major	Moderate
HA138	Agricultural features	Loss/ totally altered	Major	Moderate
HA139	Agricultural feature	Loss/ totally altered	Major	Moderate
HA140	Agricultural features	Loss/ totally altered	Major	Moderate
HA141	Agricultural feature	Loss/ totally altered	Major	Moderate
HA142	Dipolar anomaly	Loss/ totally altered	Major	Moderate

Receptor No.	Receptor Name	Effect	Magnitude	Significance
HA143	Agricultural features	Loss/ totally altered	Major	Moderate
HA144	Agricultural features	Loss/ totally altered	Major	Moderate
HA145	Dipolar anomaly	Loss/ totally altered	Major	Moderate
HA146	Agricultural features	Loss/ totally altered	Major	Moderate
HA147	Dipolar anomalies	Loss/ totally altered	Major	Moderate
HA148	Bank	Loss/ totally altered	Major	Moderate
HA149	Bank and ditch	Loss/ totally altered	Major	Moderate
HA150	Ridge and furrow	Loss/ totally altered	Major	Moderate
HA151	Brisco railway station	Loss/ totally altered	Major	Moderate
HA152	Geophysical anomaly	Loss/ totally altered	Major	Moderate
HA153	Former building	Loss/ totally altered	Major	Moderate
HA154	Roman road at A6	Partial loss/ changes to key archaeological materials	Moderate	Slight
HA155	Soil filled feature	Loss/totally altered	Major	Moderate
HA156	Soil filled feature	Loss/totally altered	Major	Moderate
HA157	Possible former track	Loss/totally altered	Major	Moderate
HA158	Possible former road	Partial loss/ changes to key archaeological materials	Moderate	Slight
HA159	Former field boundary	Loss/totally altered	Major	Moderate
HA160	Soil filled feature	Loss/totally altered	Major	Moderate
HA161	Soil filled feature	Loss/totally altered	Major	Moderate
HA162	Soil filled feature	Loss/totally altered	Major	Moderate
HA163	Soil filled feature	Loss/totally altered	Major	Moderate
HA164	Soil filled feature	Loss/totally altered	Major	Moderate
HA165	Soil filled feature	Loss/totally altered	Major	Moderate

Operation Phase

7.7.3 As outlined above, no additional effects are anticipated regarding archaeological remains during the operational phase of the Scheme. An impact assessment for

historic buildings and historic landscapes is being addressed visually, in Chapter 10, and in a separate Heritage Statement (Wardell Armstrong forthcoming⁵²).

7.8 Mitigation, Enhancement and Monitoring

Mitigation

- 7.8.1 Industry standards for EIA maintain that mitigation measures only need to be proposed where adverse effects of moderate significance or higher have been identified, and, as revealed in Table 7.7 above, this applies to 162 of the 165 sensitive receptors, with 25 being assessed as 'large'. Only three have been identified as resulting in a slight significance. The mitigation proposed to address this effect, based on consultation with the local planning authority archaeologist, is for a number of measures to occur as described below.
- A programme of archaeological recording is proposed, to photograph the hedgerows prior to any alterations occurring as a result of the scheme, ahead of the construction phase (Mitigation Strategy reference CH03).
 - For those hedgerows which include surviving traces of kest banks (some of which have been identified to receive adverse effects of moderate significance), a secondary phase of recording is proposed, to occur once the vegetation has been removed (Mitigation Strategy reference CH06).
 - For a sample of five non-kested (Mitigation Strategy reference CH05) and five kested examples of these hedgerows (Mitigation Strategy reference CH07), archaeological monitoring will be undertaken during the demolition of these boundaries (to include examples of both moderate and large effects to significance) to enable the recording of cross-sections and the recovery of any surviving artefactual material.
- 7.8.2 The remaining 140 sensitive receptors, which are not hedgerows or surviving field boundaries have a significance of magnitude of effect resulting from the Scheme of moderate. The mitigation proposed to address this significance, based on consultation with the local planning authority archaeologist, is for a topographic survey to occur on an area of ridge and furrow (CH02), archaeological recording to occur ahead of the relocation/demolition of two sensitive receptors (CH04), and for the others, a programme of archaeological trial trenching is proposed to target a sample of the remaining sensitive receptors for which knowledge at present is limited and/or which have the potential to have a value greater than low (CH01). All three of these mitigation measures would occur ahead of the construction phase of the scheme.
- 7.8.3 All seven mitigation proposals would address secondary and tertiary mitigation requirements. For details of the mitigation proposals and how they address individual receptors and the significance of the impact of the scheme, please refer to Table 7.8.

Enhancement

- 7.8.4 The only practical opportunity for enhancement relating to archaeological remains is for the incorporation of historical/archaeological information regarding some of the sensitive receptors within information panels/boards. Such boards have been

⁵² Wardell Armstrong forthcoming, Carlisle Southern Link Road: Heritage Statement

proposed in relation to landscape character in the vicinity of the River Caldew, where a new attenuation pond with increased public access is proposed (see Chapter 9 for details). This would enhance understanding of the historic use of this part of the landscape and could particularly focus on the former mill race (HA15) and associated structures (HA19), and the importance of these in the development of Cummersdale to the north.

Monitoring

- 7.8.5 As outlined in the mitigation proposals (Table 7.5) and detailed above, some assets will need subsequent recording or monitoring requirements. A summary of the mitigation types and the sensitive receptors/assets they address is provided in Table 7.8.

Table 7.8 Initial and ongoing recording and monitoring proposals

Mitigation Identifier	Asset/Sensitive Receptor addressed by mitigation
Archaeological Remains	
CH01	HA01; HA05; HA07; HA10; HA12; HA13; HA19; HA26; HA32; HA33; HA76, HA77; HA90; HA91; HA94; HA96; HA97; HA99; HA100; HA101; HA102; HA103; HA104; HA105; HA106; HA107; HA108; HA109; HA110; HA111; HA112; HA120; HA121; HA122; HA123; HA125; HA126; HA127; HA128; HA129; HA130; HA131; HA132; HA133; HA134; HA138; HA139; HA147; HA152; HA153; HA158; HA160; HA161; HA162; HA163; HA164; HA165
CH02	HA150
CH03	HA39; HA40; HA44; HA46; HA54; HA56; HA68; HA72
CH04	HA36; HA151
CH05	HA38; HA53; HA55; HA62; HA67
CH06	HA41; HA42; HA47; HA48; HA50; HA52; HA57; HA58; HA60; HA61; HA63; HA64; HA65; HA66; HA69; HA70; HA71
CH07	HA43; HA45; HA49; HA51; HA59

7.9 Residual Impact Assessment

- 7.9.1 Taking into account the mitigation strategies as proposed above, the residual impacts of the scheme on the sample of sensitive receptors subjected to mitigation would result in a reduced overall impact of the Scheme, as outlined in Table 7.9. The significance of the effect can be seen to be slight, rather than moderate and moderate, rather than large, as appropriate, because although the receptors will be permanently preserved by record, accessible in an archive, the physical effect of the Scheme will still result in loss, an effect not possible to mitigate against.

Table 7.9 Residual impacts on mitigated receptors

Impact	Receptors affected	Magnitude	Significance
Loss/ totally altered	HA01; HA05; HA07; HA10; HA12; HA13; HA14; HA19; HA32; HA36; HS38; HA39; HA40; HA41; HA44; HA45; HA46; HA47; HA48; HA49; HA50; HA51; HA52; HA53; HA54; HA55; HA55; HA56; HA57; HA58; HA59; HA60; HA61; HA62; HA63; HA64; HA65; HA66; HA67; HA68; HA69; HA70; HA71; HA72; HA73; HA74; HA78; HA79; HA98; HA99; HA100; HA101; HA102; HA103; HA104; HA105; HA106; HA107; HA108; HA109; HA110; HA111; HA112; HA120; HA121; HA122; HA123; HA125; HA126; HA127; HA128; HA129; HA130; HA131; HA132; HA133; HA134; HA138; HA139; HA147; HA150; HA151; HA152; HA153; HA155; HA156; HA157; HA158; HA159; HA160; HA161; HA162; HA163; HA164; HA165	Major	Slight
Partial loss/ changes to key archaeological materials	HA154	Moderate	Slight

7.10 Cumulative Effects

7.10.1 Other developments affecting the agricultural landscape to the south of Carlisle during their construction phase would result in detrimental permanent effects to any surviving archaeological remains within the associated areas of direct impact to be subjected to groundworks. The cumulative effects of the spread of the built urban expanse of the city of Carlisle, likely to result from the Scheme in combination with all other known developments, would result in a total loss of individual finite cultural heritage assets and would affect a future understanding of the history and evolution of the landscape south of the city.

7.10.2 Although definitive information on the historic baseline of the potential footprints of the other developments is not known at this stage, individual assets/ sensitive receptors are unlikely to be of demonstrable value higher than medium, as represented by the present baseline. Despite this, the loss of a potentially large number of heritage assets would result in a cumulative impact of a greater extent than that assessed to effect single, individual assets/sensitive receptors. However, the overall impact is unlikely to be of higher significance than 'moderate', and mitigation through further archaeological investigation rather than design, is likely to be sufficient.

7.10.3 This is applicable for a number of developments in the vicinity. There are also seven additional planning application sites (91/1050; 16/0794; 09/0413; 18/000/TEL; 16/1022; 18/1016; 18/0790), which are not included in the list below:

- St Cuthbert's Garden Village

- 253904: Land at Newhouse Farm, south-west of Orton Road, housing allocation 2015
- 253905: Land at Garden Village, west of Wigton Road, housing allocation 2015
- 253909: Former Morton Park Primary School, housing allocation 2015
- 253911: Land to the rear of the Border Terrier, housing allocation 2015
- 253927: Land to the south-west of Cummersdale Grange Farm, housing allocation 2015
- 253894: Land east of Cummersdale Road, housing allocation 2015
- 253898: Land between Carleton Road and Cumwhinton Road, housing allocation 2015
- 253906: Land north of Moorside Drive/ Valley Drive, housing allocation 2015
- 253913: Land north of Carleton Clinic, east of Cumwhinton, housing allocation 2015
- 253921: Land at Broomfallen Road, housing allocation 2015
- 253916: Land adjacent to Beech Cottage, housing allocation 2015
- 253895: Land west of How Croft, housing allocation 2015
- 253897: Land west of Wreay School, housing allocation 2015
- 253932: South-west Morton, Land allocated for employment/development
- 253683: Morton, committed approval
- 253684: Land off Peter Lane, committed approval
- 253686: Land at Hammonds Pond, committed approval

7.10.4 At this time the exact layout of St Cuthbert's Garden Village is not known. As a result, a detailed assessment of the potential interactions with the Scheme is not possible. Therefore, the inter-project cumulative effects have been assessed at a high level using professional judgement and only where the assessment topic has been determined to have clear relevance to the proposed Garden Village development.

7.11 Summary

- 7.11.1 This assessment of archaeological remains and the impact of the Scheme on significance has identified a total of at least 165 individual assets/sensitive receptors. Of these, 25 have been identified as being of medium value, the rest of low value based on current knowledge.
- 7.11.2 All of these assets/sensitive receptors lie within areas of direct impact, and therefore all have the potential to be affected by groundworks associated with the Scheme, the effects of which are estimated to result in loss/total alteration for all but three of the assets/sensitive receptors (this would result in partial loss/changes to key archaeological materials).
- 7.11.3 For the 25 heritage assets/sensitive receptors of medium value, such an impact would result in an overall effect of large significance. For 137 of the heritage

assets/sensitive receptors of low value, this would result in an overall effect of moderate significance and for the final three, an effect of slight significance.

- 7.11.4 By adhering to the seven mitigation proposals defined in this assessment and in consultation with the local planning authority archaeologist, the significance of effect resulting from the Scheme would be slight for each sensitive receptor. However, the cumulative impacts of neighbouring developments and the overall impact on finite sensitive receptors could result in a higher impact. Despite this, the overall effect is unlikely to be of higher significance than 'moderate', and mitigation through further archaeological investigation rather than design, is likely to be sufficient.

8 Nature Conservation

8.1 Introduction

8.1.1 This chapter presents the results of the assessment of ecology and nature conservation for the Scheme. The Scheme crosses open pasture fields, hedgerows and several significant watercourses. The existing baseline ecological conditions are described in detail along with the predicted ecological impacts and effects of the Scheme. The requirement for ecological mitigation measures to be included within the design proposals is described and ecological mitigation is taken into account in the assessment of the overall residual effect.

8.2 Assessment Methodology

Study Area

8.2.1 The extent of the study area has been determined in accordance with the following guidance:

- Design Manual for Roads and Bridges (DMRB) Volume 11: Environmental Assessment (Highways Agency; June 1993, as amended);
- Supplementary guidance IAN 130/10, which provides guidance on the criteria for assessment of the potential impacts of road projects on nature conservation resources;
- Supplementary guidance IAN 14/11, which details implications of highways projects on European Sites;
- DMRB Volume 10: Environmental Design and Management (Highways Agency; February 2001); and
- Species specific guidance, which is described in the DMRB series.

8.2.2 The extent of the study area was also informed through professional judgement and knowledge of the characteristics of the ecological receptors that are present within the area. Furthermore, best practice guidelines such as *Guidelines for Ecological Impact Assessment (EclA) in the UK and Ireland* (CIEEM. 2018)⁵³, and *Guidelines for Preliminary Ecological Appraisal, 2nd Edition*, (CIEEM. 2017)⁵⁴ have been drawn upon.

8.2.3 The area of land assessed by ecological surveys and assessments can be divided into two distinct sections: the proposed Scheme site (the 'Site') and the wider survey area ('the survey area'):

- The **Site** consists of the proposed Scheme footprint as well as areas to be used for construction compounds and haul roads.
- The wider **survey area** comprises a large area of land including adjacent habitats and connecting corridors in order to allow potential effects on the behaviour of key species to be considered.

⁵³ CIEEM (2018) *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine*. Chartered Institute of Ecology and Environmental Management, Winchester

⁵⁴ CIEEM (2017) *Guidelines for Preliminary Ecological Appraisal, 2nd Edition*. Chartered Institute of Ecology and Environmental Management, Winchester.

Ecological Impact Assessment

8.2.4 The habitats, species and their key functions within the study area are referred to as 'ecological features'. To determine the likelihood of a significant effect, it is first necessary to identify whether an ecological feature is suitably valuable for a significant effect upon it to be material in decision making. The CIEEM guidance for Ecological Impact Assessment (EclA) in the UK and Ireland assesses value in terms of biodiversity, social, community or economic value. These values are referenced within a geographical frame of reference, as described in Table 8.1.

Table 8.1 Value (or Sensitivity) of Ecological Features

Importance	Conservation Value	Descriptor
International (<i>European</i>)	Very High	<p>A site designated or identified for designation at the international level (e.g. Special Protection Area (SPA), Special Area of Conservation (SAC), and/or Ramsar site). Proposed or candidate sites are given the same consideration as designated sites.</p> <p>A sustainable area of any habitat listed in Annex I of the Habitats Directive or smaller areas of such habitat that is essential to maintain the viability of a larger whole.</p> <p>Any regularly occurring population of an internationally important species (e.g. Red Data Book species), which are listed as occurring in 15 or fewer 10km squares in the UK, and that is identified as of unfavorable conservation status in Europe or global conservation concern in the UK BAP.</p> <p>A regularly occurring, nationally significant population of any internationally important species.</p>
National (<i>England</i>)	High	<p>A site protected by national designations (e.g. Sites of Special Scientific Interest (SSSI), National Nature Reserve (NNR), or Marine Protected Area or a site considered worthy of this designation).</p> <p>A sustainable area of any priority habitat identified in the UK BAP, or smaller areas of such habitat that is essential to maintain the viability of a larger whole.</p> <p>A feature identified as of critical importance in the UK BAP.</p> <p>A regularly occurring, regionally or county significant population/number of an internationally/nationally important species.</p> <p>Any regularly occurring population of a nationally important species that is threatened or rare in that region of the County.</p>
Regional (<i>North West England</i>)	Medium	<p>Sustainable areas of key habitat identified in the Regional BAP or smaller areas of such habitat that is essential to maintain the viability of a larger area.</p>

Importance	Conservation Value	Descriptor
		<p>Sites which exceed the county-level designations but fall short of the SSSI selection criteria.</p> <p>Some non-statutory designated sites (Ancient Woodland, TPOs).</p> <p>Any regularly occurring, locally important population of a species listed as being nationally scarce which occurs in 16-100 10km squares in the UK or listed in the LBAP on account of its regional rarity or localization.</p> <p>A regularly occurring, locally significant population/number of a regionally important species.</p>
County <i>(Cumbria)</i>	Medium	<p>Some designated sites (e.g. Local Nature Reserves).</p> <p>Some non-statutory designated sites (including SLNCI/CWS).</p> <p>A viable area of a habitat that is uncommon in the county/district or a degraded example of a habitat identified in the local BAP.</p> <p>Sustainable population of a species that is rare or scarce within a county or listed in the local BAP on account of its regional rarity or localization.</p> <p>Sites or populations that appreciably enrich the county/district</p>
<i>Local > 5km</i>	Low	<p>Area of internationally or nationally important habitats, which are degraded and have little potential for restoration.</p> <p>Areas within the site or locally, or populations, that appreciably enrich the habitat resource within the locality, (e.g. species-rich hedgerow).</p> <p>Species or populations within the site or locally, that appreciably enrich the ecological resource within the locality.</p>
Site <i>(Scheme footprint)</i>	Negligible	<p>Areas of heavily managed or modified vegetation of low intrinsic interest and low value to species of nature conservation interest that do not appreciably enrich the site or locality (i.e. improved grassland and arable crops).</p> <p>Common and widespread species.</p>

8.2.5 Where a site has multiple designations, the assessment should consider the impacts of the scheme in respect of each of the features of each of the designations. For example, where a site is both a SSSI and SAC the impacts need to be assessed in respect of each of the qualifying features of the SSSI or SAC.

8.2.6 Legal protection is considered separately from value. The protection of a particular ecological feature through national or international legislation may not necessarily

be taken into account when assessing ecological value. For example, whilst badgers are protected under national legislation, the presence of a single badger sett would not be properly assessed as a constraint of 'national' importance. Legislation is, however, considered in terms of mitigation.

8.2.7 Effects on biodiversity features are determined by assessing the likely result of an action on the structure and function of ecosystems, biodiversity features (designated sites, habitats, species, populations of species) and the conservation status of habitats and species (including abundance and distribution). In determining the significance, the effect will be related to the geographic scale (as indicated above) and duration of effects.

8.2.8 In carrying out the assessment of the significance of effects on ecological receptors for this Environmental Statement, a general method for the grading of the significance of effects is adhered to, to ensure consistency. The assessment of potential effects uses the scale of significance shown in Table 8.2.

Table 8.2 Magnitude of Impact (or Change) Descriptors

Magnitude	Descriptor
Major Beneficial	The change is likely to restore an ecological receptor to favourable conservation status, or to create a feature of recognisable value within an international or national context – major positive impact.
Moderate Beneficial	The change is likely to restore an ecological receptor to favourable conservation status, or to create a feature of recognisable value within a regional or county context – moderate positive impact.
Minor Beneficial	The change is likely to restore an ecological receptor to favourable conservation status, or to create a feature of recognisable value within a local context including within the zone of influence – minor positive impact.
No Change/ Negligible	No change on ecological receptor.
Minor Adverse	The change affects the valued ecological receptor in the short term but there will be no permanent effect (reversible) – minor negative impact.
Moderate Adverse	The change adversely affects the valued ecological receptor, but there will probably be no permanent effect on its integrity with appropriate mitigation and is reversible – moderate negative impact.
Major Adverse	The change is likely to cause a permanent (irreversible) effect on the integrity of an ecological receptor – major negative impact.

Cumulative Effects

8.2.9 The potential cumulative effect of all stages of the proposed development (construction and operation) on all key receptors is considered. The predicted effect of each stage is detailed and any potential cumulative effect discussed.

- 8.2.10 Other plans or projects are assessed alongside the scheme's proposals to identify any cumulative effects; those that are the results of multiple actions on environmental receptors and resources, which may affect the integrity of the sites ecology and nature conservation interests. Cumulative effects will be expected where the schemes (in implementation) increase the significance or likelihood of significant effects. The list of developments considered within the cumulative effects assessment is outlined in Chapter 8.10.
- 8.2.11 Given the often-limited technical details of other developments, the likelihood of any significant cumulative effect is determined through professional judgement and knowledge of the ecology of the receptor in question.

Mitigation Measures

- 8.2.12 Ecological mitigation measures are identified using best practice guidelines such as the Design Manual for Roads and Bridges (DMRB) Volume 11 Section 3 Part 4 Chapter 7 guidance and DMRB Volume 10: Environmental Design and Management (Highways Agency; February 2001). Ecological mitigation measures have also been formulated through a series of mitigation workshops held during the design development process.
- 8.2.13 Ongoing consultation with Natural England, the Environment Agency and other statutory consultees has included discussions of ecological mitigation measures.

Habitat and Faunal Survey Methodologies

- 8.2.14 The detailed methodologies for the habitat and faunal surveys that have been undertaken to support this application are detailed in the specific habitat and faunal survey reports within Volume 3 of the ES, with key information summarised in this chapter.

8.3 Limitations and Assumptions

- 8.3.1 The DMRB is currently under review and being updated. This includes Volume 11: Environmental Assessment and DMRB Volume 10: Environmental Design and Management. Both are used as guidance for the methodology of this assessment.
- 8.3.2 The land included in individual ecological surveys is identified in the individual ecological reports in Appendices 8.1 to 8.17. These reports also identify areas of land where access was not possible, either physically or due to landowner consent not being granted. It is not considered that areas which were not surveyed due to access issues would materially change or otherwise compromise any of the ecological surveys and subsequent results.

8.4 Consultation

- 8.4.1 Consultations with stakeholders have been undertaken throughout the EIA and design process. Details are provided below. It is anticipated that these will continue into the detailed design stage of the Scheme.
- A Regulatory Stakeholder Workshop for statutory consultees held in July 2017, with representatives of Natural England in attendance.
 - Meetings with the Environment Agency were held on the 14 May 2019, 4 July 2019, and the 19 September 2019.

- Meetings were held with Natural England on the 14 May 2019, 23 July 2019 and 10 September 2019.

8.5 Regulatory and Policy Framework

8.5.1 The key legislation for protected sites and habitats that are relevant to this project are summarised in Table 8.3.

Table 8.3 Key Nature Conservation Legislation and Policy

Legislation	Description
The Convention of European Wildlife and Natural Habitats (Bern Convention 1979)	The Bern Convention aims to ensure conservation and protection of all wild plant and animal species and their natural habitats (listed in Appendices I and II of the Convention), to increase cooperation between contracting parties, and to afford special protection to the most vulnerable or threatened species (including migratory species).
EC Wild Birds Directive 1979 (European Directive 79/409/EEC on the Conservation of Wild Birds)	Council Directive 79/409/EEC on the conservation of wild birds, commonly referred to as the Birds Directive creates a comprehensive scheme of protection for all wild bird species naturally occurring in the European Union. The directive recognises that habitat loss and degradation are the most serious threats to the conservation of wild birds. It therefore places great emphasis on the protection of habitats for endangered as well as migratory species (listed in Annex I), especially through the establishment of a coherent network of Special Protection Areas (SPAs) comprising all the most suitable territories for these species. Since 1994 all SPAs form an integral part of the Natura 2000 ecological network.
Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora	The Habitats Directive aims to promote the maintenance of biodiversity by requiring Member States to take measures to maintain or restore natural habitats and wild species which are listed on the Annexes of the Directive at a favourable conservation status by introducing robust protection for those habitats and species of European importance.
The Conservation of Habitats and Species Regulations 2018	These Regulations transpose the Council Directive 92/43/EEC, on the conservation of natural habitats and of wild fauna and flora (EC Habitats Directive) and elements of the EU Wild Birds Directive in England and Wales, into national law. They provide protection for 'European Sites' and 'European Protected Species'. Under the regulations, competent authorities also have a duty to, in exercise of their function, have regard to the EC Habitats Directive and Wild Birds Directive.
The Wildlife and Countryside Act 1981 (as amended) (WCA 1981)	This is the primary UK mechanism for statutory site designation (Sites of Special Scientific Interest (SSSI's) and protection of individual species listed under Schedules 1, 2, 5, and 8 of the Act, each subject to varying levels of protection. In addition, the Act also lists (on Schedule 9) non-native invasive species to which release, spread into the wild and sale prohibitions apply including Japanese knotweed (<i>Fallopia japonica</i>) and giant hogweed (<i>Heracleum mantegazzianum</i>).
Hedgerow Regulations 1997	In England and Wales, the Hedgerow Regulations 1997 protect hedgerows that qualify as "Important" under the criteria within the Regulations necessitating permissions from local councils to permit removal.

Legislation	Description
Natural Environment and Rural Communities Act 2006 (NERC Act 2006)	This Act places a statutory duty on public bodies to further conservation of biodiversity in the exercise of their functions. In addition, Section 41 of the NERC Act requires the Secretary of State to draw up a list of Habitats and Species of Principal Importance which should be used to guide decision makers (which include local authorities) in implementing their duty under Section 40. These lists are the former UKBAP Priority Habitats and Species identified for conservation action across the UK.
National Planning Policy Framework (NPPF)	The National Planning Policy Framework (NPPF) details the Government's planning policies for England and how these are expected to be applied in forward planning and determining planning applications. The NPPF states the commitment of the UK Government to minimising impacts on biodiversity and providing net gains in biodiversity where possible, thereby contributing to the halt of the overall decline in biodiversity. It specifies the obligations that the Local Authorities and the UK Government have regarding statutory designated sites and protected species under UK and international legislation, and how this it to be delivered in the planning system. Protected or notable habitats and species (including Habitats and Species of Principal Importance) are a material consideration in determining planning applications and impacts to these features need to be identified and avoided or mitigated in order to achieve sustainable development, a requirement of the NPPF.

8.5.2 The key legislation and regulations for protected species relevant to this Scheme are summarised in Table 8.4.

Table 8.4 Protected Species Legislation

Species	Key Legal Protection
Plants	<p>Section 13 (Schedule 8) of the WCA 1981 (as amended) and regulations 42-46 (Schedule 4) of the EC Habitats Directive 1992 identify measures for the protection of wild plants. The legislation together protects all plants listed on Schedule 8 of the WCA and Schedule 4 of the Habitats Directive against:</p> <ul style="list-style-type: none"> • Intentionally picking, collecting, cutting, uprooting or destroying a wild plant listed in the schedules • Selling, offering or exposing for sale, or having in his possession or transporting for the purpose of sale, any live or dead wild plant included in the Schedules, or any part of, or anything derived from, such a plant; and • Publishing or causing to be published any advertisement likely to be understood as conveying that he buys or sells, or intends to buy or sell, any of those things. <p>Enforcement provisions were extended by the Countryside Rights of Access Act 2000, Section 81 and Schedule 12. Section 14 of the WCA 1981 prohibits the planting in the wild of plants listed in Part II of Schedule 9 or otherwise causing them to grow there. This includes (amongst others) giant hogweed and Japanese knotweed.</p>
Badger (<i>Meles meles</i>)	<p>Badgers are protected under the Protection of Badgers Act 1992 which although primarily concerning animal cruelty, creates a number of offences potentially applicable to development activities. In particular the act makes it an offence to intentionally or recklessly interfere with a badger sett by;</p> <ul style="list-style-type: none"> • Damaging a badger sett or any part of it;

Species	Key Legal Protection
	<ul style="list-style-type: none"> • Destroying a badger sett; • Obstructing access to, or any entrance of, a badger sett; • Causing a dog to enter a badger sett; or; and • Disturbing a badger when it is occupying a badger sett. <p>The act also makes wilfully killing, injuring or taking, or attempts to kill, injure or take, a badger an offence.</p>
Bats	<p>Bats are protected under Annex II of the EC Council Directive 92/43/EEC 1992 “Conservation of Natural Habitats and Wild Fauna and Flora” (the Habitats Directive) as a European Protected Species (EPS). This legislation has been transposed into UK legislation through the Conservation of Habitats and Species Regulations 2018.</p> <p>Regulation 41 of the Conservation of Habitats and Species Regulations 2018 makes it an offence to:</p> <ul style="list-style-type: none"> • Deliberately capture, injure or kill bats • Deliberately disturb bats, or • Damage or destroy a breeding site or resting place of a bat; this applies whether bats are present or not. NB – breeding sites and resting places are generally referred to as roosts. <p>In addition to the above protection, all bat species in the UK are protected under Schedule 5 of the Wildlife & Countryside Act 1981 (as amended). In addition to the above, it lists the following as additional offences:</p> <p>Disturbance of an animal whilst it is occupying a place which it uses for shelter or protection. NB – places of shelter or protection are generally referred to as roosts</p> <p>Obstruct access to any structure or place which an animal uses for shelter or protection.</p> <p>Licences are issued by Natural England to derogate from the legislation for any actions that could cause an offence but where there are no alternatives, there are imperative reasons of overriding public interest (IROPI) and the favourable status of the local bat population can be maintained within its natural range. This includes all developments and engineering schemes, regardless of whether or not they require planning permission.</p> <p>Some bat species are also listed as a Species of Principal Importance under the NERC Act 2006.</p>
Birds	<p>Birds are afforded various levels of protection and levels of conservation status on a species by species basis. The most significant general legislation for British birds lies within Part 1 of the WCA 1981 (as amended). Under this legislation it is an offence to; kill, injure or take any wild bird, take, damage or destroy the nest of any wild bird while that nest is in use or being built, take or destroy an egg of any wild bird.</p> <p>In addition to the above protection for all breeding birds under the WCA 1981 (as amended), Schedule 1 of the act lists a number of species which are (themselves and their young) protected from intentional or reckless disturbance at, on or near an active nest.</p>

Species	Key Legal Protection
	<p>Annex 1 of the EC Birds Directive 1979 also lists rare and vulnerable species of wild birds that are subject to special conservation measures.</p> <p>Some bird species are also listed as a Species of Principal Importance under the NERC Act 2006.</p>
<p>Otter (<i>Lutra lutra</i>)</p>	<p><i>Otter is protected under both the Conservation of Species & Habitats Regulations 2018, under which it is listed as a European Protected Species, and the Wildlife & Countryside Act 1981 (as amended). Under this legislation, it is an offence to:</i></p> <ul style="list-style-type: none"> • Deliberately kill, injure or take/handle an otter • Damage, destroy a breeding site or resting place; or intentionally obstruct access to any place that an otter uses for shelter or protection • Deliberately disturb an otter • Possess, control, transport, sell, exchange or offer for sale/exchange any live or dead otter or any part of an otter, and • Keep otters in captivity. <p><i>Otter is also listed as a Species of Principal Importance under the NERC Act 2006.</i></p>
<p>Red squirrel (<i>Sciurus vulgaris</i>)</p>	<p>Red squirrel is included in Schedules 5 and 6 of the Wildlife & Countryside Act 1981 (WCA) (as amended) making it an offence to:</p> <ul style="list-style-type: none"> • Intentionally kill, injure or capture (take) a red squirrel • Intentionally or recklessly damage or destroy any structure or place which a red squirrel uses for shelter or protection • Intentionally or recklessly disturb a red squirrel while it is occupying a structure or place which it uses for that purpose. <p>Red squirrel is also listed as a Species of Principal Importance under the NERC Act 2006.</p>
<p>Water vole (<i>Arvicola amphibious</i>)</p>	<p>Water vole is listed on the Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) and is afforded full protection under Section 9 of the Act. Under the Act it is an offence to:</p> <ul style="list-style-type: none"> • Intentionally capture, injure or kill a water vole • Possess or control a living or dead water vole, or any part of a water vole • Intentionally or recklessly damage, destroy or obstruct access to any place that a water vole uses for shelter or protection, or disturb a water vole while it is occupying such a place, and • Sell, offer for sale or advertise for sale a living or dead water vole. <p>Water vole is also listed as a Species of Principal Importance under the NERC Act 2006.</p>
<p>White-clawed crayfish (<i>Austropotamobius pallipes</i>)</p>	<p><i>This species is listed on Annex II of the EC Habitats Directive which lists species for which Special Areas of Conservation (SAC) can be designated. It is also listed under Schedule 5 of the WCA.</i></p>
<p>Great crested newt (<i>Triturus cristatus</i>)</p>	<p>Great crested newts are protected under Annex II of the EC Council Directive “Conservation of Natural Habitats and Wild Fauna and Flora” (the Habitats Directive) as a European Protected Species (EPS). This legislation has been transposed into UK legislation through the Conservation of Habitats and Species Regulations 2018.</p>

Species	Key Legal Protection
	<p>Regulation 41 of the Conservation of Habitats and Species Regulations 2018 makes it an offence to:</p> <ul style="list-style-type: none"> • Deliberately capture, injure or kill great crested newts or destroy their eggs • Deliberately disturb great crested newts • Damage or destroy a breeding site or resting place of a great crested newt. This applies whether newts are present or not. • In addition to the above protection, great crested newts are protected under Schedule 5 of the Wildlife & Countryside Act 1981 (as amended). In addition to the above, it lists the following as additional offences: • Disturbance of an animal whilst it is occupying a place which it uses for shelter or protection. • Obstruct access to any structure or place which an animal uses for shelter or protection. • Possess or control any live or dead specimen or anything derived from a great crested newt. <p>The above legislation applies to all life-stages of the species, from egg through larvae to sub-adults and adult newts. Great crested newt (as well as common toad) are also listed as a Species of Principal Importance under the NERC Act 2006.</p>
Bullhead (<i>Cottus gobio</i>)	This species is listed on Annex II of the EC Habitats Directive which lists species for which Special Areas of Conservation (SAC) can be designated.
Atlantic Salmon (<i>Salmo salar</i>)	<p>This species is protected under the Salmon and Freshwater Fisheries Act (SAFFA) 1975 which aims to protect freshwater fish with a particularly strong focus on salmon and trout. There are many activities that could constitute an offence under SAFFA including direct mortality, barriers to migration and degradation of habitats.</p> <p>Salmon are also listed as a Species of Principal Importance under the NERC Act 2006.</p> <p>This species is listed on Annex II of the EC Habitats Directive which lists species for which Special Areas of Conservation (SAC) can be designated.</p>
River Lamprey (<i>Lampetra fluviatilis</i>)	<p>This species is listed on Annex II of the EC Habitats Directive which lists species for which Special Areas of Conservation (SAC) can be designated.</p> <p>This species is protected under the Salmon and Freshwater Fisheries Act 1975 which aims to protect freshwater fish with a particularly strong focus on salmon and trout. There are many activities that could constitute an offence under SAFFA including direct mortality, barriers to migration and degradation of habitats.</p>
Sea Lamprey (<i>Petromyzon marinus</i>)	<p>This species is listed on Annex II of the EC Habitats Directive which lists species for which Special Areas of Conservation (SAC) can be designated.</p> <p>This species is protected under the Salmon and Freshwater Fisheries Act 1975 which aims to protect freshwater fish with a particularly strong focus on salmon and trout. There are many activities that could constitute an offence under SAFFA including direct mortality, barriers to migration and degradation of habitats.</p>
Brook Lamprey (<i>Lampetra planeri</i>)	<p>This species is listed on Annex II of the EC Habitats Directive which lists species for which Special Areas of Conservation (SAC) can be designated.</p> <p>This species is protected under the Salmon and Freshwater Fisheries Act 1975 which aims to protect freshwater fish with a particularly strong focus on salmon and trout. There are many activities that could constitute an offence under SAFFA including direct mortality, barriers to migration and degradation of habitats</p>

8.6 Baseline Conditions

Desk Study

- 8.6.1 A data consultation exercise was undertaken as part of the Extended Phase 1 Habitat Survey undertaken by Capita Ecology in October 2017. This involved a data search for statutory and non-statutory sites within 2km of the scheme. This data was provided by the Cumbria Biodiversity Data Centre (CBDC), (see Appendix 8.1). The results of this desk-based exercise are summarised in Table 8.5.

Table 8.5 Statutory and Non-Statutory Sites Designated for Nature Conservation within the site and within 2km of the site boundary

Value	Location	Descriptor
Statutory Designations		
River Eden Special Area of Conservation (SAC)	Bisects the central part of the Scheme and is located to the north and south of the scheme.	Qualifying features include: Alder woodland on floodplains; Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels; Rivers with floating vegetation often dominated by water-crowfoot; Atlantic salmon; brook lamprey; bullhead; otter; river lamprey; sea lamprey; and, white-clawed crayfish.
River Eden and Tributaries Site of Special Scientific Interest (SSSI)	Bisects the central part of the Scheme and is located to the north and south of the scheme.	<p>The site interest includes the habitat and species listed in the EC Habitats and Species Directive (92/43/EEC) that are mentioned above. The SSSI is also notified for breeding birds associated with wetlands and riparian habitats. Birds of particular note include redshank <i>Tringa totanus</i>, oystercatcher <i>Haematopus ostralegus</i>, dipper <i>Cinclus cinclus</i> and kingfisher <i>Alcedo atthis</i>. The Eden valley also provides habitat for over 1% of the national population of wintering whooper swans <i>Cygnus cygnus</i>.</p> <p>The Eden is also of high invertebrate significance for species associated with river shingle and sandbanks as well as being of national importance for riparian habitats including alder woodland and floodplain. Other notable features include: lowland wetland (fen, marsh and swamp); sand martin <i>Riparia riparia</i> colonies; trout and geology.</p>
Non- Statutory Designations		
Newbiggin Wood County Wildlife Site (CWS)	Located approximately 200m to the east of the Scheme, to the east of the M6	Ancient and secondary semi-natural broadleaved woodland. Noctule have been recorded, and the site is known to attract siskin <i>Spinus spinus</i> in winter.
Brownelson & Thurnam Wood CWS	Located approximately 125m to the south-west of the Scheme	Two adjacent ancient semi-natural woodlands.
Cummersdale Shingle Banks,	Partially located within the central	Designated for its invertebrate abundance as well as the presence of scarce and rare species.

Site of Invertebrate Significance (SIS)	section of the Scheme	
Cummersdale Landslip and Blackhall Wood Site of Invertebrate Significance SIS	Located Approximately 200m south of the Scheme	Designated for its invertebrate abundance as well as the presence of scarce and rare species.

8.6.2 The desk study identified a number of protected species records relevant to the Scheme. These are listed in Table 8.6.

Table 8.6 Protected Species records within the site and within 2km of the site boundary

Species	Details of records
Badgers	The data search returned 27 badger records. However, 18 of these were dead badgers which were mostly associated with the areas immediately surrounding M6 Junction 42 roundabout and the A595 adjacent to Peter Lane. The remaining field records are associated with Sowerby Wood, which is close to the A595 and is west of the proposed scheme, and Newbiggin Wood, which is South East of the proposed scheme, separated from the scheme by the M6 motorway.
Bats	The data search returned 35 bat records between 1996 and 2016. The records included six species of bats: common pipistrelle <i>Pipistrellus pipistrellus</i> , soprano pipistrelle <i>Pipistrellus pygmaeus</i> , noctule <i>Nyctalus noctula</i> , Daubenton's <i>Myotis daubentonii</i> , whiskered <i>Myotis mystacinus</i> and brown long-eared <i>Plecotus auritus</i> .
Barn owl	The data search returned two records of barn owl <i>Tyto alba</i> within 2km of the Scheme. These records were taken during nest box check monitoring. A third record of a road casualty was provided within a Highways England Carrion Report.
Breeding birds	The data search returned 334 records of 22 notable breeding bird species dating from 1980 to 2014 in the months March to July including several Schedule 1 species.
Wintering birds	The data search returned 433 records of 20 bird species dating from 1980 to 2014 in the months October to February.
Brown hares	The data search returned three brown hare records. These were located in the vicinities of Durdar, Blackwell and Brisco.
Fish	A desk-based study provided information on the current ecological status of fish assemblage within the two main rivers that bisect the Scheme, the River Caldeu and the River Petteril. The current Water Framework Directive (WFD) ecological status of the two watercourses at the point of the proposed bridge crossing points, as obtained from the Environment Agency is poor for the River Caldeu downstream of Caldbeck and moderate for the River Petteril downstream of the Blackrack Beck. The data search returned records of eight fish species: Atlantic salmon <i>Salmo salar</i> , Bullhead <i>Cottus gobio</i> , stone loach <i>Barbatula barbatula</i> , European eel <i>Anguilla anguilla</i> , Lamprey spp <i>Petromyzontidae</i> , Minnow <i>Phoxinus phoxinus</i> , three-spined stickleback <i>Gasterosteus aculeatus</i> , brown/sea trout <i>Salmo trutta</i> .
Great crested newts	No great crested newt records were returned in the data search

Species	Details of records
Red squirrel	The data search returned 116 records of red squirrels dating from 1992. A number of records exist along Newbiggin Road, with high concentrations of records existing in woodlands to the west of the Scheme.
Reptiles	No reptile records were returned with the data search.
Riparian mammals - Otters	The data search returned 35 otter records dating from 1991 to 2016. These included eight records from the River Caldw and six records from the River Petteril.
Riparian mammals – Water voles	No water vole records were returned with the data search.
Terrestrial invertebrates	Invertebrate records for both SIS sites were provided in Hewitt et al (2006). A total of 133 species were recorded including several Red Data Book, Nationally Scarce and Regionally Scarce species.

Field Survey - Habitats

- 8.6.3 Six Habitats of Principal Importance (HPI) were identified from the Extended Phase 1 Habitat Survey: standing water/ponds, rivers and streams, hedgerows, lowland mixed deciduous woodland, lowland meadows and wet woodland. All of these were found within the Scheme boundary and are illustrated in Table 8.7.
- 8.6.4 A total of 22 habitat types were recorded within the Phase 1 habitat survey across the 2017 and 2019 survey area. Arable fields and improved pasture were predominant in terms of area. The Phase 1 mapping is shown on Figures 8.1-8.10 and provided in Appendix 8.1.

Table 8.7 Habitats of Principal Importance/Local BAP Priority Habitats found within the site

Habitat of Principal Importance	Location and extent
Standing water/ponds	Nineteen ponds and eleven ditches were identified within 250m of the Scheme, however access was not permitted to all of these to ascertain if these quality of Pond Habitats of Principal Importance
Rivers and streams	There are six watercourses within 2km of the proposed scheme, these are; the River Caldw, the River Petteril, Calfins Beck, Fairy Beck, Woodside Beck, and Peastree Stream.
Hedgerows	A range of hedgerows comprising native species are distributed throughout the Scheme
Lowland mixed deciduous woodland	Broadleaved semi-natural woodland is present within Cat Wood and Tarn Plantation, both adjacent to Newbiggin Road. The most extensive area of semi-natural woodland is located adjacent to the River Caldw and includes Blackhall Wood, Peastree Wood and Todhills Wood. These areas of woodland comprise a mix of sycamore, alder, with holly Ilex aquifolium, willow Salix spp. and oak Quercus spp. This also includes an area of mature woodland with a high number of ancient woodland indicator species was identified immediately adjacent to the scheme at Peastree Farm.

Habitat of Principal Importance	Location and extent
Lowland Meadows	An area of species rich lowland meadow is present within the floodplain of the River Caldw, specifically on the right-hand bank, where there is significantly less management and public access.
Wet woodland	An area of alder woodland is present, within the floodplain on both banks of the River Caldw.

Standing water/ponds

8.6.5 There are 19 ponds and 11 ditches that lie within 250m of the Scheme. The position of these waterbodies relative to the scheme are shown within the appendices of the great crested newt report in Appendix 8.7.

Rivers and streams

8.6.6 There are several watercourses within 2km of the proposed scheme. These are:

- River Caldw – a tributary of the River Eden is designated as part of the River Eden SAC and River Eden and Tributaries SSSI.
- River Petteril – a tributary of the River Eden, but not designated as part of the River Eden SAC, or the River Eden and Tributaries and SSSI.
- Fairy Beck – a designated main river, and a tributary of the River Caldw. It is currently extensively modified and culverted in a number of places.
- Calflins Beck – a designated Ordinary Watercourse and a tributary of the River Caldw.
- Peastree Stream – a small stream, which runs through an area of clough woodland, and is a tributary of the River Caldw.
- Woodside Beck – should not be directly affected by the scheme.

Hedgerows

8.6.7 Hedgerows were surveyed and assessed using criteria detailed by the Hedgerow Regulations 1997 (see Appendix 8.2). Table 8.8 lists hedgerows that qualify as Important Hedgerows under the regulations.

8.6.8 Hedgerows were also assessed using HEGS survey methodology as defined Clements and Tofts (1992). Following data collection, a desk-top analysis was undertaken in which each attribute was given a score based on information gathered in the field. The relevant scores were then keyed through a flow chart to finalise a hedgerow grade. The grade is used to determine the ecological value of the hedgerow. The grading system is as follows:

- Grade 1: High to very high value
- Grade 2: Moderately high to high value
- Grade 3: Moderate value; and
- Grade 4: Low value.

8.6.9 The above grades are continuous and each grade has a plus (+) and minus (-) value. A grade 2- hedgerow is deemed to have a higher ecological value than a grade 3(+). Any hedgerow that is grade 2- and above is specified as being of conservation priority. Hedgerows which qualify under the Hedgerow Regulations 1997 and HEGS are listed in Table 8.8.

8.6.10 For ease of reference in the table, the Scheme has been split into three geographic sections. The western section commences to the west of the Newby West Roundabout to the embankment on the eastern side of the Caldew Bridge. The central section commences from the embankment on the eastern side of the Caldew Bridge to the east of the Brisco roundabout and the eastern section is from the east of the Brisco roundabout to the M6 junction.

Table 8.8 Hedgerows important for nature conservation under the Hedgerow Regulations

Hedgerow number	Location	Details
H1	Central Section	-
H2	Central Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H3	Central Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H4	Central Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H7	Central Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H8	Central Section	-
H9	Central Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H14	Central Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H28	Central Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H30	Central Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H32	Central Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H33	Central Section	-
H34	Central Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H37	Central Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H38	Central Section	This hedgerow is also categorised under HEGS as Grade 2 and above.

Hedgerow number	Location	Details
H39	Central Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H40	Central Section	-
H48	Eastern Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H49	Eastern Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H52	Central Section	
H56	Central Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H57	Eastern Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H59	Eastern Section	-
H61	Central Section	-
H63	Central Section	-
H89	Eastern Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H91	Eastern Section	-
H93	Central Section	-
H94	Central Section	-
H95	Central Section	-
H96	Central Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H98	Central Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H99	Central Section	-
H102	Central Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H106	Western Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H107	Central Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H110	Central Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H112	Central Section	This hedgerow is also categorised under HEGS as Grade 2 and above.

Hedgerow number	Location	Details
H113	Central Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H116	Western Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H117	Western Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H118	Western Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H119	Western Section	-
H128	Central Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H131	Western Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H134	Western Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H135	Western Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H136	Western Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H140	Western Section	-
H141	Western Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H142	Western Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H147	Western Section	-
H151	Western Section	-
H152	Western Section	-
H158	Western Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H160	Western Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H172	Western Section	This hedgerow is also categorised under HEGS as Grade 2 and above.
H183	Western Section	-

Hedgerow number	Location	Details
H184	Western Section	-

Lowland Mixed Deciduous woodland

- 8.6.11 Broadleaved semi-natural woodland is present within Cat Wood and Tarn Plantation, both adjacent to Newbiggin Road. The most extensive area of semi-natural woodland is located adjacent to the River Caldew and includes Blackhall Wood, Peastree Wood and Todhills Wood. These areas of woodland comprise a mix of sycamore *Acer pseudoplatanus*, alder *Alnus glutinosa*, with holly *Ilex aquifolium*, willow *Salix* sp and oak *Quercus* sp.
- 8.6.12 Two areas of willow plantation occur within the study area. One small area is associated with the arable grassland at Park Fauld Farm, with a larger area to the south of Newbiggin Road.
- 8.6.13 A clough woodland north west of Peastree Farm with a stream running through the bottom comprises mature woodland that has been present since at least 1823. This is illustrated by a range of factors including the diverse ground flora which includes eighteen species considered to be indicators of ancient woodland.
- 8.6.14 To the south of Peter Lane there is an area of approximately 7ha of semi-natural coniferous woodland known as Ashtip Wood. This was initially planted on the site of a former refuse tip but has since been allowed to develop naturally. The main canopy is dominated by Scots pine *Pinus sylvestris* with a self-seeded understorey predominantly comprising birch *Betula* sp, holly, oak and rowan *Sorbus aucuparia*.

Lowland Meadows

- 8.6.15 The majority of the grassland within the Scheme is arable or improved/species-poor semi-improved grassland. The patches of semi-improved grassland are generally associated with highway verges, and the area surrounding the roundabout of J42 of the M6.
- 8.6.16 There is an area of floodplain meadow around the River Caldew which has greater species diversity comprising species such as meadowsweet *Filipendula ulmaria*, meadow cranesbill *Geranium pratense*, marsh woundwort *Stachys palustris*, yarrow *Achillea millefolium*, wild fennel *Foeniculum vulgare*, tansy *Tanacetum vulgare*, St John's wort *Hypericum spp*, creeping cinquefoil *Potentilla reptans*, red bartsia *Odontites verna*, marsh bedstraw *Galium palustre*, crosswort *Cruciata laevipes*, ribwort plantain *Plantago lanceolata*, red clover *Trifolium pratense*, goatsbeard *Tragopogon pratensis*, marsh thistle *Cirsium palustre*, crested dog's tail *Cynosurus cristatus*, common knapweed *Centaurea nigra*, bird's foot trefoil *Lotus corniculatus*, bittersweet *Solanum dulcamara* and lords and ladies *Arum maculatum*.

Wet woodland

- 8.6.17 There is a small area of alder woodland, which is positioned either side of the River Caldew. An NVC was undertaken and this area falls within the NVC category W6a *Alnus glutinosa Urtica dioica* community (see Appendix 8.13).

Invasive species

- 8.6.18 Three invasive terrestrial plant species were found within the survey area (see Appendix 8.12): Himalayan balsam *Impatiens glandulifera*, Japanese knotweed *Fallopia japonica*, and giant hogweed *Heracleum mantegazzianum*. There was also evidence of the invasive mammal American mink *Neovison vison* found within the study area.
- 8.6.19 The invasive aquatic plant Canadian waterweed *Elodea canadensis* was found in the ponds immediately adjacent to the River Caldew.

Field Survey – Species

Badger

- 8.6.20 Surveys for badger were undertaken during 2018-2019 (see Appendix 8.4). The number and status of badger setts recorded are summarised in Table 8.9.

Table 8.9 Badger setts recorded during the 2018 - 2019 badger survey

Type of Sett	Total No.	Active	Inactive	Disused
Main	5	3	0	2
Annex	3	2	0	1
Subsidiary	3	1	2	0
Outlier	8	1	5	2
Total	19	7	7	5

- 8.6.21 Foraging signs were recorded throughout the survey area, known as ‘snuffle holes’, which are created when badgers have been rooting for earthworms, other invertebrates or tubers. Badger prints and paths were recorded throughout the scheme as were snagged guard hairs on the bottom of hedgerows and fences. Latrines and dung pits were evident within the study area; however, a large number of these were associated with the main setts S2 and S13 (locations detailed in the confidential badger report). There were a number of latrines recorded some distance from main setts, which suggests that badgers are demarcating their territorial boundaries some distance from their main setts.
- 8.6.22 The badger setts recorded during the surveys are listed in Table 8.9 and Table 8.10.

Table 8.10 Badger setts recorded during the 2018-2019 badger survey

Sett No.	Type	Active/ Disused	Distance from Scheme
S1	Outlier sett	Disused	Approximately 250m south of the scheme
S2	Main sett	Active	Approximately 75m south of the scheme
S3	Annex sett	Active	Approximately 100m south of the scheme
S4	Subsidiary sett	Active	Approximately 40m south of the scheme
S5	Annex sett	Disused	Approximately 450m south of the scheme
S6	Outlier sett	Disused	Approximately 450m south of the scheme
S7	Subsidiary sett	Disused	Approximately 75m south of the scheme
S8	Main sett	Disused	Approximately 100m north of the scheme
S9	Outlier sett	Disused	Approximately 75m north of the scheme
S10	Main sett	Disused	Approximately 10m south of the scheme
S11	Outlier sett	Disused	Approximately 100m north of the scheme
S12	Annex sett	Active	Approximately 3km north of the scheme
S13	Main sett	Active	Approximately 3km north of the scheme
S14	Outlier sett	Active	Approximately 300m south of the scheme
S15	Main sett	Disused	Approximately 50m north of the scheme
S16	Annex sett	Disused	Approximately 100m north of the scheme
S17	Outlier sett	Disused	Approximately 100m north of the scheme
S18	Outlier sett	Disused	Within the line of roundabout slip road
S19	Main sett	Active	Approximately 6km south of the scheme

- 8.6.23 In summary, six main setts were confirmed during the survey, three of which were active (S2, S13 and S19). Only one main sett (S2) is in close proximity to the Scheme.
- 8.6.24 The survey identified several areas where badger field signs were found on both sides of the scheme including to the north and south of the Caldew Bridge, to the east and west of the Durdar Roundabout, to the east and west of the Durdar Bridge and to the north and south of the Brisco Roundabout. These field signs indicated that badgers were foraging on both sides of the Scheme in these areas.
- 8.6.25 Badger paths were found which also indicated that badgers were foraging on both sides of the Scheme including west, north and east of the Durdar Roundabout, to the west, north and east of the Durdar Bridge and to the west of the Brisco Roundabout.
- 8.6.26 A bait marking survey of the three active main setts was undertaken in 2019. The low level of bait returns meant that territorial boundaries were difficult to define, however the returns at S2 suggest that this clan had a core territory which included

the perimeter of a nearby woodland (locations detailed in the confidential badger report). The marked bait returns for S13 were associated with the path between the main sett (S13) and the annex sett (S12).

Bats

- 8.6.27 The full bat survey schedule is contained within the bat report provided in Appendix 8.14. The results of these surveys are summarised below.

Bat Commuting and Foraging Routes

- 8.6.28 Bat commuting and foraging routes have been observed at various locations across the Scheme area. These are described in Table 8.11.

Table 8.11 Bat Commuting and Foraging Routes

Bat Commuting and Foraging routes	Location	Details
Transect A	River Petteril	This is a highly important foraging and commuting route for resident bat species, who appear to be using the riparian tree cover to commute and forage in this area. The proposed route crosses this river. Species recorded in this transects were common pipstrelle, soprano pipstrelle, <i>Myotis spp.</i> , and <i>Nyctalus spp</i> and brown long eared bats.
Transect B	Langdale/Piggeries	The hedgerow perimeter of the property has been shown to be in use by bats for foraging and commuting, this includes the track between the bungalow at Langdale and the old piggery buildings. Species using this area were common pipstrelle, soprano pipstrelle, <i>Myotis spp.</i> , and <i>Nyctalus spp</i> bats.
Transect C	Hedgerows close to Scalegate Roundabout and Durdar Road	The hedgerow boundaries close to the proposed Scalegate Roundabout have a low level of bat foraging, and commuting activity. The tree lined hedgerows of Durdar Road, have also been shown to have a low level of bat foraging and commuting activity. The levels of bat activity around Tarn Plantation, and to the hedgerows to the south is undetermined due to land access restraints. Species recorded during the transect surveys were common pipstrelle, soprano pipstrelle, <i>Myotis spp.</i> , and <i>Nyctalus spp</i> and brown long eared bats.
Transect D	Peastree	The transect in this location showed a moderate level of bat activity from the clough woodland round to the River Caldew. It appears bats in this location are using the small areas of woodland to commute through the landscape specifically from the clough woodland round to the River Caldew. Species recorded during the transect surveys were common pipstrelle, soprano pipstrelle, <i>Myotis spp.</i> , and <i>Nyctalus spp</i> and brown long eared bats.
Transect E	River Caldew	The transect in this location recorded high levels of bat foraging and commuting activity. This appeared to be along the river corridor, and along the public right of way, which is lined with trees. Species using this area were common

Bat Commuting and Foraging routes	Location	Details
		pipstrelle, soprano pipstrelle, <i>Myotis spp.</i> , and <i>Nyctalus spp</i> bats.
Transect F	Ashtip Wood	The transect in this location revealed a low level of bat foraging and commuting activity around the perimeter of the woodland, and in hedge lines to the south east, specifically in close proximity to a mature ash tree. Species using this area were common pipstrelle, soprano pipstrelle, <i>Myotis spp.</i> , and <i>Nyctalus spp</i> bats.

Bat Roosts - Trees

8.6.29 Trees that have been confirmed as having a bat roost within them are listed in Table 8.12.

Table 8.12 Bat Roosts - Trees

Confirmed tree bat roost	Location	Details
T8305	Just on the edge of the proposed northern embankment at the River Petheril crossing	Identified during tree climbing surveys, species was difficult to determine so not recorded. Tree to be retained.
T8315	This is in field immediately west of West Coast mainline	One common pipistrelle was recorded as emerging from the tree in August. 3 surveys not undertaken to characterise the roost, but it appears likely this is an occasional roost. Tree to be lost to the scheme.
T8320	This is in a hedgerow currently located, at the proposed Brisco Roundabout	One soprano pipistrelle was noted emerging from the tree in August. This has been identified as an occasional roost. Tree to be lost.
T8555	Within the clough woodland adjacent to Peastree Farm.	Thick layer of bat droppings noted in the tree during climbing surveys, this suggests tree is in periodic use by bats as a roosting site. The tree has not been subject to any emergence or re-entry surveys and so the species and type of roost is unknown. Tree to be retained.
T8442	On a tree within a hedge line, immediately to the east of the scheme in land just to the West of the River Caldew.	Two common pipistrelle bats were recorded emerging from the tree in September 2019. The roosts are likely to be transitional roosts used by an individual or low numbers of bats in the transitional months prior to, or following, hibernation. Tree to be lost
T8447	On a tree within a hedge line, immediately to the east of the scheme in land just to the West of the River Caldew.	A single bat was recorded within a cavity of the tree during the aerial inspection survey, but the species was not confirmed. No emergence or re-entries were noted during the dusk dawn surveys, and as such the roost is likely to be an occasional roost used by an individual or low number of bats. Tree to be lost.

Confirmed tree bat roost	Location	Details
T8484	Tree is in line of trees on southern carriageway of Peter Lane closer to Ashtip Wood.	Bat bot with dropping seen during climbing, suggests occasional use by bats. However, no emergence or re-entry surveys were undertaken at T8484 so species and roost type unknown. Tree to be retained.
T8489	Tree is line of trees on southern carriageway of Peter Lane	The tree contains two unknown pipistrelle spp., recorded during the aerial inspection surveys. No emergence or re-entry surveys were undertaken on this tree so species and roost type is unknown. Tree to be lost.
T8376	Tree to the south east of the proposed scheme, south of Newbiggin Road, in a line of trees adjoining a ditch.	The climbing surveys noted that powdered bat droppings may have been present in the tree, suggesting occasional use by bats, however this could not be confirmed, and tree has not been subject to emergence re-entry surveys so the roost type is currently unknown. Tree to be retained.
NY 42297 50550	South of the Scheme, immediately south of piggery buildings in southern corner of hedge line.	Bats were noted emerging from tree in this location during transect survey, species not noted. Tree to be retained.

Bat Roosts - Buildings and Structures

8.6.30 Buildings that have been confirmed as having a bat roost are listed in Table 8.13.

Table 8.13 Bat Roosts – Buildings and Structures

Confirmed Bat Roost	Location	Details
B124a	In excess of 250m from the proposed road to the south east of Newbiggin Road and the River Petteril	Two common pipistrelles were seen to emerge from the building. Building to be retained.
B85	Approximately 70m north of the proposed scheme	Two common pipistrelles emerged in July, and five soprano pipistrelles emerged in August. A third emergence/re-entry survey may need to be required to categorise the roost. Building to be retained.
B86e	Approximately 20m south of the proposed scheme.	Two soprano pipistrelles emerged in July, and one soprano pipistrelle emerged in August. A third emergence/re-entry survey may need to be required to categorise the roost. Building to be retained.
B111	This is within 20m of the scheme, north of Newbiggin Road, and south of Peastree Farm	One common pipistrelle emerged from the building in August. Further emergence and re-entry surveys may be needed to categorise the roost. Building to be retained.
Newbiggin Old Bridge	Approximately 200m south of proposed scheme. The bridge is a footbridge that crosses the River Petteril.	One soprano pipistrelle was noted emerging from bridge in September 2019. Data records show this bridge did contain a Daubenton's maternity roost, and the bridge was previously a subject of an EPS

Confirmed Bat Roost	Location	Details
		licence for this roost when it was rebuilt. However, no Daubenton's were recorded emerging from, or re-entering the structure during the dusk and dawn surveys. Bridge to be retained.
Cumbrian Coastline Railway Bridge over the River Caldew	Greater than 200m north of the proposed crossing of the River Caldew.	Four soprano pipistrelles and one common pipistrelle emerged from the structure in July. Bridge to be retained.

Breeding Birds

- 8.6.31 Breeding bird surveys (see Appendix 8.8) were undertaken during April-June 2019 and recorded a diverse assemblage of birds with a total of 66 species recorded. Of these, 47 were confirmed or probable breeders. Table 3.3 within the Breeding Bird Report, (Capita, 2019), shows the bird species recorded during the surveys.
- 8.6.32 Of the total number of species, 31 'notable' species' including 14 Section 41 species (Species of Principal Importance as defined by the NERC Act (2006)), 15 BoCC Red-list species and 15 BoCC Amber-list species were recorded. Fifteen of the 'notable' species are also Local Priority Species as identified by the Cumbria Biodiversity Action Plan.
- 8.6.33 Of the habitats within the Scheme area, the most important ornithologically are the river systems of the Caldew and Petteril and also areas of arable farmland with hedgerows. Both the Rivers Caldew and the Petteril support a variety of nesting waterbirds. Along the surveyed section of the Caldew were mallard (2 territories), oystercatcher (1 territory), common sandpiper (3 territories) and dipper (1 territory) while the Petteril held mallard (3 territories), oystercatcher (1 territory), common sandpiper (2 territories), dipper (1 territory) and grey wagtail (1 territory).
- 8.6.34 Two small sand martin colonies (<5 active nests) were present within the banks of the Caldew. One was located approximately 500m to the north-east of the Scheme and one located approximately 500m to the south of the Scheme. Both are unlikely to be affected by the Scheme.
- 8.6.35 A large sand martin colony with 30 active nests was present within the banks of the Petteril approximately 100m to the west of the Scheme. However, this nest site is unlikely to be directly affected by the Scheme.

Barn Owl

- 8.6.36 Three occupied barn owl nesting sites, one active nest site, and two potential nest sites were recorded during the survey. Table 8.14 lists the areas associated with barn owls.
- 8.6.37 Barn owls were also noted incidentally during other surveys; a barn owl was observed in flight in a field immediately south of Newbiggin Road, flying towards Langdale Cottage and the Piggeries, and a hunting barn owl was recorded hunting

alongside the western side of the Cumbrian Coastline Railway during a great crested newt survey.

Table 8.14 Summary of barn owl records identified through field surveys

Survey date	Type of Record (roost, feeding, nest site)	Location	Distance from Scheme
21/02/2019	Occupied Breeding Site	Kingrigg Farm	<50m
26/02/2019	Occupied Breeding Site	Hillhouse Nook Farm	<100m
Not Accessed	Active Roost/Nest Sites	Orton Park Farm	<100m
25/02/2019	Active Roost Sites	Park Fauld Farm	200m
25/02/2019	Potential Nest Site. Last used in 2017	Durdar Farm	<50m
26/02/2019	Potential Nest Site. Last used in 2017	Derelict Piggery	<100m
27/03/2019	Temporary Roost Site	Brisco Hall Farm	<100m
27/03/2019	Temporary Roost Site	Esk Building Products	<100m

Wintering Birds

- 8.6.38 The wintering bird survey (see Appendix 8.5) determined usage of the two most important ornithological habitats within the scheme: both river systems (Petteril and Caldew) and arable farmland. Several water bird species were recorded using both the Caldew and Petteril river systems during the winter, but for all species that were observed the maximum assemblage was low, with the highest number of birds for an individual species (herring gull) numbering 176 individuals.
- 8.6.39 There was a high diversity of wintering bird species using arable farmland with several of these being categorised as Red or Amber listed species and 28 in total regarded as 'notable'. These included lapwing, skylark, tree sparrow, linnets, redwing and yellowhammer.
- 8.6.40 With the diversity and in some cases, abundance, of notable bird species recorded, it has been concluded that the site is of value to wintering birds.

Brown Hares

- 8.6.41 A small number of brown hares were recorded in two specific areas of the Scheme: i) South of Newbiggin Road, and ii) between Newbiggin Road and the River Caldew, during the surveys carried out during May and June 2019 (see Appendix 8.9).
- 8.6.42 No more than five brown hares were found on any one occasion indicating that the population density across the Scheme area is low.
- 8.6.43 Both areas in which hares were recorded are large non-fragmented areas, in which there are a variety of habitats which hares may use. These areas included open grassland, agricultural land (including semi-improved grasslands), pasture, arable fields and broadleaved woodland.
- 8.6.44 The majority of the hares recorded were close to unpaved farm tracks. This is likely because the density of unpaved farm tracks has a positive effect, as the vegetation

at field tracks contributes to the diet spectrum (Roedenbeck et al, 2008). It therefore seems likely that this area is a favoured foraging location for hares and would explain the numbers of hares recorded.

Fish

- 8.6.45 From Environment Agency fish survey data, Atlantic salmon, lamprey species, European eel, brown/sea trout, bullhead, stone loach, minnow and three-spined sticklebacks have been recorded within the River Caldew and/or the River Petteril. A fish habitat survey sought to identify the key habitats in relation to the proposed scheme that supports the above fish species, and which are key to their respective life cycles (see Appendix 8.16).
- 8.6.46 Results from the fish habitat surveys showed that both rivers in the proximity of the bridge crossing locations have substrate dominated by cobbles and gravels, whilst both exhibit a range of flow types. The hydromorphological characteristics of each river are considered suitable to support the identified fish species at certain life stages.

Great Crested Newts and Other Amphibians

- 8.6.47 A juvenile great crested newt was identified during a reptile survey on 8th September 2018 from a location on the north-western bank of the River Caldew between the River Caldew and the Cumbrian Coastline railway (grid reference NY393522) (see Appendix 8.7).
- 8.6.48 In 2019, 19 ponds and 11 ditches were subject to a Habitat Suitability Index (HSI) assessment. The assessment identified three as having excellent suitability for great crested newts, six as having good suitability and five as having average suitability. Only one ditch was assessed as having good suitability for great crested newts.
- 8.6.49 An eDNA survey was undertaken in 2019 of ten ponds and one ditch. No great crested newt DNA was detected from any of the eleven waterbodies.
- 8.6.50 All eleven waterbodies were subject to aquatic presence and absence surveys undertaken between mid-March and mid-June 2019. No great crested newts were found from any of the eleven waterbodies.
- 8.6.51 It is concluded that there are no populations of great crested newts present within the Scheme. The results indicate that the ponds in question are not being used as breeding ponds, and that any population in the area is very low with a low detection rate. Furthermore, when you consider that great crested newts have been found to move 120m in one night, and like many amphibians, small numbers of individuals disperse as colonisers to distances of 1,000 m or more, it seems more likely that the great crested newt found in September 2018 may have been moving some distance from their breeding pond – perhaps up to 1km – and were perhaps using the dense vegetation to shelter during the day. It is unlikely they would use this vegetation for hibernation due to the high likelihood of flooding during the winter months, due to the proximity of the River Caldew. In light of this information, it is concluded that the individuals here do not constitute a breeding population, and therefore this species has been scoped out of this assessment.
- 8.6.52 Reptile surveys undertaken in 2018, and great crested newt surveys undertaken in 2019 revealed breeding populations of common toad *Bufo bufo*, common frog *Rana*

temporaria, smooth newt *Lissotriton vulgaris* and palmate newt *Lissotriton helveticus*.

Red Squirrel

- 8.6.53 A red squirrel survey was undertaken in selected areas throughout the survey site following an assessment of the Phase 1 habitat survey results (see Appendix 8.6). As no red squirrels were confirmed during the survey and no field signs found, this species has been scoped out for any further assessment.

Reptiles

- 8.6.54 A desk study was undertaken to assess the site for likely reptile habitat. The habitat assessment of the areas identified in the desk study confirmed four sites with suitable habitat to support reptiles. These habitats had areas that provided insolation, exposure to the sun, and some structural complexity, i.e. areas of vegetation cover and open areas. This is essential for reptiles in order to provide shelter from heat, wind and dry weather. The areas also had connectivity to other suitable areas of reptile habitat. Reptile surveys were subsequently undertaken in all four areas during 2018 (see Appendix 8.3) but no reptiles, or signs of reptiles, were found. Consequently, reptiles have been scoped out for any further assessment.

Riparian Mammals - Otter

- 8.6.55 Eight water courses were included in the otter survey (see Appendix 8.10) and otter field signs were found in seven watercourses. Only one active holt was confirmed but otter field signs were found in several locations as summarised in Table 8.15.

Table 8.15 Otter field signs locations

Watercourse name	Location	Otter field signs
Fairy Beck	Western section of the Scheme	Potential holts and prints
Lingley Close Beck	Western section of Scheme	Path and slide
River Caldew	Central section of the Scheme	Potential holts
Peastree Stream	Central section of the Scheme	Potential holts, spraints
Calflins Beck	Central section of the Scheme	Path and slide
Woodside Beck	Eastern section of Scheme	Spraint
River Petteril	Eastern section of Scheme	Confirmed holt, potential holts, prints and path/slide

- 8.6.56 The number of otter field signs that were found suggests that the otter population within the Scheme area is widespread and active. Otters were recorded on both sides of the Scheme for the Fairy Beck, River Caldew, River Petteril and Calflins Beck. The Peastree Stream is not bisected by the Scheme but is adjacent to it.

Riparian Mammals – Water Vole

- 8.6.57 A water vole survey was undertaken on every watercourse across the Scheme area (see Appendix 8.11). No water voles or signs of water voles were found. This is reinforced by the results of the original data search which yielded no water vole

records. Consequently, this species has been scoped out for any further assessment.

Terrestrial Invertebrates

- 8.6.58 An initial desk study of the Scheme for invertebrates revealed that an area in the centre of the Scheme was categorised as a Site of Invertebrate Significance (SIS). These sites are known to have importance for invertebrates but they are not formally designated; some are within SSSIs or County Wildlife Sites. A scoring system based on the number of invertebrate species, with national or regional, rare or scarce status, recorded at a site from 1979 to 2005, has generated an index value. Qualifying sites are those that reach a minimum value. This value is equivalent to the minimum selection criteria for a County Wildlife Site (although it may be based on older data) (Palmer, 2011).
- 8.6.59 Cummersdale Shingle Banks SIS comprises exposed riverine sediments, and associated riparian habitats including ruderals, woodland, grassland and the fast flowing, shallow River Calder itself. The site is centred on the grid reference NY390520 and includes both banks of the river. Previous invertebrate records for the site in 2006 indicate that it was of high invertebrate value.
- 8.6.60 Surveys were undertaken over two days for terrestrial invertebrates in early September 2018. This revealed a diversified invertebrate fauna including a crane fly belonging to the genus *Gonomyia* which was confirmed as a new species by the leading European authority on this family of flies. As a result, more detailed invertebrate surveys were conducted between May and July 2019. The results of these surveys, in their entirety, are found in the report in Appendix 8.15.
- 8.6.61 The 2019 survey identified a total of 226 terrestrial invertebrate taxa. Three UK Species of Principal Importance were recorded, one Nationally Vulnerable species, one Potentially Nationally Vulnerable species and several Nationally scarce species. Two species of high interest were also recorded on site. These were *Rhegmoclemina lunensis*, which was described as new to science in 2009, when it was discovered on river shingle on the River Lune in Lancashire, and *Tachydromia rhyacophila* which the surveyor had previously recorded from exposed river shingle in the Yorkshire Dales but has not been added to the British list as yet although the determination has been confirmed.

Summary of Baseline Conditions

- 8.6.62 An extensive series of desk studies and field surveys have been carried out covering habitats and a total of thirteen protected species.
- 8.6.63 Overall, the Scheme area has a rich diversity of habitats including two statutory sites considered to be of very high ecological value: The River Eden SAC and the River Eden & Tributaries SSSI. It also contains six Habitats of Principal Importance, as defined by the NERC Act 2006, which are considered to be of high ecological value. These are Standing Water/Ponds, Rivers and Streams, Hedgerows, Lowland Mixed Deciduous Woodland, Lowland Meadows and Wet Woodland. As well as one non-statutory designated site, deemed to be of medium ecological value; Cummersdale Shingle Banks Sites for Invertebrate Significance (SiS).
- 8.6.64 Following an extensive survey programme, covering 13 different species the Scheme area was confirmed to host nine protected taxa, including European

Protected Species, as well as those protected under various UK legislation. These are: bats, otters, fish (including bullhead and Atlantic salmon), badgers, breeding birds (including red and amber list species), barn owl, amphibians, invertebrates, and brown hare.

8.7 Impact Assessment

Construction and Clearance Phase Impacts (without mitigation)

- 8.7.1 The potential impacts during the site construction and clearance phase are described in Table 8.16. The magnitude is based on a combination of legal and ecological factors such that, for example, the loss of an active nest of a common bird species would be considered a major magnitude impact due to the legal protection afforded to breeding birds.

Operational Phase Impacts (without mitigation)

- 8.7.2 The potential impacts arising during the operational phase are described in Table 8.17.

Table 8.16 Impact Assessment without Mitigation – Site Clearance and Construction Phase

Receptor and Sensitivity	Impact	Effect	Magnitude of effect	Significance
River Eden (SAC) (Very High)	Vegetation clearance for construction of piers for bridge over River Caldew. Some vegetation clearance will be necessary on both riverbanks, within the riparian zone of the River Caldew in order to create space in which to construct the piers on the floodplain, and to create storage compounds on both sides of the river. This may include Annex I Habitat – Alder Woodland on floodplains for which the site is designated.	Loss of Alluvial Forest (alder floodplain woodland), a qualifying feature of the SAC. The flora within the vicinity of the proposed construction zones for the piers, has been identified as NVC type W6a <i>Alnus glutinosa Urtica dioica</i> community, which is one of the communities deemed as the Annex I Habitat, Alder Woodland on Floodplains. The removal of this habitat would affect the structure and function of the SAC through loss of habitat for associated qualifying species such as otter, as well potential changes to the flow regime of the river and associated changes to in-river habitat this may cause, which would affect species such as Atlantic salmon. This would be a significant negative effect at the international scale.	Very Large	Major Adverse
River Eden (SAC) (Very high)	Pollution. The construction of the bridge over the River Caldew, will involve chemicals such as fresh concrete and cement, as well as digging within the riparian zone, could elevate levels of silt within the SAC. There is also the potential for fuel leaks from vehicles and compounds proposed near the river.	Damage to SAC qualifying features and degradation of habitats supporting qualifying features. Increased levels of siltation within the watercourse have the potential to smother fish eggs of interest in the SAC, specifically fish such as bullhead and Atlantic salmon, in extreme cases this may affect migratory behaviour of fish. Fresh concrete and cement, as an alkaline substance, can raise the pH levels of fish, which can be harmful, or even fatal to aquatic life. Fuels and other chemicals entering the river system can have a variety of effects on freshwater, leading to potential fatalities to fish and invertebrates for significant lengths of the watercourse. Pollution of the soils through chemicals, including concrete can alter the soil structure in the riparian zone, which can affect the ability of plants to grow there. Run-off could also cause pollution to the watercourse. All of these would have a significant negative effect at the international scale	Very Large	Major Adverse
River Eden SAC (very high)	Disturbance to aquatic qualifying features through construction activities. Construction activities such as piling and concrete works necessary to construct the foundations of the pier supports will be occurring in the riparian zone. These have the potential to cause noise and vibration effects on the river, including the riverbed itself. Further to this vehicles within the area, will create noise and visible disturbance above baseline levels. The level of disturbance from the construction of the bridge would have a major adverse impact on the site, however this would be temporary and limited to the construction period.	Disturbance to aquatic qualifying SAC features: sea lamprey, brook lamprey, river lamprey, Atlantic salmon, bullhead, otter. Piling and concrete works can cause vibration or noise effects on fish habitat and behaviour, through the bank, bed, and into the water. Noise and vibration can disrupt spawning gravels and disturb sediment that may result in the suffocation of eggs of qualifying features of the SAC, such as Atlantic salmon. If artificial lighting is utilised during construction that produces light spill onto the river habitats, it may affect behaviour of qualifying species such as fish and otter. If unmitigated these effects would be significant at the international scale.	Very Large	Major Adverse
River Eden SAC (very high)	Spread of non-native invasive species. Site clearance and construction practices have the potential to spread non-native invasive species present on site such as Himalayan balsam, and disease within the SAC and beyond.	The spread of non-native invasive species such as Himalayan balsam will reduce the quality of the habitat both in and out of the river, by reducing the diversity of native floral species; it is also an offence under the Wildlife & Countryside Act 1981 (as amended). Their presence can also alter the structure of the riverbanks, leading to an increase in sedimentation of the watercourse, which can affect aquatic life. The River Caldew is recorded as containing American signal crayfish upstream of the location for the scheme so there is a chance of crayfish plague being present within the watercourse and that being affected by the proposed scheme and there is a risk of spreading this to other locations within the SAC. This could wipe out populations of white-clawed crayfish which are a qualifying feature of the SAC.	Very large	Major Adverse

Receptor and Sensitivity	Impact	Effect	Magnitude of effect	Significance
		The effect of spreading non-native invasive species on the site is significant at an international scale.		
River Eden and Tributaries SSSI (High)	The aquatic features of the SSSI are the same as the SAC, so the above applies here.	The notified features of the SSSI are the same as that for the SAC so the above applies here although this effect would be significant at a national level for the SSSI.	Very Large	Major Adverse
River Eden and Tributaries SSSI (High)	Vegetation clearance and disturbance during construction. Site clearance will result in the loss of habitat supporting breeding, nesting and foraging birds. This includes those assemblages associated with rivers and wetland habitats, such as oystercatcher dipper and sand martins. Construction activities, particularly in the vicinity of the bridge construction of both the River Petteril and River Caldew where piling will be used, have the potential to create excessive noise levels.	Loss of nesting and foraging habitat. Fragmentation of habitats. Disturbance to birds (particularly breeding and nesting birds). The increased levels of noise likely to arise from construction activities such as piling and drilling when constructing the bridge piers, may require birds to use more energy defending territories and therefore increase mortality/reduce breeding success within the local breeding bird population, and thus affect the local breeding bird assemblages. This is a likely moderate negative effect at the national level.	Large	Moderate Adverse
River Eden and Tributaries SSSI (High)	Vegetation clearance. Some vegetation clearance will be necessary both within the SSSI site boundary and in the vicinity of the site to on both sides of the river. This could affect invertebrates associated with the SSSI. This would have a moderate negative impact upon the site, although this is likely to only be temporary, during the construction period until the vegetation re-establishes post construction.	Loss of habitats supporting invertebrates. This will have a negative effect upon the site, as there is a risk of physical damage or fatality to nationally scarce species which inhabit the site, or indeed a reduction in habitat available to support these species, each of which may negatively affect the integrity of the site. There is likely to be a significant negative effect at the national scale.	Large	Moderate Adverse
River Eden and Tributaries SSSI (High)	Spread of non-native invasive species. Construction practices have the potential to spread invasive non-native species present on site such as Himalayan balsam, and disease within the site and beyond.	The spread of non-native invasive species such as Himalayan balsam will reduce the quality of the native habitat both in and out of the river, by competing with and reducing the diversity of native floral species. They can also alter the structure of the riverbanks, leading to an increase in sedimentation of the watercourse, which can affect aquatic life, and could smother invertebrates inhabiting the exposed riverine sediments. Without mitigation, this could have a significant negative effect at the national scale.	Large	Major Adverse
River Eden and Tributaries SSSI (High)	Pollution to the SSSI during construction, particularly to the river and the exposed riverine sediments which support rare invertebrate assemblages. The construction of the bridge over the River Caldew, will involve chemicals such as fresh concrete and cement which creates a risk of pollution, as well as digging within the riparian zone which could elevate levels of silt within the River Caldew and potentially the site itself. Without mitigation, there is also the potential for fuel leaks from vehicles and compounds proposed near the river, or from vehicular access of gravel shoals which risks pollution from run-off into the river.	Increased levels of siltation within the watercourse have the potential to settle on and smother gravels the exposed riverine sediment during high flow events. This could smother flora that support invertebrates, or indeed smother their eggs, larvae or adults. Pollution of the soils through chemicals, including concrete, risk run-off into the river and can alter the soil structure and nutrient status in the riparian zone and on exposed sediments, which can affect the ability of plants to grow there. Vehicular access to the site could lead to direct mortality of nationally scarce species recorded at the site. All of these would have a significant negative effect at the national scale.	Large	Major Adverse
Cummersdale Sites for Invertebrate Significance (High/Medium)	Vegetation clearance. The northern most pier is located in land to the north-west of the River Caldew and is within the Cummersdale Shingle SIS. The southernmost pier is in land to the south east of the River Caldew and is approximately 10m outside the SIS boundary. Some vegetation clearance will be necessary both within the SIS site boundary and in the vicinity of the site to create site compounds and storage areas on both sides of the river. This would have a moderate negative impact upon the site, although this is likely to only be temporary, during the construction period until the vegetation re-establishes post construction.	Loss of the extent of SIS. Loss of habitats supporting invertebrates. This will have a negative effect upon the site, as there is a risk of physical damage or fatality to Nationally scarce species, which inhabit the site, or indeed a reduction in habitat available to support these species, each of which will negatively affect the site. There is likely to be a significant negative effect at the county scale.	Large	Moderate Adverse

Receptor and Sensitivity	Impact	Effect	Magnitude of effect	Significance
Cummersdale Sites for Invertebrate Significance (High/Medium)	Spread of non-native invasive species. Construction practices have the potential to spread invasive non-native species present on site such as Himalayan balsam and disease within the site and wider areas.	The spread of non-native invasive species such as Himalayan balsam will reduce the quality of the habitat both in and out of the river, by reducing the diversity of native floral species. They can also alter the structure of the riverbanks, leading to an increase in sedimentation of the watercourse, which can affect aquatic life, and could smother invertebrates inhabiting the exposed riverine sediments. Without mitigation, this could have a significant negative effect at the county scale.	Large	Moderate Adverse
Cummersdale Sites for Invertebrate Significance (High/Medium)	Pollution to SIS during construction. The construction of the bridge over the River Caldew, will involve chemicals such as fresh concrete and cement, as well as digging within the riparian zone which could elevate levels of silt within the River Caldew and potentially the site itself. Without mitigation, there is also the potential for fuel leaks from vehicles and compounds proposed near the river, or from vehicular access of gravel shoals to create polluting run-off into the river.	Increased levels of siltation within the watercourse have the potential to settle on and smother gravels the exposed riverine sediment during high flow events. This could smother flora that support invertebrates, or indeed smother their eggs, larvae or adults. Pollution of the soils through chemicals, including concrete, risk run-off into the river and can alter the soil structure and nutrient status in the riparian zone and on exposed sediments, which can affect the ability of plants to grow there. Vehicular access to the site could lead to direct mortality of nationally scarce species recorded at the site. All of these would have a significant negative effect at the regional.	Large	Major Adverse
Rivers	Pollution and disturbance to the River Caldew, a tributary of the River Eden SAC and included within the River Eden and Tributaries SSSI and River Petteril a tributary of the River Eden SAC.	Pollution and disturbance to rivers that are tributaries of the River Eden SAC a Habitat of Principal Importance and the River Caldew being included in the SSSI.	Large	Major Adverse
Wet Woodland (Very High due to being a feature of the River Eden SAC)	Site clearance for construction. A small area of alder floodplain woodland in the floodplain of the River Caldew will be lost in the construction of one of the piers for the bridge.	Loss of extent of alluvial woodland – a feature of the River Eden SAC. The floodplain woodland of the River Caldew is considered to fit the qualifying feature of alluvial floodplain woodland of the River Eden SAC. The removal of this habitat risks affecting the structure and function of the SAC through loss of habitat for associated qualifying species such as otter, as well potential changes to the flow regime of the river and associated changes to in-river habitat this may cause which would affect species such as Atlantic salmon.	Moderate	Major adverse
Lowland Mixed Deciduous Woodland (High/Medium)	Site clearance for construction. Areas of woodland will be lost to the Scheme, when vegetation is cleared in order to construct the road as follows: 867m ² of woodland to the east of the River Caldew, close to Peastree Farm and Park Fauld Farm is to be lost to the scheme An area of woodland on the approach to the J42 M6 Roundabout. Ashtip Wood an area of mixed plantation woodland adjacent to Peter Lane is to be bisected by the Scheme resulting in 2.45 ha loss.	Loss of Habitats of Principal Importance. Indirect effects on the remaining woodland adjacent to removed trees through disturbance of soils or changes to hydrology. Loss of extent of habitat supporting wider biodiversity including protected species. The woodland at Peastree Farm is a mature, well-established clough woodland which has a diverse ground flora including eighteen ancient woodland indicator species. The loss of part of this woodland is considered to be significant at a county level. The loss of extent of this Habitat of Principal Importance will result in a net loss of biodiversity and reduce the structure and connectivity of this habitat in the local area. The loss of trees will affect a variety of fauna including bats who are using trees as roosting sites, within the area of clough woodland close to Peastree Farm, as well as using this area to commute and forage. Furthermore, bats have been identified as using Ashtip Wood as a commuting and foraging corridor. This information is shown within Appendix 8.14. Therefore, the loss of woodland could negatively affect the local bat population. The loss of woodland will result in the reduction of available habitat for breeding birds and potential loss of active nest sites which could affect local populations and Species of Principal Importance. Badgers have been identified as using Ashtip Wood, the River Caldew corridor and the woodland at Peastree Farm to forage, (see Appendix 8.4). The loss of this habitat represents a loss of potential foraging habitat, and indeed habitat in which setts may become established.	Large	Major Adverse

Receptor and Sensitivity	Impact	Effect	Magnitude of effect	Significance
Standing Water/ Ponds (Medium)	Habitat Loss. Two ponds will be lost as a result of the Scheme; one directly underneath the pier on the left-hand bank of the River Caldeu, the other due to the extension of the A595 Newby West Roundabout.	Direct loss of ponds and loss of habitats supporting a range of biodiversity including amphibians and the Species of Principal Importance common toad. The two ponds both contain breeding populations of several amphibian species including common frog, common toad, smooth newt and palmate newt. Without mitigation, the loss of this habitat will significantly affect the availability of habitat in the local area for these animals to breed which could reduce the population size in the area. Furthermore, the two ponds are also in areas where otters are recorded, which suggests they may be using the ponds for foraging; a reduction in amphibians may lead to a reduction in the available food sources for otter in the local area. This represents a significant negative effect at a local level.	Moderate	Moderate adverse
Standing Water/Ponds (Medium)	Vegetation clearance will be necessary in the vicinity of four ponds that are close to the Scheme. One pond is immediately adjacent to the Cumbrian Coastline Railway, to the west, two ponds are adjacent to the right-hand bank of the River Caldeu, and the final pond is currently next to the existing A595 Newby west Roundabout. The vegetation clearance will be necessary affecting the three ponds within the River Caldeu valley in order to construct the bridge piers and decking for the crossing of the river. Vegetation clearance next to the pond at the A595 Newby West Roundabout in order to increase the size of the existing roundabout.	Loss of habitats associated with ponds and terrestrial habitats supporting a range of amphibians including the Species of Principal Importance common toad. All the ponds in question are known to contain breeding populations of amphibians, namely common frog, common toad, smooth newt and palmate newt. Although these amphibians do spend time in water, they also spend a significant proportion of their time on land in adjacent suitable vegetation with areas available for refuge and in some instances hibernation. Once this vegetation is cleared there will be temporary reduction of available terrestrial habitat for these species, which in turn may reduce the populations of these species locally. Furthermore, the clearance of vegetation nearby, may cause more siltation and soil entering the ponds during times of rainfall, which could affect the water quality for a variety of species within the ponds including amphibians, invertebrates, birds and plants. These will cause slight significant effects at the local level.	Slight	Moderate adverse
Standing Water/Ponds (Medium)	Pollution to ponds during construction. Two ponds are very close to areas where works will be ongoing during the construction period, however they will not be lost to the scheme. Without mitigation, there is a risk of pollution entering these waterbodies, from chemicals, fuels, cementitious material and siltation during the construction period.	Increased levels of siltation within the watercourse have the potential to smother eggs or larvae of invertebrates, fish and amphibians. Fresh concrete and cement, as an alkali, can raise the pH levels of water, which can be harmful, or even fatal to aquatic life. Fuels and other chemicals entering a waterbody can have a variety of effects on freshwater, leading to potential fatalities to fish, invertebrates and amphibians within the waterbody. Pollution of the soils through chemicals, including concrete can alter the soil structure in the riparian zone and within the pond which can affect the ability of plants to grow in both these locations which affects the structure and function of these habitats. All of these would have a moderate negative effect at the local level.	Moderate	Moderate Adverse
Hedgerows (High/Medium)	Vegetation Clearance for construction A total of 114 hedgerows will be affected by the scheme, these will be lost or partly damaged during the site clearance and construction phase. Fifty-seven of these hedgerows are Important as defined by the Hedgerow Regulations 1997. Fifteen are considered to be grade 1 hedgerows using calculations based on the Hedgerow Evaluation and Grading System (HEGS). As such these hedgerows are deemed to be of high ecological value. A further fifty hedgerows are grade 2 and hold moderately high to high ecological value.	Loss of hedgerows and Habitats of Principal Importance. Loss of connectivity of hedgerows which could also affect species relying on the network of hedgerows such as foraging and commuting bats and breeding and wintering birds. The loss of these hedgerows will lead to a reduction in flora within the local area, including some species which are rare in the locality such as English Elm. Furthermore, hedgerows support for a variety of fauna, which may be negatively affected. For example, bats have been recorded as using the hedgerow lines on Durdar Road, and close to the proposed Scalegate Road, as well as around the perimeter of Langdale and the Piggeries to forage and commute. The loss of these hedgerows may lead to a reduction in available habitat locally for resident bat species. Badgers are using hedgerows throughout the scheme as a linear feature to demarcate their territory, and in places are using some hedgerows in which to form setts, though none of the hedgerows within the hedgerows are due to be	Large	Major Adverse

Receptor and Sensitivity	Impact	Effect	Magnitude of effect	Significance
	Seven of these hedgerows have notable species which such as lime and English elm.	lost. However,, a reduction in hedgerow habitat may lead to a reduction in available areas for badgers to form new setts locally. A variety of bird species use hedgerows to breed in and the loss or damage to these hedgerows may lead to a reduction in available breeding sites for local bird species, which may affect the population of birds in the area. Furthermore, should clearance occur during the breeding bird season, March – October, there is a risk of potential loss of active nest sites, which again could negatively affect bird populations locally. The loss of hedgerows, and connected habitat such as verges, may negatively affect local brown hare populations, the verges of hedgerows within the Peastree farm, and Floses Farm area, are generally short and seem to provide shoots for brown hares to eat. Survey results show brown hares regularly foraging in this location. The verges are less managed in the area between Buckabank Road and the proposed Scalegate Road Roundabout with a greater sward height, and surveys suggest that they are used by brown hares for their forms in which they rest in during the day. Therefore, the loss and damage of hedgerows could negatively affect the local brown hare populations. The effect of the loss and damage of the hedgerows is likely significant at the regional level.		
Grassland (Medium)	Vegetation Clearance. Less than 1ha of species-rich lowland floodplain meadow, deemed to be lowland meadows HPI, on either side of the River Caldeu will need to be cleared and will therefore be lost to the scheme in order to construct the bridge including its piers and create storage compounds. This would represent a minor adverse impact. 0.92 ha of semi improved grassland will be lost to the scheme, 66.05ha of arable farm land, and 30.29 ha of improved grassland will also be lost to the scheme. All these habitats represent some ecological value for invertebrates and ground nesting and wintering birds and the loss of this habitat would represent a moderate adverse impact.	Loss of species-rich floodplain meadow. Loss of semi-improved/improved grassland and arable fields resulting in a net loss of biodiversity. The loss of this habitat will reduce and fragment this habitat type in the local area. This will affect fauna supported by this habitat, including invertebrates and pollinators such as bees. Amphibians such as common frog and common toad have been found in the floodplain, as have a great crested newt. However, evidence suggests the great crested newt is more likely to have travelled a significant distance from their breeding pond, as there is no evidence of a breeding population in this area. Nevertheless, there is a low risk that these species could be affected locally by the loss of this habitat. Breeding birds, specifically ground nesting birds such as lapwings have been noted in some of the arable fields and will be negatively affected by the loss of this habitat. Brown hares, otters and badgers have also been noted within this area, these species will be negatively affected by the loss of this habitat, as it represents a reduction in available foraging habitat for brown hares and badgers, and a reduction in available habitat in which to lay up for otter. Significant effect at the local level.	Moderate	Moderate Adverse
Badgers (High)	Site clearance works may lead to the loss of an active subsidiary sett S4 and currently inactive setts S10, S15 and S16. Construction activities may also disturb active main sett S2, due to the works to the pond close to it.	Loss and disturbance of subsidiary badger setts. The loss of S4 subsidiary sett would reduce the range of available setts for the clan based at S2 by one. However, the clan's main sett and annex sett will remain unaffected by the proposed scheme. The setts S15,S16 and S10 had no signs of use at the time of survey, but as badgers are highly mobile species these could come back into use before the proposed scheme commences. Should these setts be active at the time prior to construction and be lost it would represent a moderate negative effect for the local badger population	Moderate	Moderate Adverse
Badger (High)	Site clearance and construction. Badger paths are evident throughout the scheme and some of these will be cleared of vegetation during site construction.	Loss and fragmentation of badger foraging routes. Clearance of the paths, may deter badgers from using them, which may limit the areas in which clans are able to forage throughout the Scheme and the surrounding area during construction. This will likely have a slight significant effect on local badger populations	Slight	Moderate Adverse

Receptor and Sensitivity	Impact	Effect	Magnitude of effect	Significance
Badger (High)	Site clearance and construction. Site clearance will lead to the loss or damage of 114 hedgerows, less than 1ha of floodplain meadow by the River Caldew, four areas of lowland mixed deciduous woodland, which total 2.49ha and 30.29ha of improved pasture and 30.17ha arable fields.	Loss of connectivity and fragmentation of badger foraging routes. The loss of a large area of hedgerow habitats represents a loss of potential sites in which badgers can form new setts. In addition, the loss and fragmentation of hedgerows will reduce the landscape connectivity along which badgers currently forage. The floodplain meadow by the River Caldew is being used by badgers in which to forage and commute as are the areas of lowland mixed deciduous woodland, improved grassland and arable fields throughout the scheme area. The loss of these areas represents a significant reduction in available habitat for which badgers can use to forage and form setts locally, and therefore this is likely to have a large significant effect at the local level.	Large	Major adverse
Bats (Very High)	Vegetation clearance in order to construct the road will lead to the loss of five bat roosts, these are T8315, immediately to the west of the West Coast Mainline, T8320, in a hedge line close to the proposed Brisco Roundabout. T8442 and T8447, which are in a hedge line immediately to the north of the Scheme, and T8489, which is adjacent to Peter Lane, and close to the proposed A595 Newby West Roundabout.	The roosts to be lost appear to be occasional roost sites for both common and soprano pipistrelle, however some will require further roost characterisation to fully classify them. However, the loss of these sites will represent a loss of roosting sites for local bat species, and as a worst case scenario that these are maternity roosts this may have a significant effect at the county level.	Large	Large Adverse
Bats (Very High)	Construction Lighting	Construction lighting around the River Petteril, Langdale and Piggeries, land surrounding Tarn Plantation, both sides of the River Caldew, and Ashtip Wood has the potential to disturb bats in this location. This may have a moderate negative effect at the local level.	Moderate	Moderate Adverse
Bats (Very High)	Construction Lighting/Noise	Light spill or noise could disturb retained bat roosts during the bat maternity period, which may affect local bat populations and breeding success. This could have a significant negative effect at the county level	Very Large	Major Adverse
Breeding Birds (High)	Site clearance will lead to the loss or damage of 114 hedgerows, less than 1ha of floodplain meadow by the River Caldew, four areas of lowland mixed deciduous woodland, which total 2.49ha and 30.29ha of improved pasture and 30.17ha arable fields.	Breeding birds including several species of ground nesting birds, red and amber list declining bird species will face a reduction of available breeding sites due to the loss of these habitats throughout the scheme. Although effects are likely to be most significant in the corridors of the River Petteril and River Caldew and arable fields within the scheme, as this is where the highest level of breeding birds were noted. There is also the risk of potential loss of active nest sites during the site clearance phase, which could affect local populations, therefore there is likely to be large significant effect at the local level.	Large	Major adverse
Breeding Birds (High)	Vegetation clearance and disturbance during construction. Site clearance will result in the loss of habitat supporting breeding, nesting and foraging birds including arable land and hedgerows.	Loss of nesting and foraging habitat. Fragmentation of habitats. Disturbance to birds (particularly breeding and nesting birds). The increased levels of noise likely to arise from construction activities such as piling and drilling when constructing the bridge piers, may cause birds to use more energy defending territory and therefore increase mortality/reduce breeding success and	Moderate	Moderate Adverse

Receptor and Sensitivity	Impact	Effect	Magnitude of effect	Significance
	Construction activities, particularly in the vicinity of the bridge construction of both the River Petteril and River Caldew where piling will be used, have the potential to create excessive noise levels.	thus affect local breeding bird populations. This is a likely moderate negative effect at the local level.		
Barn Owl (High)	Vegetation clearance. Vegetation clearance undertaken in the rough grassland in the River Caldew will have a minor adverse impact.	Loss of barn owl foraging habitat. The areas that have been identified as particularly high value based on habitat requirements as potential foraging locations that are likely to be affected by the Scheme are limited to the floodplains of the Rivers Petteril and Caldew, and Calflins Beck, hedgerows, rail and roadside embankments. Therefore, the loss of less than 1ha of Lowland Meadows HPI by the River Caldew, 133ha of scrub immediately adjacent to the Cumbrian Coastline Railway and the loss of 114 hedgerows will reduce the availability of habitat favourable for barn owl to hunt. This is likely to have a slight negative effect at the local level. Barn owls will be at greater risk of collision by vehicles due to proximity to known areas of presence.	Slight	Minor Adverse
Wintering Birds	Vegetation clearance and disturbance during construction. Site clearance will lead to the loss or damage of 114 hedgerows, less than 1ha of floodplain meadow by the River Caldew, four areas of lowland mixed deciduous woodland, which total 2.49ha and 30.29ha improved pasture and 30.17ha arable fields.	Potential for construction to disturb and remove habitat for notable wintering bird species such as red listed: yellowhammer, linnet, tree sparrow, redwing, fieldfare, starling and skylark. This loss of vegetation including arable land and associated hedgerows will represent a loss of wintering habitat for farmland species such as lapwing, yellowhammer, skylark, linnet and redwing. This will represent a moderate negative impact at the local level.	Moderate	Moderate Adverse
Brown Hare (High)	Vegetation clearance. Site clearance will lead to the loss or damage of 114 hedgerows, less than 1ha of floodplain meadow by the River Caldew, four areas of lowland mixed deciduous woodland, which total 2.49ha and 30.29ha improved pasture and 30.17ha arable fields.	Loss of habitats supporting foraging and breeding brown hare, a Species of Principal Importance. Brown hare require a mosaic of different habitats in which to successfully forage, commute and utilise forms (daytime resting areas). The loss of a variety of habitat types will mean that there is a reduction, as well as a fragmentation of available habitat for brown hare locally, this will represent a slight negative effect at the local level.	Slight	Moderate Adverse
Fish (Very High)	Pollution. The construction of the bridges over the River Caldew and River Petteril will involve chemicals such as fresh concrete and cement, as well as digging within the riparian zone, which could elevate levels of silt within these watercourses. Without mitigation, there is also the potential for fuel leaks from vehicles and compounds proposed near the river. There is also a culvert proposed on Calflins Beck, as well as a realignment to Fairy Beck. These works have the potential for sedimentation and pollution to enter these watercourses, through practices such as digging to excavate the riverbed in which to place the culvert. All these watercourses have the potential to be polluted in some way during the construction period which could affect fish within them.	Pollution to rivers supporting a range of fish species some of which are qualifying features of the River Eden SAC. Increased levels of siltation within the watercourse have the potential to smother eggs of fish such as bullhead and Atlantic salmon. In extreme cases this may affect migratory behaviour of fish. Fresh concrete and cement, as an alkali, can raise the pH levels of fish, which can be harmful, or even fatal to aquatic life. Fuels and other chemicals entering the river system can have a variety of effects on freshwater, leading to potential fatalities to fish and invertebrates for significant lengths of the watercourse. Pollution of the soils through chemicals and run-off including concrete, can alter the soil structure in the riparian zone, which can affect the ability of plants to grow. As these effects could affect populations of Atlantic salmon and bullhead it is likely that this represents a very large negative effect at the international level where the species are related to the River Eden SAC.	Very Large	Major Adverse
Fish (Very High)	Disturbance through construction activities. Construction activities such as piling and concrete works necessary to construct the foundations of the pier supports will be occurring in the riparian zone. These have the potential to cause noise and vibration effects on the river, including the riverbed itself. Further to this vehicles within the area, will create noise and visible disturbance above	Disturbance to fish species including qualifying species of the River Eden SAC and Species of Principal Importance. Piling and concrete works can cause vibration or noise effects on fish habitat and behaviour, through the bank, bed, and into the water. Noise and vibration can disrupt spawning gravels and disturb sediment that may result in the suffocation of eggs of fish species such as Atlantic salmon. Noise and vibration can also affect the	Large	Major adverse

Receptor and Sensitivity	Impact	Effect	Magnitude of effect	Significance
	baseline levels. The level of disturbance from the construction of the bridge, would have a major adverse impact on the fish, however this would be temporary and limited to the construction period.	behaviour of qualifying fish and can deter them from using an area or migrating past it. If artificial lighting of the River Petteril or River Caldew during construction is utilised it may affect migratory behaviour of fish by discouraging them from migrating upstream. As these effects could affect populations of Atlantic salmon and Bullhead, it is likely that this represents a very large negative effect at the international level.		
Fish (Very High)	Vegetation clearance Some vegetation clearance will be necessary on both riverbanks of the River Caldew and River Petteril to create space in which to construct the piers on the floodplain and to create storage compounds close to these watercourses. Fairy Beck will be re-aligned and there will be some vegetation clearance necessary in the riparian zone of Fairy Beck in order to construct this, and the new A595 Newby West Roundabout.	Loss of vegetation and alteration to river flows. The removal of this habitat, would potentially affect the flow regime of the river and associated changes to in-river habitat, which may cause a reduction in available habitat for spawning and refuge for a variety of fish species including Atlantic salmon, bullhead, and lamprey species The clearance of vegetation nearby, may cause more siltation, and soil due to enter the ponds during times of rainfall, which could affect the water quality for aquatic fauna including fish. As these effects could affect populations of Atlantic salmon and bullhead, it is likely that this represents a very large negative effect at the international level.	Large	Major adverse
Amphibians (High)	Site clearance. Two ponds will be lost to the Scheme; one directly underneath the pier on the left-hand bank of the River Caldew, the other due to the extension of the A595 Newby West Roundabout.	Loss of ponds – amphibian breeding and foraging habitats including that of common toad, a Species of Principal Importance. The two ponds both contain breeding populations of several amphibian species including common frog, common toad, smooth newt and palmate newt. The loss of this habitat represents a permanent loss of breeding habitat for several amphibian species, which may affect these populations. There is potential for the future viability of these populations to be affected, and if the population decreases they could be more at risk from certain diseases due to lack of genetic variability within the population. Therefore, this is a likely moderate negative effect at the local level.	Moderate	Moderate Adverse
Amphibians (High)	Site clearance. Vegetation clearance will be necessary in the vicinity of four ponds that are close to the Scheme. One pond is immediately adjacent to the Cumbrian Coastline Railway, to the west, two ponds are adjacent to the right-hand bank of the River Caldew, and the final pond is currently next to the existing A595 Newby west Roundabout. The vegetation clearance will be necessary for the three ponds within the River Caldew valley to construct the bridge piers and decking for the crossing of the river. Vegetation clearance next to the pond at the A595 Newby West Roundabout in order to increase the size of the existing roundabout.	Loss of terrestrial habitats supporting a range of amphibians including common toad, a Species of Principal Importance. All the ponds in question are known to contain breeding populations of amphibians, namely common frog, common toad, smooth newt and palmate newt. Although these amphibians do spend time in water, they also spend a significant proportion of their time on land in adjacent suitable vegetation with areas available for refuge, and in some instances hibernation. Once this vegetation is cleared there will be temporary reduction of available terrestrial habitat for these species, which in turn may reduce the populations of these species locally. The clearance of vegetation nearby may cause more siltation and soil to enter the ponds during times of rainfall, which could affect the water quality for amphibians. During the clearance of vegetation in these areas there is a risk of injury or fatality to resident amphibians. Therefore, there is a moderate negative effect at the local level	Moderate	Moderate Adverse
Amphibians (High)	Pollution to ponds during construction. Two ponds are very close to areas where works will be ongoing during the construction period, however they will not be lost to the scheme, and as such there is a risk of pollution entering these waterbodies, from chemicals, fuels, cementitious material and siltation during the construction period.	Deterioration in quality of aquatic habitats. Increased levels of siltation within the watercourse have the potential to smother eggs or larvae of amphibians. Fresh concrete and cement, as an alkali, can raise the pH levels of water, which can be harmful, or even fatal to aquatic life. Fuels and other chemicals entering a waterbody can have a variety of effects on freshwater, leading to potential fatalities to amphibians. Pollution of the soils through chemicals, including concrete can alter the soil structure in the riparian zone and within the pond which can affect the ability of plants to grow and limit the available habitat within pond that	Moderate	Moderate Adverse

Receptor and Sensitivity	Impact	Effect	Magnitude of effect	Significance
		could be used for refuge and breeding. This represents a moderate negative effect at the local level.		
Otter (Very High)	<p>Site clearance for construction.</p> <p>Some vegetation clearance will be necessary on both riverbanks of the River Caldew and River Petteril, in order to create space in which to construct the piers on the floodplain and to create storage compounds close to these watercourses. In one location this will affect an existing an otter holt.</p> <p>Fairy Beck will be re-aligned and there will be some vegetation clearance necessary in the riparian zone of Fairy Beck in order to construct this and the new A595 Newby West Roundabout.</p> <p>There will also be vegetation clearance undertaken of the riparian vegetation of Calflins Beck close to Durdar Bridge, as this watercourse will be culverted in this location.</p>	<p>Loss of otter holt and loss and temporary fragmentation of otter foraging habitats. The vegetation clearance will lead to the loss of a confirmed otter holt on the right-hand bank of the River Petteril, as well as loss of habitat for laying up, and refuge alongside the River Caldew, Fairy Beck and Calflins Beck.</p> <p>The loss of an otter holt represents a very large negative effect at the county level due to the effect on otter which is a qualifying feature of the downstream River Eden SAC and its status as a European Protected Species but is minimised due to the relatively widespread occurrence of otter in the area.</p>	Large	Moderate Adverse
Otter (Very High)	<p>Disturbance.</p> <p>Any lighting of the watercourse could also disturb fauna using watercourses. This would be temporary moderate adverse impact limited to the construction period.</p>	Construction activities undertaken during the hours of darkness, which are likely to require lighting in close proximity to watercourses, may deter otters from using the area. This represents a moderate negative impact at the national level.	Moderate	Moderate Adverse
Otter (Very High)	<p>Pollution</p> <p>Two ponds are very close to areas where works will be ongoing during the construction period, however they will not be lost to the scheme, and as such there is a risk of pollution entering these waterbodies, from chemicals, fuels, cementitious material and siltation during the construction period. Furthermore, the construction of the bridges over the River Caldew and River Petteril, will involve chemicals such as fresh concrete and cement, as well as digging within the riparian zone, which could elevate levels of silt within these watercourses. There is also the potential for fuel leaks from vehicles and compounds proposed near the river. There is also a culvert proposed on Calflins Beck, as well as a realignment to Fairy Beck, all these watercourses have the potential to be polluted in some way during the construction period.</p>	<p>Deterioration in quality of aquatic habitats.</p> <p>Increased levels of siltation within the watercourse have the potential to smother eggs, or larvae of invertebrates, fish and amphibians which otter may prey upon. Fresh concrete and cement, as an alkali, can raise the pH levels of water, which can be harmful, or even fatal to aquatic life. Fuels can other chemicals entering a waterbody can have a variety of effects on freshwater, leading to potential fatalities to fish, invertebrates, and amphibians within the waterbody. This could reduce the availability of prey items for the local otter population, which in turn could affect the number of otters within the local area. Pollution of the soils through chemicals, including concrete can alter the soil structure in the riparian zone and within a watercourse which can affect the ability of plants to grow in both these locations which could potentially reduce the available riparian habitats available for otters locally. This would have a large negative effect at the county level.</p>	Large	Major adverse
Terrestrial Invertebrates (High)	<p>Vegetation clearance.</p> <p>Vegetation clearance will be necessary to on both sides of the river including areas of Cummersdale Shingle Banks Site of Invertebrate Significance in order to sonstruct the bridge piers.</p> <p>There is also a 1.33 ha of scrub, mainly gorse <i>Ulex europaeus</i>,that will be cleared immediately adjacent to the Cumbrian Coastline Railway.</p>	<p>Loss of habitat supporting terrestrial invertebrates.</p> <p>The vegetation clearance works pose a risk of physical damage or fatality to nationally scarce species, which inhabit the site, or indeed a reduction in habitat available to support these species, each of which will negatively affect the local invertebrate population.</p> <p>The loss of dense scrub, particularly gorse will have a negative effect on pollinators this is because gorse is an early flowering species and is a vital food source for pollinators in early spring. Therefore this represents moderate negative effect at the national level.</p>	Moderate	Moderate Adverse

Table 8.17 Impact Assessment – Operational Phase

Receptor and Sensitivity	Impact	Effect	Magnitude of effect	Significance
River Eden (SAC) (Very High)	Shading	<p>The decking of the bridge over the River Caldew will be 17m wide and approximately 13 m high on the River Caldew.</p> <p>There is a risk it could shade vegetation including alder alluvial woodland and the vegetation associated with the SIS sites.</p> <p>However, as described in Broome et al (2005) it is considered that as long as structures achieve a height to width ratio of 0.7m there should be no shading effects.</p>	Slight	Minor Adverse
River Eden (SAC) (Very high)	River flows	<p>The construction of a new bridges over watercourses have the potential to impact upon the SAC in the following ways:</p> <p>Cause long-term morphological changes to the watercourse. Alter flow regimes Affect upstream and downstream erosional patterns, Alter flow behaviour and flow diversity.</p> <p>The above changes can affect the qualifying features in the following ways:</p> <p>The changes in substrate deposition, and flow behaviour within the river, the riparian zone and the wider floodplain will change the channel width and depth, in channel and side channel sedimentation features including exposed sediments, bank profiles, erosion features such as cliffs, and both in-channel and bankside (woody and herbaceous) vegetation cover. These are all characteristic of the river corridor and are important for the full expression of the biological community found with the SAC. If unmitigated these effects would be significant at the international scale</p>	Very Large	Major Adverse
River Eden SAC (very high)	Pollution- run-off from the cars using new road.	Run off from roads, haul routes and river crossings can cause harmful pollutants such as oils, PCBs, and microplastics entering the river system. This can directly lead to fatalities of aquatic fauna for which the SAC is designated, such as fish. It can also affect these species by polluting spawning grounds of fish and the sediment within the river. All these factors will affect the structure and function of the SAC. If unmitigated these effects would be significant at the international scale.	Very Large	Major Adverse
River Eden SAC (very high)	Lighting	Lighting of watercourses, the riparian zone and the wider floodplain can negatively impact upon the behavioural patterns of fauna for example it can significantly affect the migratory behaviour of fish, as well as the flowering and development of flora.	Very Large	Major Adverse
River Eden SAC (very high)	Noise and Vibration	Levels above baseline may impact fauna associated with the site, specifically fish and otter, as it could deter spawning fish from migrating upstream and otter from using the area.	Very Large	Major Adverse
River Eden and Tributaries SSSI (Very High)	As above	As above.	Large	Major Adverse
Cummersdale Sites for Invertebrate Significance and Terrestrial Invertebrates (High/ Medium)	Shading – comments as above for River Eden SAC	<p>The decking of the bridge over the River Caldew will be 17m wide and approximately 13m high on the River Caldew.</p> <p>There is a risk it could shade vegetation associated with the SIS sites.</p> <p>However, as described in Broome et al (2005) it is considered that as long as structures achieve a height to width ratio of 0.7m there should be no shading effects.</p>	Slight	Minor Adverse

Cummersdale Sites for Invertebrate Significance and Terrestrial Invertebrates (High/ Medium)	River flows – comments as above for River Eden SAC	<p>The construction of a new bridges over watercourses have the potential to impact upon the SAC in the following ways:</p> <p>Cause long-term morphological changes to the watercourse. Alter flow regimes Affect upstream and downstream erosional patterns, Alter flow behaviour and flow diversity.</p> <p>The above changes can affect the qualifying features in the following ways.</p> <p>The changes in substrate deposition, and flow behaviour within the river, the riparian zone and the wider floodplain will change the channel width and depth, in channel and side channel sedimentation features including exposed sediments, if unmitigated this would have a significant negative effect at the county level.</p>	Moderate	Major Adverse
Cummersdale Sites for Invertebrate Significance and Terrestrial Invertebrates (High/ Medium)	Lighting	Lighting can negatively affect the flowering and development of flora. This could affect the flora present on this site, and reduce the available habitat for the invertebrates on which the site relies. If unmitigated this would have a slight negative effect at the county level.	Slight	Minor Adverse
Lowland Mixed Deciduous Woodland (High/Medium)	Hydrology	The stream running through the clough woodland adjacent to Peastree Farm may be cut off through the designs of the cuttings and embankments immediately adjacent to the woodland. This could affect the flora, including trees and ground flora associated with the woodland.	Moderate	Moderate Adverse
Standing Water/ Ponds (High/ Medium)	Pollution	Two ponds are at risk of pollution in the form of run-off from the new road containing harmful pollutants such as oils, PCBs, and microplastics entering the ponds retained through construction. This can enter these ponds if the drainage is inadequate.	Moderate	Moderate adverse
Rivers and Streams (Very High)	Pollution	The rivers and streams on the scheme are at risk of pollution in the form of run-off from the new road containing harmful pollutants such as oils, PCBs, and microplastics entering the ponds retained through construction. This can enter the rivers if the drainage is inadequate.	Very Large	Major Adverse
Rivers and Streams (Very High)	Hydrology	The stream running through the clough woodland adjacent to Peastree Farm may be cut off through the designs of the cuttings and embankments immediately adjacent to the woodland. This could lead to a loss of this habitat type within this area.	Very Large	Major Adverse
Badgers (High)	Route alignment leading to severance and loss of habitat for badgers.	The alignment of the road will lead to habitat severance and loss of habitat and territory for badgers in locations with high badger activity, such as Durdar roundabout, between Buckabank Road and Scalegate Roundabout, and around Langdale and the Piggeries to Brisco Roundabout. If unmitigated this will have a significant negative effect at the county level.	Large	Moderate Adverse
Badgers (High)	Route alignment leading to collision risk	The route alignment is within areas where high levels of badger activity have been noted, which are; Ashtip Wood and the fields to the west between the wood and the A595. From eastern banks of the River Caldeu to Newbiggin Road, between Buckbank Road and Scalegate Road Roundabout. From the field ditch to the east of Scalegate Road Roundabout to Brisco Roundabout. In these areas, there is an increased risk of mortality to badgers due to road traffic accidents. If unmitigated this would have a significant negative effect at the county level	Large	Moderate Adverse
Badgers (High)	Lighting	Light spill in the following areas, which have been recorded as showing high levels of badger activity may deter badgers from foraging within these areas; Ashtip Wood and the fields to the west between the wood and the A595. From eastern banks of the River Caldeu to Newbiggin Road, between Buckbank Road and Scalegate Road Roundabout. From the field ditch to the east of Scalegate Road Roundabout to Brisco Roundabout. This could	Slight	Minor Adverse

		negatively affect badgers in this area by reducing the available habitat, that is favourable to forage and commute in, as such if unmitigated this would lead to a slight negative effect at the local level.		
Bats (Very High)	Road alignment	During operation, the roost identified at B111 – Oak Dene – will be completely surrounded by the road. Current designs show the area to be lit by artificial lighting. The proposed Durdar Roundabout is approximately 100m from this roost. This increased level of disturbance could lead to the loss of the roost site, as the increased levels of disturbance could render the site unusable for bats. This would lead to a loss of roosting habitat for local bat species, which would represent a minor negative effect at the local level.	Large	Minor Adverse
	Road Lighting	The current design of the road shows lighting in all areas except between Cummersdale Roundabout and Durdar Roundabout. The lighting near the River Petteril corridor may spill onto habitats used by bats and could deter bats from using this area. This area has been recorded with a very high level of bat activity. Lighting may also affect areas with lower levels of bat activity in land adjacent to the Piggeries and Langdale Cottage, South of Newbiggin Road between Buckabank Road and Scalegate Roundabout, and around Ashtip Wood. This could reduce the availability of favourable foraging and commuting habitat for local bat species. This may have a significant effect at the county level.	Large	Major Adverse
	Alignment	The current route alignment will sever two areas of very high bat activity – the River Petteril, and the River Caldew, and four areas of low bat activity, Ashtip Wood, Peastree, the area to the south of Newbiggin Road between Durdar Road and Scalegate Roundabout, and the area surrounding Langdale and the Piggeries. This severance of habitat would reduce available foraging and commuting routes for bat species, including two very important sites. This would represent a very significant negative effect at the county level.	Very Large	Major Adverse
	Alignment	The current route alignment severs commuting and foraging habitat associated with roosts at the River Petteril – Newbiggin Old Bridge to the south and T8305 to the north are roosts affected by this severance. Furthermore, the roosts at B85 and B86e, in the unmarked tree at NY 42297 50550, T8555, and T8484 also suffer severance of commuting routes between them due to the road alignment. This represents a significant negative effect at the county level.	Very Large	Major Adverse
Breeding Birds (High)	Collision risk	An increase in the number and speed of cars presents an increased risk of direct mortality of breeding birds through road traffic accidents. This is a large negative impact at a local level.	Moderate	Moderate Adverse
Barn Owl (High)	Collision risk The route alignment is close to three occupied barn owl nesting sites, one active nest site and two potential nest sites. Lighting	The current alignment of the road presents risks to the local barn owl populations, specifically in the area between the A595 Newby West Roundabout and Ashtip Wood, and in the area around Langdale, and the Piggeries to the Brisco Roundabout. Barn owls glide close to the ground when hunting, and as such are at risk of collision when in close proximity of major roads. Therefore, the road presents an increased risk of mortality for local barn owls due to road traffic accidents. This is a moderate negative effect at a county level.	Moderate	Moderate Adverse
Wintering Birds	Noise and disturbance Lighting	Increased traffic flows and speeds will increase ambient noise levels, which may deter birds from using winter roosting, foraging and loafing sites. Artificial lighting may deter birds from using an area due to an increased level of predation. These may all negatively affect the local population of wintering birds. This may present a moderate negative impact at a local scale.	Moderate	Minor Adverse
Brown Hare (High)	Alignment of the road leading to loss of habitat or habitat fragmentation.	The current scheme alignment is close to two small populations of brown hare, one in the Peastree Farm area, and the other to the south of Newbiggin Road close to Tarn Plantation. The proposed scheme will result in the fragmentation and loss of access to feeding and resting areas in the vicinity of Peastree Farm and south of Newbiggin Road. This is a likely slight negative effect at a local level.	Slight	Minor Adverse
Brown hare (High)	Collision Risk	Brown hares have been recorded in close proximity to the Scheme. This an increased risk of direct mortality of brown hare through road traffic accidents, which could negatively affect the local population of brown hares This is a moderate negative impact at a local level.	Moderate	Moderate Adverse

Fish (Very High)	River flows – see commentary as per River Eden SAC	<p>The construction of a new bridges over watercourses have the potential to impact upon the SAC in the following ways:</p> <ul style="list-style-type: none"> • Cause long-term morphological changes to the watercourse. • Alter flow regimes • Affect upstream and downstream erosional patterns, • Alter flow behaviour and flow diversity. <p>The above changes can affect the qualifying features in the following ways. The changes in substrate deposition, and flow behaviour within the river, the riparian zone and the wider floodplain will change the channel width and depth, in channel and side channel sedimentation features including exposed sediments, If unmitigated this would have a significant negative effect on fish species by reducing available in -river habitat for fish species, and potentially spawning habitat for a variety of species including Atlantic salmon, bullhead and lamprey species for which the River Eden SAC is designated.</p>	Major	Large Adverse
Amphibians (High)	<p>Fragmentation</p> <p>Two ponds are very close the route alignment</p>	<p>Amphibians moving on terrestrial land in this area may be at an increased risk of mortality due to road traffic accidents.</p> <p>This represents a slight negative effect at the local level.</p>	Slight	Minor Adverse
Otter (Very High)	Disturbance - lighting	Light spill onto the watercourses where otters have been noted; River Caldew, River Petteril, Fairy Beck and Calflins Beck, may deter otters from an area, and thus reduce the local population of otters. Furthermore, it could deter fish species from migrating further upstream, meaning a reduction available food source for otters in those areas. This is a slight negative effect at the local level.	Slight	Minor Adverse
Otter (Very High)	<p>Alignment of road leading to an increase in collision risk.</p> <p>The current road alignment is close to several areas of high otter activity including the River Caldew, the River Petteril, Fairy Beck and Calflins Beck.</p>	The Scheme passes over The River Caldew, the River Caldew, and Fairy Beck, and Calflins Beck is to be culverted. Otter signs have been recorded at these watercourses, As such there is an increased risk of otter mortality through road traffic accident if they attempt to cross the carriageway. This may negatively affect the population which is also a qualifying feature of the River Eden SAC and European Protected Species. Without mitigation, there is a likely large negative effect at the county level.	Large	Major Adverse
Otter (Very High)	Alignment of road leading reduced otter passage within watercourses	The Scheme passes over The River Caldew, the River Caldew, and Fairy Beck, and Calflins Beck is to be culverted. Otter signs have been recorded at these watercourses, and as such the Scheme could affect otter passage on these watercourses, which could affect their extent and distribution within them. Otters are a qualifying feature of the River Eden SAC and European Protected Species. Without mitigation, there is a likely large negative effect at the county level.	Large	Major Adverse

8.8 Mitigation, Enhancement and Monitoring

Site Clearance and Construction Phase

Statutory Sites Designated for Nature Conservation

8.8.1 The Appropriate Assessment undertaken for the River Eden SAC in respect of the potential impacts on the designation from the Scheme has concluded that the following avoidance, mitigation and enhancement measures are required to ensure there is no adverse effect upon site integrity. The results of this assessment are shown in Appendix 8.17.

Avoidance

8.8.2 Appropriate pollution control and attenuation measures associated with the new bridges should be carefully designed and implemented to protect water quality in the receiving watercourses. These are shown below and in the outline Construction Environmental Management Plan (CEMP), (see Volume 4), and the Appropriate Assessment activities (see Appendix 8.17):

- The type and location of piling has not been finalised but, it is considered likely that a continuous flight auger piling method will be used for permanent foundations and sheet piling for temporary works. However soft start methods will be implemented to reduce the impact of noise and vibration from the piling works.
- Piling works adjacent to Rivers, will only take place between 15th June and 30th September to avoid the fish spawning period.
- An ecologist will conduct an ecological walk over prior to works to identify any potential otter habitation within 50m of the works. If any signs of otter activity in and around the site e.g. tracks, feeding signs, road fatalities are found, the ecological checking survey will be repeated prior to works each day on that site.
- Site staff to be briefed by ecologist (e.g. via toolbox talk) on the importance of otter conservation and the legal issues regarding disturbance/ harm of otters. Vigilance will be maintained during works for otter presence.
- In- river works will only take place between 15th June and 30th September to avoid the fish spawning period.
- Works will be phased and undertaken with care so that disturbance to channel material is minimised.
- At no time will the watercourse be obstructed in such a way that fish and other aquatic species cannot pass through the bridge.
- Standard pollution prevention measures will be applied as practicable, including PPG5: Works in, near or over watercourses.
- Should the dewatering of an area of the channel be required, the area shall be locally bunded with a portadam cofferdam or sandbag cofferdam, dependent on water levels at the time of works, to divert the flowing water. No water shall be permanently abstracted from the channel.
- Bunding shall, where practicable, take place at times of low water flow to reduce the need for pumping. Where practicable the bunding shall be

constructed starting from the upstream end, to minimise the chance of aquatic species becoming trapped in the bunded area.

- Prior to dewatering of the bunded area, an appropriately qualified electrofishing specialist will conduct a rescue of aquatic species from the bunded area. If at any time the cofferdam is breached, the species rescue will be repeated.
- When dewatering the bunded area, pump inlets will be fitted with a mesh screen to prevent uptake of crayfish, fish or other aquatic species.
- Water pumped from a bunded area, if needed, will be discharged onto an open area of the riverbank through a sediment, and allowed to filter into the ground to prevent sedimentation of the channel.
- Where necessary, water quality monitoring will be undertaken to ensure pollution and sedimentation of the watercourse is minimised.
- Entry to the river channel will be in accordance with all conditions specified by the EA/ NE.
- All machinery to be used near the watercourse or within any dry working areas will be cleaned by prior to entering/ leaving site and will run on biodegradable oil.
- All machinery will be subject to standard pollution prevention measures (e.g. checked regularly for oil/ fuel leaks, refuelling done over plant nappies/ drip trays).
- All plant/ equipment will be washed down and decontaminated before leaving site to minimise the chance of spreading crayfish plague. Decontamination will only take place within a securely bunded area as far as practically possible from the watercourse.
- If fuel is required on site, it will be delivered to site in a bunded bowser and removed at the end of each shift. Adequate spill kits will be available on site always and kept ready to use, with site staff trained in their use and why they are necessary. Any fuelling operations will be only undertaken in a securely bunded area away from any drains or water courses.
- If fuel and materials storage is required on site, it will be placed as far from the river as reasonably practicable to avoid risk of pollution.
- Any operations that will cause unavoidable silt generation will be phased to keep plumes to a minimum. When silt has appeared in the channel, work will cease to allow it to clear.
- Temporary silt control measures, such as bales, will be employed to prevent sediment and polluting material from migrating downstream. These will be located at the downstream end of the works and weighed down so that sediment laden water does not pass under them.
- Mortar will be mixed in a cement mixer a significant distance from the watercourse and taken to the works area in buckets. The mortar will be determined by the proximity to the water level but in most instances, it will be a lime mortar to clause 2405 (type NHL 3.5 or lime putty) for “dry” areas, a resin grout for larger voids and Rockbond putty for works under and close to the water level.

- Ground below areas where concrete is used at height is to be protected using for example a 'hop up board' / 'young man board' / visqueen sheeting, terram or buckets if small enough.
 - An ecologist will monitor the presence of aquatic species in the work area and advise on works as appropriate.
 - Any excavations deeper than 0.5m should be covered and if left exposed overnight will have a mammal escape ramp installed at an angle of no more than 45 degrees to allow trapped individuals to escape.
 - Vehicles and materials will be inspected prior to use each day to identify any individuals which may have taken shelter. Any individuals identified will be allowed to leave the working area naturally.
 - No artificial lighting shall be used at any time during the construction period within 10 metres of the rivers and tributaries (except where this is essential for security or for health and safety reasons). This shall be extended to a minimum distance of 30 metres around any identified otter holts.
- 8.8.3 No in-channel works will be undertaken to avoid the loss of important habitats for fish, such as spawning grounds or nursery areas.
- 8.8.4 If in later detailed design it is found in-channel works are required this will be subject to further assessment. If any habitats for fish are affected in this case they would need to be recreated following completion of construction activities. This should include the creation of gravel beds and/or recreating a range of 'natural' channel features, such as 'riffles', 'pools' and 'glides
- 8.8.5 In order to avoid the spread of non-native invasive species and disease the outline CEMP, details biosecurity procedures that should be implemented. This is linked to Check – Clean – Dry, and potential disinfection of machinery equipment and footwear where applicable
- 8.8.6 The storage compounds around the River Caldew are to be in an area of improved grazing pasture on the right-hand bank, and no storage compounds will be placed within the floodplain on the left-hand bank. This will limit the loss of vegetation to directly beneath the structure, a loss of alder woodland in floodplains habitat to 0.1175ha. The total amount of alder woodland in floodplains within the River Eden SAC is recorded as 55.83ha. The loss of 0.1175ha of this habitat type represents a 0.20% loss of this habitat within the SAC. This is a negligible amount of loss and is unlikely to affect the structure and function of the SAC. This area will be allowed to naturally recolonise post construction.
- 8.8.7 Furthermore, the minimisation of loss of vegetation is crucial here as the River Caldew Geomorphology Report (Appendix 14.2) states that the current vegetation cover is crucial to avoid likely significant changes to the physical regime of the watercourse. As, vegetation loss will be limited within the floodplain to 0.1175ha, directly underneath the bridge structure, this is likely to maintain bank stability and avoid erosional and depositional changes that may occur due to the bridge in the high flow events. Therefore, the movement of the storage compounds has reduced the impact of the habitat loss to negligible upon the SAC.
- 8.8.8 The current proposed means of getting operatives and equipment across the river is by the use of a crane deck. This is because the crane deck is a contained area with less means of risk of contamination to the River Eden SAC than other considered means such as Irish fords, driving across the watercourse and the use of the

temporary bridge. All other considered means had a more significant impact on the River Eden SAC than the chosen method. However, if in later detailed design it is found that there are significant changes to the construction plans, and that temporary works, such as river crossings are needed, then this will need to be subject to further assessment.

Enhancement

- 8.8.9 Removal of a failing revetment upstream of the proposed bridge to be back in line with the Cumbrian Coastline Railway line could be considered. This would provide a more natural flow regime upstream of the bridge and could further promote additional alder woodland colonisation.
- 8.8.10 It is recommended that consideration be given to removing the weirs at Buckabank (upstream of the Scheme) or Holme Head (downstream of the Scheme), which would improve fish migration to wider stretches of river. This would provide an enhancement and increase its ability to host migratory fish, particularly salmonids.

Monitoring

- 8.8.11 The Ecological Clerk of Works (ECoW) for the Scheme will ensure that the minimum amount of alder woodland is removed, and will also monitor the site during the construction works in the vicinity of both the River Caldew and River Petteril to ensure the pollution prevention measures within the CEMP are being implemented, thereby reducing the risk of a serious pollution incident occurring within the SAC
- 8.8.12 The ECOW should also monitor for levels of construction noise and ensure that no work is being undertaken during the hours of darkness to minimise effect on nocturnal animal behaviour such as fish migration, and otter foraging.

Non-Statutory Sites Designated for Nature Conservation

Site of Invertebrate Significance

Avoidance

- 8.8.13 The extent of the Sites of Invertebrate Significance affected by the scheme has been minimised as much as possible due to the removal of the construction compounds, as detailed in 8.6.5 above. This has meant an area of less than 1 ha (0.1175 ha of alder woodland and less than 1 ha of lowland meadows HPI, will be lost within the floodplain of the River Caldew. The impact on the site will negligible following this avoidance measure.
- 8.8.14 Appropriate pollution control and attenuation measures associated with the new bridges will be carefully designed and implemented to protect water quality in the receiving watercourses.
- 8.8.15 Further to the above machine access on the existing exposed riverine sediment (gravel shoals) and removal of vegetation from these shoals will be avoided to minimise disturbance to this area through construction.

Mitigation

- 8.8.16 Terrestrial habitat will be lost from the SIS to facilitate the construction of foundations for two bridge piers. The northernmost pier is located in land to the

north-west of the River Caldew and is within the SIS. The southernmost pier is in land to the south east of the River Caldew and is approximately 10m outside the SIS boundary. Before the vegetation is removed it will be searched for invertebrates and these will be removed to a location elsewhere in the SIS. Measures to systematically “trap out” the invertebrates from the area to be lost will be considered.

Monitoring

- 8.8.17 The Ecological Clerk of Works (ECoW) will monitor the works in the vicinity of the River Caldew to ensure that the CEMP is being implemented to minimise the risk of a pollution incident occurring.

Lowland Meadows HPI

Avoidance

- 8.8.18 Prior to site clearance the ECoW will advise of ways in which to avoid damage to adjacent areas not required for construction of the road, including for storage compounds. This will formulate part of the CEMP.

Mitigation

- 8.8.19 The loss of this habitat by the scheme has been minimised as much as possible due to the removal of the construction compounds, as detailed in 8.6.6 above. This has meant an area of less than 1 ha of lowland meadows HPI, will be lost within the floodplain of the River Caldew. The impact on the site will be minor following this measure.
- 8.8.20 Landscape proposals for the scheme include planting of species-rich grassland meadow mix to the sum of 10.33ha. This represents a significant increase on this habitat within the area. The advice of a suitably qualified and experienced ecologist and landscape architect will be sought during detailed design to confirm the mix of species to be planted.

Enhancement

- 8.8.21 The planting regime will include more native species and a higher diversity across a larger area than was lost, which will represent a net gain for this habitat and the species it supports.

Monitoring

- 8.8.22 An ECoW will monitor the sites during construction to ensure damage to these areas is minimised, and that the CEMP is being followed.

Lowland Mixed Deciduous Woodland with Ancient Characteristics

Mitigation

- 8.8.23 A long established mature clough woodland with ancient woodland characteristics has been identified on a clough adjacent to a stream which runs through Peastree Farm. 867m² will be lost as a result of construction of a cutting on the Scheme. This will be mitigated with the translocation of ground flora to an area immediately adjacent to the wood, and the area will be planted with a native broadleaved

woodland high forest feathered and transplant mix to allow the ground flora to establish.

- 8.8.24 The amount of woodland affected has been minimised through design, with larger areas of woodland avoided by the route and areas of broadleaved woodland being planted throughout the scheme to compensate for this loss.
- 8.8.25 Any site clearance, including that of the mature woodland with ancient characteristics will be undertaken during the months of September to February inclusive, so as to avoid the bird nesting season.
- 8.8.26 The remaining existing woodland will be protected in line with British Standard BS5837:2012 Trees in Relation to Design, Demolition and Construction.

Enhancement

- 8.8.27 The loss of long established mature clough woodland with ancient woodland characteristics totals 867m², however the replacement planting regime including the translocation of ground flora as well, as the planting of a native broadleaved woodland high forest feathered and transplant mix totals 7,011m². This represents a significant increase in woodland habitat.
- 8.8.28 The total permanent Lowland Mixed Deciduous Woodland HPI loss stands at 4.07 ha, however there is a variety of broadleaved woodland proposed to be planted as part of the landscape design throughout the scheme. These include the woodland in 8.6.11, as well as a native broadleaved woodland scrub woodland feathered and transplant mix of 17.3ha. These planting regimes represent a significant increase in this habitat type within the scheme.

Monitoring

- 8.8.29 Translocated woodland will be monitored by the ECoW during and after translocation to ascertain if the planting regime has been successful. NVC surveys of the planted area, and the older area should be undertaken to ascertain similarity or difference between the clough woodland and the additional planted woodland.

Rivers and Streams

Avoidance

- 8.8.30 Sections 8.8.2 to 8.8.8 show avoidance measures necessary to reduce the risk of damage to rivers and streams within, and adjacent to the Scheme.

Enhancement

- 8.8.31 Fairy Beck, when diverted could have meanders incorporated into the diverted section, which over time should create a variety in riverbed structure and habitat beyond that existing in the current straightened section of Fairy Beck.
- 8.8.32 Proposals could be made to remove the weirs at Buckabank (upstream of the Scheme) or Holme Head (downstream of the Scheme), this would improve fish migration to areas of river, therefore enhancing the river and its ability to host migratory fish, particularly salmonids.

Monitoring

- 8.8.33 The ECoW will monitor the relevant watercourses during the proposed construction period to ensure the pollution prevention measures within the CEMP are being followed, thereby reducing the risk of a serious pollution incident.
- 8.8.34 The ECoW will monitor the re-alignment works to Fairy Beck to reduce the risk of a serious pollution incident occurring.

*Hedgerows**Avoidance*

- 8.8.35 In order to avoid damage to those hedgerows that are to be retained, the hedgerows will be identified on the ground and any areas highlighted as storage compounds or areas of materials and vehicle storage in order to construct the scheme that are in direct proximity of these hedgerows will incorporate a buffer zone between them and the existing hedgerows which therefore protects the hedgerow throughout construction. These buffer zones will be as wide as the hedgerow's height to ensure the majority of roots remain unaffected. Fencing will be used to mark out the buffer zone, so that personnel, materials and machinery do not enter these areas.

Mitigation

- 8.8.36 Hedgerows that are to be removed and that have been classified as grade 1 hedgerows i.e. very high to high ecological value will be removed and translocated. The position of these hedgerows is shown with the Landscape Design Plans. These areas have been selected to minimise the distance the hedgerow will be translocated from, and to attempt to maintain connectivity to adjacent hedgerows and other habitats.
- 8.8.37 There are 57 hedgerows which have been classified as 'Important' under The Hedgerow Regulations 1997 that are within the scheme boundary and as such will be impacted by the scheme. These hedgerows will require a hedgerow removal notice, as set out in Schedule 4 of The Regulations, to be received by the LPA together with the plan and evidence mentioned in the form in Schedule 4.
- 8.8.38 A variety of hedgerows will be planted predominantly alongside the roadside at the top of embankments. The planting positions are detailed within the Landscape Design Plans. These will include hedgerows with standard trees and will all be species-rich – with included five or more woody species. The woody species placed in the hedgerow will be native and represent species found within the survey area as defined in the hedgerow survey report in Appendix 8.2.
- 8.8.39 All hedgerow removal and cuttings will only be undertaken during the months of September to February inclusive to avoid the bird nesting season.

Enhancement

- 8.8.40 A total of 0.97km of native species rich hedgerow with trees are to be lost to the scheme, and 11.63km of native species rich hedgerows are to be lost to the scheme, this totals 12.6km of habitat loss. However, 2,904 linear metres of species rich hedgerows, and 14,342 linear metres of native hedgerows with trees, (total 17,296km), are to be planted. This represents a net increase in hedgerow habitat.

Monitoring

- 8.8.41 The ECoW will inspect all retained hedges every month to ensure that they have been adequately fenced off and are in no danger of being damaged during the construction.
- 8.8.42 The Ecological Clerk of Works will inspect all retained hedgerows, as well as those that have been translocated, every month to ensure that they are identified on the ground and in no danger of being damaged by construction work.

*Standing Water**Avoidance*

- 8.8.43 Sections 8.8.1 to 8.8.8 show avoidance measures necessary to avoid disturbance and reduce the risk of pollution measures within freshwater including ponds.

Mitigation

- 8.8.44 Standing water will be lost and altered by the Scheme as a pond close to the River Caldew by the western pier closest to the river will be lost during construction and its neighbouring pond may suffer from changes to hydrology due to the loss of this pond. The pond currently to the north east of the existing A595 Newby West roundabout will be lost to the Scheme. However, the scheme intends to create a further seven further ponds which will have a combined SuDS function. There will be one either side of Ashtip Wood, between the Newby West A595 Roundabout and Cummersdale Roundabout, two in the vicinity of the River Caldew, one close to Stead McAlpin, the other on the right-hand bank of the River Caldew in current grazing pasture. One immediately west of the Piggeries, one immediately south of Newbiggin Road close to the West Coast Mainline, and one either side of the River Petteril. Three of these will have no public access.
- 8.8.45 Ponds will be created to include gently sloping sides, a range of depths and irregular shape to improve their suitability as wildlife habitats.
- 8.8.46 Ponds will be planted with a mix of terrestrial, emergent and aquatic vegetation that is native and characteristic of pond habitats in the local area.

Enhancement

- 8.8.47 Two ponds will be lost and seven will be created representing a net gain of this habitat within the scheme. Three of these, one to the west of the piggeries, one to the south of Newbiggin Road, immediately west of the North West Mainline, and one of the right hand bank of the River Petteril will have no public access.

Monitoring

- 8.8.48 The ECoW will monitor the relevant watercourses during the proposed construction period to ensure the pollution prevention measures within the CEMP are being followed, thereby reducing the risk of a serious pollution incident.
- 8.8.49 Retained water bodies will be checked by the ECoW during construction to ensure they are not damaged by construction work.

*Non-Native Invasive Species**Avoidance*

- 8.8.50 A thorough biosecurity procedure will form part of the CEMP to help reduce the risk of spreading non-native invasive species and disease. This will cover both terrestrial and aquatic species. This will include the following:
- All plant and footwear will be regularly inspected and cleaned to prevent the introduction/ spread of crayfish plague and signal crayfish. The check-clean-dry methodology will be followed as far as practicable.
 - All site staff will be made aware of the need to prevent crayfish plague introduction/ spread.
 - All plant/equipment will be washed down and decontaminated before leaving site to minimise the chance of spreading crayfish plague. Decontamination will only take place within a securely bunded area as far as practically possible from the watercourse.
 - A pre-commencement survey will be undertaken prior to works commencing.
 - All plant, footwear and equipment will be checked and cleaned prior to entry to site and prior to leaving site at the end of each working day.
 - Any invasive plants found will be cordoned off and disturbance avoided where practicable.
- 8.8.51 Further to the above there are two SUDs ponds close to the River Caldw, one in an area of woodland close to Stead McAlpin downstream of the current works, and the existing railway bridge, and a second within what is existing grazing pasture, upstream of the proposed works. At the River Petteril two ponds are proposed, one beyond the left-hand bank, on current arable fields/grazing pasture, the other on the right-hand bank in an arable field close to the proposed road embankment.
- 8.8.52 Environment Agency Macrophyte data provided in 2018 for the both the River Caldw and River Petteril has been used to minimise the risk that plants being planted in these ponds are not native to their specific river and all plants to be planted will include species native to these river catchments.

Mitigation

- 8.8.53 As invasive species can spread rapidly a pre-commencement survey will be undertaken by an ecologist prior to works commencing to ensure that no invasive species have spread or established.
- 8.8.54 Known invasive species that have the potential to be impacted by the construction footprint will be eradicated in accordance with best practice guidelines prior to works commencing utilising specialist sub-contractors.
- 8.8.55 If any work will be undertaken within the vicinity of invasive species, a cordon of 7 metres will be marked out. No works should be undertaken in this area.

Monitoring

- 8.8.56 Information regarding invasive species including identification and awareness of their presence will be given during the site inductions and toolbox talks so those

working on the scheme are aware of the presence of non-native invasive species in the area.

Badger

Mitigation

- 8.8.57 One subsidiary badger sett (S4) is likely to be lost during site clearance. A Natural England sett exclusion and destruction licence including a fully detailed mitigation strategy will be needed before the work can commence. As sett S4 is close to the main sett S2 it is expected that the badgers using S4 will be able to use the main sett.
- 8.8.58 The main sett S2 may be subject to disturbance during site clearance work. Measures will be taken to minimise disturbance (i.e. by limiting duration of work) but a Natural England disturbance licence may be needed.
- 8.8.59 Badger paths will need to be maintained throughout the construction phase after the construction zone is fenced. The construction zone fence will need to be badger proofed to stop badgers entering excavations. However, breaks in the fence will need to be created to allow badgers to use their paths to access foraging land on both sides of the Scheme. This is particularly important where the badger paths cross the Scheme at Durdar, on the eastern bank of the Caldew (under the bridge) and also the Piggeries. To ensure that badgers can access both sides of the Scheme during construction activities breaks in the construction zone fence using badger gates should be created on the line of badger paths. Badgers should be allowed to use the badger paths in the construction zone. To facilitate this, badger paths should be baited with appropriate badger food and exposed trenches should be covered overnight.
- 8.8.60 Badgers are largely nocturnal so it will be necessary to ensure badger pathways are accessible at the end of every working day.
- 8.8.61 Permanent badger mitigation measures are included in the design at the locations listed below. These will be designed to meet minimum specifications set out in the DMRB. These will need to be installed as early in the construction process as possible:
- One badger tunnel under the Durdar road embankment to the south.
 - A culvert to the east of Scalegate Roundabout will also be used as a badger tunnel.
 - Badger fencing is to be used to guide badgers into the entrances.
- 8.8.62 Permanent badger fencing is included in the design and will be installed at an early stage of construction to ensure that badgers have sufficient time to habituate to the new road layout. The areas where badger fencing is required are:
- Newby West Roundabout to the eastern boundary of Ashtip wood (south side only)
 - North side of Caldew crossing embankment to Durdar Roundabout (both sides)
 - Buckabank Road to Scalegate Roundabout (south side only) and

- From the field ditch at Scalegate Roundabout to Brisco Roundabout (both sides).

8.8.63 An access bridge linking Peastree Farm with pastures to the south of the Scheme will also be created early in the construction programme. Once constructed this bridge can be seeded for use by badgers.

8.8.64 A cycle bridge at Brisco Roundabout will be seeded to persuade badgers to use the bridge to access the other side of the Scheme. Badger movement will need to be managed using badger fencing.

Enhancement

8.8.65 The new hedgerows that have been incorporated into the scheme design will provide badgers with additional foraging and sett creation habitats.

8.8.66 The new areas of woodland and scrub incorporated into the scheme design will provide new areas of foraging for local badger clans.

Monitoring

8.8.67 The 2018/2019 badger survey will need to be repeated no more than 6 months prior to commencement of site clearance and construction activities to ensure that changes in badger activity are identified and that contemporaneous data can be provided to Natural England to support badger licence applications

8.8.68 Badger activity will need to be monitored every week during construction to ensure that fences are not being breached, badger tunnels are being used and that changes in badger movements are being noted and mitigation adjusted accordingly.

Bats

Avoidance

8.8.69 T8442 and T8447 are currently likely to be lost by the scheme due to the re-routing of utilities. However, it may be possible to avoid this depending on the approach to undertaking the diversions. Discussions will be undertaken with the contractor, when appointed, to find a suitable solution.

8.8.70 To avoid light pollution affecting bats during the construction phase, no night time working will be permitted on site.

8.8.71 Works close to known roosts in retained trees, specifically T8305 at the River Petteril and T8376 to the south of the Newbiggin Road, and T8555 in the clough woodland at Peastree will, as far as practicable, not be undertaken during the maternity season for bats, which is May to August inclusive, to ensure that connectivity is maintained from the roost to the wider environment throughout this important season.

Mitigation

8.8.72 If T8442 and T8447 require removal, an EPS licence from Natural England will be required. Mitigation will be finalised and conditioned within the EPS license, which will be applied for once planning permission is granted. Mitigation will include the provision of a suitable alternative roosting location. The replacement tree will be in a suitable location, and of sufficient size and health for the feature, and it will be

surveyed to ensure no existing roosts are present which could also be affected. It is anticipated these replacement roosts will be placed on nearby adjacent mature trees in the unaffected hedge line, or in the group of trees to the south to provide connection to the River Caldeu. Their exact location will be defined in the detailed design stage.

- 8.8.73 T8315 will require an EPS licence from Natural England prior to its removal. Mitigation will include the provision of a suitable alternative roosting location. The replacement tree will be in a suitable location, and of sufficient size and health for the feature, and it will be surveyed to ensure no existing roosts are present and would be affected. It is anticipated these will be on a mature tree directly to the north of the existing roost. This is approximately 20m away from the existing roost. However, the exact location will be defined in detailed design stage.
- 8.8.74 T8320 will require an EPS licence from Natural England prior to its removal. A suitable alternative roosting location will be identified as for other affected roosts. This replacement roost will likely be in the form of a bat box on a tree to the south of the existing roost approximately 100m away, on the opposite side of the road. However, the exact location will be determined in the final design phase.
- 8.8.75 T8489 will require an EPS licence from Natural England prior to its removal. As with other roosts, an alternative location will be identified in a suitable tree nearby. It is likely this replacement roost will be either further along Peter Lane to the south in retained trees, or bat boxes on sticks could be used in the new broadleaved woodland plantation proposed around the Fairy Beck diversion, or within Ashtip Wood. The final location of this will be agreed in final design.

Enhancement

- 8.8.76 Further roosting opportunities within the proposed bridge crossings of the River Petteril and River Caldeu, and any areas of broadleaved woodland planting will also be considered as part of the detailed design. This could include around SUDS ponds, especially those inaccessible to the public, close to Langdale and the Piggeries, the east bank of the River Petteril, and just south of Newbiggin Road west of the North West Mainline.

Monitoring

- 8.8.77 The new roost locations will be monitored by a licensed ecologist for the number of years stipulated within the EPS licence; this may be for a length of up to 3 years.

Breeding birds

Mitigation

- 8.8.78 The potential loss of active nests during the site clearance phase can be avoided by removal of potential nesting habitat during the period September-February. It is important to consider ground nesting bird habitat as well as hedgerows and trees in this process. Species such as osytercatcher that nest within gravel shoals, and sand martins that nest within the exposed earth river banks on both rivers of the river, should be unaffected, as these habitats will not be directly worked upon during the Scheme construction.
- 8.8.79 If nesting bird habitat has to be removed during the nesting bird season then it will be checked by the ECoW before it is removed. If nesting birds are confirmed it may

be possible to establish an exclusion zone around the nest until the young are fledged. Only after the nest is no longer in use can the nesting habitat be removed.

- 8.8.80 The loss of some bird nesting habitat during the site clearance phase can be mitigated by erecting bird nest boxes specifically to provide nesting opportunities for the farmland bird species that were identified during the bird survey.
- 8.8.81 To avoid the possibility of birds nesting in construction zones the habitat in the zones should be managed to dissuade nesting birds. It is important to consider ground nesting bird habitat as well as hedges and trees in this process. If nests become established a zone will need to be establish an exclusion zone around the nest until the young are fledged. Only after the nest is no longer in use can the nesting habitat be removed.

Enhancement

- 8.8.82 The loss of nesting habitat during the site clearance and construction phase will be indirectly mitigated during this phase by the planting of new hedges and trees throughout the scheme, which will provide further areas for nesting birds to use once established.

Monitoring

- 8.8.83 Active monitoring of the bird population in all areas of the Scheme should be undertaken by the EcoW.

Barn Owl

Avoidance

- 8.8.84 The design of the bridge by the River Caldew means that the bridge decking will be approximately 13m from the ground meaning that any barn owl foraging in this area will be able to continue to do so underneath the newly constructed bridge.

Mitigation

- 8.8.85 The areas that have been identified as particular high value based on habitat requirements as potential foraging locations that are likely to be affected by the Scheme are limited to the floodplains of the Rivers Petteril and Caldew and Calflins Beck, hedgerows, rail and roadside embankments. Therefore, the loss of less than 1ha of Lowland Meadows HPI by the River Caldew, 1.33ha of scrub immediately adjacent to the Cumbrian Coastline Railway and the loss of 114 hedgerows will reduce the availability of habitat favourable for barn owl hunting. However, these habitats are set to mitigated for within the scheme design.

Enhancement

- 8.8.86 Sections 8.8.40 for hedgerows and 8.8.21 relating to lowland meadows HPI show an increase in these habitats within the scheme. A total of 1.33ha of scrub will be lost by the Cumbrian Coastline Railway, however 1.97ha of scrub planting will be planted in the same area. This represents a net increase within this area of favourable barn owl hunting habitat.

*Brown Hare**Avoidance*

- 8.8.87 Establishing the construction zones may isolate brown hares from their foraging habitats. As per 8.8.61 for badgers once the construction zone is fenced gaps breaks in the fence will need to be created to allow hares to access land either side of the construction zone. This is particularly important around the Durdar Roundabout and South of Newbiggin Road. These breaks can be in the same areas as that for badgers.

Monitoring

- 8.8.88 The ECoW will actively monitoring brown hares and their movements during the construction phase.

*Fish**Avoidance*

- 8.8.89 Sections 8.8.2 to 8.8.8 show avoidance measures necessary to reduce the risk of damage and disturbance to fish species during construction.

Enhancement

- 8.8.90 Fairy Beck, when diverted could have meanders incorporated into the diverted section, these meanders overtime should create a variety in riverbed structure and habitat beyond that existing in the current straightened section of Fairy Beck.
- 8.8.91 Proposals could be made to remove the weirs at Buckabank (upstream of the Scheme) or Holme Head (downstream of the Scheme), this would improve fish migration to areas of river, therefore enhancing the river and its ability to host migratory fish, particularly salmonids.

Monitoring

- 8.8.92 The ECoW will monitor the relevant watercourses during the proposed construction period to ensure the pollution prevention measures within the CEMP are being followed, thereby reducing the risk of a serious pollution incident.

*Amphibians**Avoidance*

- 8.8.93 A Reasonable Avoidance Method Statement (RAMS) will form part of the CEMP in relation to amphibians during the construction period, especially in relation to works in the River Caldeu river valley and close to the pond by the A595 Newby West Roundabout.

Mitigation

- 8.8.94 The section on standing waters 8.8.44 to 8.8.46 shows mitigation measures applicable for standing waters and amphibians.

Enhancement

- 8.8.95 Paragraph 8.8.47 details the enhancement measures being proposed at standing waters, which will be relevant for amphibians.
- 8.8.96 When creating new ponds some of the terrestrial habitats will include features such as log piles which could be used as terrestrial refugia for amphibians.

Monitoring

- 8.8.97 An ECoW will monitor the construction phase of the works to reduce the risk of harm arising to amphibian species.

*Riparian Mammals - Otters**Avoidance*

- 8.8.98 Sections 8.8.2 to 8.8.8 detail avoidance measures necessary to avoid pollution to watercourses, disturbance to aquatic and riparian life and measures to reduce the risk of physical harm to otter.

Mitigation

- 8.8.99 The confirmed otter holt on the northern side of the River Petteril is very close to the Petteril Bridge and will need to be removed during site clearance. This will need to be undertaken under a Natural England EPS Licence. It is expected that as a condition of the licence, three artificial otter holts will be required to be created within the scheme site clearance depending on the conditions. The areas currently identified for their position are: to the north of the proposed crossing at the foot of the proposed embankment in an area of broadleaved woodland; approximately 100m south of the proposed embankment on the left-hand bank in an area of proposed broadleaved woodland planting; and immediately south of the proposed embankment on the left hand bank towards the foot of the embankment in an area of proposed broadleaved woodland planting. Finalisation of the position and materials to be used for these otter holts will be undertaken during detailed design.
- 8.8.100 Otters use Fairy Beck as a commuting route. However, a section of the beck will be located in a construction zone. Temporary mammal fencing can be used to channel otters along the beck during the construction programme. However, the alignment of the beck will be changed significantly during the construction phase to accommodate the new Newby West Roundabout. At a stage when the alignment is being changed access for otters will need to be temporarily lost.
- 8.8.101 Otter fencing will be incorporated into the design, and erected during the construction period, in the following locations:
- The area between the Newby West Roundabout and Dalston Road Roundabout, including the area of the east bound carriage way of the A595.
 - The area eastern banks of the River Caldey, to Peastree Farm.

Monitoring

- 8.8.102 Further surveys of the otter holt will be undertaken to provide contemporaneous information for the licence application. Further surveys will also be needed of locations where additional artificial otter holts are intended to be located.

8.8.103 The ECoW will be required to monitor the Fairy Beck realignment to ensure that the otter mitigation is correctly installed and that otters are using it. Disturbance from construction zones will also need to be monitored.

8.8.104 The ECoW will monitor the relevant watercourses during the proposed construction period in the to ensure the pollution prevention measures within the CEMP are being followed, thereby reducing the risk of a serious pollution incident.

Terrestrial Invertebrates

Avoidance and Mitigation

8.8.105 The measures outlined for the SIS (paras 8.8.13 to 8.8.16) apply to invertebrates of exposed riverine sediments.

Enhancement

8.8.106 Just beyond the Cumbrian Coastline railway line a 1.33ha of dense scrub, mostly gorse will be removed during the construction phase. However, 1.97ha will be planted in the same area. This should achieve net gain of this habitat within the scheme, which is important as an early flowering species for pollinators.

Monitoring

8.8.107 The ECoW will be actively monitoring the SIS ensuring that no site is not adversely affected by construction activities.

Operational Phase

Statutory Sites Designated for Nature Conservation

8.8.108 The Appropriate Assessment undertaken in respect of the Scheme in relation to the River Eden SAC (Appendix 8.17) concluded that the following avoidance, mitigation and enhancement measures were required to reduce the risk of likely adverse effect upon site integrity during the operational phase.

Avoidance

8.8.109 A geomorphological assessment has been undertaken on the preferred route crossing to inform the location of the bridge support columns. This identified the likely channel migration footprint over time, with the positioning of the support piers designed to minimise the geomorphological impact.

8.8.110 The design of the bridge has the bridge decks at approximately 13m above the River Caldew and 7m above the River Petteril. Any noise or vibration, at the water level will be minimal.

8.8.111 The bridge over the River Caldew is approximately 13.4m high and has decking that is 17.8m wide, a study by Broome et al (2005)⁵⁵ showed that a height width ratio of greater than 0.7 has no measurable effect on the habitat beneath. The height width ratio of the bridge at the River Caldew, using the information above, is 0.75. This

⁵⁵ Broome, S.W., Craft, C.B., Struck, S.D. and M. SanClements. 2005. Effects of Shading from Bridges on Estuarine Wetlands. [pdf] Available at: <https://connect.ncdot.gov/projects/planning/RNAProjDocs/2001-12FinalReport.pdf>

means there should be a negligible effect upon the flora and flora beneath the structure.

- 8.8.112 There are four SuDS ponds proposed near to both the River Caldew and River Petteril, which could allow drainage from the road to enter the watercourse during operation. These will require permits from the Environment Agency which will require that pollution levels are compliant with legal requirements. This should ensure no impact from the drainage of the road and a negligible effect upon the site.
- 8.8.113 The lighting design for the scheme has no lighting on the road from Cummersdale Roundabout to Durdar Roundabout, which means that the river corridor will not be lit.
- 8.8.114 According to the Air Pollution Information System (www.apis.ac.uk), the critical load of NO_x for the in-river flora is 30ug/m³. The rate of NO_x during operation is less than 30ug/m³, and therefore there is no likely significant effect in terms of air pollution from the scheme on this habitat type.

Mitigation

- 8.8.115 In order to avoid vegetative stripping in large flood events the use of a 2m x 2m culvert with the invert set at bed level of the paleo-channel on the edge of the agricultural land lowers the average velocity through the 3rd span at the 1:1000-yr flow from 1.7 m/s to 1.65 m/s (baseline condition is 0.9 m/s, this makes impacts on the alluvial forest, and other vegetation unlikely as the velocities all remain below the threshold of 2.44 m/s which marks tree instability.

Enhancement

- 8.8.116 The bridge will shade a small area north of the River Caldew and the River Petteril, this will provide an area of cooler water for fish to rest in and will have a minor beneficial effect.

Monitoring

- 8.8.117 The ECoW will be actively monitoring the SAC/SSSI for signs of damage by run off. Following construction, this could be compared to water quality values at pre-construction levels.
- 8.8.118 The site could be monitored for a period of two years following construction to ascertain the impact upon resident invertebrate species, fish and otter.

Non-Statutory Sites Designated for Nature Conservation

- 8.8.119 Information above in 8.8.104 to 8.8.114 relevant in terms of operational phase impacts for Cummersdale Shingle Banks Site of Invertebrate Significance.

Lowland Mixed Deciduous Woodland with Ancient Characteristics

Avoidance

- 8.8.120 The scheme design incorporates a drainage system that allows the current land drainage patterns to be maintained in this area. This would reconnect the majority of existing drainage pathways so that the majority of the flow of water into the existing stream and beck are maintained.

Rivers and Streams HPI

Avoidance

- 8.8.121 The scheme design incorporates a drainage system that allows the current land drainage patterns to be maintained in this area. This would reconnect the majority of existing drainage pathways so that the majority of the flow of water into the existing stream and beck are maintained.

Badgers

- 8.8.122 The scheme design has incorporated badger fences to be erected in the following locations, which have been identified as having high levels of badger activity, to reduce the risk of road traffic accidents:

- On the A595 from the A595 Newby West Roundabout to just past KIngrigg Farm on the west carriageway. On the eastern carriageway, this will go from the field boundary to the new roundabout, and around it and follow the A685 in an easterly direction to the end of the field boundary.
- Around the new roundabout heading through Ashtip Wood to its current eastern fence line. On the opposite side of the road this will go, from the eastern fence line of Ashtip Wood to the new roundabout
- From the embankment on the eastern side of the River Caldew to Durdar Rounabout on both sides of the road, and then heading north east from the existing farm track at Peastree Farm to the end of the copse at Durdar Farm, on the northern side of the Road only.
- From Buckabank Road to Scalegate Rounabout on the southern edge of the road only.
- From the field ditch to the east of Scalegate Roundabout to Brisco Roundabout, on both sides of the road.
- There are also cattle grids placed at strategic locations on cycle paths and access tracks to avoid badgers using them and getting on the road.

- 8.8.123 To ensure badgers are able to access their territory and foraging areas either side of the Scheme, permanent mitigation has been incorporated into the design in the following places:

- The overbridge on the footpath close to Peastree Farm will have an area that is green, and this will be seeded for use by badgers to allow them to cross the scheme.
- A badger tunnel will be provided within the embankment of Durdar Bridge to the south of the Scheme, this will allow badgers safe passage from east to west across the scheme.
- The culvert to the east of Scalegate Roundabout will be used as a badger tunnel.

*Bats**Avoidance*

- 8.8.124 The effects of operational light spill at the River Petteril, Ashtip Wood, the River Caldew, Peastree, the fields between Durdar Road and Scalegate Roundabout, and the fields surrounding Langdale and the Piggeries where bat activity has been noted, should be minimised by looking at the lighting design and incorporating some changes at the final design stage. This could involve lowering the height of the lighting, using hoods and cowls on the lights in these areas, or looking to remove lighting in these areas.

Mitigation

- 8.8.125 The roost that has been recorded at B111 – Oak Dene – will be surrounded by the new road and will therefore be subject to high levels of light and noise. It is likely this will mean the roost is no longer usable for bats and an EPS licence from Natural England will be needed due to the loss of this roost. Mitigation will be finalised and conditioned within the EPS license. Mitigation will include the provision of a suitable alternative roosting location. The replacement will be on a retained tree in a suitable location, and of sufficient size and health for the feature. It will be surveyed to ensure no existing roosts are present and would be affected. It is anticipated this replacement roost will likely be in some retained mature trees to the west of the existing roost, however the exact location of this will be determined in final design
- 8.8.126 Bat commuting routes in the fields to the south of Tarn Plantation and the hedgerows lining Durdar Road and the road close to Scalegate Roundabout, Ashtip Wood, and Langdale and the Piggeries will be severed. Consideration of the design and reinstating or compensation of the loss of foraging and commuting corridors will be undertaken within the detailed design stage. This will include potential bat “hop - overs”, by planting vegetation that will direct bats up and over the road, or deflect them east – west along the proposed scheme itself. These will need to be located in fields to the south of Tarn Plantation and the hedgerows lining Durdar Road and the road close to Scalegate Roundabout, Ashtip Wood, and Langdale and the Piggeries, but the exact location of these will be agreed in the final design stage.
- 8.8.127 As the River Petteril bat commuting routes will be severed by the road due to the loss of linear vegetation currently used by the bats in which to commute, consideration of the design and reinstating of the foraging and commuting corridors will be undertaken during the final design stage. This will include consideration of the landscaping in this area and designing it in such a way so as to direct bats beneath the underpass and not up towards the road. The exact location, and landscaping should will be identified during the final design stage.

Enhancement

- 8.8.128 Additional bat boxes will be considered for placement in retained trees or planted mature hedgerow trees, or broadleaved woodland. This will provide further roost locations for bats in the locality.

Monitoring

- 8.8.129 Any new bat boxes erected as mitigation, or enhancement will be monitored by an appropriately licensed ecologist for the number of years stipulated within the EPS licence. This may be up to 3 years after erection.
- 8.8.130 Any bat “hop overs” that have been installed to maintain bat commuting routes will be monitored in the form of bat activity surveys over a number of years, once erected, and following the road opening, to ascertain their usage levels by bats.

*Otters**Avoidance*

- 8.8.131 The badger fencing mentioned in 8.8.62 will be dual use to avoid otters getting onto the carriageway, and as such should reduce the risk of otter casualties via road traffic accidents from the Scheme during operation.

Mitigation

- 8.8.132 During operation of the road, otter passage may be affected in the following watercourses: River Caldew, River Petteril, Calflins Beck, and Fairy Beck. Calflins Beck will include the addition of a culvert underneath Durdar Bridge, and the A595 Roundabout will be extended in size. This will be mitigated against in the following ways:
- The bridge at the River Caldew has been designed to be approximately 13m above the ground level, this means otters will be able to pass under the bridge, and otter passage near the river will not be affected.
 - The bridge at the River Petteril will include an otter ledge on the right-hand bank pier to maintain otter passage on the bankside at this location.
 - The culvert at Calflins Beck will contain an otter pass so that otter passage within the watercourse is maintained.
 - Fairy Beck is to be diverted from its current course underneath the A595 Newby West Roundabout, under the A595 to the South West and then under the Scheme to the north east before heading underneath Peter Lane. Each of the crossing points at these locations will contain culverts with otter passes to maintain otter passage within the watercourse.

*Barn Owl**Mitigation*

- 8.8.133 Barn owls have been identified as using several areas of the scheme, namely around Kingrigg Farm and the Piggeries. Therefore, Planting of trees, shrubs and hedge planting will be used to deflect barn owls over the carriageway in order to reduce traffic related mortality. These have been proposed in line with existing woodland belts, or newly proposed woodland belts for the road, to help guide barn owls around the scheme. These will be in the following locations:
- The western bound carriageway of the A595 from the entrance to Kingrigg Farm to the field boundary with Ashtip Wood. This planting will follow the boundary of the new road.

- From the track to the west of Langdale, the Piggeries and the proposed SUDS Pond to the Brisco Roundabout.

8.8.134 To discourage barn owls from hunting close to the Scheme verge and grassland management adjacent to the Scheme will include regular mowing of grassland areas to lower sward height, making it less suitable to prey species, and thus discourage barn owls from these areas.

8.9 Residual Impact Assessment

8.9.1 Table 8.18 sets out the ecological receptors where committed mitigation and enhancement measures do not reduce the impacts significantly.

8.9.2 It is recommended that to lower the impacts on bats, birds, badgers, otters and other taxa from residual lighting, the highway lighting design around the Fairy Beck diversion to Ashtip Wood, from Durdar Roundabout to Scalegate Roundabout, from the Piggeries to Brisco Roundabout and in the vicinity of the River Petteril, in particular, should be further developed during the detailed design stage to further reduce potential light spillage beyond the highway boundary.

Table 8.18 Residual Impact Table

Receptor	Impact	Effect	Magnitude (post mitigation)	Significance
River Eden SAC (Sensitivity-Very High)	Loss of alder floodplain woodland	Loss of extent of woodland however this will re-establish on re-colonisation	Minor	Adverse – in the short-term
Hedgerows (Sensitivity-High)	Fragmentation	Impacts of fragmentation cannot be fully mitigated	Minor	Adverse
Badgers (High)	Route alignment	Severance of territory and foraging habitat between Newbiggin Road and the Scheme, this is due to area being earmarked for St. Cuthberts Garden Village, and thus badgers being excluded in this area.	Minor	Adverse
Badgers (High)	Loss of subsidiary sett.	A subsidiary sett S\$ will be lost by the scheme, this will reduce the setts in the area for use by badgers based at S2 by one	Minor	Adverse
Badgers (High)	Operational lighting spilling beyond the road decking at the Langdale and the Piggeries, between Durdar Road and Scalegate Road Roundabout, Durdar Roundabout and Ashtip Wood.	Discouraging badgers from using known commuting and foraging corridors	Moderate	Adverse
Bats (High)	Operational lighting spilling beyond the road decking, in particular in the areas identified during transect surveys at the River Petteril, Langdale and the Piggeries, between Durdar Road and Scalegate Road Roundabout, and Ashtip Wood. However, the lighting scheme as a whole would need to be considered, as bats could be utilising areas throughout the length of the proposed scheme.	Fragmentation of commuting and foraging corridors	Moderate	Adverse
Breeding birds	Lighting	Operational lighting specifically in areas around the River Petteril will deter birds from	Moderate	Adverse

Receptor	Impact	Effect	Magnitude (post mitigation)	Significance
		roosting, and forming nests in these areas due to increased risk of predation. Furthermore, it may alter breeding behaviour, reducing the risk of successful breeding		
Breeding birds	Route alignment	Road alignment will increase likelihood of road collisions.	Minor	Adverse
Wintering birds	Habitat loss	Loss of habitat such as arable fields totalling 30.17 ha. This is a loss of habitat for species such as lapwing, redwing, skylark.	Minor	Adverse
Wintering birds	Lighting	Operational lighting specifically in areas to the South of Newbiggin Road, and around the River Petteril may deter birds from using the area due to increased risk of predation.	Moderate	Adverse
Wintering birds	Noise and disturbance	Operational noise and disturbance in areas, may deter wintering birds from using the area.	Minor	Adverse
Otters (High)	Operational lighting spilling beyond the road decking at the River Petteri and close to Fairy Beck.	Deter otters from using this area. However, with bridge being 7m above the River Petteril and lighting being set to 50% of lumen output between 21:00 and 06:00, this is likely to have a minor effect.	Minor	Adverse
Brown Hare (High)	Route alignment.	Severance of access to foraging habitat immediately south of Newbiggin Road.	Minor	Adverse
Fish (High)	Operational lighting spilling beyond the road decking at the River Petteri.	Deter fish from migrating upstream during spawning period. However, with bridge being 7m above the River and lighting being put to 50% of lumen output between 21:00 and 06:00 likely to have a minor effect.	Minor	Adverse.

8.10 Cumulative Effects

- 8.10.1 Developments in the vicinity of the Scheme that may have the potential to result in in-combination effects on the ecology and biodiversity of the area are discussed below.
- 8.10.2 In combination effects in relation to the European Designated Sites, the River Eden Special Area of Conservation (SAC) are discussed within the Appropriate Assessment in Appendix 8.17.
- 8.10.3 91/1050 – Westrigg Road/Wigton Road. This is a proposed development of 48 dwellings. If construction overlaps with CSLR this would increase ambient noise and light levels in that area. Furthermore, there would be further loss of habitat once built, that could impact upon resident flora and fauna. Therefore, there may be cumulative impacts.
- 8.10.4 18/1043 – Golden Fleece Service Station, Carleton, Carlisle, Carleton, CA4 0AN. This is a proposed demolition and replacement of a canopy forecourt. The construction and operational impacts on this, will largely be screened by the M6 motorway, as the garage is over the opposite side of the junction 42 of the M6. There is unlikely to be any cumulative impacts.
- 8.10.5 18/1016 – Land adjacent to Blackwell House Durdar. This a proposed development of 48 dwellings, if construction occurs same time as the Scheme this may add to effects, specifically in relation to noise, air and lighting. Habitat lost to construct this scheme, could lead to a reduction in habitat locally for a variety of fauna and flora species, and therefore there may be cumulative effects.
- 8.10.6 18/0003/TEL – Southbound Grass Verge, Dalston Road, Carlisle. This is the installation of a 20m high monopole and associated equipment and infrastructure. This is a small development with a negligible impact beyond its footprint, there is likely to be negligible cumulative effects from this scheme.
- 8.10.7 16/1022 – Land to the rear of Irvings Place, Dalston Road, Cummersdale. This is the erection of 17 dwellings and associated infrastructure. This is addition of 17 dwellings, in close proximity to the Scheme, if construction overlaps this may increase effects of noise, air and light pollution during the construction period. Therefore, there may be some likely cumulative effects.
- 8.10.8 16/0794 – Kingrigg Farm. This is an erection of a standby electricity generation plant, in a new portal framed building, and installation of ancillary equipment. The habitat loss here would be of arable land, which may mean a loss of habitat for ground nesting birds. Surveys indicate badgers use the field as a means of access, however this would have minimal impact upon the resident populations, and thus a negligible effect during operation. During construction, if these overlap it may add to local levels of light, air and noise pollution, although these cumulative effects should be minor.
- 8.10.9 09/0413 - Land at Morton bounded by Wigton Road, Peter Lane And Dalston Road, Carlisle, Cumbria. This is development off land at south Morton bounded by Wigton Road, Peter Lane And Dalston Road, Carlisle, for residential (Maximum 825 dwellings), employment (40,000m2 floorspace) and public open space purposes as well as associated work. If construction occurs at the same time as the Scheme, this may have significant impacts in terms of noise disturbance, light disturbance and levels of air pollution in the area. This will most likely impact on otters using

Fairy Beck. The land lost will likely be improved grassland and arable land, however it does hold some value for breeding birds, and could potentially be used for barn owls for hunting, as there is a breeding site within a 1km, at Kingrigg Farm. Therefore, there are potential for cumulative effects in construction and operation with the Scheme.

- 8.10.10 18/0790 – Scalegate Road Brisco. This is an application of a new school, and associated infrastructure including car parks and sport facilities. This is over a kilometre from the scheme and so it is unlikely that any impacts during construction will be exacerbated if construction occurs at the same time as the scheme. This may involve some additional loss of habitat locally although this should have a minor negative effect on local flora and fauna.
- 8.10.11 St. Cuthbert's Garden Village – At this time the exact layout of St Cuthbert's Garden Village is not known. As a result, a detailed assessment of the potential interactions with the Scheme is not possible. Therefore, the inter-project cumulative effects have been assessed at a high level using professional judgement and only where the assessment topic has been determined to have clear relevance to the proposed Garden Village development.
- 8.10.12 This is currently stage 2 masterplan in terms of development, and knowledge of proposals is limited to coloured areas on a map. The Garden Village concept is to build up to 10,000 new homes and associated employment opportunities. The areas highlighted on the map, would lead to significant habitat loss, of broadleaved woodland, arable and grazing pasture, with some pockets of semi-improved grassland, there would be habitat loss, and severance issues for all taxa within this study with the exception of fish. This may have a major adverse impact upon all taxa and habitat types mentioned above unless adequate mitigation and compensation measures are incorporated into its design.

8.11 Summary

- 8.11.1 In summary, it is considered that the only significant adverse effects on biodiversity from the Scheme once all mitigation, compensation and enhancement are considered is operational effects from lighting on bats, badgers, otters and birds. However, these impacts should be reduced at final design stage with minor changes to the lighting design proposals in the key areas that are causing the impact.
- 8.11.2 The total habitat loss equates to 89.24ha, of which 60.46ha is arable fields and improved grassland, which are of relatively low ecological value to many taxa, although not all. The Landscape Design Plans have approximately 91.16ha of new habitat proposed including 10.33ha of species rich meadows and 23.33ha of native woodland planting. Overall the scheme will improve the east west connectivity of habitats and provide an increase in diversity and abundance of certain habitats above the baseline conditions.

9 Landscape

9.1 Introduction

- 9.1.1 This chapter assesses the effects of the Scheme on the landscape character of the area.
- 9.1.2 The European Landscape Convention (ELC) adopts a definition of landscape that is adopted in the “Guidelines for Landscape and Visual Impact Assessment (Third Edition)”: “*Landscape is an area, as perceived by people, whose character is the result of the action and interaction of natural and/ or human factors*” (Council of Europe, 2000)⁵⁶.
- 9.1.3 It also states that: “Character is not just about the physical elements and features that make up a landscape, but also embraces the aesthetic, perceptual and experiential aspects of the landscape that make different places distinctive.” (Landscape Institute and Institute of Environmental Management & Assessment, 2013).⁵⁷
- 9.1.4 Firstly, the existing landscape within the study area will be assessed to determine its character and value. The second part of the assessment will consider the effects of the proposed Scheme on the landscape and the significance of those effects, when considering the sensitivity of each character area and the magnitude of change proposed.
- 9.1.5 Following the updates to the EIA Regulations 2017, comments on the effects on Human Health shall be included within this chapter as a consequence of the effects on landscape.
- 9.1.6 An additional section will consider the cumulative effects of the Scheme together with other projects with planning permission within the study area. As a result of the Scoping Opinion, St Cuthbert’s Garden Village will also be considered as part of this assessment.
- 9.1.7 The chapter will conclude by summarising the overall effects of the proposed development on landscape character.

9.2 Assessment Methodology

Guidelines

- 9.2.1 The following guidance has been used for this assessment:
- The Landscape Institute and the Institute of Environmental Assessment - Guidelines for Landscape and Visual Assessment Third Edition, 2013.
 - DMRB, Volume 11, Section 3, part 5, (Landscape Effects) June 1993, amended August 1994.

⁵⁶ Council of Europe. 2000. *European Landscape Convention*, Strasbourg: Council of Europe.

⁵⁷ Landscape Institute and Institute of Environmental Management and Assessment. 2013. *Guidelines for Landscape and Visual Impact Assessment*. Third Edition. Abingdon, Routledge.

- IAN 135/10 - Landscape and visual effects assessment, November 2010.
- Cumbria Landscape Character Guidance and Toolkit, Cumbria County Council, March 2011.

9.2.2 In accordance with IAN 135/10, a Detailed Assessment has been carried out, due to the potentially significant effects on the landscape character.

9.2.3 In carrying out the assessments, reference has been made to the following documents and resources:

- Cumbria Landscape Character Guidance, Cumbria County Council, March 2011;
- Cumbria Historic Landscape Characterisation, Cumbria County Council, July 2009;
- National Character Area Profile 6: Solway Basin, Natural England, 2015.
- Side by Side Georeferenced Map Viewer (<https://maps.nls.uk/geo/explore/side-by-side>)
- Dalston Neighbourhood Area Plan 2015-2030, adopted April 2018.

9.3 Methodology

9.3.1 The methodology is defined by the requirements for environmental assessment of road proposals, as described in IAN 135/10. The following section outlines the methodology that was used for the Landscape Character Impact Assessment.

Establishing the baseline and study area

9.3.2 The study area was established through desk-based research. After reviewing the designations and landscape character areas, it was considered that a 500m buffer was proportionate for the Scheme, extending to 1km around the larger bridge structures, as recommended by the Scoping Opinion from Cumbria County Council. Consultation with Natural England and Cumbria County Council confirmed that the landscape designations recorded in Stages 1 and 2 of the assessment remained unchanged. Figure 9.1 (Volume 2) illustrates the study area for this assessment.

9.3.3 Within the study area, the baseline for the assessment was then determined through a combination of desk-based research and field survey. The recent publication of the Landscape and Townscape Appraisal, St Cuthbert's Garden Village,⁵⁸ (later referred to as the "Landscape and Townscape Appraisal") has provided good baseline information for the majority of the study area. Where relevant, much of the baseline description has been duplicated from this document. The St Cuthbert's Garden Village Landscape Sensitivity Study Durdar & Brisco⁵⁹, was also used to assist with determining the baseline.

⁵⁸ LUC in association with Nick Haynes, May 2017. Landscape and Townscape Appraisal, St Cuthbert's Garden Village.

⁵⁹ Gillespies, October 2018, St Cuthbert's Garden Village Landscape Sensitivity Study Durdar and Brisco.

9.3.4 Field surveys took place on the following dates:

- 26th February 2019
- 8th March 2019
- 11th -13th March 2019
- 18th March 2019 2nd July 2019.

9.3.5 The “Template for Field Survey Work” from Appendix 4 of the Cumbria Landscape Character Toolkit was used to complete an assessment of the landscape character at a number of survey locations. These completed “Landscape Survey Sheets” are included within Appendix 9.1. Photographs were taken during these visits to further illustrate the key characteristics of each defined character area. The “Landscape Baseline Descriptions and Photography” document is within Appendix 9.2. Where the “Landscape and Townscape Appraisal” does not cover the whole study area, new character areas were identified, mapped and described using the information gathered. The character areas used for this assessment are shown on the “Landscape Character Areas” plan, Figure 9.1.

Determining the sensitivity of the receptors

9.3.6 Field survey and desk studies were carried out to determine the “sensitivity” of each of the landscape receptors (character areas) to change. The values were assigned based on descriptors in Table 9.1, which is an extract from IAN 135/10, to ensure clarity and consistency. The evaluation of the sensitivity of the receptor is judged on factors such as quality, value, rarity and contribution to wider landscape character, as well as the degree to which the particular characteristics could be replaced or substituted. The sensitivity rating is dependent on the nature of the proposed development and the ability of the existing landscape to accommodate the perceived changes.

Table 9.1 Landscape Sensitivity and Typical Examples

Sensitivity	Typical Descriptors and Examples
High	<p>Landscapes which by nature of their character would be unable to accommodate change of the type proposed. Typically, these would be;</p> <ul style="list-style-type: none"> • Of high quality with distinctive elements and features making a positive contribution to character and sense of place. • Likely to be designated, but the aspects which underpin such value may also be present outside designated areas, especially at the local scale. • Areas of special recognised value through use, perception or historic and cultural associations. • Likely to contain features and elements that are rare and could not be replaced.
Moderate	<p>Landscapes which by nature of their character would be able to partly accommodate change of the type proposed. Typically, these would be;</p> <ul style="list-style-type: none"> • Comprised of commonplace elements and features creating generally unremarkable character but with some sense of place.

Sensitivity	Typical Descriptors and Examples
	<ul style="list-style-type: none"> Locally designated, or their value may be expressed through non-statutory local publications. Containing some features of value through use, perception or historic and cultural associations. Likely to contain some features and elements that could not be replaced.
Low	<p>Landscapes which by nature of their character would be able to accommodate change of the type proposed. Typically, these would be;</p> <ul style="list-style-type: none"> Comprised of some features and elements that are discordant, derelict or in decline, resulting in indistinct character with little or no sense of place. Not designated. Containing few, if any, features of value through use, perception or historic and cultural associations. Likely to contain few, if any, features and elements that could not be replaced.

Determining the magnitude and impact

- 9.3.7 In accordance with the IAN 135/10 guidance, an assessment of the project characteristics, such as size and extent; location and alignment; type and massing; was used to determine the potential landscape impacts.
- 9.3.8 To determine impacts on vegetation, Figures 9.5 to 9.20 illustrate the hedgerows that are being lost and retained as a result of the Scheme, including Important Hedgerows. Figures 9.21 to 9.36 illustrate the impacts on trees and woodland as a result of the Scheme. For further details of the impacts on trees and woodland, refer to the Tree Survey and Arboricultural Impact Assessment report (CSLR-CAP-EGN-00-RP-V-0030) within Volume 4.
- 9.3.9 The magnitude of these impacts to each of the landscape receptors was determined by the descriptors set out in Table 9.2.

Table 9.2 Magnitude and nature of impact and typical descriptors

Magnitude of Impact	Typical Criteria Descriptions
Major adverse	Total loss or large-scale damage to existing character or distinctive features and elements, and/or the addition of new but uncharacteristic conspicuous features and elements.
Moderate adverse	Partial loss or noticeable damage to existing character or distinctive features and elements, and/ or the addition of new but uncharacteristic noticeable features and elements.
Minor adverse	Slight loss or damage to existing character or feature and elements, and / or the addition of new but uncharacteristic features and elements.

Magnitude of Impact	Typical Criteria Descriptions
Negligible adverse	Barely noticeable loss or damage to existing character or features and elements, and/ or the addition of new but uncharacteristic features and elements.
No change	No noticeable loss, damage or alteration to character or features or elements.
Negligible beneficial	Barely noticeable improvement of character by the restoration of existing features and elements, and/or the removal of uncharacteristic features and elements, or by the addition of new characteristic elements.
Minor beneficial	Slight improvement of character by the restoration of existing features and elements, or by the addition of new characteristic elements.
Moderate beneficial	Partial or noticeable improvement of character by the restoration of existing features and elements, and/ or the removal of uncharacteristic and noticeable features and elements, or by the addition of new characteristic features.
Major beneficial	Large scale improvement of character by the restoration of features and elements, and/ or the removal of uncharacteristic and conspicuous features and elements, or by the addition of new distinctive features.

Determining the significance of environmental effects

- 9.3.10 The first assessment determined the significance of the landscape effects without mitigation measures.
- 9.3.11 In accordance with IAN 135/10, this has been assessed at Construction Phase, Winter of Year 1 and Summer of Year 15. The effects on night time character has also been assessed. The significance of the landscape effects of the Scheme was derived by assessing the value, or “sensitivity” of the receptor, against the degree of chance, or “magnitude of impact” resulting from the development. These valuations are combined by referring to a matrix as shown within Table 9.3 to identify the “significance of effects”.

Table 9.3 Significance of effects categories

		Magnitude of Impact				
		No change	Negligible	Minor	Moderate	Major
Landscape sensitivity	High	Neutral	Slight	Slight/ Moderate	Moderate/ Large	Large/ Very Large
	Moderate	Neutral	Neutral/ Slight	Slight	Moderate	Moderate/ Large
	Low	Neutral	Neutral/ Slight	Neutral/ Slight	Slight	Slight/ Moderate

9.3.12 Table 9.4 provides typical descriptors of the significance of effects categories. Effects that are Moderate, Large, or Very Large are considered to be “significant”.

Table 9.4 Typical descriptors of the significance of effect categories

Significance category	Typical description of effect
Very large beneficial effect	The project would: <ul style="list-style-type: none"> • Greatly enhance the character (including quality and value) of the landscape • Create an iconic high-quality feature and/or series of elements. • Enable a sense of place to be created or greatly enhanced.
Large beneficial effect	The project would: <ul style="list-style-type: none"> • Enhance the character (including quality and value) of the landscape. • Enable the restoration of characteristic features and elements lost as a result of changes from inappropriate management or development. • Enable a sense of place to be enhanced.
Moderate beneficial effect	The project would: <ul style="list-style-type: none"> • Improve the character (including quality and value) of the landscape. • Enable the restoration of characteristic features and elements partially lost or diminished as a result of changes from inappropriate management or development. • Enable a sense of place to be restored.
Slight beneficial effect	The project would: <ul style="list-style-type: none"> • Complement the character (including quality and value) of the landscape. • Maintain or enhance characteristic features and elements. • Enable some sense of place to be restored.
Neutral effect	The project would: <ul style="list-style-type: none"> • Maintain the character (including quality and value) of the landscape. • Blend in with characteristic features and elements.

Significance category	Typical description of effect
	<ul style="list-style-type: none"> • Enable a sense of place to be retained.
Slight adverse effect	<p>The project would:</p> <ul style="list-style-type: none"> • Not quite fit the character (including quality and value) of the landscape. • Be at variance with characteristic features and elements. • Detract from a sense of place.
Moderate adverse effect	<p>The project would:</p> <ul style="list-style-type: none"> • Conflict with the character (including quality and value) of the landscape. • Have an adverse impact on characteristic features or elements. • Diminish a sense of place
Large adverse effect	<p>The project would:</p> <ul style="list-style-type: none"> • Be at considerable variance with the character (including quality and value) of the landscape. • Degrade or diminish the integrity of a range of characteristic features and elements. • Damage a sense of place.
Very large adverse effect	<p>The project would:</p> <ul style="list-style-type: none"> • Be at complete variance with the character (including quality and value) of then landscape. • Cause the integrity of characteristic features and elements to be lost. • Cause a sense of place to be lost.

Identifying mitigation measures

- 9.3.13 Design elements have been introduced to mitigate adverse effects of the Scheme. This was determined following the assessment phase during two mitigation workshops; the first on 28th March 2019 and the second on 6th June 2019.
- 9.3.14 As a result of these workshops, mitigation was listed in the Mitigation Schedule (Appendix 17.1) which can be cross referenced with the Mitigation Plans (Figures 17.1 – 17.3) to geographically locate each item, where applicable.

Assessing residual effects

- 9.3.15 Following the introduction of mitigation, receptors that were previously identified to have significant effects were assessed again. This residual impact assessment determined whether mitigation caused a change in significance of effects. Again, the effects have been assessed at both Construction Phase, Year 1 and Year 15, however, these assessments include mitigation measures. The assessment at different stages allows for a comparison to show how adverse landscape effects can be mitigated over time using planting design.

Identifying cumulative effects

- 9.3.16 The cumulative landscape impacts of any proposed developments within the study area have been assessed for all committed or existing developments. Further

details of these developments can be found in the Cumulative Effects section, later in this chapter.

9.4 Limitations and Assumptions

- 9.4.1 Access to private property was not be possible during field study. Field survey information was gathered from areas with public access only.
- 9.4.2 Information and details of the construction phase are subject to change and further clarification. This will include, but not be limited to, information such as: site compound locations, lighting, construction movement and access areas, stockpile locations. Utility diversions have not been assessed due to the unknown impacts of these on the landscape. To assess the impacts during the construction phase, information on the Temporary Works Areas and Compounds plan (CSLR-CAP-LPN-00-DR-Z-0202) has been used.
- 9.4.3 Information on hedgerows has been limited to the surveys carried out for this project. There are some hedgerows within the study area that were not surveyed due to restrictions on access. These are shown on the “Hedgerows lost to scheme” plans Figures. 9.5 to 9.21.
- 9.4.4 The Cumulative Effects section requires the assessment of other committed developments as well as the St Cuthbert’s Garden village indicative masterplan proposals, in accordance with the Scoping Opinion. In some cases, there is limited information available regarding the detail of the developments referred to in this section, for example, appearance, scale, density, vegetation loss and timescales of construction and completion. Therefore, the Cumulative Effects section is limited to general comments on the potential cumulative impacts and effects on landscape.

9.5 Consultations

- 9.5.1 Consultation has taken place with Natural England 13th August 2018. Their response did not include specific information relating to landscape.
- 9.5.2 Consultation has also taken place with Edward Page, planning officer at Cumbria County Council on 20th March 2019, as well as during both Mitigation Workshops.

9.6 Regulatory and Policy Framework

National Planning Policy Framework (NPPF), February 2019

- 9.6.1 The local planning policies echo the themes of the NPPF, February 2019, which are summarised below.
- 9.6.2 “Achieving well-designed places”, states that planning policies and decisions should ensure that developments: “are visually attractive as a result of good architecture, layout and appropriate and effective landscaping; are sympathetic to local character and history, including the surrounding built environment and landscape setting, while not preventing or discouraging appropriate innovation or change (such as increased densities); establish or maintain a strong sense of place, using the arrangement of streets, spaces, building types and materials to create attractive,

welcoming and distinctive places to live, work and visit.” - Section 12, Ministry of Housing, Communities and Local Government, February 2019.⁶⁰

- 9.6.3 NPPF’s policy on “*Conserving and enhancing the natural environment*” also states that planning policies and decisions should contribute to and enhance the natural and local environment by... “*protecting and enhancing valued landscapes. recognising the intrinsic character and beauty of the countryside... including the economic and other benefits of the best and most versatile agricultural land and of trees and woodland... minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures.*” - Section 15, Ministry of Housing, Communities and Local Government, February 2019.
- 9.6.4 NPPF’s policy on “Conserving and enhancing the historic environment” states that planning strategies should take into account “the desirability of new development making a positive contribution to local character and distinctiveness; and opportunities to draw on the contribution made by the historic environment to the character of a place.” - Section 15, Ministry of Housing, Communities and Local Government, February 2019.

Local planning policy: Carlisle District Local Plan 2015 – 2030⁶¹

- Policy SP 6 - Securing Good Design,
- Policy SP 8 – Green and Blue Infrastructure,
- Policy GI 1 – Landscapes,
- Policy GI 4 - Open Space,
- Policy GI 5 - Public Rights of Way,
- Policy GI 6 - Trees and Hedgerow.

Neighbourhood planning policy: Dalston Parish Neighbourhood Plan 2015 - 2030⁶²

- Strategic Objective 1. “To ensure that development is of an appropriate scale for its location, is designed to a high quality, is genuinely sustainable and reflects local character and distinctiveness.”
- Strategic Objective 6. “To protect and enhance the natural and built environment of the Parish, including its landscape, geological assets (...), built heritage, archaeological sites and wild-life habitats.”
- Policy DNP-SP 1 – Sustainable Development – this policy highlights the importance of landscape character in the following extract:

⁶⁰ Ministry of Housing, Communities and Local Government, 2019. National Planning Policy Framework.

⁶¹ Carlisle City Council, 2016. Carlisle District Local Plan 2015 – 2030.

⁶² Dalston Parish Council, Dalston Parish Neighbourhood Plan 2015 – 2030.

“1. Development should reflect the unique distinctiveness of Dalston Village or the particular settlement or location within the Parish. 2. Development proposals that, as viewed from publicly accessible locations, will visually significantly diminish the openness of the rural gap between Carlisle and Dalston, north of the railway line, will not be supported unless they:

- *Have been identified through masterplanning as necessary for the implementation of St Cuthbert’s Garden Village; or*
 - *Propose employment premises within or adjacent to groups of buildings without adverse impact on the rural landscape and where there would be no significant adverse residential or visual amenity impacts;*
 - *Relate to essential utility infrastructure that cannot be located elsewhere.”*
- Policy DNP-E 1 Landscape, Habitats and Rural Character – this policy stated that: *“in order to be supported, development proposals must demonstrate they will not significantly detrimentally affect the Parish’s landscape, wildlife habitats, rural character, green spaces, footpaths, cycleways, bridleways, built heritage, archaeological sites and ecosystems.”* It also makes specific reference to the value of the landscape around the River Caldew and the footpaths, bridleways and cycleways within the Parish.
 - Policy DNP-E 3 Historic Boundary Walls
 - Policy DNP-E 4: Local Green Spaces.

9.7 Baseline Conditions

9.7.1 The study area extends over a 500m envelope around the proposed development site and over a 1km envelope around major structures, to consider how the Scheme will affect the character of the surrounding landscape.

9.7.2 The baseline landscape character considers existing landscape character at a national, regional and local level.

Landscape Character Areas: Level 1 - National

9.7.3 The national level considers the “National Character Area Profile 6. Solway Basin”, Natural England, 2015.

Landscape Character Areas: Level 2 – Regional

9.7.4 The existing landscape character is described at a regional level in the “Cumbria Landscape Character Guidance and Toolkit”, March 2011; which categorises the existing landscape character within the study area into the following landscape character areas: “5a: Lowland Ridge and Valley”, “5b: Low Farmland”, “5d: Urban Fringe” and “Urban Area”. The “Urban Areas” have not been described in this assessment, so this will need further field and desk survey to determine this.

Landscape Character Areas: Level 3 – Local

- 9.7.5 For this assessment, the baseline has been established at a local level, predominantly using the six local landscape and townscape character areas identified in the “Landscape and Townscape Appraisal”.
- 9.7.6 Where this level of information was not available for part of the study area, further field and desk survey information has been gathered to provide baseline information and determine the sensitivity to change.
- 9.7.7 The “Landscape Baseline Descriptions and Photography” Appendix 9.2 provides further detail and photography illustrating the different landscape receptors for this assessment and their sensitivity to change.

Sub-Urban Carlisle: 1960’s Residential Cul-De-Sac

Key characteristics:

- Open grain of residential properties, set back from the road within generous plots with wedges of open space.
- Muted colour palette, with predominantly modern brick 1960’s semi-detached properties and bungalows.
- Mixed urban boundaries, including bow top fencing, chainlink fencing, modern brick walls, timber panel fencing and residential hedging.
- Open spaces are not particularly diverse in vegetation, predominantly being mown grass with a small number of isolated ornamental trees.
- Tranquillity varies across the character area but there are some areas of calm due to the scale of the estate, away from the busier roads.

Night Time Character

- 9.7.8 Due to the urban, residential land use within this character area, artificial lighting levels are relatively high and traffic flows vary, depending on proximity to the busy A595. The residential character means that traffic levels away from this road are relatively low.

Landscape Designations

- 9.7.9 There are no landscape designations within this character area.

Changes in The Landscape

- 9.7.10 Due to land allocations in the area for residential and employment, it is likely that after 15 years tranquillity levels will reduce further and the sense of openness that can be found in certain areas will be lost, increasing the sense of enclosure.

Sensitivity

- 9.7.11 Due to the sub-urban character of this area, there not being any landscape designations and there not being any particularly locally distinctive features of value present; it is considered that this character area would be able to accommodate change of the type proposed. Therefore, the sensitivity of this landscape receptor has been classed as: **LOW**.

Carlisle Urban Fringe: Transport Corridor and Mixed Residential

Key Characteristics

- Long term urban influences on agricultural land, including various new housing developments that do not respond to their location in appearance, or scale.
- Agricultural character at risk of being lost due to urban pressures.
- Medium sized, regular fields bounded by hedgerows, with more hedgerow trees west of the A595.
- Many of the hedgerows in this area have become leggy due to lack of management.
- Some areas of poorer land management, typically grazed by sheep, used as small horse paddocks or left unmanaged.
- Small cluster of Garden Village early 20th century housing provides architectural interest on the approach to Carlisle, which is damaged by fuel station and more modern housing estates.
- Busy A595 road into Carlisle and further traffic noise from other busy roads has an effect on tranquillity.

Night Time Character

- 9.7.12 The night time character of this area is less illuminated than a typical urban fringe environment, with street lighting columns focused around the A595 and the A595/ Peter Lane roundabout but continuing along the main roads. Traffic along the major roads will also contribute to the urban qualities, as well as the residential development on the corner of Peter Lane and Dalston Road.

Landscape Designations

- 9.7.13 There is one Grade II listed building and one Grade II listed milestone in this character area. There are also several individual TPO trees a TPO group on the western side of the A595 along Glaramara Drive and Suttle Lane. Important Hedgerows are recorded along the southern edge of this character area, to the north of Peter Lane and to the north of the A689.

Changes in the Landscape

- 9.7.14 Much of this area is allocated for residential development, employment development or primary shopping area. It is highly likely that this area will undergo significant transformation in the next decade, including loss of hedgerows, loss of agricultural land, further loss of tranquillity and increasing urbanisation.

Sensitivity

- 9.7.15 This area is sub-urban in character and includes several major roads. There are few landscape designations (other than one Grade II listed building and one Grade II listed milestone) and there are not many locally distinctive features of value. It is, therefore, considered that this character area would be able to accommodate change of the type proposed. Therefore, the sensitivity of this landscape receptor has been classed as: **LOW**.

Carlisle Urban Fringe: Lowland Ridge and Valley Transport Corridor*Key Characteristics*

- Long distance views of both the Lake District fells and the north Pennines.
- Medium distance views of south Carlisle, including the Pirelli factory which is a landmark feature but forms an unattractive feature in the landscape.
- Gently sloping topography, open in character with very slight ridges and valleys.
- Well managed regular shaped medium to large pasture fields, bounded by hedges and hedgerow trees.
- Broadleaf woodland shelter belts, and coniferous plantation woodland intersperse the open landscape.
- Scattered farms and equestrian yards.
- Urban interventions include large pylons, wind turbines and solar panels.
- Linear settlements with a mixture of vernacular brick or sandstone buildings and more modern styles.
- Busy rural roads and main link roads with large highway signage, lighting columns, roundabouts and high traffic volumes.
- Renewable energy including solar panels and wind turbines form dominant features in the landscape.
- Large electricity pylons also run through this character area.

Night Time Character

- 9.7.16 The night time character of this area is still influenced by the busy A595 and the A595/ Dalston Road roundabout, where there is a number of street lighting columns permanently illuminating the roundabout. However, the remainder of this area has a very rural night time character, with little artificial lighting or residential development. The road network through this area will provide a sense of urban activity through this area.

Landscape Designations

- 9.7.17 There are three Grade II listed buildings/ structures, the two buildings lie within Newby West and milestone on the A595 at Newby Cross. There are several Important Hedgerows within this character area, (both for archaeology and history and for wildlife and landscape).

Changes in the Landscape

- 9.7.18 There are no allocated sites for development in this area. Changes in the landscape may be influenced by changes in agricultural practices or stewardship schemes. There is a potential that there may be an increase in use of land for renewable energy infrastructure in the future.

Sensitivity

- 9.7.19 It is considered that this receptor would be able to accommodate change of the type proposed. Whilst there is some sense of place and features of value, there are no statutory landscape designations and the presence of some features that lower the quality of the overall landscape, including the dominance of the busy road network and associated infrastructure.
- 9.7.20 Therefore, the sensitivity of this landscape receptor has been classed as: **LOW**.

Gently Rolling Lowland Ridge and Valley Farmland and Industrial Cummersdale*Key Characteristics*

- Gently undulating land that rises to a high point of 74m at High Brownelson, a relatively pronounced hill in the wider context, bounded to the south and east by the shallow incised Caldew valley;
- Strongly rectilinear field pattern in the west, defined by a series of access tracks running perpendicular to the long straight of the B5299, and reinforced by field boundary trees;
- More irregular fields in the east, with occasional shelterbelts linking to the woodlands that emphasise the edge of the Caldew valley, including established broadleaf woodland;
- Little natural landcover, though generally intact hedges with trees form a habitat network linking to the Caldew corridor;

- Occasional clumps of trees, with larger plantation blocks west of the B5299;
- Woodland forms a screen to the Pirelli factory, though the buildings and chimneys are a visual presence in the north of the area;
- Cummersdale presents an abrupt boundary of garden fences, though with mature vegetation and trees to soften the settlement edge;
- Limited road access through the area to the Caldew, other than via Cummersdale, contrasting with the busy nature of the B5299 Dalston Road;
- Individual dwellings located primarily along the B5299, with urban development ongoing to the north-west;
- Rights of way linking the B5299, Cummersdale and the Caldew valley;
- Views from higher ground over the Caldew to the distant North Pennines – long views from the B5299 look north to Dixon’s Chimney and south to the Lakeland Fells; and
- Away from the B5299 this is an undeveloped rural landscape, though the Pirelli factory and the village of Cummersdale influence the level of tranquillity in the north;
- Agricultural core of High Cummersdale;
- Victorian civic buildings within Cummersdale.
- A combination of both sandstone and traditional brick are common throughout the village, for building materials and walling.

Night Time Character

- 9.7.21 This area is sparsely populated and is predominantly agricultural land, with the exception of Cummersdale. No through roads cross through this character area, meaning that the night time character is much more rural, despite being close to the edge of the city. Cummersdale is a small village with some artificial lighting. Some street lighting can also be found on Dalston Road on the edge of this character area.

Landscape Designations

- 9.7.22 Grade II Listed Buildings include: Spinners Arms and Cummersdale House. There are TPO groups and individual TPO trees (ref. TPO292) within Cummersdale Village on Caldew Road. There are several Important Hedgerows within this character area, (both for archaeology and history and for wildlife and landscape).

Changes in the Landscape

- 9.7.23 The St Cuthbert's Garden Village proposals currently indicate that much of the agricultural land will be used for residential development, meaning that it is likely that land use and character within area will be transformed.
- 9.7.24 Further changes in the landscape may be influenced by changes in agricultural practices or stewardship schemes. There is a potential that there may be an increase in use of land for renewable energy infrastructure in the future.

Sensitivity

- 9.7.25 This landscape provides some sense of place and features of value, but no landscape designations (other than several Grade II listed buildings). There are also some features that lower the quality of the overall landscape. It is considered this character area would be able to partly accommodate change of the type proposed. Therefore, the sensitivity of this landscape receptor has been classed as: **MODERATE.**

Caldew River Valley Green Corridor, Mill and Print Works*Key Characteristics*

- The River Caldew meanders through a shallow valley contained by often steeply sloping valley sides, opening out to a wider floodplain in the north;
- The modest river follows a gently sinuous course forming pools, riffles and gravel bars, with visible evidence of river terraces, former river channels and dried-up oxbow lakes;
- A series of small tributary becks enter the Caldew from the east, flowing through incised gullies providing pockets of topographical variety along the valley sides;
- In the south of the area, landcover comprises a mix of riparian woodland, grassland, mature woodland, and areas of open river banks covered with semi-mature trees and scrub;
- Further north, the wide floodplain is divided into large regular fields of improved pasture by neat hedges, though the more naturalistic landcover continues through the open space to the west of the river;
- Significant areas of mature deciduous woodland along the steeper valley sides, as well as a concentration of riparian woodland around the print works;
- The most extensive areas of woodland and semi-natural land cover in the study area, with the Caldew forming part of the River Eden SSSI and Special Area of Conservation;
- The Cumbria Coast railway line follows the river, with embankments crossing the floodplain and several stone-built underbridges;

- Visible industrial heritage including the brick chimney at Cummersdale
- Print Works, and weirs and mill lades;
- Overt modern structures are infrequent, though the print works and Pirelli factory are visible in the north, and a large railway bridge is a prominent feature – much further south a twin row of pylons cross the valley;
- No roads run through the main valley (with the exception of the quiet, minor access road to the industrial works to the north), and there are no road crossings of the river, contributing to a sense of tranquillity that is emphasised by the enclosed wooded landscape;
- For walkers and cyclists it is a more accessible area, forming a green corridor for the Cumbria Way long-distance route and local footpaths connecting Denton Holme with Cummersdale, Blackwell and Dalston;
- A visually contained area, the southern part is particularly enclosed with an intimate and secluded character and offers the most tranquil landscape of the study area.

Night Time Character

- 9.7.26 This character area is very rural and features very few urban influences or artificial lighting. The only features that likely to affect night time character may include the railway, which will have a very infrequent impact. Caldew Road is a minor road at the north of the character area and only leads to the industrial buildings to the north, which do have some artificial lighting, making the character here more urban but relatively inactive.

Landscape Designations

- 9.7.27 Grade II listed Building Caldew Bank lies close to the large industrial buildings in Lower Cummersdale. Dalston Hall Wood is an Ancient Woodland, in addition to an area of woodland to the west of the Racecourse, known as Toddhill Wood. An area of mature woodland with ancient characteristics to the south of Peastree Wood also falls within this character area. Important Hedgerows are on the edge of this character area, (both for archaeology and history and for wildlife and landscape).

Changes in the Landscape

- 9.7.28 This character area features the most natural landscapes within the study area and there are no allocations for development within this area. The area around the industrial print works buildings may adapt through time, however, little development is likely overall. The railway may undergo improvement works in the future.
- 9.7.29 In the main valley area, changes in the landscape may be influenced by changes in agricultural practices or stewardship schemes. The changing course of the River Caldew may influence land use or landscape pattern in this area.

Sensitivity

- 9.7.30 The area is tranquil and visually contained, with numerous natural, historic and cultural features that add to the sense of place of this valley. However, there are few landscape designations in the area and the presence of urban infrastructure such as the electricity pylons, the railway and palisade fencing and a wind turbine are apparent in the area and reduce the quality slightly. Therefore, the sensitivity of this landscape receptor has been classed as: **MODERATE**.

Carlisle Urban Fringe: Busy Linear Settlements, Racecourse and Irregular Field Patterns

Key Characteristics

- Gently undulating land, sloping gently down to north and west from more elevated land south of Durdar at Burthwaite Hill;
- To the west the land falls away to the shallow incised valley of the River Caldew and to the north is a more gradual slope down towards the edge of Carlisle;
- The incised courses of two small streams provide slight topographical variation in the west of the area;
- Large, semi-regular arable fields, with hedges and some hedgerow trees and some distinctive lines of mature trees and shelterbelts;
- Smaller, elongated rectangular fields of pasture are located adjacent to the settlement edge of Durdar, and tend to be enclosed by more continuous hedgerows with more trees;
- Woodlands include the rectangular blocks of Cat Wood and Tarn Wood near Durdar, and Toddhills Wood that provides a link between the racecourse and the Caldew;
- An intensively farmed area, with limited habitat though with important connections to native broadleaf woodland in the Caldew valley;
- Limited time depth in the landscape, deriving from localised patterns of narrow fields, and occasional stone gate posts, and from the remnant rural settlement of Blackwell;
- More developed than other parts of the study area, Durdar Road provides a spine for a series of linear developments including the villages of Blackwell and Durdar;
- The rural character of “old” Blackwell is subsumed by the suburban character of houses along Durdar Road which, like the housing in Durdar, does not relate strongly to the rural setting;

- The racecourse includes a number of larger buildings including a modern grandstand which is the tallest building in the area and forms a key local landmark, while the white fencing and extensive car parks extend the influence of the racecourse into the wider landscape;
- Durdar Road and Newbiggin Road are busy routes through this area, in contrast with the quieter, narrower Scalegate Road;
- Few public rights of way serve Durdar, though there are links to the Caldew corridor in the west part of this area, and a key link from Cummersdale through Blackwell to Upperby;
- Occasional longer distance views, mainly from the edges of this plateau area, looking east to the North Pennines; north over Carlisle towards Scotland; and glimpses south-west to the Lakeland Fells;
- A more open and exposed landscape in the north, where trees are fewer, while the south-west has the most rural character in this area, though the level of development limits tranquillity across this character area;
- Agricultural character and origins of main townscape components of Blackwell – Blackwell Farm and Blackwell House;
- Ribbon development at Blackwell along Durdar Road;
- Durdar cross-roads: former inn and smithy;
- Suburban cul-de-sacs within Durdar.
- Linear pattern of rural road network.

Night Time Character

- 9.7.31 Carlisle Racecourse and the urban areas around Durdar and Blackwell result in an increase in urban character in this character area. Street lighting along Durdar Road and Newbiggin Road provides permanent illumination, as well as the lighting from housing, the racecourse and the road network, which provide a sense of activity through traffic lighting and noise. Away from the villages, rural night time characteristics increase.

Landscape Designations

- 9.7.32 A small portion of the Ancient Woodland at Toddhill Wood, to the west of the Racecourse is included within this character area. An area of mature woodland with ancient characteristics to the south of Peastree Wood also falls within this character area. There are also several individual trees with TPO's (ref. TPO132) to the north of the residential development on Newbiggin Road and on the northern edge of the road itself. There is also a TPO group (ref.152) to the north of the same residential area, overlapping some of the individual trees. There are a large number of Important Hedgerows in this area (both for archaeology and history and for wildlife and landscape).

Changes in the Landscape

- 9.7.33 The St Cuthbert's Garden Village proposals currently indicate that the majority of the agricultural land within this character area will be used for residential development, with a smaller area of employment land to the south of Durdar. This would result in a significant change in land use and character, transforming this landscape.
- 9.7.34 Further changes in the landscape may be influenced by changes in agricultural practices or stewardship schemes. There is a potential that there may be an increase in use of land for renewable energy infrastructure in the future.

Sensitivity

- 9.7.35 This landscape does have numerous features which provide some sense of place. However, due to the sub-urban character, existing busy roads and there being few landscape designations, it is considered that it would be able to partly accommodate change of the type proposed. Therefore, the sensitivity of this landscape receptor has been classed as: **MODERATE**.

Agricultural Brisco And Historic Parkland

Key Characteristics

- Generally sloping down to the north and east towards Carlisle and the Petteril valley, from a high point at Burthwaite Hill to the south;
- Small incised valley of the Cammock Beck runs through the north of the parcel providing localised variation in topography, and framing the ridge on which Brisco sits;
- Open farmland, primarily under arable cultivation but with occasional smaller fields of pasture;
- Relatively simple field pattern comprising large and moderately sized fields of regular form, though with remnants of strip-field patterns around Brisco;
- The flatter area around Newbiggin Road and Oakland House has a strongly rectilinear pattern that extends west towards Durdar;
- Intactness of field boundary hedges varies significantly, with the most continuous sections, as well as the most numerous field boundary trees, in the area around Brisco;
- A significant number of mature field trees, as well as clumps of woodland around farms and houses, also contribute to the well-established character around Brisco, which continues south to the remnant designed landscape associated with Newbiggin Hall;

- Generally intensively farmed, with limited patches of semi-improved grassland, and regenerating scrub in the north by the Petteril, as well as some extensive private gardens;
- Two minor roads radiate out from Upperby, one passing through Brisco and another further west, which continue south to the villages of Wrey and Burthwaite respectively – the long straight of Newbiggin Road links these in the south;
- Although extensive, the Lough Farm equestrian centre and the former brickworks east of Brisco are not prominent in the landscape;
- Little public access, with only two footpaths that both run from Brisco Road to the Petteril;
- Views from the elevated ridge around Brisco Hill look eastward across the Petteril to the North Pennines, as well as westward towards the racecourse buildings; and
- Panoramic views are available from the high point on Brisco Road, looking north across Carlisle towards Scotland; east to the North Pennines; and south-west to the Lakeland Fells.
- Strong historic core formed by Brisco Hall and its associated farmsteading, and the Georgian farmhouse of Brisco Farm.
- Brisco Common is an important, if modest, feature.
- This character area extends to the M6 motorway, which has a significant effect on tranquillity locally. A motorway maintenance compound also lowers the quality of the landscape locally in this area.
- Impressive, curved, sandstone walls provide strong entrance features into both Woodside Lodge and Brisco Hill.
- The West Coast Main Line provides a strong boundary to this character area to the east. A length of this has been recently deforested, resulting in a loss of green infrastructure in the area.
- Linear road network creates a strong pattern in the landscape.

Night Time Character

- 9.7.36 This majority of this character area has a very rural night time character, with no significant artificial street lighting, even in residential areas around Brisco and on the main road network. The only lighting will come from residential properties and farms themselves, which are concentrated along the road network in a linear pattern. Traffic will provide some sense of activity. To the south, the busy M6 motorway and Junction 42 provide an almost constant stream of night time activity,

which will locally affect some of this character area. To the east, the West Coast Main Line also contributes to this activity.

Landscape Designations

- 9.7.37 Several listed buildings and features can be found within this character area. There are four Grade II listed buildings within Brisco, as well as St Ninians Well, just to the north east of the village. Two other listings are at Woodside Lodge and include the Lodge and Stableblock and the gate piers. Two areas of Ancient Woodland are designated within this character area, however, the majority of Sawpit Wood has been noted to have been felled. A smaller area of Ancient Woodland can be found south of Woodside Beck.
- 9.7.38 There are a large number of Important Hedgerows within this character area (both for archaeology and history and for wildlife and landscape). An area of open land in Brisco is designated as Common Land.

Changes in the Landscape

- 9.7.39 The St Cuthbert's Garden Village proposals currently indicate that an area to the north of Brisco will undergo development for residential use. This could have damaging effects on the traditional characteristics of this linear village.
- 9.7.40 Further changes in the landscape may be influenced by changes in agricultural practices or stewardship schemes. There is a potential that there may be an increase in use of land for renewable energy infrastructure in the future.

Sensitivity

- 9.7.41 There are many features and characteristics that add quality to this character area. However, due to the limited number of landscape designations and the adverse effects of the M6 motorway and the West Coast Mainline, it is considered that this landscape would be able to partly accommodate change of the type proposed. Therefore, the sensitivity of this landscape receptor has been classed as: **MODERATE**.

Elevated Burthwaite and Rolling Farmland

Key Characteristics

- Rolling topography contrasts with the flatter areas around Durdar and Newbiggin Road.
- Elevated position on ridge provides long distance views to the Pennines to the east and the Lake District fells to the south.
- Pastoral fields, irregular in shape and relatively small in size, with hedgerow boundaries with some hedgerow trees. Not all hedgerows are intact, however, with post and wire stock proof fence boundaries in some areas.
- Some of the fields are rougher in appearance due to management and use for grazing, with some better quality fields used for silage.

- Small areas of mixed woodland and broadleaf shelterbelts are a key characteristic, providing some sense of enclosure, despite the more exposed, elevated position.
- A narrow, minor road runs north-west to south-east through Burthwaite, along which the majority of the linear settlement lies.
- Burthwaite is a very small hamlet, with residential buildings modest in scale, a range of ages and styles and with a mixture of sandstone and render with slate roofs. Several farms exist within the village, with agricultural buildings and a silage pit.
- An area adjacent to an area of woodland is being used as allotments.

Night Time Character

- 9.7.42 This area is particularly rural and has no artificial street lighting. A small amount of lighting will be noticeable from the small number of properties within Burthwaite. Traffic along this minor road will contribute to a sense of urban activity in the area, however, this is limited.

Landscape Designations

- 9.7.43 There are no landscape designations within this character area. Hedgerows within this character area were not surveyed, so it is not known if these are classed as Important Hedgerows.

Changes in the Landscape

- 9.7.44 There are no allocated sites for development in this area. Changes in the landscape may be influenced by changes in agricultural practices or stewardship schemes. There is a potential that there may be an increase in use of land for renewable energy infrastructure in the future.

Sensitivity

- 9.7.45 The rural, slightly more isolated qualities of this landscape provide some sense of place and characteristics of interest. However, due to the elements being generally commonplace and the lack of landscape designations, it is considered that this landscape would be able to partly accommodate change of the type proposed. Therefore, the sensitivity of this landscape receptor has been classed as:
MODERATE.

Petteril River Valley Green Wedge and Transport Corridor

Key Characteristics

- Shallow valley comprising flat and gently sloping banks, low river terraces and floodplain, and meandering river course, contained by gradually sloping sides;
- Fossilised river channels and oxbow lakes visible alongside the main channel;
- A generally open landscape, with river terraces forming local containment;

- Shallow, gentle, slow flowing river featuring pools, riffles and gravel banks, though with propensity to flood across the valley floor;
- Medium-large sized fields of pasture, irregular in shape, and with weaker field boundaries than elsewhere;
- Semi-natural grassland in the north as the valley transitions from farmland to urban green corridor;
- Riparian woodland, particularly in the north, but intermittently following the river as well as some former channels;
- Beyond the M6, the valley narrows and woodland cover increase towards Newbiggin Woods nature reserve;
- There are few buildings, though the area is bounded by a main road and railway line and overlooked by settlement at Carleton;
- Tranquillity is particularly limited around the M6, where Junction 42 has a significant presence in the landscape;
- Footpaths line the river, with footbridges allowing access between Harraby, Upperby, Carleton and the popular car park close to the M6 that gives access to Wreay Woods; and
- Views along and across the valley from locations on the A6, from the edge of Harraby, forming a key part of the approach to Carlisle from the south-east.
- The M6 and Junction 42 roundabout and bridges have a strong presence within this character area, severing the river valley and creating a lack of connection.
- There are numerous bridges in the area, many of which are utilitarian road bridges in appearance, with concrete being the predominant material. In pleasant contrast, a newer footbridge over the Petteril, provides great architectural quality and character, using sandstone and weathering steel and a gently arching profile. Unfortunately, this is compromised due to the close proximity to two unattractive road bridges.
- The buildings around Newbiggin Hall provide great architectural quality and strong local character, with sandstone buildings, walls and slate roofs.
- The West Coast Main Line provides a strong boundary to this character area to the west. A length of this has been recently deforested, resulting in a loss of green infrastructure in the area.
- The A6 provides a strong boundary to the north-west, which forms a strong feature in the landscape due to its straight nature.

- The course of an old Roman road runs parallel with the A6, which has connection with the Park House Roman Fort that lies outside of this character area, to the south-east.
- Newbiggin Wood forms a strong feature in the landscape and its maturity provides rich character and a sense of time depth in the landscape. The banked valley side emphasises the sense of enclosure in this area of the valley.
- Fewer indicators of the remnant designed landscape associated with Newbiggin Hall, which has been severed by the West Coast Mainline Railway.

Night Time Character

- 9.7.46 The busy M6 motorway and Junction 42 provide an almost constant stream of night time activity, as well as the A6 and Newbiggin Road. The West Coast Main Line also contributes to this activity. Artificial street lighting is particularly focused around the M6 Junction 42 roundabout and the A6, which provide an elevated boundary to this character area.

Landscape Designations

- 9.7.47 Newbiggin Wood is both an Ancient Woodland and Local Nature Reserve. A concentration of listed buildings can be found at Newbiggin Hall, including Newbiggin Hall itself and a wall to the south-west which are both Grade II* listed. In addition to these, the Farmhouse and attached outbuildings, the Barns and an Ice House are all Grade II listed. There are Important Hedgerows to the north of Newbiggin Hall (for wildlife and landscape).

Changes in the Landscape

- 9.7.48 There are no allocated sites for development in this area. Changes in the landscape may be influenced by changes in agricultural practices or stewardship schemes. There is a potential that there may be an increase in use of land for renewable energy infrastructure in the future.
- 9.7.49 The changing course of the River Petteril may influence land use or landscape pattern in this area.

Sensitivity

- 9.7.50 This landscape contains many natural, historical and cultural elements and characteristics of interest that add to the sense of place of this area. However, due to the heavy presence of the M6, Junction 42, Newbiggin Road, the A6 and associated infrastructure, it is considered that it would be able to partly accommodate change of the type proposed. Therefore, the sensitivity of this landscape receptor has been classed as: **MODERATE**.

Elevated, Agricultural Carleton, Rolling Farmland and Transport Corridor

Key Characteristics

- An undulating landscape of slightly elevated rolling farmland, falling west to the Petteril and northward towards Scotby;

- The sloping western edge provides a setting to the shallow Petteril valley, with a skyline of mature trees as viewed from the A6 south of Carleton;
- Wash Beck flows north to Scotby, while an unnamed beck flows west under the M6 and into the Petteril, demonstrating the nature of this area as a low ridge;
- A particularly distinctive set of narrow fields associated with Carleton, with more irregular fields further east, and south of the M6 a strongly rectangular series of fields;
- Lines of trees follow the few becks and lanes and occasional field boundaries, though the main concentration of woodland is the roadside vegetation along the M6 and Junction 42;
- Predominantly pastoral area, with limited semi-natural land cover, though with important links to the upper Petteril and Newbiggin Woods to the south;
- Limited time depth visible except in the vicinity of Carleton and its historic field patterns;
- Settlement fringe character present in the north at the edge of Carlisle and extending along the A6 south of Carleton;
- The M6 Junction 42 is a substantial visual and audible presence in the landscape, with associated development extending its influence;
- Limited footpath access into this area, though important links to the Petteril valley and north across the M6;
- Long views east to the North Pennines are common in this area, and southern views look to Carrock Fell;
- Views over the Petteril valley from the western edge of this landscape, though the wider area is not overlooked and has indistinct skylines; and
- Rural tranquillity in this area is limited by the presence of busy roads and the generally intensive nature of the farmland.

Night Time Character

- 9.7.51 The busy M6 motorway and Junction 42 provide an almost constant stream of night time activity, as well as the A6 and Newbiggin Road. Artificial street lighting is particularly focused around the M6 Junction 42 roundabout and the A6.

Landscape Designations

- 9.7.52 There is a TPO group, (reference TPO162) to the north-west of Junction 42. Hedgerows in this character area were not surveyed, therefore, it is not known

whether there are any Important Hedgerows present. There are a high percentage of Grade II Listed Buildings within Carleton village.

Changes in the Landscape

- 9.7.53 The current proposals for the St Cuthbert's Garden Village indicate a large area of additional residential development to the south east of Carleton, linking the A6 and Cumwhinton Road. It also indicates a large area of land that would be used for employment to the north east of Junction 42. An increase in urban pressures may lead to further urbanisation of the road network.
- 9.7.54 Further changes in the landscape may be influenced by changes in agricultural practices or stewardship schemes. There is a potential that there may be an increase in use of land for renewable energy infrastructure in the future.

Sensitivity

- 9.7.55 It is considered that due to both the existing large amount of urban infrastructure in this area affecting landscape quality and the limited number of landscape designations in the area, this receptor would be able to accommodate change of the type proposed. Therefore, the sensitivity of this landscape receptor has been classed as: **LOW**.

9.8 Impact Assessment

- 9.8.1 An impact assessment has been undertaken to assess the significance of effects of the Scheme without mitigation at Construction Phase, Operational Phase (Winter Year 1). Due to there being no significant change between Winter Year 1 and Summer Year 15 without any proposed mitigation, a repeat assessment for Summer Year 15 was not included. An additional assessment of the effects on night time character has also been included within this section to assess the significance of increased artificial lighting as a result of the Scheme.

Construction Phase

- 9.8.2 Table 9.5 sets out the identified impacts arising from the construction phase on the landscape character of the area.

Operation Phase: Winter Year 1

- 9.8.3 Table 9.6 sets out the identified impacts at winter of Year 1 of operation on the landscape character of the area.

Table 9.5 Impact Assessment - Construction Phase

Receptor	Impact	Effect	Magnitude	Significance
Suburban Carlisle: 1960's residential cul-de-sac <i>(low)</i>	No change	No effect	No change	Neutral Effect
Sub-urban Carlisle: Urban fringe transport corridor and mixed residential <i>(low)</i>	<p>A main site compound will be located in an existing field within this character area to the north east of the proposed roundabout.</p> <p>The A595 will be widened and two large embankments will be created up to (approx. 8m in height) will be constructed and a new foot and cycle bridge crossing to the north of the proposed roundabout (which is predominantly within the adjacent character area).</p> <p>Vegetation loss will include loss of hedgerows along the A595, where the road will be widened and for the creation of new embankments for the new foot and cycle bridge. To the west of the A595/ A689 junction, approximately 7no. mature trees will be lost from within one of the lost hedgerows, plus some younger hedgerow trees that were planted as part of the Carlisle Northern Development Route (CDNR).</p>	<p>Adverse effects include:</p> <p>The construction of 6m high embankments and new bridge will increase the urban character and damage the quality of the landscape in this area, partially creating a visual barrier with the surrounding landscape to the south and introducing a dominant vertical feature which is uncharacteristic of this landscape.</p> <p>The site compound will cause both damage to the agricultural land and will be discordant to the landscape in this area. Due to the scale of this compound it is likely that it will become a dominant feature in the landscape. This will lower the quality of the landscape.</p> <p>Increased construction activity will detract from the rural qualities of this landscape which were already under pressure from the busy transport corridors.</p> <p>Vegetation loss in this area during construction will be damaging to some of the key features in this character area, including hedgerows boundaries and mature hedgerows trees.</p>	Major Adverse	Moderate Adverse Effect
Carlisle urban fringe: lowland ridge and valley farmland and transport corridor <i>(low)</i>	<p>The construction of the new, larger roundabout around the existing A595/ A689 roundabout.</p> <p>Felling of approx. 16no. mature hedgerow trees to allow for road widening of the A595 to the south of the newly constructed roundabout.</p> <p>Felling of three large areas of young mixed broadleaf tree planting adjacent to the existing A595 roundabout and within the centre.</p> <p>Felling of a group of mixed conifers and broadleaf woodland to allow for the creation of a new access to Kingrigg.</p> <p>Felling of approximately 11no. hedgerow trees to the south of Peter Lane, within sections of Important and non-designated hedgerows that will be removed during construction.</p> <p>The phasing of the construction of this roundabout will cause increased congestion and construction traffic movements on the existing road network during this phase and will further add to the sense of business and urban character of this transport corridor.</p> <p>To the south of the new road corridor, a strip of the mature, coniferous plantation woodland will be clear felled with a "scalped edge" (to reduce the risk of windfalls).</p> <p>Earthworks and construction activities within the road corridor will sever the fields to the west and east of the plantation woodland.</p> <p>Large excavations will be required for a two drainage ponds between Peter Lane and the proposed road corridor, creating large footprints of excavated ground in this area.</p>	<p>Adverse effects include:</p> <p>Loss and damage to the quality of the managed, agricultural landscapes.</p> <p>Loss and severance of both the hedgerow trees and hedgerows (including Important Hedgerows) which are key features in this landscape. This will have an adverse effect on landscape character and the historic landscape.</p> <p>Severing of rectilinear field patterns will weaken this key characteristic.</p> <p>Loss of a large proportion of plantation woodland will create a noticeable "scar" in the landscape here, particularly due to the scalped edge which is discordant with the rectilinear blocks and patterns that are typical of this landscape.</p> <p>An increase in urban features and construction traffic will have an adverse effect on the rural qualities of this character area. The large site compound between Peter Lane and the new road cause both damage to the agricultural land and will be discordant to the landscape in this area. Due to the scale of this compound it is likely that it will become a dominant feature in the landscape, particularly together with the large road corridor. This will lower the quality of the landscape.</p> <p>Broad corridors of earthwork activities, including the creation of new drainage ponds will have damaging effects to landscape quality.</p> <p>Steeper earthworks connecting to the overbridges will appear discordant with the gently rolling topography of this character area and wider landscape. They will also appear particularly prominent as they are constructed whilst unvegetated.</p>	Major Adverse	Moderate Adverse Effect

Receptor	Impact	Effect	Magnitude	Significance
	<p>To the west of Pond B, a large site compound area will be in use.</p> <p>Adjacent to Dalston Road, 50m wide and up to 6m high embankments will be created to meet the new foot and cycle bridge over Dalston Road.</p> <p>Approximately 16no. Norway Maple hedgerow trees will be lost from the hedgerows at Dalston Road to allow for the creation of embankments and widening of the road. Non-designated hedgerows will also be removed here to allow for construction of the road.</p> <p>Large earthworks and construction activities will be required for the creation of Cummersdale Roundabout at Dalston Road.</p> <p>New 10m lighting columns and large, highways signage will be erected during construction, around the roundabouts and throughout the proposed road alignment.</p>			
<p>Gently rolling lowland ridge and valley farmland and industrial Cummersdale (moderate)</p>	<p>Construction of an approx. 100m wide corridor of the proposed road and earthworks will sever rolling agricultural land, perpendicular to the field patterns in this area.</p> <p>Earthworks activities will include the creation of a large embankment to serve the overbridge on Dalston Road and of a false cutting to the north of the new road corridor.</p> <p>Approximately 21 mature hedgerow trees will be felled in addition to removal hedgerows to allow for construction of the broad road corridor here, including Important Hedgerows.</p> <p>Throughout the eastern stretch of the road, large excavations will be required for the road cuttings.</p> <p>An area of agricultural land to the east of this character area (north of the road corridor) will be used as a large site compound and a smaller area to the south west to be used for crane access.</p> <p>Erection of 10m high lighting columns and large highways signage close to the Dalston Road roundabout.</p>	<p>Adverse effects include;</p> <p>Damage to the quality of the agricultural landscape through construction and earthworks activities.</p> <p>Damage to the quality of the hedgerow trees in the area which are key features in this landscape.</p> <p>Severance and loss of hedgerows (both Important and non-designated), which are a key characteristic of the area. This will have an adverse effect on landscape character and the historic landscape.</p> <p>An increase in urban features and traffic through this character area will have an adverse effect on the rural qualities of this character area.</p> <p>Steeper earthworks connecting to the overbridge will appear discordant with the gently rolling topography of this character area and wider landscape, as will the steep cuttings. They will also appear particularly prominent due to them being unvegetated at this phase.</p> <p>The large site compound will become a dominant feature in this rural landscape and have an adverse effect on quality.</p>	Major Adverse	Large Adverse Effect
<p>Caldew river valley green corridor, mill and print works (moderate)</p>	<p>During construction, there will be a number of areas of high construction activity within this valley, including creation of crane platforms on both the western valley side and to the east of the River Caldew. Large plant will be used during this scheme.</p> <p>An additional site compound with a smaller office set up, welfare and storage areas will be located to the east of the valley floor, south of the proposed bridge embankments.</p> <p>Large-scale earthworks operations will include the creation of steep cuttings in both the western and eastern valley sides.</p>	<p>Adverse effects will include:</p> <p>The site compounds, construction vehicle activity and temporary works features such as scaffold and temporary bridges will have a dramatic reduction in the sense of tranquillity and calm within this self-contained area, which is key characteristic.</p> <p>Vegetation loss will damage the quality of this area.</p> <p>The scale of the features being constructed in this valley are disproportionate to other natural and man-made features in this area.</p> <p>Effects on landform will be significant, with engineered slopes of both cuttings and embankments appearing discordant with the natural topography of this open river valley.</p>	Major Adverse	Very Large Adverse Effect

Receptor	Impact	Effect	Magnitude	Significance
	<p>Additional cuttings will run along the western valley side to excavate for a new multi-user path into the valley. In addition to this, an (approx.) 95m wide, 250m long and 11.8m high embankment will be created within the flat valley floor with steep engineered slopes.</p> <p>Two large SuDS ponds, Pond C and Pond D will be excavated during this phase.</p> <p>Vegetation loss will include areas of mixed woodland will be removed from an area of woodland close to the existing railway bridge to allow for the construction of SuDS Pond C. A portion of the mature broadleaf woodland with ancient characteristics will be felled to allow for the creation of the cuttings on the eastern valley side. Scrub vegetation will also be removed on the western valley side. Large areas of scrub vegetation will be lost on the eastern valley side to allow for earthworks activities here and the creation of the multiuser path.</p> <p>A new bridge structure will be constructed, spanning both the Cumbrian Coast Line Railway and the River Caldew. This bridge will have three spans, with piers that will be faced with sandstone masonry. To construct this, scaffold systems will be set up around each pier structure. The bridge will also be constructed with a weathering steel plate girder and concrete deck. Bridge parapets will be 1.5m high with the exception of a 1.8m high solid galvanised steel high containment parapet over the railway line.</p>	<p>Excavation for the SuDS ponds will create dominant features within this natural landscape whilst unvegetated.</p> <p>The appearance of the varied parapets will also not compliment the character of this area, particularly with the 1.8m high solid parapets introducing a harsh feature in the landscape.</p>		
<p>Sub-urban Carlisle: Busy linear settlements, race course and irregular field patterns (moderate)</p>	<p>A site compound will be located within an existing field to the south-east of the proposed roundabout, with large portions of agricultural land being used for stockpiling and storage to the north and west of the proposed roundabout, which together with the road corridor will have a large footprint in the landscape. An additional area will be used for temporary works within an area of existing willow plantations to the south of the proposed cuttings into the Caldew Valley.</p> <p>Vegetation loss will include removal of a large percentage of willow plantation from an area of agricultural land, where this land will be used to excavate a cutting. Approximately 38 individual trees, groups of hedgerow trees and a group of trees to the southern edge of Tarn Plantation will be felled due to allow for the construction of the roads, bridges and associated temporary works. A large proportion of hedgerows will also have lengthy sections removed, including a number of Important Hedgerows.</p> <p>Earthworks activities will include the excavation of large cuttings within existing agricultural land to create the broad road corridor. Additional cuttings will be excavated for the construction of the large roundabout within an existing field. Large embankments will also be constructed to the north-east of this roundabout to allow for the construction of a foot and cycle bridge. Embankments will also be constructed for a new accommodation bridge to the west of Peastree Farm.</p> <p>A new road bridge will be constructed close to Ivegill Road, south of Durdar, which will curve around the existing road, which will remain operational during construction. Around this, large engineered embankments will be created with steep slopes to support the new road construction. The area within the field to the east of this will be used as a crane platform to install the bridge.</p>	<p>Adverse effects will include:</p> <p>A large site compound, stockpile/ temporary works areas and construction of the roundabout and road corridors will create a prominent feature in this predominantly rural, flat open landscape and will not be sensitive to the setting. Construction activity in the area will have a damaging effect on tranquillity and the rural qualities of this area, increasing the urban qualities.</p> <p>Severance and loss of hedgerows, including Important Hedgerows, which are a key characteristic of the area. will have an adverse effect on landscape character and the historic landscape.</p> <p>Loss of hedgerow trees, including high quality mature trees which are a key characteristic of this landscape.</p> <p>The earthwork activities involved in creating the new road corridor, roundabouts, embankments and cuttings will have a dramatic change in the landscape and will become a dominant feature through this predominantly rural landscape.</p> <p>The creation of large embankments and cuttings will be discordant with the existing, relatively flat natural topography.</p> <p>New urban features being installed such as large lighting columns and highway signage will increase the urban character of this area, particularly in the south-east where these are more concentrated.</p> <p>The overbridge at Durdar Road and associated embankments will have an adverse effect due to the curved alignment not fitting the typical linear grid pattern of the rural road network, as well as the elevated nature of the bridge and engineered embankments in this relatively flat landscape.</p> <p>The construction of three bridges within this character area will have an adverse effect as large vertical urban features of this nature are rare in this flat, open landscape.</p>	<p>Major Adverse</p>	<p>Very Large Adverse Effect</p>

Receptor	Impact	Effect	Magnitude	Significance
	10m high lighting columns and large highways signage will be erected, particularly concentrated around the new roundabout and the new road which will run to the south-east of this.			
Agricultural Brisco and historic parkland (moderate)	<p>Areas of agricultural land will be used for temporary works and stockpile/ storage areas here to the north-east of the proposed Scalegate Roundabout; to the north west of the proposed Brisco Roundabout and adjacent to the West Coast Mainline to the north of the proposed road corridor. An additional main site compound will be sited adjacent to the West Coast Mainline to the east of this character area and south of the proposed road corridor, where there will be site accommodation, office set up, main canteen and welfare and asphalt hardstanding throughout.</p> <p>Construction of two new roundabouts and a new length of road within existing agricultural land between Scalegate Road and Brisco Road. The alignment of the road construction severs agricultural land but is perpendicular to the field pattern.</p> <p>Vegetation loss will include the felling of approximately 18 mature hedgerow and parkland trees plus groups of mature hedgerow trees close to the Piggery. Large quantities and lengths of hedgerows will also be removed and severed to allow for construction of the road, embankments and roundabouts, including Important Hedgerows.</p> <p>Excavations for a drainage pond will be created within an existing field to the west of the "Piggery", approximately 110m long and 50m wide.</p> <p>Construction of a new overbridge to the west of the Brisco roundabout will require the construction of large engineered embankments, which are up to 8m in height.</p> <p>10m lighting columns will be erected throughout this stretch of road and will be particularly concentrated around the roundabouts. Highways signage will also be installed towards the end of the construction phase.</p>	<p>Adverse effects will include:</p> <p>Construction of a broad road corridor together with large temporary works and compound areas within this open, rural landscape will increase the urban character of this area and damage the key characteristics and landscape quality. The scale of the site compounds and road corridor will become a dominant feature within this landscape that is discordance of the typical, rural characteristics of this landscape.</p> <p>Tranquillity will be reduced due to construction activity.</p> <p>New urban features being installed such as large lighting columns and highway signage will increase the urban character of this area.</p> <p>The construction of bridge and earthworks within this character area will have an adverse effect as large vertical urban features of this nature are rare in this flat, open landscape.</p> <p>The excavations for the drainage pond will add to the damage to the quality of this rural landscape.</p> <p>Severance and loss of hedgerows, many of which are Important Hedgerows, which are a key characteristic of the area, will have an adverse effect on landscape character and the historic landscape.</p> <p>Loss of approximately 3no. individual, mature parkland trees which are key features in this landscape will damage the landscape quality.</p> <p>Loss of hedgerow trees, including high quality mature trees which are a key characteristic of this landscape will damage the landscape quality.</p>	Major adverse	Large Adverse Effect
Elevated Burthwaite and rolling farmland (moderate)	Construction activity and change in land use within the adjacent character area may impact key views and tranquillity.	Reduction in quality of some key views and tranquillity from construction activity, however, no effect on the landscape within this character area.	No change	Neutral Effect
Petteril river valley green wedge and transport corridor (moderate)	<p>Five temporary works/ smaller compound/ welfare areas will be located within agricultural land to the north and south of the road corridor. Two of these areas will be used to aid the beam lifts for construction of the West Coast Mainline bridge and the Petteril Bridge.</p> <p>Construction of a new bridge crossing over the West Coast Mainline and the River Petteril will involve high numbers of construction vehicles, including large plant e.g. cranes.</p> <p>Earthwork activities will involve the creation of new large embankments around the new bridges, tying into the existing embankment at Newbiggin Road close to Junction 42.</p>	<p>Adverse effects will include:</p> <p>Loss of vegetation within this green corridor will be damage the quality of this character area.</p> <p>The introduction of the large earthworks and bridge structures will further damage the natural topography and landform within this open valley.</p> <p>The site compound will be out of character with the rural nature of this open river valley and pastoral farmland.</p> <p>Construction activity will increase the connection with the busy M6 transport corridor and damage the special qualities and remaining tranquil nature of this rural, riverside landscape.</p> <p>An increase in urban features will be discordant from the rural qualities of this landscape.</p>	Major adverse	Very Large Adverse Effect

Receptor	Impact	Effect	Magnitude	Significance
	<p>Vegetation loss will include felling of approximately 7no. hedgerow and river bank trees plus a number of groups of hedgerow trees around Newbiggin Road and alongside the A6. A large area of broadleaf woodland will be felled on the existing embankments around Newbiggin Road close to Junction 42. Some sections of hedgerows will also be removed to allow for the construction of the road alignment, including two short sections of Important Hedgerows at the access of Newbiggin Hall and the proposed footpath link to Newbiggin Bridge.</p> <p>Construction of a new minor road will link the old Newbiggin Road to the new link road to the west of the Petteril, which be constructed on embankment.</p> <p>A new cycle/ pedestrian link will be constructed on majority of the old Newbiggin Road.</p> <p>10m lighting columns will be erected throughout this stretch of road. Highways signage will also be installed towards the end of the construction phase.</p> <p>Excavation within the valley floor will be required for the creation of two new drainage ponds to the south of the new road.</p>	<p>Loss of vegetation will also have an adverse effect, with the loss of river bank trees and woodland resulting in damaging the character.</p> <p>Severance and loss of hedgerows, which are a key characteristic of the area, will have an adverse effect on landscape character.</p> <p>Excavation of new ponds in this area will appear uncharacteristic of a landscape of this type and will appear engineered compared to the river's natural gently meandering course.</p>		
Elevated, agricultural Carleton, rolling farmland and transport corridor <i>(low)</i>	Localised widening works to existing A6 and Junction 42 roundabout.	Negligible effect.	Negligible.	Neutral Effect

Table 9.6 Impact Assessment – Operation Phase Winter Year 1

Receptor	Impact	Effect	Magnitude	Significance
Sub-urban Carlisle: 1960's residential cul-de-sac (low)	No change.	No effect.	No change	Neutral Effect
Sub-urban Carlisle: Urban fringe transport corridor and mixed residential (low)	<p>The site compound area to the north-east of the Newby West Roundabout will have been reinstated with grass seed, however, this will not yet be well established.</p> <p>The A595 to the north of the Newby West roundabout will be wider, with the loss of mature hedgerows. The approach to the Newby West roundabout will be four lanes wide close to the roundabout itself.</p> <p>The new embankments for the foot/ cycle bridge to the north of the roundabout will have been grass seeded but this will not yet be well established.</p> <p>A new overbridge over the A595 to the north of the Newby West Roundabout.</p>	<p>Adverse effects include:</p> <p>The new embankments and bridge will increase the urban character and damage the quality of the landscape in this area, partially creating a visual barrier with the surrounding landscape to the south and introducing a dominant vertical feature which is uncharacteristic of this landscape.</p> <p>Loss of hedgerow boundaries, including Important Hedgerows and hedgerow trees which are key features in this landscape. This will have an adverse effect on landscape character and on the historic landscape.</p> <p>A larger roundabout on the periphery of this character area, the new foot/ cycle bridge, new signs, lighting and other urban features together with the widening of the A595 north of the proposed roundabout is likely to increase the urban character of this landscape.</p>	Minor Adverse	Slight Adverse Effect
Carlisle urban fringe: low land ridge and valley farmland and transport corridor (low)	<p>The Newby West Roundabout will have a much larger footprint than the previous A595/ A689 roundabout. It will have four widened spur roads, with four lanes wide close to the roundabout itself.</p> <p>Approximately 16no. mature hedgerow trees will have been lost during construction to allow for the road widening of the A595 to the south of Newby West Roundabout, in addition to the loss of three large areas of broadleaf tree planting adjacent to the previous A595 roundabout and within the centre of this. An additional group of mixed conifers will have been lost at the new Kingrigg access. Along Peter Lane, approximately 11no. hedgerow trees will have been lost. Long lengths of both Important and non-designated hedgerows will have been lost during construction, along the A689, the A595, Peter Lane and hedgerows severed by the road to the south of Peter Lane.</p> <p>The new foot/ cyclebridge over the A595 to the north of the Newby West Roundabout will have large embankments, with grass seeding that will not yet be fully established.</p> <p>A new SuDS pond, Pond A, to the north west of the new roundabout, between the new link road and Peter Lane. Vegetation around this will not yet be well established.</p> <p>The new link road will run in a south easterly direction from the Newby West Roundabout and link to the Cummersdale Roundabout at Dalston Road, severing agricultural land.</p> <p>Both new roundabouts will feature a concentration of 10m high lighting columns, large highways signage and a new overbridge.</p>	<p>Adverse effects include:</p> <p>Severing of rectilinear field patterns will weaken this key characteristic.</p> <p>Loss and severance of both the hedgerow trees and hedgerows (including Important Hedgerows) which are key features in this landscape. This will have an adverse effect on landscape character and the historic landscape.</p> <p>Loss of a large proportion of plantation woodland will create a noticeable “scar” in the landscape here, particularly due to the scalloped edge which is discordant with the rectilinear blocks and patterns that are typical of this landscape.</p> <p>An increase in urban features and traffic through this character area will have an adverse effect on the rural characteristics of this area, which are already damaged from existing transport corridors.</p> <p>The introduction of the new SuDS ponds will reduce the amount of agricultural land use, which is a key characteristic of this landscape.</p> <p>Steeper earthworks connecting to the foot/ cycle bridges will appear discordant with the gently sloping topography of this character area and wider landscape. They will also appear particularly prominent vertical features, particularly whilst the grass seed is not fully established.</p>	Moderate Adverse	Slight Adverse Effect

Receptor	Impact	Effect	Magnitude	Significance
	<p>Dalston Road will be widened to four lanes wide close to the roundabout itself, as well as the link road being four lanes wide close to the roundabout.</p> <p>A second SuDS pond, Pond B, to the north west of the Dalston Road roundabout will have limited vegetation cover as this will take more time to establish.</p> <p>The new link road will increase the flows of traffic to the north of this character area, but will reduce traffic flows on the existing Peter Lane, which will be stopped up.</p> <p>Earthworks across this section are engineered in appearance and lie within the highway boundary.</p>			
Gently rolling lowland ridge and valley farmland and industrial Cummersdale (moderate)	<p>The new link road alignment will cut through the existing open, gently rolling agricultural land to the south of Cummersdale, on a north east facing slope.</p> <p>Approximately 21 mature hedgerow trees will be have been lost during construction, in addition to removal hedgerows, including Important Hedgerows, that were severed for the new road corridor.</p> <p>The road alignment will dissect existing rectilinear field patterns and sections of field boundaries.</p> <p>The Cummersdale Roundabout and foot/ cycle bridge is on the western boundary of this character area, with a large embankment that runs from the overbridge to the cycleway on the north side of the link road. Grass seed will not yet be well established.</p> <p>10m high lighting columns and signage will also be concentrated close to the Cummersdale Roundabout.</p> <p>Further east, the road lies within steep cuttings in the landscape, increasing in depth towards the Caldew Valley.</p> <p>There will be an increase in traffic flows through this area, which was previously open agricultural land with no roads other than Dalston Road along the western boundary and minor roads within Cummersdale.</p> <p>Earthworks across this section are engineered in appearance and lie within the highway boundary.</p> <p>Areas used for compounds and temporary works will now be reinstated and grass seeded, however, this will not yet be fully established.</p>	<p>Adverse effects include:</p> <p>The presence of a new road and increase in urban features through this landscape will have an adverse effect on the tranquil, rural characteristics of this character area.</p> <p>Damage to the quality of the hedgerow trees in the area which are key features in this landscape.</p> <p>Severance and loss of hedgerows (both Important and non-designated), which are a key characteristic of the area. This will have an adverse effect on landscape character and the historic landscape.</p> <p>The severing of field patterns is less damaging here, as the road alignment of the road follows the pattern almost perpendicular, resulting in the rectilinear character being retained to some degree.</p> <p>Steeper earthworks connecting to the overbridge will appear discordant with the gently rolling topography of this character area and wider landscape, as will the steep cuttings. They will appear particularly prominent due to grass seed not being well established at this phase.</p> <p>The new cuttings within this landscape will be engineered in character, however, will make the road a less prominent feature, so the effect will be relatively neutral here.</p> <p>An increase in urban features and traffic through this character area will have an adverse effect on the rural qualities of this character area.</p> <p>The adverse effects of the compounds and temporary works areas will be negligible once these have been reinstated.</p>	Moderate Adverse	Moderate Adverse Effect
Caldew river valley green corridor, mill and print works (moderate)	<p>Temporary works areas and compounds will have been reinstated and seeded with grass seed, which will not yet have fully established.</p> <p>A new major bridge structure will cross this open river valley, with large embankments rising from the western valley side, transferring to a three-span bridge, elevated approximately 10m above the floor of the river valley. This is to</p>	<p>Adverse effects include:</p> <p>The largest effect within this character area will be the introduction of a large-scale, urban structure through this open valley and the presence of busy traffic, where previously there was no road network.</p> <p>The large embankments will also have an major adverse effect on the key characteristics of this landscape, due to their scale within the flat valley floor and their engineered appearance.</p>	Major Adverse	Large Adverse Effect

Receptor	Impact	Effect	Magnitude	Significance
	<p>be supported by two piers located either side of the River Caldew. The engineered slopes around this bridge will not yet be well vegetated.</p> <p>The bridge joins a large embankment to the east of the River Caldew, which protrudes over half of the flat river valley floor before tying into the steeper valley side to the east into steep cuttings.</p> <p>On the bridge itself, solid 1.8m high, high containment parapets will be required over the Network Rail land where the bridge crosses the Cumbrian Coast Line Railway. Across the remainder of the bridge, the parapets will be 1.5m high with open rails.</p> <p>A large pond is proposed to the south of the largest embankment, towards the east of the valley floor.</p> <p>Earthworks across this section are engineered in appearance and grass seeding will not be well established at this phase.</p> <p>Vegetation loss will include areas of mixed woodland that have been removed from an area of woodland close to the existing railway bridge to allow for the construction of SuDS Pond C. A portion of the mature broadleaf woodland with ancient characteristics will have been lost during the construction of the cuttings on the eastern valley side. Scrub vegetation will also have been removed on the western valley side. Large areas of scrub vegetation will have been lost on the eastern valley side around a 3m wide cycle and pedestrian route will run north of the new bridge, along the eastern valley side in cutting, tying into the existing PROW to the north west of the railway bridge.</p> <p>The two, new large SuDS ponds within this character area will be prominent features within this landscape with vegetation that has not yet established. An access track will lead down from the valley side to the south of the new road to the south of Pond D.</p>	<p>The loss of vegetation within this area, including mature broadleaf trees and scrub vegetation will have an adverse effect on one of the key characteristics within this character area.</p> <p>The presence of the two SuDS ponds, Ponds C and D, will also have an adverse effect on character, due to the valley floor having a much more natural character.</p> <p>The appearance of the varied parapets will also not compliment the character of this area, particularly with the 1.8m high solid parapets introducing a harsh feature in the landscape.</p>		
<p>Sub-urban Carlisle: Busy linear settlements, race course and irregular field patterns (moderate)</p>	<p>Areas used for temporary works and compounds during construction will now be reinstated, although the grass seed will not be well established at this phase.</p> <p>Vegetation loss will include a large percentage of willow plantation from an area of agricultural land; approximately 38 individual trees, groups of hedgerow trees and a group of trees to the southern edge of Tarn Plantation. A large proportion of hedgerows will also have had lengthy sections removed, including a number of Important Hedgerows.</p> <p>In the north-west of this character area, the new road lies within deep cutting, to the south west of a narrow, wooded tributary valley. The cutting slopes have been grass seeded, however, this is not yet well established.</p> <p>To the west of Peastree Farm, a new accommodation bridge will feature embankments with steep, engineered slopes. A new foot/ cyclebridge to the north west of Durdar roundabout will include a series of large embankments that wrap around this new roundabout. These embankments will have been seeded with grass seed that will not yet be well established at this phase. The overbridge to the north-east is the most prominent in the landscape, as this is more elevated than the surrounding land, resulting in larger embankments leading up to it.</p>	<p>Adverse effects include:</p> <p>The areas used for compounds/ temporary works will have a negligible effect on the landscape once reinstated.</p> <p>Severance and loss of hedgerows, including Important Hedgerows, which are a key characteristic of the area. will have an adverse effect on landscape character and the historic landscape.</p> <p>Loss of hedgerow trees, including high quality mature trees which are a key characteristic of this landscape.</p> <p>Where fields are severed, due to the irregularity of the patterns here this is has a limited effect, assuming that adjacent land use can continue.</p> <p>The new roundabouts and associated signs, lighting and other infrastructure will increase the urban nature of this area, resulting in a reduction in tranquillity and the perception of the urban fringe character extending further south.</p> <p>The engineered slopes will also have an adverse effect, particularly due to the flatter topography of this landscape.</p> <p>The curved alignment of the new roads, the road bridge at Durdar Road and associated embankments will have an adverse effect on landscape character, due to the curved alignment being discordant with the typical linear grid pattern of the rural road network in this landscape.</p>	<p>Major Adverse</p>	<p>Large Adverse Effect</p>

Receptor	Impact	Effect	Magnitude	Significance
	<p>Durdar Roundabout has four spur roads, which all lie in cutting. The roundabout will feature a higher concentration of 10m high lighting columns as well as large highways signage.</p> <p>A large road bridge serving Durdar Road to the south of the village, which requires large embankments, which will not be well vegetated at this stage. The alignment of this is more curved than the linear alignment of the previous road.</p> <p>The link road runs west to east across the relatively flat land to the south of Tarn Plantation.</p> <p>Earthworks across this section are engineered in appearance and lie within the highway boundary.</p>	<p>The stark, engineered embankments will also be particularly prominent in this relatively flat or gently sloping landscape, resulting in an adverse effect on the natural topography.</p>		
<p>Agricultural Brisco and historic parkland (moderate)</p>	<p>The areas of land used for temporary works and compounds will now be reinstated and seeded with grass seed, which will not yet be well established.</p> <p>The new link road runs in a west-east direction, following the general grain of the field patterns.</p> <p>Two new roundabouts will be in operation within this landscape character area; Redcat Roundabout and Brisco Roundabout. The majority of the footprint of Redcat Roundabout lies within an area of long, thin, rectilinear fields which run north to south. The roundabout will feature a higher concentration of 10m high lighting columns as well as large highways signage.</p> <p>A second roundabout will link the road with Brisco Road, again featuring a higher concentration of 10m high lighting columns and large highways signage.</p> <p>Vegetation loss will include loss of approximately 18no. mature hedgerow and parkland trees, plus groups of mature hedgerow trees close to the Piggery. Large quantities and lengths of hedgerows will also have been lost, including Important Hedgerows.</p> <p>A large foot/ cycle bridge to the west of Brisco Roundabout will also require large engineered embankments, which will not be well vegetated at this stage.</p> <p>A large SuDS pond to the west of the Piggery and a smaller SuDS pond next to the West Coast Mainline will not be well vegetated at this stage.</p> <p>To the east of the Brisco Road roundabout, the link road runs north-east towards a new bridge over the West Coast Main Line.</p>	<p>Adverse effects include:</p> <p>The areas used for compounds/ temporary works will have a negligible effect on the landscape once reinstated.</p> <p>The main adverse effects of the development at this time would be the introduction of a large road and large roundabouts and associated infrastructure which are much more urban in character than the other rural, narrower roads in the area, which are generally grid-like in pattern.</p> <p>The new road bridge and associated engineered slopes to the large embankments will have significant prominence in this relatively flat landscape, having an adverse effect on the natural topography.</p> <p>Loss of hedgerows, including Important Hedgerows, hedgerow trees and will also have an adverse effect on these key characteristics of this landscape.</p> <p>Loss of approximately 3no. individual, mature parkland trees which are key features in this landscape will damage the landscape quality.</p> <p>Smaller embankments and cuttings will appear engineered in appearance and will be prominent in this agricultural landscape.</p> <p>The introduction of the SuDS ponds are not typical features within this landscape and will appear more urban in character due to their scale and unvegetated appearance.</p> <p>Tranquillity will be affected within this area with increased traffic flows further south, however, traffic flows will be reduced on Newbiggin Road.</p>	<p>Moderate adverse</p>	<p>Moderate Adverse Effect</p>
<p>Elevated Burthwaite and rolling farmland (moderate)</p>	<p>No impact.</p>	<p>No effect.</p>	<p>No change</p>	<p>Neutral Effect</p>
<p>Petteril river valley green wedge and transport corridor (moderate)</p>	<p>Areas used for temporary works and compounds during construction will now be reinstated, although the grass seed will not be well established at this phase.</p> <p>The link road features two major bridge crossings within this character area.</p>	<p>Adverse effects include:</p> <p>The areas used for compounds/ temporary works will have a negligible effect on the landscape once reinstated.</p>	<p>Major adverse</p>	<p>Large Adverse Effect</p>

Receptor	Impact	Effect	Magnitude	Significance
	<p>On the western boundary, a large bridge crossing over the West Coast Main Line just to the north of the existing Newbiggin Road bridge, slightly elevated from the surrounding land.</p> <p>Larger embankments are required to cross the River Petteril, which is another major structure to the north of the Newbiggin Road Petteril crossing.</p> <p>New, large embankments tie into the existing embankments on Newbiggin Road, towards Junction 42.</p> <p>Vegetation loss will have included approximately 7no. hedgerow and river bank trees plus a number of groups of hedgerow trees around Newbiggin Road and alongside the A6. A large area of broadleaf woodland will have been lost on the existing embankments around Newbiggin Road close to Junction 42. Some sections of hedgerows will have also been removed. This includes loss of two short sections of Important Hedgerows at the access of Newbiggin Hall and the proposed footpath link to Newbiggin Bridge.</p> <p>A new minor road is proposed to link the old Newbiggin Road to the new link road to the west of the Petteril, which lies on embankment.</p> <p>A new cycle/ pedestrian link will mostly lie within of the footprint of the old Newbiggin Road.</p> <p>Two new SuDS ponds have been created in to the south of the road in this area.</p>	<p>Loss of vegetation within this green corridor will be damage the quality of this character area.</p> <p>The new road, proposed structures and embankments will have an adverse effect on the character of this landscape, with the introduction of engineered slopes, particularly within the flat river valley floor. The rolling topography of this landscape means that some steeper slopes are typical, however, the engineered appearance of these will add to the urban character here, particularly whilst vegetation is not well established.</p> <p>Severing of pastoral land and the existing open character will also have an adverse effect.</p> <p>New ponds in this area will appear uncharacteristic of a landscape of this type and will appear engineered compared to the river's natural gently meandering course.</p>		
Elevated, agricultural Carleton, rolling farmland and transport corridor (low)	No impact.	No effect.	No change	Neutral Effect

Operational Phase: Summer Year 15

- 9.8.4 During summer of Year 15 (without mitigation), the effects will be similar to those described in Table 9.6 above. Due to there being no mitigation considered for this impact assessment, the only difference would be that proposed grass seeding would become more established, therefore, there would be no reduction in the significance of adverse effects.

Operational Phase (Winter Year 1): Night time character

- 9.8.5 During operation, night time character is likely to be affected by the introduction of proposed artificial lighting throughout the scheme, as well as the increase in lighting from traffic. The existing lighting within the study area is illustrated on Figure 9.3, which can be compared with the proposed lighting and existing lighting that will be present during the Operational Phase of the Scheme on Figure 9.4. For additional description on the baseline night time character, refer to the Landscape Baseline section.
- 9.8.6 The following section provides a brief description of the impacts and effects on night time character.

Sub-urban Carlisle: 1960's residential cul-de-sac (low sensitivity)

- 9.8.7 There will be negligible change to the night time character. Therefore, the significance of effects on night time character would be neutral.

Sub-urban Carlisle: Urban fringe transport corridor and mixed residential (low sensitivity)

- 9.8.8 Impacts will include an increase in lighting along the A595 north of the proposed roundabout, on the A689 and on Peter Lane, all on the periphery of this character area. There will also be a decrease in traffic lighting along Peter Lane. Due to the baseline character being urban fringe, the adverse impacts would be of negligible magnitude. Therefore, the significance of effects on night time character would be neutral.

Carlisle urban fringe: low land ridge and valley farmland and transport corridor (low sensitivity)

- 9.8.9 Impacts will include an increase in lighting concentrated around both the A595/A689 round about and the proposed Cummersdale Roundabout; increased lighting throughout the length of road between these two roundabouts through the existing farmland and woodland to the south of Peter Lane and increased lighting from traffic flows in this area. The effects of these impacts on night time character will be an increase in illumination within a previously rural section of this landscape. The magnitude of this change will be major adverse and therefore, the significance of effects on night time character would be moderate adverse.

Gently rolling lowland ridge and valley farmland and industrial Cummersdale (moderate sensitivity)

- 9.8.10 Night time impacts on this landscape will include the increase in lighting concentrated around the Cummersdale Roundabout and the increase in traffic along the new road between this roundabout and the Caldew crossing, through existing farmland. The effects of this change will be an increase in an urban fringe

night time character. The magnitude of this change will be moderate adverse, therefore, the significance of effects on night time character will be moderate adverse.

Caldew river valley green corridor, mill and print works (moderate sensitivity)

- 9.8.11 The impacts within this character area will include the presence of traffic lighting on the Caldew Bridge and roads on the embankments and within the cuttings either side of this. Due to the lack of urban features within this character area and the limited artificial lighting prior to this scheme, the effects of this will be an increase in urban character. The magnitude of change in this area will be minor, as there is no proposed permanent lighting throughout this character area, however, vehicle lighting will have an impact. Therefore, the significance of effects will be moderate adverse.

Sub-urban Carlisle: Busy linear settlements, race course and irregular field patterns (moderate sensitivity)

- 9.8.12 The impacts within this character area will include the presence of traffic lighting throughout the proposed road alignment, which is predominantly away from settlements within existing farmland. Permanent artificial lighting will be concentrated around the Durdar Roundabout and Scalegate Roundabout. It will also be present for the entire proposed road between these two roundabouts, but not on Ivegill Road or the overbridge. The effects of this will be a particular increase in illumination to the south and west of Durdar, increasing the urban character of this area. The magnitude of change will be major adverse and, therefore, the significance of effect will be large adverse.

Agricultural Brisco and historic parkland (moderate sensitivity)

- 9.8.13 The impacts within this character area will include permanent artificial lighting throughout the new road alignment, with particular concentrations around the Scalegate Roundabout and the Brisco Roundabout. The baseline night time character of this area is particularly rural, with very few properties and very little artificial lighting, as the area is predominantly farmland. The existing road network would have traffic movements. The effects of the new road traffic movements and permanent lighting will be an increase in urban character. The magnitude of change will be major adverse. The significant of effects will be large adverse.

Elevated Burthwaite and rolling farmland (moderate sensitivity)

- 9.8.14 Impacts will only include impacts on surrounding views from this character area, as the area's elevated position looks down onto the road alignment to the north. Whilst the area will have the perception of being closer to the urban fringe, there will be negligible change to the night time character within the character area itself. Therefore, the significance of effects on night time character would be neutral.

Petteril river valley green wedge and transport corridor (moderate sensitivity)

- 9.8.15 The baseline night time character of this area is affected by the M6 motorway, Junction 42 and the A6. However, the main valley of the River Petteril does not feature artificial lighting, other than the existing traffic over Newbiggin Road and the M6 bridges. The impact on this character area will be the increase in traffic flows on the new road and bridge crossings over the Petteril and railway. Permanent artificial lighting columns will also be present throughout the road in this area. The effect of this will be an increased urban character within this open river valley. The

magnitude of impact on this character area will be moderate adverse. Therefore, the significance of effects on night time character will be moderate adverse.

Elevated, agricultural Carleton, rolling farmland and transport corridor (low sensitivity)

- 9.8.16 Impacts will only include impacts on surrounding views from this character area, as the area's elevated position looks down onto the road alignment to the south west. There will be negligible change to the night time character within the character area itself. Therefore, the significance of effects on night time character would be neutral.

9.9 Mitigation, Enhancement and Monitoring

Mitigation

- 9.9.1 To avoid, reduce or compensate significant adverse landscape effects, various mitigation has been proposed. Table 9.7 provides details of the mitigation proposals, the receptors to which it applies and the particular impact or effect that it is mitigating.
- 9.9.2 Within Table 9.7, a reference code is also shown against each item, which correlates with the Mitigation Plans (Figure 17.1 – 17.3) to illustrate the location of each item where applicable.
- 9.9.3 For the residual impact assessment, this mitigation is considered as part of the proposed scheme.

Enhancement

- 9.9.4 In addition to the proposed mitigation, further opportunities for enhancement have been identified and have been included within the proposed design.
- 9.9.5 Landscape enhancement includes the following:
- Areas of native bulb and perennial planting, native shrub and individual tree planting both along the proposed highway and within land adjacent to this.
 - New cycle stands, signage, footways, seating and information/ interpretation materials and informal play features using felled timber around SuDS ponds A, B, C, D and G, where public access is more likely due to the proximity of residential areas or public rights of way.
 - Proposed artwork/ sculpture referencing the local character and heritage of the areas on Newby West, Durdar and Brisco roundabouts.
 - Around the Caldew valley PROW, bespoke informative signage relating to the local landscape, history, ecology and natural river processes and have been proposed, as well as the artwork strategy that has been referenced in the Mitigation Schedule.

- Within the Caldew valley, additional robust timber seating, informal natural play features and natural stone boulders have been proposed to further enhance this landscape.
- At Pond D, a boardwalk has been proposed over part of the pond to provide a different experience and vantage point for pedestrians at this location.

9.9.6 For further details of proposed enhancement measures, refer to the Landscape Strategy document (Planning Application document: CSLR-CAP-ELS-00-RP-L-3001).

Monitoring

9.9.7 It is critical that any proposed mitigation is monitored and is retained in good condition to maintain full effectiveness. This is particularly crucial with mitigation planting, which needs close monitoring to ensure that it establishes fully to serve its function.

9.9.8 Mitigation should be maintained and monitored continuously to ensure that it is serving the function that was committed through the proposed design. If any damage or failure is present, this must be replaced as soon as possible. This responsibility will be with the contractor for a five-year period after opening of the scheme to ensure the mitigation is established. Any loss of plants will be replaced within this period. Following this establishment period, responsibility for maintenance will transfer to Cumbria County Council as the Highways Authority.

Table 9.7 Landscape Mitigation

Ref	Impact/Effect	Receptor/s	Mitigation
LC01	Alignment of route will detract from the rectilinear field patterns Loss of mature hedgerows.	Carlisle urban fringe: low land ridge and valley farmland and transport corridor. Sub-urban Carlisle: Busy linear settlements, race course and irregular field patterns. Agricultural Brisco and historic parkland.	Species rich, native hedgerow planting.
LC02	Alignment of route will detract from the rectilinear field patterns Loss of mature hedgerows and hedgerow trees.	Carlisle urban fringe: low land ridge and valley farmland and transport corridor. Gently rolling low land ridge and valley farmland and industrial Cummersdale. Sub-urban Carlisle: Busy linear settlements, race course and irregular field patterns. Agricultural Brisco and historic parkland. Petteril river valley green wedge and transport corridor.	Species rich, native hedgerows with standard, native broadleaf tree planting.
LC03	Loss of plantation woodland.	Carlisle urban fringe: low land ridge and valley farmland and transport corridor.	Mixed native coniferous and broadleaf woodland planting.
LC04	Loss of large continuous areas of both mature deciduous woodland Introduction of engineered slopes that are uncharacteristic of the natural topography and typical vegetation.	Caldew river valley green corridor, mill and print works.	Native broadleaf woodland planting.
LC05	Loss of large continuous areas of both mature deciduous woodland on the valley sides and semi-mature riparian woodland on the valley floor; loss of an intimate and secluded character, that is a result of minimal urban influences and an enclosed wooded landscape. Introduction of engineered slopes that are uncharacteristic of the natural topography and typical vegetation.	Caldew river valley green corridor, mill and print works.	Scattered tree and scrub planting, to mitigate loss of vegetation and to better integrate engineered slopes into the landscape.
LC06	Alignment of route will detract from the rectilinear field patterns Increase in generic urban features and presence of road vehicles (traffic) that detract from landscape character, including lighting columns, signage and wider road network.	Gently rolling low land ridge and valley farmland and industrial Cummersdale. Sub-urban Carlisle: Busy linear settlements, race course and irregular field patterns. Agricultural Brisco and historic parkland.	Rectilinear areas of woodland planting to mitigate the effect of roundabouts, overbridge and associated infrastructure and traffic on the landscape.
LC07	Increase in generic urban features and presence of road vehicles (traffic) that detract from landscape character, including lighting columns, signage and wider road network.	Carlisle urban fringe: low land ridge and valley farmland and transport corridor. Gently rolling low land ridge and valley farmland and industrial Cummersdale. Sub-urban Carlisle: Busy linear settlements, race course and irregular field patterns. Agricultural Brisco and historic parkland.	Roundabout designed to reflect local landscape character, using hard and soft landscape design.
LC08	Large bridges at river crossings introducing urban features in the landscape. Increase in traffic resulting in a loss of tranquillity. Damaging the intimate and secluded character found within the Caldew valley. Damaging the open river corridor characteristics.	Caldew river valley green corridor, mill and print works. Petteril river valley green wedge and transport corridor.	Sensitive and creative design of bridges to create a "gateway" to Carlisle. Bridges designed to be slender in form and maximise span widths and heights to maintain some visual connectivity. Bridges designed to visually recede into the landscape and reflect local character, using locally sourced materials.

Ref	Impact/Effect	Receptor/s	Mitigation
LC09	Foot and road overbridges to introduce large, vertical urban features into these landscapes.	Carlisle urban fringe: low land ridge and valley farmland and transport corridor. Gently rolling low land ridge and valley farmland and industrial Cummersdale. Sub-urban Carlisle: Busy linear settlements, race course and irregular field patterns. Agricultural Brisco and historic parkland. Petteril river valley green wedge and transport corridor.	Bridges designed to reflect local landscape character, using locally sourced materials and materials that visually recede into the landscape.
LC10	Generic, urban transport corridor being introduced to a predominantly rural landscape, damaging character and sense of place.	Carlisle urban fringe: low land ridge and valley farmland and transport corridor. Gently rolling low land ridge and valley farmland and industrial Cummersdale. Caldew river valley green corridor, mill and print works. Sub-urban Carlisle: Busy linear settlements, race course and irregular field patterns. Agricultural Brisco and historic parkland. Petteril river valley green wedge and transport corridor.	An artwork strategy to be developed to provide reference to local history, culture and the natural environment that is specific to each affected character area.
LC11	Change to the natural topography through creation of engineered slopes.	Carlisle urban fringe: low land ridge and valley farmland and transport corridor. Gently rolling low land ridge and valley farmland and industrial Cummersdale. Sub-urban Carlisle: Busy linear settlements, race course and irregular field patterns. Agricultural Brisco and historic parkland. Petteril river valley green wedge and transport corridor.	Grading out of slopes to a 1:10 gradient to allow these to be returned to agricultural use.
LC12	Loss of trees from the banks of the River Petteril.	Petteril river valley green wedge and transport corridor.	Riparian tree planting to river banks.
LC13	Loss of individual parkland trees.	Agricultural Brisco and historic parkland.	Replacement individual tree planting.

9.10 Residual Impact Assessment

Construction Phase

- 9.10.1 Due to there being no proposed mitigation for landscape effects during the Construction Phase.

Operational Phase: Winter Year 1

- 9.10.2 An assessment of the residual impacts after mitigation has been applied has been carried out for the receptors where there were significant adverse effects (moderate, large or very large) in the impact assessment. Proposed mitigation has been considered to determine the change in significance of effects. The results of the assessment are provided in Table 9.8.

Operational Phase: Summer Year 15

- 9.10.3 To highlight the effect of the maturing of vegetation over time, an assessment of the residual impacts after mitigation has been able to establish over 15 years has been carried out for the same receptors. The results of the assessment are provided in Table 9.9.

Table 9.8 Residual impact assessment - Operational Phase: Winter Year 1

Receptor	Impact	Effect	Magnitude	Significance
Gently rolling lowland ridge and valley farmland and industrial Cummersdale (moderate)	<i>As operational assessment before mitigation with the following changes:</i>	<i>As operational assessment before mitigation with the following changes:</i>	Moderate Adverse	Moderate Adverse Effect
	Species rich, native hedgerows with standard, native broadleaf tree planting.	The newly planted hedgerows and hedgerow tree planting will not yet be fully effective in mitigating loss of hedgerows and hedgerow trees and change in boundary treatments. However, their presence provides investment in the future landscape.		
	Slopes have been constructed at a shallower gradient (1:10 as oppose to 1:3) to allow for more land to be returned to agricultural use.	The narrowing of the road corridor will reduce the adverse effect on the landscape, despite it being unlikely that the slopes returned for agricultural use will become fully vegetated. The gradient of these slopes will also limit the damage to the natural topography.		
	Roundabout designed to reflect local landscape character, using hard and soft landscape design.	Cummersdale Roundabout has been designed with local sandstone walling and mixed broadleaf woodland planting, which although is not yet established provides an investment in the future landscape. The sandstone walling is typical of this character area and creates a design which is locally distinctive and reflects and sense of place.		
	Woodland planting on false cutting to north west of Cummersdale Roundabout. (Visual impact mitigation from Cummersdale)	This woodland planting will be very young and will appear discordant from areas of more mature woodland and trees in the area. However, the presence provides investment in the future landscape.		
	Section of translocated hedgerow (nature conservation mitigation) to the north of the new road.	Following translocation, this hedgerow will not yet be fully established, however, it's presence provides investment in the future of the landscape.		
Caldew river valley green corridor, mill and print works (moderate)	<i>As operational assessment before mitigation with the following changes:</i>	<i>As operational assessment before mitigation with the following changes:</i>	Major Adverse	Large Adverse Effect
	Sensitive and creative design of bridges to create a "gateway" to Carlisle, to mitigate the effect of large, urban features being introduced to these landscapes. Bridges designed to visually recede into the landscape, using slender design, locally sourced materials.	Using materials and a design that is more sensitive to the local environment will help to reduce the severity of effects in this area.		
	An artwork strategy to be developed to provide reference to local history, culture and the natural environment that is specific to each affected character area.	This artwork will have beneficial effects on the landscape, strengthening the sense of place of the area and celebrating local history, culture and the natural environment.		
	Dense scrub planting to western valley sides (nature conservation mitigation).	This planting will not be very well established at this phase but its presence provides investment in the future landscape.		
	Mixed species broadleaf woodland planting to the large embankments to the east of the River Caldew; to the cuttings further east and around Pond C to the north of the valley.	This woodland planting will be very young and will appear discordant from areas of more mature woodland and trees in the area. However, its presence provides investment in the future landscape.		
	Scattered tree and scrub planting, to mitigate loss of vegetation and to better integrate engineered slopes into the landscape.	This new scattered tree and scrub planting will be very young and will appear discordant from areas of more mature woodland and trees in the area. However, its presence provides investment in the future landscape.		
Sub-urban Carlisle: Busy linear settlements, race course and irregular field patterns (moderate)	<i>As operational assessment before mitigation with the following changes:</i>	<i>As operational assessment before mitigation with the following changes:</i>	Major Adverse	Large Adverse Effect
	Mixed species broadleaf woodland planting to the cuttings and to the severed land between the road cuttings and area of woodland to the north-west of Peastree Farm.	This woodland planting will be very young and will appear discordant from areas of more mature woodland and trees in the area. However, its presence provides investment in the future landscape.		
	Rectilinear areas of woodland planting to mitigate the effect of roundabouts, overbridge and associated infrastructure and traffic on the landscape.	This woodland planting will be very young and will appear discordant from areas of more mature woodland and trees in the area. However, its presence provides investment in the future landscape.		

Receptor	Impact	Effect	Magnitude	Significance
	Species rich, native hedgerow planting.	The newly planted hedgerow will not yet be fully effective in mitigating loss of hedgerows and change in boundary treatments. However, their presence provides investment in the future landscape.		
	Species rich, native hedgerows with standard, native broadleaf tree planting.	The newly planted hedgerow and hedgerow tree planting will not yet be fully effective in mitigating loss of hedgerows and hedgerow trees and change in boundary treatments. However, their presence provides investment in the future landscape.		
	Bridges designed to visually recede into the landscape, using slender design, locally sourced materials. Bridges designed to be locally distinct, reinforcing a sense of place.	Using materials and a design that is more sensitive to the local environment will help to reduce the adversity of effects in this area.		
	Grading out of slopes to a 1:10 gradient to allow these to be returned to agricultural use.	The narrowing of the road corridor will reduce the adverse effect on the landscape, despite it being unlikely that the slopes returned for agricultural use will become fully vegetated. The gradient of these slopes will also limit the damage to the natural topography.		
	Roundabout designed to visually recede into the landscape, using hard and soft materials to reflect the local character.	Using a geometric pattern of hedgerows and semi mature hedgerow trees will provide a design that is more sensitive to the local environment will help to reduce the adversity of effects in this area. Design that focuses on strengthening the sense of place of the area and celebrating local history, culture and the natural environment will reduce the adverse effects of having such a large urban feature within the environment.		
	Additional loss of hedgerows, including Important Hedgerows (for Agricultural Land Use mitigation)	The additional loss of these established hedgerows will cause further adverse effects to the landscape quality.		
Agricultural Brisco and historic parkland (moderate)	<i>As operational assessment before mitigation with the following changes:</i>	<i>As operational assessment before mitigation with the following changes:</i>	Moderate Adverse	Moderate Adverse Effect
	Species rich, native hedgerow planting.	The newly planted hedgerow will not yet be fully effective in mitigating loss of hedgerows and change in boundary treatments. However, its presence provides investment in the future landscape.		
	Species rich, native hedgerows with standard, native broadleaf tree planting.	The newly planted hedgerow and hedgerow tree planting will not yet be fully effective in mitigating loss of hedgerows and hedgerow trees and change in boundary treatments. However, its presence provides investment in the future landscape.		
	Grading out of slopes to a 1:10 gradient to allow these to be returned to agricultural use.	The narrowing of the road corridor will reduce the adverse effect on the landscape, despite it being unlikely that the slopes returned for agricultural use will become fully vegetated. The gradient of these slopes will also limit the damage to the natural topography.		
	Roundabout designed to visually recede into the landscape, using hard and soft materials to reflect the local character.	At Redcat Roundabout, a simple, central area of broadleaf woodland to the centre will not yet be established, but will provide investment in the future landscape. At Brisco Roundabout, sandstone walling in a similar curved style to reflect gateways at Brisco Hill and Woodside Hall together with semi mature beech trees will result in a design that is more sensitive to the local environment will help to reduce the adversity of effects in this area. Design that focuses on strengthening the sense of place of the area and celebrating local history, culture and the natural environment will reduce the adverse effects of having such a large urban feature within the environment.		
	Bridges designed to visually recede into the landscape, using slender design, locally sourced materials. Bridges designed to be locally distinct, reinforcing a sense of place.	Using materials and a design that is more sensitive to the local environment will help to reduce the adversity of effects in this area.		

Receptor	Impact	Effect	Magnitude	Significance
	Rectilinear areas of woodland planting to mitigate the effect of roundabouts, overbridge and associated infrastructure and traffic on the landscape.	This woodland planting will be very young and will appear discordant from areas of more mature woodland and trees in the area. However, its presence provides investment in the future landscape.		
	Replacement individual tree planting.	This tree planting will be very young and will appear discordant from areas of more mature, parkland trees in the area. However, its presence provides investment in the future landscape.		
	Semi mature hedgerow trees will be planted at 5m spacings to mitigate for severing key barn owl flight routes (Nature Conservation mitigation).	This regular pattern will be less typical of this landscape. Providing more of an avenue of trees, rather than the random spacing which is more typical.		
	The proposed embankment to the south of The Langdale's will be extended (Noise and Vibration mitigation).	This will increase the severity of the adverse effect on the natural topography of this landscape, which was already being damaged by the proposed earthworks for the overbridge ramps.		
	Additional loss of hedgerows, including Important Hedgerows (for Agricultural Land Use mitigation)	The additional loss of these established hedgerows will cause further adverse effects to the landscape quality.		
Petteril river valley green wedge and transport corridor (moderate)	<i>As operational assessment before mitigation with the following changes:</i>	<i>As operational assessment before mitigation with the following changes:</i>	Major Adverse	Large Adverse Effect
	Species rich, native hedgerows with standard, native broadleaf tree planting.	The newly planted hedgerow and hedgerow tree planting will not yet be fully effective in mitigating loss of hedgerows and hedgerow trees and change in boundary treatments. However, its presence provides investment in the future landscape.		
	Riparian tree planting to river banks.	This tree planting will be very young and will appear discordant from areas of more mature trees elsewhere along the river edge. However, its presence provides investment in the future landscape.		
	Mixed species broadleaf woodland planting.	This woodland planting will be very young and will appear discordant from areas of more mature woodland and trees in the area. However, its presence provides investment in the future landscape.		
	Bridges designed to visually recede into the landscape, using slender design, locally sourced materials.	Using materials and a design that is more sensitive to the local environment will help to reduce the adversity of effects in this area.		
	Sensitive and creative design of bridges to create a "gateway" to Carlisle, to mitigate the effect of large, urban features being introduced to these landscapes.	Using materials and a design that is more sensitive to the local environment will help to reduce the adversity of effects in this area.		
	Bridges designed to visually recede into the landscape, using slender design, locally sourced materials.			
	A proposed embankment to the south east of Brisco roundabout as additional noise mitigation.	This will increase the severity of the effect on the natural topography of this landscape.		

Table 9.9 Residual impact assessment - Operational Phase: Summer Year 15

Receptor	Impact	Effect	Magnitude	Significance
Gently rolling lowland ridge and valley farmland and industrial Cummersdale (moderate)	<i>As operational assessment before mitigation with the following changes:</i>	<i>As operational assessment before mitigation with the following changes:</i>	Minor Adverse	Slight Adverse Effect
	Species rich, native hedgerows with standard, native broadleaf tree planting.	The hedgerow and hedgerow tree planting will now be more effective in mitigating loss of hedgerows and hedgerow trees and change in boundary treatments. The hedgerow trees will not have the same sense of maturity and time depth but will add value to the landscape and reinforce this key characteristic.		
	Slopes have been constructed at a shallower gradient (1:10 as oppose to 1:3) to allow for more land to be returned to agricultural use.	The narrowing of the road corridor will reduce the adverse effect on the landscape. The gradient of these slopes will also limit the damage to the natural topography.		
	Roundabout designed to reflect local landscape character, using hard and soft landscape design.	Cummersdale Roundabout has been designed with local sandstone walling and mixed broadleaf woodland planting, which will now be well established and help to break up the mass of this urban feature with planting that is characteristic of the area. The sandstone walling is typical of this character area and creates a design which is locally distinctive and reflects and sense of place.		
	Woodland planting on false cutting to north west of Cummersdale Roundabout. (Visual impact mitigation from Cummersdale)	This woodland planting will now be established and will complement other woodland blocks in this landscape.		
	Section of translocated hedgerow (nature conservation mitigation) to the north of the new road.	This hedgerow will now be fully established, mitigating the loss of this key feature.		
Caldew river valley green corridor, mill and print works (moderate)	<i>As operational assessment before mitigation with the following changes:</i>	<i>As operational assessment before mitigation with the following changes:</i>	Minor Adverse	Slight Adverse Effect
	Sensitive and creative design of bridges to create a “gateway” to Carlisle, to mitigate the effect of large, urban features being introduced to these landscapes. Bridges designed to visually recede into the landscape, using slender design, locally sourced materials.	Using materials and a design that is more sensitive to the local environment will help to reduce the adversity of effects in this area.		
	An artwork strategy to be developed to provide reference to local history, culture and the natural environment that is specific to each affected character area.	This artwork will have beneficial effects on the landscape, strengthening the sense of place of the area and celebrating local history, culture and the natural environment.		
	Dense scrub planting to western valley sides (nature conservation mitigation).	This planting will now be well established and help the engineered embankment slopes appear better integrated within the landscape.		
	Mixed species broadleaf woodland planting to the large embankments to the east of the River Caldew; to the cuttings further east and around Pond C to the north of the valley.	This woodland planting will now be established and will complement the wooded valley sides and tributaries within this landscape. It will also allow the engineered slopes to appear more integrated within the wider landscape by softening their appearance.		
	Scattered tree and scrub planting, to mitigate loss of vegetation and to better integrate engineered slopes into the landscape.	This tree and scrub planting will now be established and will complement the vegetation in the wider landscape. It will also allow the engineered slopes to appear more integrated within the wider landscape by softening their appearance.		
Sub-urban Carlisle: Busy linear settlements, race course and irregular field patterns (moderate)	<i>As operational assessment before mitigation with the following changes:</i>	<i>As operational assessment before mitigation with the following changes:</i>	Minor Adverse	Slight Adverse Effect
	Mixed species broadleaf woodland planting to the cuttings and to the severed land between the road cuttings and area of woodland to the north-west of Peastree Farm.	This woodland planting will now be established and will complement the mature wooded tributary valleys within this landscape.		
	Rectilinear areas of woodland planting to mitigate the effect of roundabouts, overbridge and associated infrastructure and traffic on the landscape.	This woodland planting will now be established and will complement other woodland blocks in this landscape. It will also aid the integration of the road infrastructure with the field pattern that is characteristic of the area and soften the impact of these urban features.		

Receptor	Impact	Effect	Magnitude	Significance
	Species rich, native hedgerow planting.	The hedgerows will now be more effective in mitigating loss of hedgerows and will be more typical of boundary treatments in this landscape.		
	Species rich, native hedgerows with standard, native broadleaf tree planting.	The hedgerow and hedgerow tree planting will now be more effective in mitigating loss of hedgerows and hedgerow trees and change in boundary treatments. The hedgerow trees will not have the same sense of maturity and time depth but will add value to the landscape.		
	Bridges designed to visually recede into the landscape, using slender design, locally sourced materials. Bridges designed to be locally distinct, reinforcing a sense of place.	Using materials and a design that is more sensitive to the local environment will help to reduce the adversity of effects in this area.		
	Grading out of slopes to a 1:10 gradient to allow these to be returned to agricultural use.	The narrowing of the road corridor will reduce the adverse effect on the landscape. The gradient of these slopes will also limit the damage to the natural topography.		
	Roundabout designed to visually recede into the landscape, using hard and soft materials to reflect the local character.	The geometric pattern of hedgerows will now be more effective now this planting is mature. Semi mature hedgerow trees will also provide a design that is more sensitive to the local environment will help to reduce the adversity of effects in this area. Ornamental meadow planting will also reinforce the rural qualities of this landscape and provide a strong sense of place. Design celebrating local history, culture and the natural environment will reduce the adverse effects of having such a large urban feature within the environment.		
	Additional loss of hedgerows, including Important Hedgerows (for Agricultural Land Use mitigation)	Whilst these hedgerows have been lost from the landscape pattern, the new hedgerow planting will now be partially effective in mitigating the loss of this green infrastructure feature.		
Agricultural Brisco and historic parkland (moderate)	<i>As operational assessment before mitigation with the following changes:</i>	<i>As operational assessment before mitigation with the following changes:</i>	Minor Adverse	Slight Adverse Effect
	Species rich, native hedgerow planting.	The hedgerows will now be more effective in mitigating loss of hedgerows and will be more typical of boundary treatments in this landscape.		
	Species rich, native hedgerows with standard, native broadleaf tree planting.	The hedgerow and hedgerow tree planting will now be more effective in mitigating loss of hedgerows and hedgerow trees and change in boundary treatments. The hedgerow trees will not have the same sense of maturity and time depth but will add value to the landscape.		
	Grading out of slopes to a 1:10 gradient to allow these to be returned to agricultural use.	The narrowing of the road corridor will reduce the adverse effect on the landscape. The gradient of these slopes will also limit the damage to the natural topography.		
	Roundabout designed to visually recede into the landscape, using hard and soft materials to reflect the local character.	At Redcat Roundabout, a simple, central area of broadleaf woodland to the centre will now be well established, reducing the overall perceived width of this urban feature and reflecting the local landscape. At Brisco Roundabout, sandstone walling in a similar curved style to reflect gateways at Brisco Hill and Woodside Park together with semi mature beech trees will result in a design that is more sensitive to the local environment will help to reduce the adversity of effects in this area. Ornamental meadow planting will also reinforce the rural qualities of this landscape and provide a strong sense of place. Design celebrating local history, culture and the natural environment will reduce the adverse effects of having such a large urban feature within the environment.		
	Bridges designed to visually recede into the landscape, using slender design, locally sourced materials. Bridges designed to be locally distinct, reinforcing a sense of place.	Using materials and a design that is more sensitive to the local environment will help to reduce the adversity of effects in this area.		
	Rectilinear areas of woodland planting to mitigate the effect of roundabouts, overbridge and associated infrastructure and traffic on the landscape.	This woodland planting will now be established and will complement other woodland blocks in this landscape. It will also aid the integration of the road		

Receptor	Impact	Effect	Magnitude	Significance
		infrastructure with the field pattern that is characteristic of the area and soften the impact of these urban features.		
	Replacement individual tree planting.	This tree planting will now be more established. Whilst these trees will not have the same sense of maturity and time depth as the historic parkland trees, they will add value to the landscape.		
	Semi mature hedgerow trees will be planted at 5m spacings to mitigate for severing key barn owl flight routes.	This regular pattern will be less typical of this landscape. Providing more of an avenue of trees, rather than the random spacing which is more typical. It is likely that these trees will now have required thinning, which may reduce the formality of this planting. These trees will add value to the landscape providing a source of green infrastructure.		
	The proposed embankment to the south of The Langdale's will be extended as additional noise mitigation.	This will increase the severity of the effect on the natural topography of this landscape, which was already being damaged by the proposed earthworks for the overbridge ramps.		
	Additional loss of hedgerows, including Important Hedgerows (for Agricultural Land Use mitigation).	Whilst these hedgerows have been lost from the landscape pattern, the new hedgerow planting will now be partially effective in mitigating the loss of this green infrastructure feature.		
Petteril river valley green wedge and transport corridor (moderate)	<i>As operational assessment before mitigation with the following changes:</i>	<i>As operational assessment before mitigation with the following changes:</i>	Minor Adverse	Slight Adverse Effect
	Species rich, native hedgerows with standard, native broadleaf tree planting.	The hedgerow and hedgerow tree planting will now be more effective in mitigating loss of hedgerows and hedgerow trees and change in boundary treatments. The hedgerow trees will not have the same sense of maturity and time depth but will add value to the landscape.		
	Riparian tree planting to river banks.	This tree planting will now be more established, strengthening a key characteristic in this landscape.		
	Mixed species broadleaf woodland planting.	This woodland planting will now be established and will complement the wooded valley sides within this landscape. It will also allow the engineered slopes to appear more integrated within the wider landscape by softening their appearance.		
	Bridges designed to visually recede into the landscape, using slender design, locally sourced materials.	Using materials and a design that is more sensitive to the local environment will help to reduce the adversity of effects in this area.		
	Sensitive and creative design of bridges to create a "gateway" to Carlisle, to mitigate the effect of large, urban features being introduced to these landscapes.	Using materials and a design that is more sensitive to the local environment will help to reduce the adversity of effects in this area.		
	Bridges designed to visually recede into the landscape, using slender design, locally sourced materials.			
	A proposed embankment to the south east of Brisco roundabout as additional noise mitigation.	This will increase the severity of the effect on the natural topography of this landscape.		

9.11 Cumulative Effects

9.11.1 The following section provides a brief description of the cumulative effects of the Scheme and the developments shown on the Committed Development Plan (see Chapter 16, Figure 16.1) that are located within the study area for this assessment.

Sub-urban Carlisle: 1960's residential cul-de-sac (low sensitivity)

9.11.2 The significance of effects from the Scheme itself are considered to be neutral here. However, two developments will have additional impacts on this character area.

9.11.3 An application (planning reference "14/0975") for the erection of 18no. affordable dwellings with associated gardens and parking was granted in 2015. Work on this site has commenced and is unlikely to have any additional effects on this landscape due to the development proposed being residential and on a brownfield site.

9.11.4 The application for the installation of a 20m high monopole and associated equipment and infrastructure (planning reference "18/0003/TEL") is unlikely to have additional effects due to it being similar in nature to the existing lighting columns on this area of Dalston Road. A short section of hedgerow will be lost to allow for the installation of this feature.

9.11.5 A large residential development (planning reference "09/0413") is also proposed at Morton within the adjacent character area, however, the amalgamation of these two residential areas and loss of views over open green space will increase the urban character of this character area.

Sub-urban Carlisle: Urban fringe transport corridor and mixed residential (low sensitivity)

9.11.6 The significance of effects from the Scheme are considered to be moderate adverse during construction, reducing to slight adverse once the large site compound has been reinstated and construction activities have ended.

9.11.7 However, the large-scale development of land at south Morton bounded by Wigton Road, Peter Lane and Dalston Road (planning reference "12/0692") will increase the adversity of significance of effects. This development includes residential (maximum 825 dwellings), employment (40,000m² floorspace) and public open space, as well as associated works including vehicular access, drainage, services and landscaping pursuant to Outline Permission "09/0413". The detailed planning application was granted permission on 19 Jul 2013 and small percentages of this development have been constructed or are under construction.

9.11.8 According to the documents associated with the outline application, the proposals will include two to three story developments of low-medium density to the periphery and higher density to the centre. The layout to the north in a "cul-de-sac" radial style, similar to the adjacent grain of the residential area here, whereas to the south a grid pattern will reflect the linear road network and rectilinear field patterns. A linear open green space is proposed to run south west to north east along the course of Fairy Beck, incorporating various amenity areas and habitat enhancements, including woodland copses and SuDS features, allotments and play spaces. Many of the existing hedgerows have been proposed to be retained, with the exception of short lengths removed for a new road network and four longer lengths of hedgerow to the south-west of this area, which has been allocated for

“employment/ development” and is referred to in the masterplan as a commercial business park.

- 9.11.9 For this development, however, it is not possible to fully assess the significance of the cumulative effects without more details of material finishes and appearance of the built form proposed, as these will be influential in affecting local character and sense of place. Similarly, with the large-scale housing allocations labelled as “Land at Newhouse Farm, south-west of Orton Road” (30.2ha) and “Land at Garden Village, West of Wigton Road” (6.43ha), without detail of scale, density, appearance and layout it is not possible to fully determine the significance of effects.
- 9.11.10 The impacts of these developments in addition to the CSLR Scheme, will be both beneficial and adverse. The increase in urban development (predominantly residential with some employment) will have an adverse effect on this landscape, which is typically open and agricultural. There will be loss of open space, loss of hedgerows, trees and other vegetation and a reduction in tranquillity. Increased permanent lighting and vehicle lighting will also have adverse effects on night time character.
- 9.11.11 However, the areas of publicly accessible open green space (for example, the proposed Fairy Beck Park) and the proposed planting and facilities within these spaces could result in beneficial effects, particularly when considered with the additional planting and open green space to the south of Peter Lane (in the adjacent character area).

Carlisle urban fringe: low land ridge and valley farmland and transport corridor (low sensitivity)

- 9.11.12 The only additional development within this character area is the planning application “16/0794” for the erection of standby electricity generation plant in new portal framed building and installation of ancillary equipment. The scale and appearance of this development is unlikely to have additional significant effects on the landscape. The proposed buildings are agricultural in character and if clad sensitively, will not be uncharacteristic of this landscape. The siting of this development close to the mature plantation woodland will also help to minimise the effect of the scale of this building.

Gently rolling lowland ridge and valley farmland and industrial Cummersdale (moderate sensitivity)

- 9.11.13 There are three additional developments to consider within this character area. The first planning reference “16/1022” for the erection of 17no. dwellings and associated infrastructure on the junction of Dalston Road and Cummersdale Road. The scale and location of this residential development means that it is unlikely to cause significant adverse effects on the landscape, however, the design of the housing is not a strong reflection of the local vernacular. Similarly, the 0.39 ha housing allocation for the land east of Cummersdale Road is unlikely to have significant adverse effects in combination with the road.
- 9.11.14 However, the cumulative effects of these two small developments in combination with the CSLR Scheme and the proposed area for development of the St Cuthbert’s Garden Village are very likely to be significant, transforming a rural, agricultural area into an area of urban fringe. These developments will have many impacts on this landscape, affecting scale, pattern, land use, vegetation cover, tranquillity and other perceptual qualities. The night time character will also become far more

urbanised, in an area with little artificial lighting before construction to an area that will be permanently lit as well as the moving vehicular lighting throughout this landscape. The townscape character of Cummersdale itself will be impacted through being enclosed around the south-western edge which was previously open to rolling agricultural land. A local/ district centre has been indicated adjacent to the Cummersdale Roundabout, which will also result in a sense of urbanisation in this landscape. Without further details of the appearance, scale and densities of this development and the treatment of existing vegetation, it is not possible to fully determine the significance of effects on this landscape.

Caldew river valley green corridor, mill and print works (moderate sensitivity)

- 9.11.15 Despite there being no additional developments to consider within this character area, it is likely that the development of St Cuthbert's Garden Village will result in increased users of this valued river corridor landscape. Whilst this will have an impact on some perceptual characteristics of this landscape, it is unlikely to change the significance of effects on this receptor.

Sub-urban Carlisle: Busy linear settlements, race course and irregular field patterns (moderate sensitivity)

- 9.11.16 Within the study area, the only developments to consider are the St Cuthbert's Garden Village indicative proposals for a large area of residential and a band of potential longer term employment. The cumulative effects of these two developments in combination with the CSLR Scheme are very likely to be significant, transforming a predominantly rural, agricultural area into an area of urban fringe. These developments will have many impacts on this landscape, affecting scale, pattern, land use, vegetation cover, tranquillity and other perceptual qualities.
- 9.11.17 The night time character will also become far more urbanised, in an area with little artificial lighting before construction to an area that will be permanently lit as well as the moving vehicular lighting throughout this landscape. The townscape character of Durdar itself will be impacted through being enclosed around the south-western edge which was previously open to rolling agricultural land. A local/ district centre has been indicated adjacent to the spur road junction with Durdar Road, to the south of the Racecourse, which will also result in a sense of urbanisation in this landscape.
- 9.11.18 A narrow belt of employment land is indicated to the south of the CSLR. The nature of this development is likely to be highly uncharacteristic of this landscape, where land use is predominantly agricultural/ equestrian or residential linear villages.
- 9.11.19 Without further details of the appearance, scale and densities of this development and the treatment of existing vegetation, it is not possible to fully determine the significance of effects on this landscape.

Agricultural Brisco and historic parkland (moderate sensitivity)

- 9.11.20 The proposed area of St Cuthbert's Village is outside of the study area for the landscape assessment.

Elevated Burthwaite and rolling farmland (moderate sensitivity)

- 9.11.21 There are no additional developments within this character area, however, the dramatic increase in urban development to the north for the St Cuthbert's Garden

village will result in impacts to the perceptual qualities of this landscape. The rural road network will increase in traffic and the open views towards Carlisle and beyond will be changed, increasing the characteristics of an urban fringe environment.

Petteril river valley green wedge and transport corridor (moderate sensitivity)

- 9.11.22 No additional developments will impact this landscape. There will be a change in views from the St Cuthbert Garden Village development in the adjacent character area at Carleton due to its elevated position, however, this will have limited effect on this landscape.

Elevated, agricultural Carleton, rolling farmland and transport corridor (low sensitivity)

- 9.11.23 Within this character area, there are three areas of additional development to consider. The first is a 7.25ha development between Carleton Road and Cumwhinton Road (planning application reference "13/0983"). The proposal is for 189 residential units and associated infrastructure. The layout of the housing is in a grid-like cul-de-sac arrangement and the density is greater than the housing adjacent to it. An area of open green space is central to the development. The housing will be a combination of brick, natural stone clad and rendered, however, the detail of the brick/ stone/ render types and colours will influence the effects on the landscape and townscape character.
- 9.11.24 The proposals for St Cuthbert's Garden Village indicate an area of residential land between the A6 and Cumwhinton Road, a local/ district centre on the A6 to the south-east of Carleton centre and an area of employment land to the north-east of Junction 42.
- 9.11.25 The cumulative effects of these three areas of development in combination with the CSLR Scheme are very likely to be significant, expanding the urban influences on the increasingly rare areas of agricultural land. These developments will have many impacts on this landscape, affecting scale, pattern, land use, vegetation cover, tranquillity and other perceptual qualities. The night time character will also become even more urbanised, in addition to the lighting associated with the M6 and Junction 42 and A6 at Carleton. The townscape character of Carleton itself will be impacted through becoming enclosed by urban development, potentially damaging the agricultural rural qualities of the village itself. The local/ district centre will also result in a sense of urbanisation in this landscape.
- 9.11.26 The area of employment land will relate to the commercial development around Junction 42. However, the scale is indicated to be much greater and is located on a relatively elevated position, meaning it will have prominence in the landscape.
- 9.11.27 Without further details of the appearance, scale and densities of this development and the treatment of existing vegetation, it is not possible to fully determine the significance of effects on this landscape.

9.12 Summary

9.12.1 During Summer of Year 15 of the Scheme there will still be slight adverse effects on the following receptors:

- Gently rolling lowland ridge and valley farmland and industrial Cummersdale;
- Caldew river valley green corridor, mill and print works;
- Sub-urban Carlisle: Busy linear settlements, race course and irregular field patterns;
- Agricultural Brisco and historic parkland;
- Petteril river valley green wedge and transport corridor.

9.12.2 In summary, the residual effects of the Scheme during Summer of Year 15 are not considered to be significant. Table 9.10 demonstrates the reduction of adverse effects through effective landscape mitigation.

Table 9.10 Landscape assessment summary table

Receptor	Sensitivity	Impact Assessment (pre-mitigation)				Residual Impact Assessment		
		Construction Phase	Operation Winter Year 1	Operation Summer Year 15	Night time Winter Year 1	Construction Phase	Operation Winter Year 1	Operation Summer Year 15
Sub-urban Carlisle: 1960's residential cul-de-sac	low	Neutral	Neutral	Neutral	Neutral	Neutral	* Not assessed	* Not assessed
Sub-urban Carlisle: Urban fringe transport corridor and mixed residential	low	Moderate adverse	Slight adverse	Slight adverse	Neutral	Moderate adverse	* Not assessed	* Not assessed
Carlisle urban fringe: lowland ridge and valley farmland and transport corridor	low	Moderate adverse	Slight adverse	Slight adverse	Moderate adverse	Moderate adverse	* Not assessed	* Not assessed
Gently rolling lowland ridge and valley farmland and industrial Cummersdale	moderate	Large adverse	Moderate adverse	Moderate adverse	Moderate adverse	Large adverse	Moderate adverse	Slight adverse
Caldew river valley green corridor, mill and print works	moderate	Very large adverse	Large adverse	Large adverse	Moderate adverse	Very large adverse	Large adverse	Slight adverse
Sub-urban Carlisle: Busy linear settlements, race course and irregular field patterns	moderate	Very large adverse	Large adverse	Large adverse	Large adverse	Very large adverse	Large adverse	Slight adverse
Agricultural Brisco and historic parkland	moderate	Large adverse	Moderate adverse	Moderate adverse	Large adverse	Large adverse	Moderate adverse	Slight adverse
Elevated Burthwaite and rolling farmland	moderate	Neutral	Neutral	Neutral	Neutral	Neutral	* Not assessed	* Not assessed
Petteril river valley green wedge and transport corridor	moderate	Very large adverse	Large adverse	Large adverse	Moderate adverse	Very large adverse	Large adverse	Slight adverse
Elevated, agricultural Carleton, rolling farmland and transport corridor	low	Neutral	Neutral	Neutral	Neutral	Neutral	* Not assessed	* Not assessed

* Character areas without significant effects (moderate/ large/ very large) at Summer Year 15 of the Impact Assessment were not assessed for residual effects after mitigation

10 Visual Impacts

10.1 Introduction

- 10.1.1 This chapter assesses the potential significant visual impacts on receptors likely to arise from the Scheme during construction, and in Years 1 and 15 of operation.
- 10.1.2 Visual receptors are defined as people who are receptive to changes in specific views and include views from residential and commercial properties, Public Rights of Way, public open space, and any other specific viewpoints within the visual envelope. Impacts are recorded from within the visual envelope (a theoretical boundary which defines the area/areas from where the development is visible). This is determined by computer analysis, the methodology for which is described later in this chapter.
- 10.1.3 This chapter assesses the visual impact that the Scheme may have upon visual receptors by firstly describing the views and visibility in the surrounding area, and then by identifying the impacts that would result from the Scheme. Where necessary mitigation measures are proposed, and the impact of these mitigation measures is assessed.

10.2 Assessment Methodology

Guidelines

- 10.2.1 The assessment has been carried out in accordance with guidance and techniques presented in the following documents.
- Highways Agency (now Highways England) - DMRB Volume 11 Section 3 Part 5 (Landscape Effects); June 1993, amended August 1994.
 - Highways Agency (now Highways England) - Interim Advice Note (IAN) 135/10 Landscape and Visual Effects Assessment: November 2010
 - Cumbria County Council - Cumbria Landscape Character Guidance and Toolkit. – March 2011.
 - the Landscape Institute and Institute of Environmental Management & Assessment -The Guidelines for Visual Impact Assessment (Third Edition): 2013
 - Natural England - National Character Area profile 6: Solway Basin: 2015

Methodology

Study Area

- 10.2.2 Visual impact can affect large areas extending from the Scheme where views in and out of the development site are possible. The visual envelope of the Scheme has been defined to focus the study area on visual receptors (people) likely to experience significant effects. The study area extends for a 1km envelope around the Scheme site considering the scale of the development.
- 10.2.3 The study area is shown on Figure 1.1 and was refined and agreed through consultation with Cumbria County Council. Beyond this (owing to the nature of the

Scheme and the context of the site) any impacts are considered to be not significant. Within the study area boundary, a viewpoint study was agreed and carried out as detailed below.

- 10.2.4 The Scheme connects Junction 42 of the M6 to the A595 at Peter Lane. The landscape within the study area comprises largely rural urban fringe and agricultural land.
- 10.2.5 The urban fringe occurs in a narrow band around the edge of Carlisle, including the northern part of the study area. This area includes the villages of Cummersdale, Brisco, Durdar and Carleton, as well as Carlisle Racecourse. This gives way to agricultural land which extends out beyond the study area boundary.
- 10.2.6 In the vicinity of the River Caldew, the landscape becomes more undulating creating more of a ridge and valley like nature.
- 10.2.7 For this assessment, the base year has been set as 2020 and the completion of the Scheme will be 2023. Assumptions have therefore been made regarding changes to the views in the period between completing the assessment and the base year at completion. The assessment was carried out for the base year and operation - Year 1 and Year 15.

Methodology for Baseline Desktop Survey

- 10.2.8 A theoretical visual envelope referred to as the Zone of Theoretical Visibility (ZTV) (shown in Figures 10.1 to 10.3), was produced with GIS based computer modelling software. This approach uses elevation data to create a bare earth digital terrain model of the study area and calculate inter-visibility between points or along lines radiating out from the development location, to construct maps showing the area from which the proposal may potentially be visible and those from which it is not visible. These were developed using a Digital Terrain Model (DTM) and Digital Surface Model (DSM) from Lidar data to a resolution of 5m.
- 10.2.9 The ZTV identifies land that is visually connected (theoretically) with the proposal. The graded colours reflect the percentage visibility of the proposed development from any particular viewpoint in the model. These viewpoints represent visual receptors (people) and are focussed on the more sensitive types of receptors (which are more likely to experience significant effects). The locations of viewpoints were focussed in visibility 'hot spots' identified by analysis and professional judgment i.e. areas showing the greatest visibility.
- 10.2.10 A further ZTV was run to show the scheme at night and the potential impact from road lighting. Spot heights were raised by 10m to represent the top of lighting columns. 10m was taken as this represents the worst-case scenario.
- 10.2.11 The viewpoints for the assessment were chosen by identifying potential receptors within the visual envelope. OS mapping, aerial photography and PRow data were all used to identify preliminary viewpoints. These were then tested using Google Street-view (where coverage exists) and verification on site considering the screening effects of buildings within the views.
- 10.2.12 A final viewpoint study plan was defined, and the viewpoints agreed as above. These viewpoints were then assessed in the field using the methodology outlined below.

Methodology for Baseline Field Surveys

10.2.13 Fieldwork was undertaken on 21st and 30th August 2018 (summer) and again on 6th and 8th March 2019 (winter). Feedback from public consultation resulted in additional fieldwork being undertaken on 2nd July 2019 in order to assess Newbiggin Hall. The following tasks were carried out:

- Check visibility of the Scheme development site from the viewpoints identified and agreed in the viewpoint study, to establish the visual baseline condition, and carry out a visual impact assessment for each viewpoint.
- Take photographic records of views in accordance with the Landscape Institute Advice Note 01/11 *Best Practice for Photography – ‘Photography and Photomontage in Landscape and Visual Impact Assessment’*.
- Identify and assess any additional viewpoints that would add significant value to the viewpoint study and add them to the assessment (where pertinent).

10.2.14 Fieldwork viewpoint baseline assessments are reported in Table 10.5.

10.2.15 All viewpoints are selected as being representative, to illustrate a larger number of viewpoints that cannot all be included individually. For example, one house is representative of the views of a number of houses in a settlement and certain points may be chosen to represent views from key pathways.

10.2.16 The viewpoints were selected to represent views seen by the following groups:

- Residents of dwellings.
- Walkers, cyclists and horse-riders (WCH) using recreational footpaths, cycle routes or public rights of way.
- Recreational users associated with the river corridor and public open space.

10.2.17 Receptor viewpoints were chosen carefully to:

- focus the study;
- represent the receptors most significantly affected;
- represent a proportional range of viewing distances in the study area;
- represent a proportional range of receptor types in the study area; and
- represent both static and moving receptors in the landscape.

10.2.18 In selecting the location of receptor viewpoints, they were split into two types: specific and representative.

10.2.19 A “specific” receptor viewpoint records the baseline view of a fixed viewer e.g. resident at a known location such as a dwelling, other small property, mapped feature, vantage point, or monument etc.

10.2.20 A “representative” receptor viewpoint records the baseline view of a moving viewer e.g. walker, commuter etc. in an unfixed location such as a road, path, cycle route, river, canal, common land, amenity area, open space, large community facility etc.

- 10.2.21 The final defined study area and receptor viewpoints were agreed with Cumbria County Council after the preliminary field work. Detailed field assessments (of viewpoints) were focused within 1km from the centre line of the scheme. This is shown on Figures 10.1, 10.2 and 10.3.
- 10.2.22 For the purpose of this study, significant visual impacts are as defined in the Design Manual for Roads and Bridges i.e. those which give rise to moderate, large or very large impacts (both adverse and beneficial).

Impact Assessment

- 10.2.23 The baseline information is the starting point for assessment. Once this information has been gathered, an assessment of visual impacts pre-mitigation was undertaken. The impacts were discussed with the engineering team throughout the Stage 2 design process enabling early changes to be made to the design before the Stage 3 assessment was undertaken.
- 10.2.24 The process of design development and mitigating the effects of the design on visual amenity is iterative. Discussions with Cumbria County Council, engineers and consultees were undertaken throughout the design development period, including looking at the proposed embankments and the use of cuttings/false cuttings to reduce impacts. This was fed into the design and taken into account in the impact assessment.
- 10.2.25 Upon completion of the design and taking into account any mitigation measures, an assessment of the mitigated scheme was carried out to identify construction and operational residual impacts.
- 10.2.26 Because visual impact assessment cannot be scientifically quantified, it was important to clearly define the criteria for assessment to ensure that the basis for decisions was consistent and to clarify the rationale for professional judgments. Assessment criteria were based upon the series of tables provided in the Interim Advice Note 135/10 'Landscape and Visual Effects Assessment' November 2010, and reproduced in Table 10.1, Table 10.2 and Table 10.3.
- 10.2.27 Impacts have been identified for the following phases of the scheme and where appropriate, the likely duration stated:
- Construction phase - worst case scenario assumed - peak activity for any given view;
 - Operational phase - opening year;
 - Operational phase - year 15, after mitigation has established and taken effect. The sensitivity of receptors depends on the location, context and expectations of the receptor (viewer), and the duration of time over which the receptor is affected by the change resulting from the development. The identification of various categories of visual receptor and the assumed visual sensitivity of each, forms part of the visual baseline against which the change in the view brought about by the proposed development can be assessed. Table 10.1 outlines the sensitivity ratings applied to the baseline.

Table 10.1 Visual Sensitivity and Typical Descriptors

Sensitivity of receptor	Description
High	Residential properties/residents. Users of Public Rights of Way or other recreational trails (e.g. National Trails, footpaths, bridleways, Core Paths etc.). Users of recreational facilities where the purpose of that recreation is enjoyment of the countryside (e.g. Country Parks, National Trust or other access land etc.).
Moderate	Outdoor workers. Users of scenic roads, railways or waterways or users of designated tourist routes. Schools and other institutional buildings, and their outdoor areas.
Low	Indoor workers. Users of main roads (e.g. trunk roads) or passengers in public transport on main arterial routes. Users of recreational facilities where the purpose of that recreation is not related to the view (e.g. sports facilities).

Magnitude of Impact

10.2.28 The assessment of magnitude of identified impacts records the degree of change in the composition of particular views: comparing the existing view (baseline) to that which would result as a consequence of the Scheme. In determining the magnitude of impact, the following were considered:

- Scales of change - large scale projects usually generate a greater magnitude of change, but not always.
- Nature of change - the extent to which a given change is out of character with the existing view can influence the magnitude of the impact.
- Distance - the magnitude of any change would generally decrease with distance, until a point is reached where there is no discernible change.
- Screening - certain features may screen or partially screen particular views. Where the feature is vegetation (e.g. deciduous trees) the screening effect may be seasonal.
- The direction and focus of the view - if the change occurs in the part of the landscape which is the principal area of existing visual interest, the effects are likely to be perceived to be greater than if the proposed change occurs away from the main area of visual interest. This is especially relevant in the context of views from within houses (which are effectively framed by their windows), or from gardens (where views are often restricted by vegetation), and from prominent or locally valued viewpoints.
- Whether the receptor is static or moving – a greater emphasis was placed upon static receptors than moving receptors from a single viewpoint. However, the cumulative effect of several affected views on a moving receptor may have a high magnitude of impact.

- Numbers and types of receptors potentially affected at a viewpoint - (e.g. a popular viewpoint, busy trunk road, little-used path or minor lane).
- Night time impacts on receptors - street lighting and headlight glare can introduce additional adverse visual impacts after dark. Conversely, feature lighting can have beneficial visual impacts at night time.

10.2.29 The magnitude of impact, or degree of change, is assessed using the criteria in Table 10.2.

Table 10.2 Magnitude of Impact and Typical Descriptors

Magnitude of impact	Descriptor
Major	The project, or a part of it, would become the dominant feature or focal point of the view.
Moderate	The project, or a part of it, would form a noticeable feature or element of the view which is readily apparent to the receptor.
Minor	The project, or a part of it, would be perceptible but not alter the overall balance of features and elements that comprise the existing view.
Negligible	Only a very small part of the project would be discernible, or it is at such a distance that it would form a barely noticeable feature or element of the view.
No change	No part of the project, or work or activity associated with it, is discernible.

Assessing the Significance of Visual Impacts

10.2.30 The assessment of the significance of the visual effects is derived by taking the sensitivity ratings applied at baseline, together with the magnitude of change in the view resulting from the development and combining the results on the significance matrix as shown in Table 10.3. A significance rating has been applied to the detailed impacts assessment taking into account the effect of agreed and committed mitigation. The typical descriptors of the significance of effect categories are listed in Table 10.4.

10.2.31 Moderate or higher impacts are considered to be significant.

Table 10.3 Impact Significance Matrix

		Magnitude of Impact (Beneficial or Adverse)				
		No Change	Negligible	Minor	Moderate	Major
Visual Sensitivity	High	Neutral	Slight	Slight/ Moderate	Moderate/ Large	Large/Very Large
	Moderate	Neutral	Neutral/Slight	Slight	Moderate	Moderate/ Large
	Low	Neutral	Neutral/Slight	Neutral/Slight	Slight	Slight/ Moderate

Table 10.4 Typical Descriptors of the Significance of Effect Categories

Significance	Typical Descriptors of Effects
Very large Beneficial	The project would create an iconic new feature that would greatly enhance the view.
Large Beneficial	The project would lead to a major improvement in a view from a highly sensitive receptor.
Moderate Beneficial	The proposals would cause obvious improvement to a view from a moderately sensitive receptor, or perceptible improvement to a view from a more sensitive receptor.
Slight Beneficial	The project would cause limited improvement to a view from a receptor of medium sensitivity, or would cause greater improvement to a view from a receptor of low sensitivity.
Neutral	No perceptible change in the view.
Slight Adverse	The project would cause limited deterioration to a view from a receptor of moderate sensitivity, or cause greater deterioration to a view from a receptor of low sensitivity.
Moderate Adverse	The project would cause obvious deterioration to a view from a moderately sensitive receptor, or perceptible damage to a view from a more sensitive receptor.
Large Adverse	The project would cause major deterioration to a view from a highly sensitive receptor, and would constitute a major discordant element in the view.
Very Large Adverse	The project would cause the loss of views from a highly sensitive receptor, and would constitute a dominant discordant feature in the view.

Construction and Operational Impacts

10.2.32 The assessment is focused on the operational effects during construction and at completion of the works referred to as Year 1 and at Year 15 following completion. Residual Impacts refers to those significant adverse or beneficial impacts of the mitigated Scheme and are assessed using the same assessment criteria as for the assessment carried out on the unmitigated scheme.

10.2.33 The detailed assessment of the residual visual impacts takes into account all proposed mitigation. This may take the form of solid barriers such as fences or earth mounds, which would be effective from the first day of opening, or screen planting, which would take a number of years to mature and achieve full effect.

Overall Impact Significance

10.2.34 An assessment of impact significance was made for each visual receptor and can be found in Section 10.5. The results from these assessments informed the overall impact assessment on visual amenity which is included in the section summary

Methodology for Preparation of Mitigation Proposals

10.2.35 In order to develop mitigation measures which would reduce adverse impacts of the scheme, mitigation workshops were run, attended by the engineers and environmental team. The purpose of the workshops was to collaboratively agree how the initial impacts of the scheme could be reduced or improved through the design process.

Informal Discussion

10.2.36 In addition to the formal workshops there were numerous informal meetings and discussions between designers, environmental assessors and the client to consider options to improve the environmental design of the Scheme.

10.2.37 The outcome of this iterative process and the mitigation workshops was a series of mitigation proposals, presented below and a series of plans identifying the location of proposed mitigation (see Chapter 17, Figures 17.1-17.3).

10.3 Limitations and Assumptions

10.3.1 The field survey was undertaken on public land due to limited access to private property. The approach taken in these circumstances was in line with best practice guidance IAN 135/10 "Landscape and Visual Effects Assessment", November 2010, which advises estimating the nature of the view and number of receptors affected from the nearest areas with public access.

10.3.2 Viewpoints were selected to provide 'representative' views from all the affected residential areas.

10.3.3 It is assumed that the management of the surrounding buildings and landscape will generally continue until construction of the Scheme. Changes in maintenance and landscape management practices are difficult to predict and therefore it has been assumed that there will be no changes to the existing visual amenity between the time of assessment and the start of construction. The impacts are therefore based on the existing views.

10.4 Consultation

- 10.4.1 Consultation was undertaken with Cumbria County Council from November 2017 onwards as part of the Stage 2 design development, in which a number of representative viewpoints were agreed. Consultation then continued throughout the Stage 3 assessment in order to agree the level of assessment and the final location and number of viewpoints.

10.5 Regulatory and Policy Framework

National Planning Policy Framework (NPPF), February 2019

- 10.5.1 These local planning policies echo the themes of the NPPF, revised February 2019, which are summarised below.
- 10.5.2 “Achieving well-designed places”, states that planning policies and decisions should ensure that developments: “are visually attractive as a result of good architecture, layout and appropriate and effective landscaping; are sympathetic to local character and history, including the surrounding built environment and landscape setting, while not preventing or discouraging appropriate innovation or change (such as increased densities); establish or maintain a strong sense of place, using the arrangement of streets, spaces, building types and materials to create attractive, welcoming and distinctive places to live, work and visit.” - Section 12, Ministry of Housing, Communities and Local Government, February 2019.

Carlisle District Local Plan 2015 - 2030

- 10.5.3 Policy SP 6 - Securing Good Design – encourages development that effectively responds to the local character and context through the retention of important landscape features including trees, shrubs, hedges and other wildlife habitats. “Infrastructure shall be incorporated without detrimental harm to retained features.”
- 10.5.4 Policy SP 8 – Green and Blue Infrastructure – seeks to mitigate unavoidable harm to a green infrastructure asset through development. “Any measure shall be of similar or better quality to that lost, including fulfilling the same functions.”
- 10.5.5 Policy GI 1 – Landscapes – values all landscapes for “their intrinsic character and protecting them from excessive, harmful or inappropriate developments, particularly those areas less able to accommodate significant change. Where the opportunity arises, measures should be taken to enhance or restore valued landscapes”.
- 10.5.6 Policy GI 4 - Open Space – “Any development resulting in a partial or total loss of an area of Open Space to non-sport or recreation uses or would otherwise detract from the role and function an open space is valued for will not normally be permitted. Consideration would be given to any development where a surplus of open space is available locally or where the development of a small part of the area of open space would enable investment to improve the quality of the rest of the site. Other grounds for consideration include if the site is deemed to have little community value; or where it is proposed to dispose of the statutory open space”
- 10.5.7 Policy GI 5 - Public Rights of Way - “Proposals that would affect existing rights of way will not be permitted unless an alternative route is available, or can be made available, which is safe, attractive, is well integrated with the existing network and is not significantly longer than the original route.”

- 10.5.8 Policy GI 6 - Trees and Hedgerow –Existing trees and hedgerows shall be protected wherever possible from harm or removal during development. The policy states a preference for native tree species where practicable and where trees and hedgerows are lost during a development, there is a requirement to replant replacements on site or on an appropriate alternate location. “The extent of replanting required will be representative of the age, number and size of trees, or length of hedgerows, originally lost.”

10.6 Baseline Conditions

- 10.6.1 An initial baseline assessment was carried out during the walk over surveys on 2nd and 30th August 2017 as part of Stage 2. Further walk over surveys took place on 21st and 30th August 2018 and 11th and 18th March 2019. A further assessment was carried out at Newbiggin Hall on the 2nd July 2019.
- 10.6.2 A total number of 8 viewpoints around the site were assessed in terms of their features and sensitivity. These are summarised in Table 10.5 and shown on Figures 10.1, 10.2 and 10.3. The baseline conditions within the study area and their defined sensitivity is shown in Table 10.5.

Table 10.5 Summary of the Baseline Information and Sensitivity

View point Number	Brief Baseline Description of the Existing View	Sensitivity
1	Cummersdale - The baseline view from the edge of this village consists of open ridge and valley agricultural land with medium to large fields defined by hedgerows. Fields are used for both pastoral grazing and livestock related crops, creating a patchwork field pattern. Small areas of plantation woodland, isolated mature broadleaf trees and isolated dwellings are also present in the landscape. Due to this visual receptor being the residents of Cummersdale the sensitivity has been classed as “High”.	High
2	Cumbria Way/ NCN7 / River Caldew - The baseline view from this major recreational route offers open rural views of the Caldew river valley, with rich and varied landscape elements from the pebble beach on the meanders of the river, expanses of native grassland, succession willow wetlands within the floodplain to areas of mature broadleaf woodland and rolling pastoral fields on the valley sides. Due to this visual receptor being both the Cumbrian Way and National Cycle Network Route 7, the sensitivity has been classed as “High”.	High
3	Durdar North - The baseline view from the edge of this small linear village consists of relatively flat land on the edge of Carlisle Racecourse that consists of large fields used for both pastoral grazing and livestock related crops, defined by hedgerows interspersed with isolated mature broadleaf trees. Occasional wind turbines, large agricultural sheds at the racecourse and electricity pylons in the distance provide dominant features in the landscape. Due to this visual receptor being the residents of Durdar the sensitivity has been classed as “High”.	High
4	Durdar South – The baseline view from the southern extents of the village of Durdar features the busy Newbiggin Road and views of relatively flat, pastoral agricultural land. This partially screened by the mature hedgerow running along Newbiggin Road. The existing road features highways lighting columns in this area. A small area of broadleaf plantation woodland features to the south east of the view and mature hedgerows with mature broadleaf trees and some sections of metal railing divide large	High

View point Number	Brief Baseline Description of the Existing View	Sensitivity
	fields. The line of Durdar Road running south of the village is well screened behind further mature hedgerows.	
5	River Petteril Public Right of Way – The baseline view from this receptor features the Petteril river valley, with gently rolling topography opening out into the flat valley floodplain further north. The landscape is typically pastoral grazing land with some mature trees providing a parkland character. The river edge consists of mature trees and hedgerows. The views from this receptor includes built elements, including the West Coast Mainline Railway and the embankments of Newbiggin Road approaching Junction 42 of the M6. Due to this visual receptor being users of a public right of way, the sensitivity has been classed as “High”.	High
6	Carleton – This viewpoint is on the outer extents of the study area. The central baseline view offers longer views from Carleton out over the trees situated on the River Petteril floodplain below. Closer in the view the road cuts right down the centre heading towards Junction 44 of the M6. Either side residential properties align the road with some vegetation helping to break up the built form.	High
7	Morton - The baseline view is in the proximity of properties along Newfaithes Road and Irton Place (Morton) looking south. The near view offers open views across agricultural fields well defined by mature hedgerows. Peter Lane and the A595 roundabout are visible in the distance although they are partially screened by existing mature vegetation in the view.	High
8	Newbiggin Hall cottages- The baseline view is in the proximity of the cottages located within the grounds of Newbiggin Hall. The near view offers restricted views towards the Westcoast mainline railway. The southern extent of Carlisle is visible within the background of the view. To the west Newbiggin Road as it rises to the junction with Brisco Road is visible. A small group of residential buildings at the junction is visible within a group of trees. To the east the meandering flow of the River Petteril is visible with its vegetated riverbank and further east, the M6 carriageway and the motorway Junction 42 overbridge roundabout.	High

10.7 Impact Assessment

Construction Phase

10.7.1 The following is a list of aspects that were considered in the assessment of impacts arising from the construction phase:

- Loss of vegetation (although scrub can develop on construction sites);
- Earthworks and construction works (including stockpiles);
- The siting of any temporary buildings;
- The siting of any compounds;
- The visibility of plant and materials;

- Floodlighting;
- Changes in traffic flows.

10.7.2 Detailed assessments for each viewpoint during the construction phase without mitigation are described below and should be read in conjunction with Figures 10.1, 10.2 and 10.3 for the viewpoint locations.

Viewpoint 1 Cummersdale

10.7.3 Construction activities associated with the scheme would be clearly visible in the mid distant view approximately 430m to the construction site. Plant and construction activities associated with the embankments for the false cutting will be visible across the view. To the right, plant and construction activities associated with the construction of the roundabout at Dalston Road will be visible however, existing vegetation helps screen this element. During the winter months, any floodlighting associated with construction will be visible right across the view. This will create an additional visual intrusion onto land which is predominantly agricultural and unlit. The height and design of the contractor's buildings within the site compound may also cause a visual barrier in the view,

10.7.4 Magnitude: **Major adverse**. Significance: **Large adverse**.

Viewpoint 2 Cumbria Way/ NCN7 / River Caldew

10.7.5 The use of cranes and other plant associated with the construction of the bridge will dominate the view. New materials forming the bridge structure and engineered embankments will form an uncharacteristic element of the view. During the winter months any floodlighting associated with construction will be dominant. The height and design of the contractor's buildings within the site compound may also cause a visual barrier in the view,

10.7.6 Magnitude: **Major adverse**. Significance: **Large adverse**.

Viewpoint 3 Durdar North

10.7.7 The construction site will form a noticeable part of the short and middle range views from the residential properties on Dalston Road. The construction will involve the creation of a link road through existing agricultural land connecting back to Durdar Road. Plant and construction activities associated with the new roundabout will be visible in the mid-range view. During the winter months any floodlighting associated with construction will be visible.

10.7.8 Magnitude: **Major adverse**. Significance: **Large adverse**.

Viewpoint 4 Durdar South

10.7.9 The construction site will form a noticeable part of the short and middle range views from the residential properties on Newbiggin Road. To the right the construction of the bridge and associated embankment will form a substantial element; however, the existing hedgerow in the foreground will help to soften the view at this location. Cranes and other plant associated with the construction of the bridge and the link road will also be visible in the view.

10.7.10 Magnitude: **Major adverse**. Significance: **Large adverse**.

Viewpoint 5 River Petteril Public Right of Way

- 10.7.11 Construction activities would be visible in all aspects of the view. To the left large new embankments will be constructed in the near distance, the road curving down to a new bridge over the River Petteril. This will be partially screened from existing vegetation along the river corridor in summer. In winter, the construction activities will be more prominent due to the loss of foliage which will decrease screening. Within the central view at this location will be construction works associated with the road and embankments leading to a second bridge over the railway. This will be partially screened by the existing topography; however, cranes and plant associated with the construction works will still be visible. During the winter months, any floodlighting associated with construction will be visible across the whole view.
- 10.7.12 Magnitude: **Major adverse**. Significance: **Large adverse**.

Viewpoint 6 Carleton

- 10.7.13 Construction activities will be largely screened in both summer and winter months due to the mature trees on the River Petteril floodplain below. During the winter months any floodlighting associated with construction will be barely noticeable.
- 10.7.14 Magnitude: **Negligible**. Significance: **Slight adverse**.

Viewpoint 7 Morton

- 10.7.15 The construction site will be approximately 800m from this viewpoint. There will be a loss of existing woodland in the distant centre creating potential adverse impacts on the view. To the right plant and construction activities associated with the roundabout where Peter Lane joins the A595 will be partially visible. Existing mature hedgerows in the near view will help to soften the impact from construction activities. Plant and construction activities associated with the embankments will also be visible in the distance.
- 10.7.16 Magnitude: Moderate adverse. Significance: Moderate adverse.

Viewpoint 8 Newbiggin Hall Cottages

- 10.7.17 The construction site will be approximately 200m from this viewpoint, with the construction site of Brisco roundabout approximately 800m from the viewpoint. There will be some tree and hedgerow loss to facilitate construction of the roundabout and the road. Plant and construction activities associated with the roundabout, bridge and road construction will be visible across the view.
- 10.7.18 Magnitude: **Major adverse**. Significance: **Large adverse**.
- 10.7.19 Table 10.6 provides a summary of the impacts, magnitude and overall significance at each of the viewpoints.

Table 10.6 Summary of construction phase visual impacts (without mitigation)

Receptor	Impact	Effect	Magnitude	Significance
Cummersdale (High)	Removal of existing vegetation. Construction works, and lighting.	Loss of visual amenity for the receptor	Major	Large Adverse
Cumbria Way/ NCN7 / River Caldeu (High)	Removal of existing vegetation. Construction works, and lighting.	Loss of visual amenity for the receptor	Major	Large Adverse
Durdar North (High)	Removal of existing vegetation. Construction works, and lighting.	Loss of visual amenity for the receptor	Major	Large Adverse
Durdar South (High)	Removal of existing vegetation. Construction works, and lighting.	Loss of visual amenity for the receptor	Major	Large Adverse
River Petteril Public Right of Way (High)	Removal of existing vegetation. Construction works, and lighting.	Loss of visual amenity for the receptor	Major	Large Adverse
Carleton (High)	No change to the view	No Change	Negligible	Slight Adverse
Morton (High)	Removal of existing vegetation. Construction works, and lighting.	The partial loss of visual amenity for the receptor	Moderate	Moderate Adverse
Newbiggin Hall Cottages (High)	Removal of existing vegetation. Construction works, and lighting.	The partial loss of visual amenity for the receptor	Major	Large Adverse

Operation Phase

10.7.20 The following is a list of aspects that have been assessed as part of the operational phase impacts, without mitigation:

- Height and appearance of retaining walls.
- Height and appearance of embankments.
- Position, height and appearance of new built structures.
- The visibility of the carriageway.
- Changes to vegetation.
- Light spill from the proposed carriageway lighting.
- The visual impact of traffic flows on the existing and new road, including the headlight lighting.

10.7.21 Photomontages have been produced (refer to Appendix 10.1) showing the original views and the 3D model of the Scheme within the existing topography. The rendered images include the existing built form but deliberately do not include the proposed landscaping, to ensure the proposed works are accurately represented without mitigation.

10.7.22 Detailed assessments of the operation phase impacts (in Year 1 and Year 15 post-construction) for each viewpoint without mitigation are described in the following sections.

Viewpoint 1 Cummersdale

10.7.23 This viewpoint is slightly elevated however the new road will be partially screened due to it running through a false cutting. The movement of lorries and other high sided vehicles and some light from the proposed carriageway lighting will be noticeable. To the right the new roundabout at Dalston Road will be partially visible however existing vegetation will help screen this within the view.

10.7.24 The magnitude of impact in Year 1 will be **Moderate adverse**, and remain unchanged in Year 15 without mitigation, therefore the significance of the effect is assessed as **Moderate adverse**.

Viewpoint 2 Cumbria Way/ NCN7 / River Caldew

10.7.25 In Year 1 of operation the new bridge over the River Caldew and its embankments will dominate the view forming an uncharacteristic structure in a more rural landscape. Any embankments will appear more engineered compared to the landscape around it. The view will include flickers of light from moving vehicles which will create an additional intrusion in the view at night.

10.7.26 The magnitude of impact in Year 1 will be **Major adverse**, and remain unchanged in Year 15 without mitigation, therefore the significance of the effect is assessed as **Large adverse**.

Viewpoint 3 Durdar North

10.7.27 From this viewpoint, there will be clear short and middle range views of the link road and associated traffic movement which connects into Durdar Road. This will result in a loss in visual amenity as the Scheme cuts through the existing agricultural landscape. The roundabout will be partially visible in the middle of the view. Proposed carriageway lighting and the lights associated with moving vehicles will create additional intrusion in the view at night.

10.7.28 The magnitude of impact in Year 1 will be **Major adverse**, and remain unchanged in Year 15 without mitigation, therefore the significance of the effect is assessed as **Large adverse**.

Viewpoint 4 Durdar South

10.7.29 In Year 1 of operation, the Scheme will still form a noticeable part of the short and middle range views from the residential properties on Newbiggin Road running approximately 300m to the south. Durdar Road bridge that crosses the new link road to the south of the village will be visible due to the loss of existing hedgerows and mature trees. The bridge embankments will be a major change in the view. However, the existing hedgerow in the foreground will help to soften the view at this

location. Proposed carriageway lighting and the lights associated with moving vehicles will create additional intrusion in the view from this location at night.

- 10.7.30 The magnitude of impact in Year 1 will be **Major adverse**, and remain unchanged in year 15 without mitigation, therefore the significance of the effect is assessed as **Large adverse**.

Viewpoint 5 River Petteril Public Right of Way

- 10.7.31 In Year 1 of operation the Scheme will be visible in all aspects of the view. The large new embankments will be visible in the near distance, with the road curving down to a new bridge over the River Petteril. This will be partially screened by existing vegetation along the river corridor in summer. In winter, the Scheme will be more prominent due to the reduced foliage screening the view. The new embankments leading to a second bridge over the railway will continue to be visible in the view. The existing topography slopes up at this location reducing the view of the scheme. The increased vehicular movements will create a visual intrusion in the view. Proposed carriageway lighting and the lights on moving vehicles will increase this visual intrusion at night.

- 10.7.32 The magnitude of impact in Year 1 will be **Major adverse**, and remain unchanged in Year 15 without mitigation, therefore the significance of the effect is assessed as **Large adverse**.

Viewpoint 6 Carleton

- 10.7.33 In Year 1 and therefore also in Year 15 of operation, the Scheme will be largely screened due to the existing vegetation and built form closer in the view.
- 10.7.34 The magnitude of impact in Year 1 will be **Negligible** and remain unchanged in Year 15 therefore the significance of the effect is assessed as **Neutral**.

Viewpoint 7 Morton

- 10.7.35 In Year 1 of operation, the new roundabout where the Scheme joins the A595 will be partially visible in the distance approximately 770m from this location. In the centre of the view the Scheme will be partially screened by existing vegetation adjacent to Peter Lane. The visual amenity for residential receptors will be partially compromised as the scheme is a visual feature in part of the view. Any carriageway lighting and the lights from moving vehicles will create a minimal incursion on the view at night due to the distance from the receptor.
- 10.7.36 The magnitude of impact in Year 1 will be **Moderate adverse**, and remain unchanged in Year 15 without mitigation, therefore the significance of the effect is assessed as **Moderate adverse**.

Viewpoint 8 Newbiggin Hall cottages

- 10.7.37 In Year 1 of operation, the Brisco roundabout will be visible in the distance approximately 800m from this location. Earth bunds adjacent to the roundabout will help to screen the roundabout in the view. To the west, the scheme introduces a second road into the viewpoint with the existing road retained for access. The visual amenity for residential receptors will be partially compromised as the route is a visual feature in the view. Any carriageway lighting and the lights from moving vehicles will create an incursion on the view at night due to the short distance from

the receptor. The existing bridge over the railway will be retained and a second constructed as part of the Scheme, which will be visible from the viewpoint.

10.7.38 The magnitude of impact in Year 1 will be **Major adverse**, and remain unchanged in Year 15 without mitigation, therefore the significance of the effect is assessed as **Large adverse**.

10.7.39 Table 10.7 provides a summary of the impacts, magnitude and overall significance at each of the viewpoints.

Table 10.7 Summary of operation phase visual impacts (without mitigation)

Receptor	Impact	Effect	Magnitude	Significance	
				Year 1	Year 15
Cummersdale (High)	Loss of vegetation. Partial Intrusion of lighting and visibility of larger vehicle movements.	Loss of Visual amenity	Moderate Adverse	Moderate Adverse	Moderate Adverse
Cumbria Way/ NCN7 / River Caldew (High)	Loss of vegetation. Intrusion of the new bridge, lighting and visibility of vehicle movements.	Loss of Visual amenity	Major Adverse	Large Adverse	Large Adverse
Durdar North (High)	Loss of vegetation. Dissection of agricultural land Intrusion of lighting and visibility of vehicle movements.	Loss of Visual amenity	Major Adverse	Large Adverse	Large Adverse
Durdar South (High)	Loss of vegetation. Intrusion of the new bridge, lighting and visibility of vehicle movements.	Loss of Visual amenity	Major Adverse	Large Adverse	Large Adverse
River Petteril Public Right of Way (High)	Loss of vegetation. Intrusion of the new bridges, engineered embankments, lighting and visibility of vehicle movements.	Loss of Visual amenity	Major Adverse	Large Adverse	Large Adverse
Carleton (High)	No change to the view	No change	Negligible	Neutral	Neutral
Morton (High)	Loss of vegetation. Intrusion of the new roundabout, engineered embankments, lighting and visibility of vehicle movements.	The partial loss of visual amenity.	Moderate Adverse	Moderate Adverse	Moderate Adverse
Newbiggin Hall cottages (High)	Loss of vegetation. Intrusion of the new roundabout, engineered embankments, railway bridge, lighting and visibility of vehicle movements.	The partial loss of visual amenity.	Moderate Adverse	Large Adverse	Large Adverse

10.8 Mitigation, Enhancement and Monitoring

Mitigation

Temporary Mitigation

- 10.8.1 Temporary mitigation is generally associated with the temporary construction phase impacts.
- 10.8.2 Significant impacts during the construction phase are predicted at viewpoints 1, 2, 3, 4, 5, 7 and 8 (residential and recreational receptors). The proposed temporary mitigation measures are summarised in Table 10.8.

Table 10.8 Summary of proposed temporary mitigation

Location/ Receptor	Nature of Impact	Mitigation
2,4, 5, 7 & 8	Site compounds, temporary buildings and the movement of construction vehicles will have a negative effect on the visual amenity. The height and design of the contractor's buildings may cause a visual barrier or a visual disturbance which would detract from the existing visual amenity.	Careful planning of the construction phasing and layout to ensure visually intrusive features are located away from sensitive receptors or screened appropriately. CEMP to include detailed methodology.
2,4, 5, 7 & 8	There will be a significant loss of vegetation, including a number of trees during the construction phase of the works. The removal of this vegetation will result in increased levels of visual disturbance and the loss of visual amenity. It should also be noted that there will be some trees/ vegetation removal during the operational phase at some of these locations which is dealt with in the following section.	Any loss of vegetation generally and in particularly trees will be mitigated by the planting of substitutes during the earliest possible planting season. The principle of only removing trees and mature shrubs where it is essential will be adopted, and the arboricultural impact assessment will be used to guide removal. The contractor should confirm planning approval has been gained prior to the removal of any trees and, must seek further planning approval before removing any additional trees or mature shrubs which are not identified for removal on the contract drawings.
2,4, 5, 7 & 8	The light pollution created by the floodlighting of the site compounds etc. will cause a visual disturbance to any receptors, especially in the evening and early morning.	All lighting used will be directional and all efforts should be made to avoid unnecessary light pollution. CEMP to include detailed method statement.
2,4, 5, 7 & 8	The storage of topsoil has the potential to cause a loss of visual amenity.	Stockpiles of topsoil should be no higher than 2m and the stockpiling should comply with BS 3882:2015
2,4, 5, 7 & 8	The roads that are being used as the main access/supply routes to the proposed development site will become	CEMP to include further details of the construction traffic movements

Location/ Receptor	Nature of Impact	Mitigation
	busier during the construction phase. This additional traffic will create a visual disturbance.	

Permanent Mitigation

- 10.8.3 Permanent mitigation is required where long term significant impacts have been identified through the construction and operational phases.
- 10.8.4 Significant impacts have been identified to viewpoints 1, 2, 3,4,5,7 and 8 (residential and recreational receptors).
- 10.8.5 Landscape planting proposals have been developed to support mitigation measures and the landscape design for the Scheme. These are described in more detail below.

Viewpoint 1 Cummersdale

- 10.8.6 Mitigation to screen the Scheme will be in the form of compensatory planting and landforms. Native broadleaf woodland is proposed to screen Cummersdale roundabout to the right of the view and species rich hedgerows along the false cutting in the centre view.

Viewpoint 2 Cumbria Way/ NCN7 / River Caldew

- 10.8.7 The proposed bridge over the River Caldew will be designed to visually recede into the landscape. The ratio of the main span in relation to the side spans enhances the appearance. The slender design includes curved soffits, edge cantilevers and tapered piers. Native broadleaf woodland will be planted to soften the engineered embankments associated with the bridge. Vegetation lost on the riverbanks will be mitigated with mixed native scrub and scattered trees helping to increase the natural look of the landscape.

Viewpoint 3 Durdar North

- 10.8.8 Mitigation at Durdar roundabout will take the form of native broadleaf woodland planting. The link road through to Durdar road will be lined with native species rich hedgerow softening the impact on the view.

Viewpoint 4 Durdar South

- 10.8.9 The proposed Durdar Bridge will be designed to fit within the surrounding landscape. Native broadleaf woodland will be planted to mitigate the built form and the associated engineered embankments. Existing hedgerows and trees are to be retained where possible aiding to screen then the scheme from this viewpoint.

Viewpoint 5 River Petteril Public Right of Way

- 10.8.10 The large proposed embankments where the Scheme connects into Junction 42 will be planted with native broadleaf woodland softening the view to the left across the river. The two proposed bridges forming the river and rail crossings have been

designed to fit within the surrounding landscape. Proposed hedgerows running adjacent to the alignment will help mitigate the carriageway within the view.

Viewpoint 7 Morton

- 10.8.11 Mixed native woodland planting including some larger semi mature stock is proposed on the embankments adjacent to the roundabout which will also help to screen the cycle overbridge. The proposed bridge has been designed to fit within the surrounding landscape.

Viewpoint 8 Newbiggin Hall cottages

- 10.8.12 Mitigation to screen the scheme will be in the form of compensatory planting and landforms. Native broadleaf woodland is proposed to screen Brisco roundabout to the right and along the proposed embankments adjacent to the scheme moving left in the view. Native scrub planting with scattered trees is proposed within the vicinity of the pond towards the railway line.

- 10.8.13 Table 10.9 provides a summary of the proposed permanent mitigation.

Table 10.9 Summary of proposed permanent mitigation

Schedule No.	Location/ Receptor	Nature of Impact	Mitigation
VI01	1, 2, 3, 4, 5, 7 & 8	Potential loss of existing mature trees and vegetation. The removal of trees will expose the receptor to the proposed scheme.	Any lost trees and/or shrubs will be replaced as part of the landscape planting proposals increasing the net number. and where appropriate, the replacement vegetation will include large stock size trees.
VI02	1, 2, 3, 4, 5, 7 & 8	The new, wide link road and associated traffic movements becoming a dominant feature in the view.	Proposed hedgerow planting.
VI03	1, 2, 3, 4, 5, 7 & 8	Potential for embankments to introduce engineered form into the landscape.	Larger embankment slopes to be planted to soften the impact on the landscape.
VI04	2	Loss of vegetation to the riverbanks along the Caldew due to the new bridge crossing. Engineered slopes and large urban bridge structure forming large features in the view.	Mixed native scrub planting and scattered trees.
VI05	1, 2, 3, 4, 5, 7 & 8	Introduction of bridges forming a dominant urban feature in the view.	Bridges designed to visually recede into the landscape, using slender design Bridges designed to be locally distinct, reinforcing a sense of place.

Schedule No.	Location/ Receptor	Nature of Impact	Mitigation
VI06	1, 2, 3, 4, 5, 7 & 8	Potential for embankments to introduce engineered form into the landscape	Slopes on the backside of embankments to be slackened and returned to agricultural land. (embedded in the design for the assessment)
VI07	1	View of infrastructure and activities associated with the scheme including carriageway, roundabouts, signs, lighting columns and traffic movements.	Cutting/false cutting to aid visual screening of road. (embedded in the design for the assessment)

Enhancement

10.8.14 In addition to the proposed mitigation, further opportunities for enhancement have been identified and have been included within the proposed design.

10.8.15 Landscape enhancement includes the following:

- Areas of native bulb and perennial planting, native shrub and individual tree planting both along the proposed highway and within land adjacent to this.
- New cycle stands, signage, footways, seating and information/ interpretation materials and informal play features using felled timber around SuDS ponds A, B, C, D and G, where public access is more likely due to the proximity of residential areas or public rights of way.
- Proposed artwork/ sculpture referencing the local character and heritage of the areas on Newby West, Durdar and Brisco roundabouts.
- Around the Caldew valley PROW, bespoke informative signage relating to the local landscape, history, ecology and natural river processes and have been proposed, as well as the artwork strategy that has been referenced in the Mitigation Schedule.
- Within the Caldew valley, additional robust timber seating, informal natural play features and natural stone boulders have been proposed to further enhance this landscape.
- At Pond D, a boardwalk has been proposed over part of the pond to provide a different experience and vantage point for pedestrians at this location.

10.8.16 For further details of proposed enhancement measures, refer to Landscape Strategy Document (Planning Application document: CSLR-CAP-ELS-00-RP-L-3001).

Monitoring

- 10.8.17 It is critical that any proposed mitigation is monitored and is retained in good condition to maintain full effectiveness. This is particularly crucial with mitigation planting, which needs close monitoring to ensure that it establishes fully to serve its function.
- 10.8.18 Mitigation should be maintained and monitored continuously to ensure that it is serving the function that was committed through the proposed design. If any damage or failure is present, this must be replaced as soon as possible. This responsibility will be with the contractor for a five-year period after opening of the scheme to ensure the mitigation is established. Any loss of plants will be replaced within this period. Following this establishment period, responsibility for maintenance will transfer to Cumbria County Council as the Highways Authority.

10.9 Residual Impact Assessment

- 10.9.1 Mitigation during construction will create no change for all viewpoints, however for all viewpoints the mitigation will not be sufficient to reduce the magnitude of the impact in the long term, therefore it will remain moderate to large adverse as the new road will dominate the views.
- 10.9.2 Table 10.10 presents a summary of the proposed mitigation for the construction phase and how it will affect the significance of effects for each viewpoint (moderate adverse or above).

Table 10.10 Summary of residual construction impacts (with mitigation)

Receptor	Impact	Effect	Magnitude	Significance
Cummersdale (High)	Removal of existing vegetation, construction works, and lighting.	Loss of visual amenity	Major	Large Adverse
Cumbria Way/ NCN7 / River Caldew (High)	Removal of existing vegetation, construction works, and lighting.	Loss of visual amenity	Major	Large Adverse
Durdar North (High)	Removal of existing vegetation, construction works, compound area and lighting.	Loss of visual amenity	Major	Large Adverse
Durdar South (High)	Removal of existing vegetation, construction works, and lighting.	Loss of visual amenity	Major	Large Adverse
River Petteril Public Right of Way (High)	Removal of existing vegetation, construction works, and lighting.	Loss of visual amenity	Major	Large Adverse
Morton (High)	Removal of existing vegetation, construction works, compound area and lighting.	The partial loss of visual amenity.	Moderate	Moderate Adverse
Newbiggin Hall Cottages (High)	Removal of existing vegetation, construction works, compound area and lighting.	The partial loss of visual amenity.	Major	Large Adverse

Operational Impacts moderate adverse or above (opening, year 1 and year 15)

Viewpoint 1 Cummersdale

- 10.9.3 In Year 1 the magnitude of impact at this viewpoint will remain as moderate adverse as planting will not screen large and high-sided vehicle movement. The false cutting is likely to remain a visible entity in the view. By Year 15, the planting will have established, the magnitude will potentially be reduced to minor adverse, therefore the significance of the effect will be reduced to Slight Adverse.

Viewpoint 2 Cumbria Way/ NCN7 / River Caldew

- 10.9.4 In Year 1 the new bridge over the River Caldew will continue to dominate the view as a significant built structure within a rural environment. Existing riverside vegetation will partially screen the road to the east and south. The new planting on the embankment will have little effect on screening the road until it reaches maturity. By Year 15 the planting will have matured, providing an improvement on the baseline, reducing the magnitude of impact to moderate adverse. Therefore, the significance of the effect will be reduced to Moderate Adverse.

Viewpoint 3 Durdar North

- 10.9.5 In Year 1 the roadside hedgerow planting, which includes semi-mature tree stock within it, will reduce the magnitude of visual impact to moderate. By Year 15 the new hedgerow vegetation will have matured sufficiently to integrate the road into the wider landscape context, resulting in a magnitude of impact of minor adverse. Therefore, the significance of the effect will be reduced to Slight Adverse.

Viewpoint 4 Durdar South

- 10.9.6 In Year 1, the bridge will remain a noticeable part of the short and middle range views from the residential properties along Newbiggin Road. The new planting will not have matured sufficiently to reduce the magnitude of impact for both the bridge and the road. By Year 15 the vegetation will have sufficiently matured to reduce the magnitude of visual impact to minor adverse, therefore the significance of the effect will be reduced to Slight Adverse.

Viewpoint 5 River Petterill Public Right of Way

- 10.9.7 In Year 1 the scheme will be visible, although partially screened by existing vegetation. However, the new planting will not have matured sufficiently to contribute to any screening of the Scheme. In winter, the road will be dominant in the view because of the deciduous planting. By Year 15 the new planting will have matured helping to integrate the Scheme into the wider landscape; however, the bridge and embankments will remain a significant built structure within the rural landscape. Traffic movements, lights and roadside lighting will also remain a visual intrusion within the landscape. Magnitude is expected to remain as moderate adverse, therefore the significance of the effect will remain Moderate Adverse.

Viewpoint 7 Morton

- 10.9.8** Mitigation planting will include semi-mature specimens. This will help screen views of the Scheme to the west. The magnitude of impact is expected to remain as moderate adverse. By Year 15 the new vegetation will have matured around the roundabout sufficiently to reduce the magnitude of impact to minor adverse, therefore the significance of the effect will reduce to Slight Adverse.

Viewpoint 8 Newbiggin Hall cottages

- 10.9.9** In Year 1 the roundabout will be partially screened by the semi-mature broadleaf planting., whilst the planting around the pond will partially screen the road. The railway bridge will be a visually prominent structure within a largely rural landscape. The new bridge is adjacent to the existing bridge, with both visible from this viewpoint. The retained road will also be visible in the centre of the view. In Year 1 the magnitude of impact is expected to be reduced to moderate adverse. By Year 15 the new vegetation will have sufficiently matured around the roundabout and the section of the new road to reduce the magnitude of impact to minor adverse. Therefore, the significance of the effect will reduce to Slight Adverse.
- 10.9.10** Table 10.11 summarises the effectiveness of proposed mitigation for the operational phase and the subsequent assessment of the magnitude of the impact and the significance of effects for each viewpoint.

Table 10.11 Summary of residual operational impacts (with mitigation)

Receptor	Impact	Effect	Magnitude	Significance	
				Year 1	Year 15
Cummersdale (High)	Loss of vegetation. Intrusion of the new roundabout, lighting and visibility of larger vehicle movements.	The partial loss of visual amenity.	Year 1 - moderate adverse Year 15 - minor adverse	Moderate Adverse	Slight Adverse
Cumbria Way/ NCN7 / River Caldew (High)	Loss of vegetation. Intrusion of the new bridge and visibility of vehicle movements and associated lighting	The loss of visual amenity.	Year 1 - large adverse Year 15 - moderate adverse	Large Adverse	Moderate Adverse
Durdar North (High)	Loss of vegetation. Dissection of agricultural land Intrusion of the new roundabout, lighting and visibility of larger vehicle movements.	The partial loss of visual amenity.	Year 1 - moderate adverse Year 15 - minor adverse	Moderate Adverse	Slight Adverse
Durdar South (High)	Loss of vegetation. Intrusion of the new bridge, lighting and visibility of vehicle movements.	The partial loss of visual amenity.	Year 1 - major adverse	Large Adverse	Slight Adverse

Receptor	Impact	Effect	Magnitude	Significance	
				Year 1	Year 15
			Year 15 - minor adverse		
River Petteril Public Right of Way (High)	Loss of vegetation. Intrusion of the new bridges, engineered embankments, lighting and visibility of vehicle movements.	The loss of visual amenity.	Year 1 - major adverse Year 15 - major adverse	Large Adverse	Moderate Adverse
Morton (High)	Loss of vegetation. Intrusion of the new roundabout, engineered embankments, lighting and visibility of vehicle movements.	The partial loss of visual amenity.	Year 1 - moderate adverse Year 15 - minor adverse	Moderate Adverse	Slight Adverse
Newbiggin Hall Cottages (High)	Loss of vegetation. Intrusion of the new roundabout, engineered embankments, railway bridge, lighting and visibility of vehicle movements.	The partial loss of visual amenity.	Year 1 - moderate adverse Year 15 - minor adverse	Moderate Adverse	Slight Adverse

10.10 Cumulative Effects

10.10.1 The cumulative effects of proposed development adjacent to and in conjunction with the assessed effects of the Scheme have been assessed. The following paragraphs consider the agreed planning applications within the study area (1km envelope) which have been consented for development.

10.10.2 Application 91/1050: Proposed erection of 48 no. dwellings (for rent & shared ownership) The application site is on land adjacent Westrigg Road/Wigton Road and Morton Park. The only potential viewpoint impacted will be Viewpoint 7, however this will be to the far right in the view therefore no cumulative effects are considered likely.

10.10.3 Application 18/1043: Proposed demolition and replacement of canopy forecourt; with the introduction of a new petrol tank and two additional petrol islands (total of 4 islands/dispensing pumps); additional car parking and enhanced access. Extension to existing shop to accommodate new shower facilities and food to go unit. Proposed new external seating to the rear of the building. The application site is at the Golden Fleece Service Station. There are no viewpoints affected by this development therefore no cumulative effects are considered likely.

10.10.4 Application 18/1016: Residential development to provide 42no. Dwellings (33no. Houses and 9no. Apartments) Works to be carried out include new build, the conversion of existing buildings and works to form two improved vehicular accesses. This includes the demolition of no.68 Durdar Road. The application site is at the former stables, horsebox & lorry park, land adjacent Blackwell house, Durdar

Road. There are no viewpoints affected by this development therefore no cumulative effects are considered likely.

- 10.10.5 Application 18/0003/TEL: Installation of 20m high monopole, associated equipment and infrastructure. Southbound grass verge, Dalston Road. Although this will create a tall element in the landscape, there will be no cumulative effect from this development as this development is to the north and east, whereas the views from Viewpoint 1 at Cummersdale and Viewpoint 7 at Morton are to the south.
- 10.10.6 Application 16/1022: Erection of 17no. dwellings and associated infrastructure. This application site is on Land to the rear of Irvings Place, Dalston Road, Cummersdale. This development is to the north and east, whereas the views from Viewpoint 1 at Cummersdale and Viewpoint 7 at Morton are to the south. Therefore, there will be no cumulative effects from this development.
- 10.10.7 Application 16/0794: Erection of standby electricity generation plant in new portal framed building and installation of ancillary equipment. This application is at Kingrigg Farm, Newby Cross. During construction there is the potential for some cumulative effects, however due to existing vegetation and the distance to the view this will be negligible. During operation there will be no cumulative effect.
- 10.10.8 Application 09/0413: Residential (maximum 825 dwellings), employment (40,000m² floorspace), and public open space purposes as well as associated works. This application is for the development of land at south Morton bounded by Wigton Road, Peter Lane and Dalston Road, Carlisle. The only viewpoint impacted will be Viewpoint 7. This potentially will create a large adverse cumulative effect in the view. The outlook from the residence of Morton will significantly change. Mixed native woodland, ornamental planting and native shrubs are proposed in this location to mitigate the scheme. And help to reduce the cumulative impact.
- 10.10.9 Application 18/0790: Erection of school and associated access, car parking, sports facilities, landscaping and substation. This application is on land at Scalegate Road, Brisco. There are no viewpoints effected therefore no cumulative effects are considered likely.
- 10.10.10 Carlisle City Council has aspirations for development of a garden village (St. Cuthbert's). At this time the exact layout is not known and as such has only been assessed at a high level, where relevant to the Scheme. Residential areas containing local district centres are proposed at Cummersdale, Durdar and Carleton. There are also two areas allocated for employment south of Durdar and east of Carleton respectively It is envisaged this will result in a major adverse magnitude of impact resulting in a Very Large Adverse significance of effect for viewpoints 1, 3 and 4. There will also be a minor adverse magnitude of impact resulting in a Slight Adverse significance of effect on viewpoint 8. The majority of the garden village in this location will be screened by existing properties on the A6.
- 10.10.11 There are a few sites under the 2015 housing allocation within the study area which have not been submitted for planning and for which there is insufficient detail to enable assessment of their impacts in conjunction with the CSLR scheme.

10.11 Summary

- 10.11.1 This assessment has considered both the construction and operation phase visual impacts of the Scheme at eight agreed viewpoints, the significance of impacts at each location and how these will be mitigated.
- 10.11.2 During the construction phase, visual impacts will be associated with the construction vehicles and plant, site compounds and associated temporary lighting, and the loss of some existing vegetation. During construction of the new road and its associated structures, heavy machinery including lifting equipment will be brought onto site and will remain there for periods of time. This will have an adverse visual impact at several viewpoints.
- 10.11.3 The site compounds will contain several temporary buildings and will also generate construction traffic on the existing roads through the study area. This will have an adverse visual impact on the receptors that have views to these areas.
- 10.11.4 During the operational phase the visual impacts will be associated with the new infrastructure e.g. road and bridge structures, vehicle movements and headlights (especially in the winter months), signage and new highway lighting. The signs, barriers, footpath and highway lighting will introduce an illuminated and occasionally dynamic element into the landscape.
- 10.11.5 The introduction of new traffic will impact some residential areas which will become more exposed by loss of vegetation and increased proximity to the new road.
- 10.11.6 The proposed mitigation will reduce the adverse visual effects arising from the Scheme. Mitigation is generally provided through landscape planting proposals therefore the effectiveness of mitigation will develop over time. There will be a loss of existing vegetation during the construction phase but the planting of a significant number of trees will reduce the visual impact of the scheme and improve the visual amenity in the long term.
- 10.11.7 The significance of the residual construction phase effects on all the viewpoints range from moderate adverse to large adverse.
- 10.11.8 None of the operational impacts have resulted in a beneficial effect on the visual amenity from any particular viewpoint. The significance of the operational phase effects on all the viewpoints in Year 1 range from moderate adverse to large adverse and slight adverse to moderate adverse in Year 15
- 10.11.9 Proposed landscape mitigation will reduce the magnitude of visual impacts in the operational phase. In Year 1 the significance of visual effects, when looking at the overall scheme will be moderate adverse. By Year 15 mitigation planting will have matured reducing the effects to slight adverse.

11 Agricultural Land Use

11.1 Introduction

11.1.1 This chapter assesses the impact of the proposed CSLR scheme on agricultural land and farming businesses within the study area in line with the guidance presented in the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3 Part 6: Chapters 6 to 10.

11.1.2 As specified in DMRB, the scope of this assessment includes:

- the quantity and quality (defined by Agricultural Land Classification (ALC) grade) of land that will be permanently lost to the scheme,
- the impact of severance and access changes on agricultural businesses,
- the type of husbandry utilising the land,
- major accommodation works for access, water supply and drainage; and
- the future viability of the affected farm businesses (as influenced by the above factors) under the completed scheme scenario.

11.1.3 For the assessment, a viable farm business is considered to be a net farm income, not less than the average minimum wage, while still providing a return on capital employed in the business (excluding land).

11.1.4 The assessment of farm viability is limited to the agricultural units that are currently farmed as viable businesses. Interviews with landowners during the study (as detailed in the CSLR Agricultural Impact Assessment (AIA), (Appendix 11.1) identified 15 viable agricultural businesses that would be affected by the proposed scheme.

11.1.5 This chapter assesses the anticipated impacts on these businesses throughout the Scheme area, from construction through to the operational phase.

11.2 Assessment Methodology

Guidelines

11.2.1 This assessment has been conducted in line with the guidance presented in the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3 Part 6: Chapters 6 to 10.

11.2.2 The Stage 2 ALC survey was undertaken in line with *Revised guidelines and criteria for grading the quality of agricultural land, October 1988*, Ministry of Agriculture, Fisheries and Food (MAFF), and Natural England Technical Information Note TIN049: *Agricultural Land Classification: protecting the best and most versatile agricultural land*. Insofar as further discussion and analysis of ALC is required at Stage 3, this guidance has still been followed.

Methodology

Study area

- 11.2.3 The study area for this assessment has been determined by visual assessment of the farm units that are considered likely to be affected by the scheme, on a case-by-case basis. The 15 farm business receptors identified in the AIA are shown on Figure 11.1.

Study baseline

- 11.2.4 An ALC survey of the site was undertaken in December 2017 as part of the Stage 2 EIA (Appendix 11.1). The survey area was sufficient to cover the potential route options at that time, and this data has been carried forward to Stage 3. The nature of the ALC system is such that this data does not have a limited lifespan within foreseeable timescales.
- 11.2.5 An initial baseline of farm units likely to be affected by access and severance issues was established through desk-based analysis of OS maps and aerial photography. This was later refined as further information became available.
- 11.2.6 All other baseline information was established through face-to-face interviews with the farmer/landowner of the likely affected units as part of the AIA. A standard data collection and assessment form was used to enable succinct surveying of the farm units re: the size of the unit, the type of production/ husbandry, management systems employed and any other relevant information. These interviews directly enabled the production of the AIA, which in turn:
- identified the viable farm businesses to be included in the EIA baseline; and
 - provided the financial impact aspects for this ES chapter.
- 11.2.7 The study baseline year is 2020. Unlike some EIA topic chapters, the baseline is purely based on a 'do-nothing' and 'do-something' scenario, with no year 15 assessment. This is because the future of agriculture is too unpredictable to make a reasonable assumption as to a 15 year 'do-nothing' baseline.

Determining the sensitivity of receptors

- 11.2.8 DMRB Vol. 11 does not prescribe a system for assessing receptor sensitivity so a qualitative approach has been adopted, with typical descriptors for each sensitivity grade outlined in Table 11.1. In reality, each farm unit and its management challenges are unique and are to a degree assessed on their own circumstances. For example, a large dairy farm that is located primarily off-site but is losing all of a remote grazing/fodder production holding on-site would itself be classified as being of very high sensitivity, but the remote holding would not be a significant loss to the overall business. It is also notable that many farms are not a homogenous land use and will feature a variety of practices e.g. mixed arable/grazing.
- 11.2.9 There is also a level of variation in how impacts affect different types of husbandry. Typically, arable profit margins per hectare are lower than those of intensive livestock farms so arable farming is more vulnerable to the effects of land take. Conversely, arable farms are generally less affected by severance as machinery movements are relatively easy to re-route. The opposite is true for livestock (particularly dairy) farms, where land take is generally less of an issue than

severance. The need for regular stock movements and the slow speed involved (2kph) means that there are many more limitations associated with severance.

11.2.10 The sensitivity classifications in Table 11.1 are therefore an *outline* guide to give context to the farm impact assessment process. Where there is any doubt as to the sensitivity of a receptor, a precautionary approach has been taken.

Table 11.1 Receptor sensitivity and examples

Sensitivity	Typical descriptors and examples
Very high	<p>Farms that have almost no scope for flexibility in their normal operations and management due to factors such as a crucial dependency on the spatial relationship of land to key infrastructure, where day to day operation requires frequent movement between the two, or a dependency on resources and infrastructure that is difficult to replace/ relocate; overall, a farm that viability is likely to be endangered due to the effects of the scheme. Typically, these could include:</p> <ul style="list-style-type: none"> • Dairy farms • Farms that are already running at maximum reasonable efficiency to enable a profit • Farms where the effects of the scheme happen to damage/ remove an area where all of the most profitable aspects of the farm are located e.g. stewardship scheme qualifying features, most productive land, fodder cropping, diversification enterprises.
High	<p>Farms that lack flexibility in their normal operations and management due to a high intensity usage or dependency on maximising resources and infrastructure; a farm where viability may be threatened, for example:</p> <ul style="list-style-type: none"> • Intensive livestock production • Farms with a high dependency on e.g. existing internal and external access, services, drainage, and/ or infrastructure • Holdings primarily centred around equestrian use such as riding schools • Farms with a high dependency on BPS payments, diversification enterprises and/ or environmental stewardship scheme payments based on natural resources, ecosystem services, and/ or management practices.
Medium	<p>Farm types that have a degree of flexibility in their normal operations and management; a farm business that could, with some minor changes to management, logistics, and infrastructure, cope with the effects of the scheme and where viability is unlikely to be threatened, for example:</p> <ul style="list-style-type: none"> • Livestock grazing farms such as sheep or beef • Arable farms • Affected areas of land that are an addition to the main farm unit such as remote fields rented for temporary grazing.
Low	<p>Land that is currently under agricultural use, but for on a non- commercial/ non-profit basis, for example:</p> <ul style="list-style-type: none"> • “Hobby farms” where any income from produce is not the primary source of income for the owner/ occupier and is not currently viable as a farm business • Farms that are less than 5ha in size and therefore ineligible for BPS payments
Negligible	<p>Land that is not currently in agricultural usage at the time of assessment but has previously been used for/ could, with some modification, be returned to agricultural use, for example:</p>

	<ul style="list-style-type: none"> • River margins land that is not currently grazed or otherwise managed • Fell land that is not currently grazed or managed for agricultural profit • Land that is set- aside for any other reason.
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Identification of impacts

11.2.11 As with sensitivity, impacts will be identified on a case by case basis primarily through the land occupier interviews but also through a combination of visual inspection/walkovers where access is granted, aerial photography, and GIS study.

Assigning magnitude to impacts

11.2.12 DMRB Vol 11 does not prescribe a system for assessing impact magnitude, so a qualitative approach has been adopted. There are multiple impacts of a scheme that can affect a farm unit in their own way, but the overall combination of these effects determines the future viability of the business. It should be noted that experiencing an impact in one aspect, such as severance, does not necessarily imply the same level of impact either in other aspects or overall.

11.2.13 The loss of land (including land permanently lost due to severance making it unviable) is initially quantified per farm using GIS but has a contextual impact dependant on the size and husbandry of the farm in question. The magnitude is assigned through professional judgement informed by the landowner interviews.

11.2.14 Severance is also quantified pre- and post-mitigation through GIS, but again has a contextual impact determined from the interviews. It is measured in terms of the potential economic impact of servicing land that has been separated from the rest of the farm. The impact of severance is dependent on how the land is used and husbandry practice.

11.2.15 Disruption to services and infrastructure (e.g. drainage, water supply, power supply) is identified through the landowner interviews, and like severance is strongly contextual to each unique farm unit.

11.2.16 The overall economic impact on farm viability (and the standalone severance impact) is measured using potential change to the Management and Investment Income (MII). This is a financial measure that can be used to assess the performance of a farm. This information can then be used to assess the effect of land loss. The MII is calculated by subtracting total inputs (including an allowance for the farmer's own labour) from the total farm output. However, the MII of a farm is not necessarily reduced in proportion to the area of land which may be lost or severed from it.

11.2.17 To establish a subjective assessment of the likely impact of a proposal, an estimate is made of the likely economic loss caused by land-take, husbandry changes and/or access and severance issues. Allowance is also made for the impact of noise, light, littering and trespass introduced by the Scheme on livestock, particularly dairy cattle who are sensitive to disruption for a period before re-adjusting. Additional incomes such as from diversification measures and environmental stewardship schemes are also accounted for within the overall viability assessment, though the specific loss of an environmentally sensitive feature that is part of a stewardship scheme is primarily dealt with as a compensation issue.

- 11.2.18 The calculation of the reduced output is relatively simple, as production from the land lost will cease and the variable costs associated with that production e.g. seeds, fertilisers, etc. will be saved. The fixed costs of the farm will initially be the same for the smaller unit as they were for the original one, and so the proportionate loss of MII will usually be greater than the proportional loss of land. In time, opportunities may arise for a reduction of the fixed costs and so the initial reduction in MII due to land loss is likely to be the maximum experienced.
- 11.2.19 A farm is considered viable when a positive MII results from the farming system being used. If the estimated reduction in MII is greater than 100%, the farming business cannot provide a return on the capital invested, neither can it fully remunerate the farmer for their labour. Such a situation would mean that the capital base of the business would need to be depleted to pay recurrent costs and therefore the business would be unviable. This system can also be utilised to assess potential increased costs caused by severance and access issues.
- 11.2.20 The data used for the economic impact assessment is taken from the *Rural Business Research Farm Business Survey for the North West 2017-18* (Defra) and is based on average performance not the individual unit affected. Using these calculations, the qualitative economic assessment criteria shown in Table 11.2 have been developed.

Table 11.2 Magnitudes of impact and typical descriptors

Magnitude	Typical descriptors and examples
Major	<p>Land take is substantial, relative to the total size of the agricultural unit, and is likely to endanger viability.</p> <p>Severance is going to create a permanent barrier to the movement of livestock and machinery, vital to the operation of the farm. Viability is likely to be threatened.</p> <p>Services and infrastructure required for the farm to function are severely or completely compromised. Viability is likely to be threatened.</p> <p>The reduction in MII is >80%.</p>
Moderate	<p>Land-take is moderate relative to the total size of the agricultural unit. Viability may be threatened, depending on structure and farm type.</p> <p>Severance is going to provide a significant, but not a permanent barrier. Viability may be threatened depending on structure and farm type.</p> <p>Services and infrastructure required for the farm to function are partially compromised. Viability may be threatened, depending on structure and farm type.</p> <p>The reduction in MII is 40- 80%.</p>
Minor	<p>Land-take is slight relative to the total size of the agricultural unit. Viability unlikely to be threatened, depending on structure and farm type.</p> <p>Severance is going to provide a slight but not a permanent barrier. Viability unlikely to be threatened, depending on structure and farm type.</p> <p>Services and infrastructure required for the farm to function are slightly compromised. Viability unlikely to be threatened, depending on structure and farm type.</p> <p>The reduction in MII is 10- 40%.</p>
Negligible	<p>Land-take is minor relative to the total size of the agricultural unit. Viability will not be threatened.</p>

Magnitude	Typical descriptors and examples
	Severance is going to be minor, with little or no permanent barrier. Viability will not be threatened depending on structure and farm type. Services and infrastructure required for the farm to function are unlikely to be compromised. Viability will not be threatened. The reduction in MII is <10%.
No change	No change to land area, severance, services and infrastructure or MII

Assessing the significance of impacts

- 11.2.21 To determine the significance of impacts, the sensitivity of the receptor and the magnitude of the impacts will be assigned a descriptor as set out in Table 11.3.

Table 11.3 Significance of effects matrix

	Magnitude				
Sensitivity	No change	Negligible	Minor	Moderate	Major
Very high	Neutral	Slight	Moderate or large	Large or very large	Very large
High	Neutral	Slight	Slight or moderate	Moderate or large	Large or very large
Medium	Neutral	Neutral or slight	Slight	Moderate	Moderate or large
Low	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or moderate
Negligible	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight

- 11.2.22 As noted in section 11.2.8, there is a degree of flexibility in the assignment of sensitivity depending on the unique circumstances of each farm business. Therefore, the above matrix is a guide to the significance of an effect but is not a rigid descriptor.
- 11.2.23 Table 11.4 identifies the typical impact descriptors associated with the effects in Table 11.3 Significance of effects matrix. In theory the same scale applies to both adverse and beneficial impacts. However, as the proposed scheme is a new highway in a currently greenfield location, there are not realistically anticipated to be any beneficial impacts for agriculture.

Table 11.4 Typical descriptors of significance categories

Significance	Typical descriptors of effect
Very large adverse	The scheme is predicted to affect the farm, through changes to e.g. land area/ usage, access/ severance, services/ infrastructure, Basic Payment Scheme (BPS)/ environmental stewardship payments/ diversification income, or any other factor or a combination of the aforementioned, to a degree that the farm is rendered unviable.
Large adverse	The scheme is predicted to affect the farm, through changes to e.g. land area/ usage, access/ severance, services/ infrastructure, BPS/ environmental stewardship payments/ diversification income, or any other factor or a combination of the aforementioned, to a degree that the farm is not likely to be rendered unviable, but suffers a loss of profit and will require changes to the farming system/ management that compromise the system's flexibility.
Moderate adverse	The scheme is predicted to affect the farm, through changes to e.g. land area/ usage, access/ severance, services/ infrastructure, BPS/ environmental stewardship payments/ diversification income, or any other factor or a combination of the aforementioned, to a degree that the farm is not rendered unviable, but will suffer a small reduction in net income and will require modest changes to the system.
Slight adverse	The scheme is predicted to have little or no impact on the farm unit or its management, day- to- day operations, or profitability. Some minor changes may be required to the farming system but it's flexibility will not be compromised.
Neutral	The scheme does not affect the farm unit or its management, day- to- day operations, or profitability.

Identification and assessment of inter- project cumulative impacts

- 11.2.24 A list of known developments in the local area of the CSLR scheme has been compiled, including committed approvals, housing allocations, land allocated for employment/development and the likely future site of the St Cuthbert's Garden Village (SCGV).
- 11.2.25 The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 require that consideration is given to "the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources". It is likely that there will be cumulative impacts resulting on agricultural land use from the aforementioned committed developments and the CSLR scheme.
- 11.2.26 It is certain that these developments will be located on currently agricultural land, and that their occupation of said land will be permanent with little to no scope for returning any of it to agriculture. Where the footprint of these developments is known, these are considered as an additional land-take impact, and a judgement made of the likely effect on farms together with the CSLR scheme.

Identification of mitigation measures

- 11.2.27 The identification of mitigation measures has been considerate of the mitigation hierarchy i.e. the general principle that mitigation should seek to, in order of preference, avoid, minimise, remediate and offset impacts.
- 11.2.28 Operational phase mitigation measures have been identified in consultation with the landowners and scheme designers through interviews and mitigation workshops and typically include:
- the provision of alternative access tracks and gateways where the existing access is lost,
 - the provision of access bridges/ overpasses where farm units are split,
 - the incorporation of access beneath bridge spans
 - the protection and/ or replacement of utilities, services, and infrastructure where these could be damaged or removed, and;
 - the returning of some scheme land e.g. earthwork slopes to agricultural use post- completion.
- 11.2.29 Construction phase mitigation is more difficult to identify at the design stage but will be incorporated into the Construction Environmental Management Plan (CEMP). These measures generally follow best practice construction guidance e.g. Defra's *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites* and guidelines to prevent the spread of livestock disease.

11.3 Limitations and Assumptions

- 11.3.1 The detailed ALC surveys were limited to land where landowner permission was given to access the site. In some cases, the most limiting factor e.g. climate, flood risk, or gradient may be determined from the desktop aspect of the ALC survey, but this will not be as accurate as a full desktop and site survey. There are some locations where the loss of land due to direct land take or severance lay outside of the ALC survey area (due to minor design changes after the survey was completed). These areas are minor (cumulatively approximately 5.39 ha) and are assumed to primarily be Grade 3a; although most of the surrounding area is 3b it has been assumed for this assessment that the worst-case scenario applies and the un-surveyed land is all classed as 3a (best and most versatile).
- 11.3.2 One-to-one landowner interviews were carried out in March 2019, but farms deemed to be non-viable agricultural units were not interviewed. In these cases, visual observation and an estimate of the potential impact on the farming system will be made, if applicable in the future. The data used for the economic impact assessment is taken from the *Rural Business Research Farm Business Survey for the North West 2017-18* (Defra) and is based on average performance, not the individual unit affected.

11.4 Consultations

- 11.4.1 Natural England (NE) were consulted during the Stage 2 assessment to confirm that it was acceptable to modify the ALC survey methodology to one soil auger per every two hectares rather than the usual one per hectare given the size of the site. NE confirmed this was acceptable.

- 11.4.2 Natural England advised seeking guidance from the Defra Animal and Plant Health Agency prior to soil movement works to prevent the potential disturbance of carcass burial pits or the inadvertent spreading of soil borne plant or animal diseases. The Food and Environment Research Agency (FERA) and Animal Health divisional offices have confirmed that there is no scheduled land within 0.5km of the site. This information covers only recorded incidences and does not necessarily mean there will be no issues.
- 11.4.3 Consultation with Natural England, Defra and the Rural Development Service National Land Management Team has revealed that there is unlikely to be any significant areas of higher grade agricultural land taken by this proposal. Defra have also confirmed that the loss of the BMV soil resulting from the Scheme is not a national issue.
- 11.4.4 The primary consultees for the assessment have been the landowners. Initially, 18 landowners were interviewed to obtain information about their land management and husbandry practices. The AIA screened out three of these landowners as not running commercially viable agricultural businesses, so the remaining 15 have been carried forward to this assessment.

11.5 Regulatory and Policy Framework

- 11.5.1 There is no single specific policy or guidance protecting soil or outlining how to account for its protection in EIA, though a number of policy documents refer to its consideration in planning related matters.
- 11.5.2 Paragraph 109 of the National Planning Policy Framework (NPPF) states that:
“The planning system should contribute to and enhance the natural and local environment by... protecting and enhancing valued landscapes, geological conservation interests and soils.”
- 11.5.3 Specifically, in relation to agriculture, paragraph 112 of the NPPF states that:
“Local planning authorities should take into account the economic and other benefits of the best and most versatile (BMV) agricultural land. Where significant development of agricultural land is demonstrated to be necessary, local planning authorities should seek to use areas of poorer quality land in preference to that of a higher quality.”
- 11.5.4 The NPPF Annex 2: Glossary defines BMV land as “Land in grades 1, 2 and 3a of the Agricultural Land Classification”.
- 11.5.5 Whilst the NPPF does not define “significant” in terms of development of agricultural land, the Town and Country Planning (General Development Procedure) Order 2010 specifies that; where development which is not for agricultural purposes and is not in accordance with the provisions of a development plan requires the loss of 20ha of BMV land the Secretary of State for the Environment, Food and Rural Affairs must be consulted prior to the grant of permission.
- 11.5.6 Natural England’s Technical Information Note TIN049: *Agricultural Land Classification: protecting the best and most versatile agricultural land*, is an explanatory note that outlines the purpose and methods of ALC and affirms that they must be consulted for all applications where the loss of BMV land is 20ha or greater.

- 11.5.7 Policy SP 8, paragraph 3.77 of the Carlisle District Local Plan 2015- 2030 indicates a presumption against the loss of ‘green infrastructure’ and specifies that productive landscapes (including agriculture), will “be protected from inappropriate development through this policy”.
- 11.5.8 Recent Government Agricultural Strategy has focused attention on the need for National food security. Maintaining and optimising food production is one area that has been highlighted. The loss of agricultural land to any development means that the area available for production is reduced. The need to screen the route and reduce sound and noise impacts requires an additional land requirement. This must be balanced with the national strategy to maintain and optimise food production. Additional environmental screening and off-site plantings need to be justified.

11.6 Baseline Conditions

- 11.6.1 The study area mainly consists of gently undulating land at an average elevation of approximately 70m AOD, with some steeper land present on the flanks of the Caldew and Patteril rivers. At the time of the ALC survey in November 2017 (undertaken to inform the Stage 2 route option assessment) most of the land was under grass and being grazed by overwintering sheep, with minor areas of cereal and fodder maize production.
- 11.6.2 The site was found to be mainly dominated by loamy soils with slowly permeable subsoil formed in glacial till. Most of this land is limited to Subgrade 3b by wetness. Some areas of land, particularly at the east end of the site, are formed over permeable sand and gravel giving ALC Grades of 2 or 3a. There are also some floodplain areas limited to Grade 4 by the high flood risk, others by gradient, and some wet scrub areas limited to Grade 5. Table 11.5 ALC grade distribution within the study area summarises the ALC grade distribution in the study area.

Table 11.5 ALC grade distribution within the study area

Grade/ Subgrade	Description	Area (ha)	% of survey area
Grade 1	Excellent quality agricultural land	0	0
Grade 2	Very good quality agricultural land	19.83	4.51
Subgrade 3a	Good quality agricultural land	46.36	10.53
Subgrade 3b	Moderate quality agricultural land	295.36	67.11
Grade 4	Poor quality agricultural land	5.49	1.25
Grade 5	Very poor quality agricultural land	4.29	0.97
Non- agricultural land	e.g. woodland, hardstanding	68.64	15.6
Total		440.09	100

- 11.6.3 The study area has two key constraints to the west and east that limit free movement of agricultural traffic e.g. machinery and livestock; the rivers Caldew and

Petteril respectively. Both rivers are also roughly paralleled in their route by two separate railway lines. The central area between is occupied by numerous agricultural holdings, which consist of both the “usual” arrangement of land attached to a centralised farmhouse and infrastructure, and isolated plots of land owned by agricultural businesses based off-site.

- 11.6.4 The isolated plots depend on the local road network for access, but the larger site-based farms are also sometimes fractured by these rural roads and depend on them for access. As the land uses on site include both arable and animal husbandry, the local roads are frequented by a mixture of farm vehicles. The proximity of the racecourse can lead to complex farm vehicle movements at certain times.
- 11.6.5 There are no more than three holdings within the study area currently under an environmental stewardship scheme that are potentially affected by the route options. These are all entry level schemes. There are no English Woodland Grant Scheme designations located within the study area.
- 11.6.6 The AIA has identified 15 farm units within the study area that are considered to be economically viable, listed in Table 11.6. Three other units that were smallholdings or let pasture were screened out of assessment.

Table 11.6 Farm units in the study area scoped into EIA

Landowner ID code	Approximate farm size (ha)	Farm type
D1	102.67	Dairy
E1	32.93	Mixed livestock and equine
F1	323.76	Dairy, beef and sheep
J	242.82	Arable and beef
K2	106.43	Dairy
N2	190.21	Grass lets and livestock
O2	49.90	Grass and environmental scheme
P	48.56	Beef and grass lets
T	402.27	Dairy
U2	283.29	Arable and beef
W	227.42	Dairy
W1	184.14	Arable, beef and sheep
X	76.89	Willow, equestrian and grass let
Y	182.11	Dairy
Z1	295.43	Arable, beef and sheep

11.7 Impact Assessment

Construction Phase

Land quality

11.7.1 It is difficult to quantify the anticipated impact of construction works on land quality, as the ALC system is concerned with how soil properties affect long-term agricultural use rather than short-term management. However, land quality has the potential to be affected by physical and chemical damage e.g. pollution incidents during construction, which is covered under construction phase mitigation.

Severance

11.7.2 It is difficult at this stage to precisely quantify the impacts of temporary severance during the construction phase as details about construction methods and the phasing of works will be developed at the detailed design stage. These are to be confirmed during detailed design once the construction programme has been compiled. As detailed spatial information is not currently available, worst-case assumptions have been made regarding the likely degree of severance caused by temporary works. It is also assumed that all receptors would be affected by temporary construction severance throughout the whole of the construction period.

11.7.3 The anticipated general impacts are likely to include:

- Disruption to the movements of livestock, machinery and vehicles,
- Increased journey times on local roads,
- Disturbance to dairy cattle from changes to routine journeys; and,
- A general reduction in farm efficiency from the above.

11.7.4 It should be noted that the temporary severance of land is, to a degree, automatically offset by the reduced management costs associated with that land being temporarily taken out of agricultural use.

11.7.5 These impacts should be accounted for in the CEMP and wherever practicable avoided, reduced, and/or mitigated for in that order of preference.

11.7.6 Table 11.7 details the anticipated worst-case scenario impacts of land severance per farm.

Table 11.7 Temporary construction severance impact

Landowner ID code	Approximate farm size (ha)	Magnitude of impact
D1	102.67	Minor
E1	32.93	Negligible
F1	323.76	Negligible
J	242.82	Minor
K2	106.43	Minor
N2	190.21	Negligible
O2	49.90	Negligible
P	48.56	Moderate
T	402.27	Minor
U2	283.29	Minor
W	227.42	Negligible
W1	184.14	Minor
X	76.89	Negligible
Y	182.11	Moderate
Z1	295.43	Negligible

Land take

- 11.7.7 The temporary land take per landowner has been estimated using the extent of land required for construction as shown Figure 11.2. This is summarised in Table 11.8.
- 11.7.8 This land will be required for plant movements, soil storage and construction. It is anticipated that these areas will be returned to agricultural use post-construction.
- 11.7.9 The anticipated impacts are likely to be similar to those of construction phase severance, though depending on the timing of construction works there may also be a reduction in the availability of land for crop planting, grazing, machinery storage etc. This will vary depending on the husbandry of the affected farm.

Viability

- 11.7.10 While the above construction phase factors will have an effect on agricultural production and management in the short term, these impacts will be revisable and phased. The construction works in isolation are not anticipated to have any significant effect on viability for any of the farms.

Table 11.8 Anticipated temporary land take per farm unit

Landowner ID code	Approximate farm size (ha)	Approximate temporary land take (ha)	Temporary land take as % of total farm size	Magnitude of Impact
D1	102.67	9.57	9.32	Minor
E1	32.93	3.36	10.19	Minor
F1	323.76	8.99	2.78	Negligible
J	242.82	15.90	6.55	Moderate
K2	106.43	4.61	4.33	Minor
N2	190.21	0.46	0.24	Negligible
O2	49.90	7.19	14.41	Minor
P	48.56	10.96	22.58	Moderate
T	402.27	3.84	0.96	Negligible
U2	283.29	14.38	5.08	Moderate
W	227.42	12.58	5.53	Minor
W1	184.14	13.92	7.56	Moderate
X	76.89	6.73	8.75	Minor
Y	182.11	19.49	10.70	Minor
Z1	295.43	3.22	1.09	Moderate

Operation Phase

Land quality

11.7.11 The finished Scheme will take some areas of agricultural land permanently out of use, both directly for the road alignment and also for earthworks, landscaping, and balancing ponds.

The anticipated permanent loss of land (pre-mitigation), by ALC grade, is shown on Figure 11.3 and detailed in Table 11.9.

Table 11.9 Anticipated permanent loss of land by ALC grade

ALC grade	Area (ha)
1	0
2	4.39
3a	13.69
3b	49.32
4	2.51
5	0.68
Total	70.59
Total BMV land	18.08

11.7.12 As the 18.08ha of BMV land anticipated to be lost is less than 20ha, this is not considered to be a significant impact and its loss is not considered an issue of national importance. Mitigation will still be applied to minimise BMV land loss at the local scale.

Severance

11.7.13 The proposed route alignment will permanently prevent access to some areas of agricultural land, either by removing the current highway access or by intersecting a farm so that the land is cut off from the central farm infrastructure.

11.7.14 The areas of permanently severed (pre-mitigation) land are shown on Figure 11.4 and the affected receptors listed in Table 11.10.

Table 11.10 Operational severance areas per landowner

Landowner ID code	Severed land (ha)	Severed land as % of total farm size
P	0.67	1.38
U2	8.78	3.10
X	0.69	0.89
Y	0.55	0.30

Land take

11.7.15 Operational land take includes not just the land permanently lost to the scheme alignment and associated earthworks, ponds etc., but also accounts for land permanently lost to severance as described in the previous section.

11.7.16 Table 11.11 lists the permanent loss of agricultural land per landowner. This is also shown visually on drawing Figure 11.5.

Table 11.11 Operational land take per landowner

Landowner ID code	Land take (ha)	Land take as % of total farm size
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D1	6.58	6.40
E1	0.58	1.75
F1	4.06	1.25
J	6.94	2.86
K2	2.18	2.05
N2	0.11	0.06
O2	0.31	0.62
P	5.62	11.57
T	2.11	0.53
U2	12.52	4.42
W	7.94	3.49
W1	7.29	3.96
X	4.28	5.56
Y	12.27	6.74
Z1	1.09	0.37

Viability

11.7.17 The operational impacts on farm viability caused by land take and severance are summarised in Table 11.12 as a reduction in farm MII.

Table 11.12 Operational impacts on farm viability

Landowner ID code	Impact	Magnitude
D1	Direct loss of 6.58ha of mixed use grazing/ arable land. Loss of current access points from Dalston Road and Peter Lane. Impaired movements of vehicles, plant and livestock. Loss of stock handling, drainage and water troughs.	Moderate
E1	Direct loss of 0.58 ha of grazing land. Additional loss of land currently let from CCC. Disruption of farm access from A595. Impaired movements of vehicles, plant and livestock.	Moderate
F1	Direct loss of 4.06 ha of arable land. Impaired movements of vehicles, plant and livestock from Dalston Road and Grace Lane.	Minor
J	Direct loss of 6.94 ha of mixed use grazing/ arable land. Severance of field south of Newbiggen Road.	Major

Landowner ID code	Impact	Magnitude
	Impaired movements of vehicles, plant and livestock from Newbiggen Road and Wreay Road. Loss of northern access point to East Park (land used to host Cumberland Show).	
K2	Direct loss of 2.18 ha of grazing land. Severance of northern half of land parcel from Burthwaite Croft. Loss of current access points from highway, impaired movements of vehicles, plant, livestock and umbilical slurry system.	Moderate
N2	Direct loss of 0.11 ha of grazing land. Loss of current access points from Newbiggen Road. Impaired movements of vehicles, plant and livestock from Newbiggen Road.	Minor
O2	Direct loss of 0.31 ha of river valley grazing land.	Minor
P	Direct loss of 5.62 ha of grazing land. Severance of multiple fields from Durdar Farm by new link to Durdar Road. Impaired movements of vehicles, plant and livestock. Likely damage to field drainage and water supply.	Major
T	Direct loss of 2.11 ha of grazing land. Severance of land to the north of the proposed road. Impaired movements of vehicles, plant, livestock and umbilical slurry system.	Minor
U2	Direct loss of 12.52 ha of mixed arable/ grazing land. Severance of land north of the proposed route, increased journey times via Grace Lane. Impaired movements of vehicles, plant and livestock.	Major
W	Direct loss of 7.94ha of grazing land. Loss of current access points to land south of the proposed road and severance of land north of road. Impaired movements of vehicles, plant and livestock.	Moderate
W1	Direct loss of 7.29 ha of mixed use arable/ grazing land. Land north of the proposed road severed from Durdar House, increased journey times via Newbiggen Road. Impaired movements of vehicles, plant and livestock.	Major
X	Direct loss of 4.28 ha of grazing and willow biofuel land.	Moderate
Y	Direct loss of 12.27 ha of grazing land. Proposed road bisects pastures near to River Caldew and severs farm from current access to Newbiggen Road. Likely damage to field drainage and water supply. Impaired movements of vehicles, plant, livestock and umbilical slurry system.	Major

Landowner ID code	Impact	Magnitude
Z1	Direct loss of 1.09 ha of grazing land. Second access point that is a requirement for UFAS- accredited food store potentially severed from Durdar Road. Impaired movements of vehicles, plant and livestock.	Minor

11.8 Mitigation, Enhancement and Monitoring

Construction Phase

11.8.1 During the construction phase, the following mitigation measures should be applied to the works via the detailed design and/or CEMP as appropriate to minimise soil damage, disruption to agricultural businesses and excessive land usage/disturbance:

- Retention of stripped top soil and re-use in structural landscaping following Defra's *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites* guidelines.
- Use of appropriate vegetation and planting to help restore soil functionality over time.
- Measures such as tracked runways and weight-spreading plant tyres/ tracks to minimise soil compaction and preserve soil integrity.
- The implementation of a Soil Management Plan, to be adhered to through the works.
- Wetting of heaped soils to minimise dust generation and contamination.
- The storage of soils within the ownership of the land from where they were excavated to prevent cross-farm disease transmission and/or contamination.
- Installation of pre-construction drains where applicable.
- Access and services to be maintained throughout construction process in consultation with landowners and farmers and implemented, where appropriate, through traffic and construction management plans.
- Appropriate control of construction noise and disturbance e.g. noise-reducing hoarding.
- Provision of temporary cattle handling facilities and access tracks where required.
- Purchase of land enabling farmer to vacate and relocate or retire as required.

Operational Phase

11.8.2 The majority of operation phase mitigation is implemented through the design of the Scheme and has been previously identified and implemented through the Stage 2 assessment. Most of this mitigation remains relevant and has been carried forward into Stage 3 and is summarised in Table 11.13 to provide context.

Table 11.13 Mitigation measures identified at Stage 2 and carried forward to Stage 3 design

Landowner ID code	Proposed Mitigation
D1	Access retained via track from Dalston Road B5229 and Peter Lane. Associated stock handling, drainage and water troughs to be replaced.
E1	Access to A595 retained.
F1	Provision of new access track to severed land south of the proposal. Re-instatement of drainage, water troughs and stock handling facilities as required.
J	Severed fields retain access via new accommodation tracks off Wreay Road. Land north of the proposal has access maintained via Newbiggin Road. Re-instatement of drainage, water troughs and stock handling facilities as required.
K2	Land severed to the north of the proposal. Access retained off Newbiggin road and new slip roads. Re-instatement of drainage, water troughs and stock handling facilities as required. Culvert for umbilical system as appropriate.
N2	New accommodation works provide access to fields. Re-instatement of drainage, water troughs and stock handling facilities as required.
O2	Negligible severance and access issues in operational phase. Access required throughout construction phase.
P	Multiple severed fields given new access points onto the CSLR slip road, Peastree Lane, Newbiggin road and the minor road network. Re-instatement of drainage, water troughs and stock handling facilities as required.
T	Small area of land severed to the north of the proposal. Access retained off Newbiggin Road. Re-instatement of drainage, water troughs and stock handling facilities as required. Culvert for umbilical system as appropriate.
U2	Provision of new access track to severed land south of the proposal. Additional track provided to access land severed north of the proposal. Re-instatement of drainage, water troughs and stock handling facilities as required.
W	Access to land severed to the south of the proposal and access lost to the north maintained via proposed underpass to Newbiggin View and via old road. Re-instatement of drainage, water troughs and stock handling facilities as required.
W1	Fields severed to the west and east of Durdar north of the proposed route have access retained off Newbiggin road and Durdar road. Re-instatement of drainage, water troughs and stock handling facilities as required.
X	Re-instatement of drainage, water troughs and stock handling facilities as required.
Y	Provision of an accommodation bridge to access severed land to the south. Retained access to the west via bridge underpass at the river Caldew. Re-

Landowner ID code	Proposed Mitigation
	instatement of drainage and water troughs. Culverts for umbilical slurry system as applicable.
Z1	Field severed by new CSLR slip road has access retained off Durdar road. Requirement for UFAS accredited food store for second access to be retained for farm via Floses and Peastree lane. Re-instatement of drainage, water troughs and stock handling facilities as required.

- 11.8.3 For farm units that continue to be affected by severance from the Stage 2 design, further detailed development of the Scheme in Stage 3 has allowed for more precise mitigation in the form of underpass/overbridge placement, access tracks, and alternative gateways that have been provided wherever practicable.
- 11.8.4 The loss of land (of all ALC grades) has been mitigated for wherever possible through the landscaping plan returning land to agricultural use e.g. through grading of the earthworks slopes.
- 11.8.5 General operation phase mitigation measures include the following:
- Suitable signage and fencing to prevent trespass and fly tipping.
 - Design of lighting e.g. direction lighting to minimise light pollution towards farms and livestock in fields.
 - Re-instatement of permanent farm accesses.
 - Re-instatement of farm drainage and water troughs.
 - Provision of new stock handling facilities and turning heads as agreed with affected landowners.
 - Removal and/or realignment of fences, walls and hedges where identified by landowner to make field parcels viable again.

11.9 Residual Impact Assessment

Construction Phase

- 11.9.1 The construction phase impacts have been mitigated as far as possible as outlined in the previous section. These measures will be implemented through the CEMP, detailed design stage and further consultation with landowners as appropriate. As construction impacts are short-term and revisable, no residual impact assessment of them has been undertaken.

Operation Phase

Land quality

- 11.9.2 The permanent loss of land from agricultural use has been mitigated for by returning land to agricultural use wherever possible, detailed in Table 11.14 and shown on Figure 11.6.

Table 11.14 Residual land take by ALC grade

ALC grade	Preliminary operational land take (ha)	Land returned to agriculture (ha)	Residual operational land take (ha)
1	0	0	0
2	4.39	0.52	3.87
3a	13.69	0.99	12.70
3b	49.32	5.03	44.30
4	2.51	0.00	2.51
5	0.68	0.00	0.68
Total	70.60	6.53	64.06
Total BMV land	18.08	1.51	16.57

- 11.9.3 Although both the un-mitigated and residual loss of BMV land are below 20ha and therefore not considered to be of national or regional significance by NE and Defra, BMV land is a limited resource and the restoration of BMV land should be undertaken where practicable.

Severance

- 11.9.4 The residual impacts related to severance of land are shown on Figure 11.7.
- 11.9.5 Following mitigation, only two landowners will be affected by severance: U2 (1.22ha) and X (0.69ha). The impacts of this permanent severance have been accounted for in the assessment of viability and these farms remain viable.

Land take

- 11.9.6 The residual operational phase land take, with areas returned to agricultural use highlighted, is shown on Figure 11.8.
- 11.9.7 Table Table 11.15 details the residual land loss for each affected landowner. The impact of this land loss on MII has been incorporated into the assessment of viability. This residual land loss has been calculated as follows:

(Land take from Scheme footprint + residual severed areas) – land returned to agriculture = Residual land take

Table 11.15 Residual operational land take per landowner

Landowner ID code	Land returned to agricultural use (ha)	Residual land take (ha)	Land take as % of total farm size
D1	0.31	6.26	6.10
E1	0.10	0.47	1.44
F1	0.87	3.19	0.98
J	0.15	6.79	2.80
K2	0.10	2.08	1.96
N2	0.00	0.11	0.06
O2	0.00	0.31	0.62
P	0.87	4.08	8.40
T	0.00	2.11	0.52
U2	0.10	5.90	2.08
W	0.58	7.36	3.24
W1	1.67	5.62	3.05
X	0.00	4.27	5.56
Y	0.98	10.74	5.90
Z1	0.14	0.95	0.32

Viability

11.9.8 The residual impacts of the proposed scheme on farm viability are detailed in Table 11.16.

Table 11.16 Residual operational impacts on farm viability

Landowner ID code	Impact	Magnitude
D1	Loss of 6.26ha of mixed use grazing/ arable land. Access maintained from Dalston Road and Peter Lane, negligible severance impact. No significant impact on business viability.	Minor
E1	Loss of 0.47ha of grazing land. Total loss of land currently let from CCC. Access to A595 retained, negligible severance impact. No significant impact on business viability.	Minor
F1	Loss of 3.19ha of arable land. Access maintained from Dalston Road and Peter Lane via mitigation accommodation tracks in scheme design. Negligible severance impact. No significant impact on business viability.	Negligible

Landowner ID code	Impact	Magnitude
J	<p>Loss of 6.79ha of mixed use grazing/ arable land.</p> <p>Severed fields retain access from Wreay Road and Newbiggen Road via new gates and mitigation accommodation tracks in design, minor severance impact.</p> <p>Significant impact on farm business, but unlikely to threaten viability. Some business restructuring will be required.</p>	Moderate
K2	<p>Loss of 2.08ha of grazing land.</p> <p>Access to fields north of the proposal retained from Newbiggen Road, negligible severance impact.</p> <p>No significant impact on business viability.</p>	Minor
N2	<p>Loss of 0.11ha of grazing land.</p> <p>Access to fields maintained by mitigation accommodation access in design. Negligible severance impact.</p> <p>No significant impact on business viability.</p>	Negligible
O2	<p>Loss of 0.31ha of river valley grazing land.</p> <p>Access maintained beneath Caldew bridge, negligible severance impact.</p> <p>No significant impact on business viability.</p>	Negligible
P	<p>Loss of 4.08ha of grazing land.</p> <p>Access maintained to severed fields via mitigation access points in design, but severance impact remains moderate.</p> <p>Significant impact on farm business, will become unviable.</p>	Major
T	<p>Loss of 2.11ha of grazing land.</p> <p>Access retained to land north of CSLR via mitigation access point in design from Newbiggen Road, minor severance impact.</p> <p>No significant impact on business viability.</p>	Negligible
U2	<p>Loss of 5.90ha of mixed arable/ grazing land, of which 1.22 ha is due to permanent severance.</p> <p>Access to land north and south of CSLR retained via accommodation access tracks in design, minor severance impact.</p> <p>Significant impact on farm business, but unlikely to threaten viability. Some business restructuring will be required.</p>	Moderate
W	<p>Loss of 7.36ha of grazing land.</p> <p>Access to severed land maintained by accommodation tracks near Petteril crossing, negligible severance impact.</p> <p>No significant impact on business viability.</p>	Minor
W1	<p>Loss of 5.62ha of mixed use arable/ grazing land.</p> <p>Access maintained to severed fields from Newbiggen Road and Durdar Road, moderate severance impact.</p> <p>Significant impact on farm business, but unlikely to threaten viability. Some business restructuring will be required.</p>	Moderate
X	<p>Loss of 4.27ha of grazing and willow biofuel land, of which 0.69ha is due to permanent severance.</p> <p>No access issues, negligible severance impact.</p>	Minor

Landowner ID code	Impact	Magnitude
	No significant impact on business viability.	
Y	Loss of 10.74ha of grazing land. Access retained to severed areas via accommodation bridge, underpass and gates, moderate severance impact. Significant impact on farm business, but unlikely to threaten viability. Some business restructuring will be required.	Moderate
Z1	Loss of 0.95ha of grazing land. Second access for UFAS- accredited food store maintained in CSLR design, negligible severance impact. No significant impact on business viability.	Negligible

11.9.9 The residual impact assessment has shown that only one farm (landowner P) is forecast to become unviable as a result of the Scheme, with an impact magnitude of Major.

11.9.10 Four additional farms (landowners J, U2, W1 and Y) are forecast to have their businesses significantly affected with impact magnitudes of Moderate. Although this is unlikely to be a viability issue, they will require some business re-structuring. Re-structuring in the arable sector is considerably easier than in livestock, particularly dairy units. This would be accounted for in the compensation package provided.

11.9.11 Although the loss of the ‘best and most versatile’ soil as a result of the Scheme is not a national issue, efforts should be made to minimise agricultural land-take to reduce the economic impact and preserve the best soils on a local basis.

11.9.12 Overall, there will be no significant impact on agriculture at a national or regional level. Locally there will be a moderate impact.

11.10 Cumulative Effects

11.10.1 Cumulative effects can arise when the impacts of two or more projects combine to form an impact on a receptor that is greater than the individual impacts of each project.

11.10.2 In the case of the CSLR site, there is a large amount of land that is subject to approved development. As part of the Carlisle and Regional Development Plan there is a proposal for the St. Cuthbert’s Garden Village (SCGV) project which would see a large integrated urban community established in the vicinity of the proposed road. At this time the exact layout of the SCGV is not known. As a result, a detailed assessment of the potential interactions with the Scheme is not possible. Therefore, the inter-project cumulative effects have been assessed at a high level using professional judgement and only where the assessment topic has been determined to have clear relevance to the proposed Garden Village development.

11.10.3 Additionally, there are other areas of committed housing and employment development approval, some of which have already begun construction. These and the SCGV are shown on Figure 16.1.

11.10.4 Using the SCGV and committed approval data provided by CCC, an assessment has been made of land loss per landowner due to the future developments. This is

shown on Figure 11.9 and detailed in Table 11.17. The cumulative land take figures and impact magnitudes reflect the combined land take of both CSLR and the cumulative developments.

Table 11.17 Anticipated cumulative land take impacts on farm viability

Landowner ID code	Anticipated cumulative land take (ha)	Impact on viability
D1	Not affected	N/A
E1	Not affected	N/A
F1	13.55	Moderate
J	16.55	Moderate
K2	4.79	Minor
N2	Not affected	N/A
O2	Not affected	N/A
P	22.78	Major
T	Not affected	N/A
U2	6.31	Minor
W	Not affected	N/A
W1	34.10	Major
X	Not affected	N/A
Y	26.43	Major
Z1	21.38	Major

11.10.5 The scale of these approved developments will require a considerable area of agricultural land. Although the majority of this would be of the lower agricultural grades 3b and 4, there would still be a considerable amount of the 'best and most versatile' land grade 2 and 3a required. The combined effect is unlikely to be significant nationally but is likely to be significant locally.

11.10.6 At this stage, it is considered likely that under the scenario of all the permitted developments proceeding, four farms (landowners P, W1, Y and Z1) would become unviable.

11.11 Summary

11.11.1 At its current stage of design, the proposed CSLR highway scheme is anticipated to result in one farm (landowner P) becoming unviable.

11.11.2 Four additional farms (landowners J, U2, W1 and Y) are forecast to have their businesses significantly impacted but remain viable by the CSLR scheme alone. However, after accounting for the impacts of the currently known permitted developments in the local area, landowners W1, Y and Z1 would be forecast to become unviable within the foreseeable future.

- 11.11.3 The loss of the best and most versatile agriculture soils by the CSLR scheme is not considered to be significant on a national scale. It is currently unknown what the cumulative impact on BMV land would be as no detailed field-scale ALC survey data are available for these sites. However, based on the proportions of each grade represented within the CSLR site, this is unlikely to be significant nationally but is likely to be significant locally.
- 11.11.4 Overall there is anticipated to be **no significant impact** on agriculture at a National, or Regional level. Locally there will be a **moderate** impact.

12 Noise and Vibration

12.1 Introduction

12.1.1 Road traffic gives rise to noise and airborne vibration. Changes in road layout, specification, and traffic all have the potential to permanently affect the acoustic character of an area, while road construction and maintenance may change the acoustic character of the area only temporarily. It is worth noting that changes to the acoustic character of an area may give rise to either beneficial, or adverse effects on nuisance and health.

12.1.2 This chapter assesses the noise and vibration effects of the likely construction and operation of the Scheme.

12.2 Assessment Methodology

Guidance

12.2.1 The significance of any effect is a function of the receptor sensitivity, and the magnitude of impact; the latter being determined by the change in noise levels.⁶³ The Design Manual for Road and Bridges (DMRB) HD 213/11⁶⁴ offers no methodology for defining the sensitivity of receptors, or the significance of effect, therefore, professional judgement and good practice, based on additional guidance has also been used, as outlined within Table 12.1.

Table 12.1 Documentation forming the basis of assessment

Parameter	Phase	Assessment	Reference
Sensitivity of receptor	Construction	Site noise	BS 5228-1 ⁶⁵ Annex E.3 / NPPF ^{66,67}
		Site vibration	BS 5228-2 ⁶⁸ Annex B
		HGV traffic	Not defined. Residential receptors considered sensitive to noise.
		Diverted traffic	
	Operation	Road traffic noise	NPPF (including NPSE and PPGN)
Magnitude of impact	Construction	Site noise	Not defined – impact (noise level) as per BS 5228-1 Annex F
		Site vibration	Not defined – impact (vibration level) as per BS 5228-2 Tables E.1 and E.2.
		HGV traffic	DMRB HD 213/11
		Diverted traffic	

⁶³ Highways England et al., DMRB Volume 11, Section 2, Part 4 LA 104 Environmental assessment and monitoring, July 2019.

⁶⁴ Highways England et al., DMRB Volume 11, Section 3, Part 7 HD 213/11 Rev. 1 Noise and vibration, November 2011.

⁶⁵ British Standards Institution, BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Noise.

⁶⁶ Ministry of Housing, Communities & Local Government, National Planning Policy Framework, 2019.

⁶⁷ NPPF 2019 includes references to: Department for Environment, Food & Rural Affairs (Defra), National Policy Statement for England (NPSE), 2010. Further advice provided in the Planning Policy Guidance on Noise (PPGN), 2019

⁶⁸ British Standards Institution, BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Vibration.

Parameter	Phase	Assessment	Reference
	Operation	Road traffic noise	
Significance of effect ⁶⁹	Construction	Site noise	BS 5228-1
		Site vibration	BS 5228-2
		HGV traffic	Not defined (professional judgement based on EIA Regs Schd.3 ⁷⁰)
		Diverted traffic	
	Operation	Road traffic noise	DMRB LA 104 ⁷¹ and NPPF

Methodology

12.2.2 The overarching methodology steps, as used to assess both temporary and permanent alterations to the acoustic character, are as follows, with further detail for each assessment type within subsequent sections.

- Establish study areas
- Identify Noise (or vibration) sensitive receptors (NSRs)
- Define the baseline
- Establish the sensitivity of receptor, including the lowest-observed-adverse-effect-level (LOAEL) and the significant-observed-adverse-effect-level (SOAEL)
- Establish magnitude of impact
- Assess significance of effects
- Identify and assess cumulative effects
- Identify potential mitigation, enhancement and monitoring measures
- Co-ordination with other regimes

⁶⁹ In each case, in the context of the criteria in Schedule 3 of The Town and Country Planning (Environmental Impact Assessment) Regulations 2017, which for instance, takes into account the size of the population likely to be affected.

⁷⁰ Schedule 3 of The Town and Country Planning (Environmental Impact Assessment) Regulations 2017.

⁷¹ Highways England et al., DMRB Volume 11, Section 2, Part 4 LA 104 Environmental assessment and monitoring, July 2019.

12.2.3 Table 12.2 provides definitions for the various concepts mentioned throughout this chapter.

Table 12.2 Definitions of concepts

Concept	Definition
NSR	Noise (or vibration) sensitive receptor: an area where members of the public are regularly present, and likely exposed to traffic, or construction noise, for a prolonged period. Includes residential properties, schools, hospitals, and care homes.
LOAEL	Lowest-observed-adverse-effect-level: the level of noise exposure above which adverse effects on health and quality of life occur. Defined in NPSE
SOAEL	Significant-observed-adverse-effect-level: the level of noise exposure above which significant adverse effects on health and quality of life occur. Defined in NPSE
dB L_{A10,18h} façade	Customary parameter in which daytime traffic noise is reported in the UK. It is the arithmetic average of the 18 L _{A10,1h} noise levels between 06:00 and midnight on a typical workday. It is customarily reported as façade level, which is the noise level 1 metre from a façade, encompassing both incident and reflected noise.
dB L_{night,outside} free-field	Parameter in which night-time noise is reported as per ISO 1996 ⁷² . It is the energetic averaged or equivalent noise level between 23:00 and 07:00 over a typical year. It is reported as free-field level, which is the noise level in open space, encompassing the incident noise, but not façade reflected noise
Relevant construction period of time	Typically taken as 10 days in any 15 days period or 40 days in any 6 months

Construction Phase

12.2.4 The study areas are defined in Table 12.3, and illustrated on Figure 12.1.

Table 12.3 Construction noise and vibration study areas

Phase	Assessment type	Study area distance
Construction	Noise	600m from red line boundary
	Ground-borne vibration	100m from construction vibration activities

12.2.5 The baseline has been established through noise surveys and noise modelling of road and rail traffic.

12.2.6 BS 5228-1 provides the ‘ABC’ method, categorising the sensitivity of the surrounding area to construction noise as a function of the current noise levels in that area. Thus, construction noise is more noticeable and intrusive in areas with low existing noise levels (Category A), than areas with intermediate (Category B), or high noise levels (Category C). The values provided by BS 5228-1 for the ‘ABC’ method have been used as the SOAEL and LOAEL for the construction noise

⁷² International Organization for Standardization, ISO 1996 Acoustics -- Description, measurement and assessment of environmental noise, 2016.

assessment, and are shown in Table 12.4. Further information on the choice for the SOAEL and LOAEL is provided in Appendix 12.1.

- 12.2.7 Construction site noise levels were predicted in accordance with the methodology described in BS 5228-1 Annex F.
- 12.2.8 If sustained for a relevant period of time, construction noise levels exceeding the LOAEL values in Table 12.4, would be *present and intrusive*, whereas noise levels exceeding Category C SOAEL thresholds, or those increasing existing noise levels more than 3 dB where existing ambient noise levels already surpass the SOAEL, would be *present and disruptive*.

Table 12.4: Sensitivity of residential receptors to construction noise

Assessment category and threshold value period (L_{Aeq})	Threshold value, in decibels (dB)		
	Category A ^A (LOAEL)	Category B ^B (LOAEL)	Category C ^C (SOAEL)
Night time (2300-0700)	45	50	55
Evening and weekends ^D	55	60	65
Daytime (0700-1900) and Saturday (0700-1300)	65	70	75

^A Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.
^B Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.
^C Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.
^D 19.00–23.00 weekdays, 13.00–23.00 Saturdays and 07.00–23.00 Sundays.

- 12.2.9 The methodology to assess potential construction vibration impacts is provided in Appendix 12.2. Construction vibration has been scoped out due to the following:
- Short duration vibratory activities such as the use of vibratory rollers during road surfacing are of short duration, equivalent to levels that may exist during road maintenance works such as road resurfacing, and therefore considered not significant.
 - There are no sensitive receptors within 100m of piling works, only expected to take place in the West Coast Main Line bridge.
- 12.2.10 Cumulative effects during construction would be identified from the existence of concurrent proposed development that may be taking place at the same time as the Scheme works.
- 12.2.11 Best Practicable Means (BPM), BS 5228, are a means of mitigation during construction approved by the Control of Noise (Code of Practice for Construction and Open Sites) (England) Order, 2015 as the code of practice for noise and vibration control on construction and open sites in relation to Section 71 of the Construction Pollution Act 1974 (CoPA).

Operation Phase

12.2.12 The study areas are defined in Table 12.5, and illustrated in Figure 12.2.

Table 12.5 Operation noise and vibration study areas

Phase	Assessment type	Study area distance
Operational	Noise	600m from Scheme's carriageway edge
	Airborne vibration	40m from carriageway edge

12.2.13 The baseline has been established through noise surveys and noise modelling of road and rail traffic.

12.2.14 Daytime noise levels, dB $L_{A10,18h}$, are typically façade values, whereas night-time noise levels, dB $L_{night,outside}$, are typically free-field values. Under the calculation methodology (CRTN – see below) façade levels at 1 metre from the façade are +2.5 dB higher than free-field levels.

12.2.15 For NSRs already experiencing high noise levels, even a small increase in the overall noise level may result in *significant adverse* effects, though little to no change in behaviour would likely occur (PPGN⁷³). Thus, the sensitivity of a receptor has been defined by absolute noise levels, with receptors subject to higher existing noise levels more sensitive to noise changes, or the magnitude of impact. Table 12.6 defines residential receptor sensitivity, with other uses discussed on a case by case basis.

Table 12.6 Sensitivity to noise of residential receptors

Sensitivity	Noise level	Perception	Change in behaviour and attitude	Change on acoustic character of the area
High	Above the SOAEL	<i>Present and disruptive</i>	Increasingly causes a material change in behaviour and attitude with extensive and regular changes at the highest levels	Quality of life diminished due to change in acoustic character of the area. Health effects increasingly relevant.
Medium	Between the LOAEL and the SOAEL	<i>Present and intrusive</i>	Increasingly causes small changes in behaviour and attitude.	Affects the acoustic character of the area such that there is a perceived change in the quality of life.
Low	Below the LOAEL	<i>Present and not intrusive; or not present</i>	No change in behaviour or attitude.	It may slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.

⁷³ Ministry of Housing, Communities & Local Government, Planning practice guidance, Noise. Paragraph: 006 Reference ID: 30-006-20190722. Revision date: 22 07 2019.

12.2.16 Table 12.7 outlines the long-term SOAEL and LOAEL for road traffic noise determined in accordance with the NPSE. Further information on the choice for the SOAEL and LOAEL is provided in Appendix 12.1.

Table 12.7 SOAEL and LOAEL for long-term road traffic noise during daytime and night-time

Parameter	Value for daytime	Value for night-time
SOAEL	68 dB L _{A10,18h} (façade)	55 dB L _{night,outside} (free-field)
LOAEL	55 dB L _{A10,18h} (façade)	45 dB L _{night,outside} (free-field)

Source: Noise Insulation Regulations 1975 for daytime SOAEL. WHO Night-noise guidelines for Europe 2009⁷⁴ for night-time SOAEL. WHO Environmental Noise Guidelines for the European Region (2018)⁷⁵ for daytime and night-time LOAEL. Assumption of predominant non-motorway environment for conversion from L_{den} to L_{Aeq,18h} for daytime LOAEL according to TLR conversions⁷⁶.

12.2.17 The level of detail in this assessment is in line with a DMRB HD 213/11 detailed assessment, focusing on understanding changes in noise and airborne vibration, in terms of nuisance and health effects. This is considered appropriate since this report intends to explore potential effects under the EIA Regulations⁷⁷, the NPPF and the Noise Insulation Regulations (NIR)^{78,79}.

12.2.18 Table 12.8 illustrates the DMRB HD 231/11 methodology defining the magnitude of impact, note, the area of no change has been expanded to results between minus 1 and plus 1 dB to account for the uncertainty of the Calculation of Road Traffic Noise technical memorandum (CRTN)⁸⁰ noise prediction model in line with the methodology used in Highways England Schemes, such as the Smart motorways programme.

⁷⁴ World Health Organization, Night-noise guidelines for Europe, 2009.

⁷⁵ World Health Organization, Environmental Noise Guidelines for the European Region, 2018.

⁷⁶ Transport Research Laboratory (TRL) and Casella Stanger, Defra – Method for converting the UK road traffic noise index L_{A10,18h} to the EU noise indices for road noise mapping, 2006.

⁷⁷ England, The Town and Country Planning (Environmental Impact Assessment) Regulations 2017.

⁷⁸ England and Wales, The Noise Insulation Regulations 1975 (as amended 1988).

⁷⁹ England, The Highways Noise Payments and Movable Homes (England) Regulations 2000 (as amended 2000 and 2001).

⁸⁰ Department of Transport & Welsh Office, Calculation of Road Traffic Noise, 1988.

Table 12.8 Magnitude of impact for noise and vibration

Noise change	Magnitude of impact in the short term	Magnitude of impact in the long term
+ 10.0 dB or higher	Major adverse	Major adverse
+ 5.0 dB to +9.9 dB		Moderate adverse
+ 3.0 dB to +4.9 dB	Moderate adverse	Minor adverse
+ 1.0 dB to +2.9 dB	Minor adverse	Negligible adverse
-0.9 dB to +0.9 dB	No change	No change
-2.9 dB to – 1.0 dB	Minor beneficial	Negligible beneficial
-4.9 dB to -3.0 dB	Moderate beneficial	Minor beneficial
-9.9 dB to -5.0 dB	Major beneficial	Moderate beneficial
- 10 dB or lower		Major beneficial

12.2.19 The magnitude of impact is defined from the expected noise levels in four scenarios, defined in Table 12.9.

Table 12.9 Scenarios for operational noise

Scenario	Opening year	Future year (Worst case within 15 years after the opening year)
Without Scheme	Do-Minimum 2023 (DM'23)	Do-Minimum 2038 (DM'38)
With Scheme	Do-Something 2023 (DS'23)	Do-Something 2038 (DS'38)

12.2.20 These scenarios are then compared as shown in Table 12.10.

Table 12.10 Comparisons of scenarios

Description	Comparison	Example
Short term (Do-Something)	DS'23 vs DM'23	Changes to noise levels as a result of the Scheme, upon opening of the Scheme
Long term Do-Minimum	DM'38 vs DM'23	Changes to noise levels in the long term without the Scheme in place
Long term Do-Something	DS'38 vs DM'23	Changes to noise levels in the long term with the Scheme in place

12.2.21 Where road traffic noise is dominant, daytime noise levels, dB $L_{A10,18h}$, are calculated in line with CRTN and DMRB HD 213/11 Annex 4, with night-time noise levels, dB $L_{night,outside}$, in line with TRL Method 3⁸¹ from daytime levels.

⁸¹ Transport Research Laboratory (TRL) and Casella Stanger, Defra – Method for converting the UK road traffic noise index $L_{A10,18h}$ to the EU noise indices for road noise mapping, 2006.

- 12.2.22 Where noise from road traffic is not dominant, extrapolating the results of noise measurements has determined the noise levels.
- 12.2.23 The contribution from rail noise in the areas closest to railway lines has been modelled as per the Calculation of Railway Noise (CRN)⁸².
- 12.2.24 The matrix within Table 12.11 identifies the potential significance of effect, from the sensitivity of a receptor, and the magnitude of impact. However, the final professional judgement on whether a Scheme results in a significant effect on noise and vibration will also consider other factors, as defined in Schedule 3 of the EIA Regulations 2017, such as affected population size. Groups of houses of around 5 or more dwellings have been considered a community where significant effects may occur even below the SOAEL. Otherwise, receptors have been considered isolated dwellings where significant effects may only occur above the SOAEL and non-significant adverse effects may occur between the LOAEL and the SOAEL.

Table 12.11 Significance of effect matrix

		Receptor sensitivity		
		Low	Medium	High
Magnitude of impact	Major adverse	Moderate	Large	Very large
	Moderate adverse	Slight	Moderate	Large
	Minor adverse	Neutral	Slight	Moderate
	Negligible adverse	Neutral	Neutral	Slight
	No change	Neutral	Neutral	Neutral
	Negligible beneficial	Neutral	Neutral	Slight
	Minor beneficial	Neutral	Slight	Moderate
	Moderate beneficial	Slight	Moderate	Large
	Major beneficial	Moderate	Large	Very large

- 12.2.25 Two traffic datasets have been modelled. The core traffic model does not include the St Cuthbert's Garden Village development. The Garden Village traffic model includes cumulative effects from the predicted future traffic growth of other known schemes, primarily the Garden Village development.
- 12.2.26 Mitigation measures have been identified among the design and mitigation techniques described in DMRB HD 213/11, and should be applied from most resilient to less resilient as per the order of preference shown in Table 12.12.

⁸² Department of Transport, Calculation of railway noise, 1995.

Table 12.12 Identified mitigation techniques (as per DMRB HD 213/11)

Preference	Mitigation	Reason
1	Horizontal realignments and vertical alignments	To keep the route away from sensitive receptors, and low within cuttings which provide screening
2	Environmental barriers (earth bunds)	Earth bunds provide screening
3	Low-noise surfaces	To reduce the noise levels from tyres. Especially effective where average speed is above 75km/h and/or the number of HGVs at low speed is low
4	Environmental barriers (noise fences)	Noise fences provide screening
5	Speed and volume restrictions	Generally, at lower speeds less noise is generated, as is true for lower traffic flows and percentages of HGVs

12.2.27 To identify the best available mitigation techniques, different parameters were considered, such as suitability, robustness, and cost-effective analysis, alongside other criteria, such as the potential for mitigating more than one effect, as an earth mound provides both noise and landscape mitigation.

12.2.28 The Noise Insulation Regulations (NIR) provide for the provision of double glazing and, where there is no alternative ventilation, mechanical ventilation, for certain eligible receptors. The receptors must meet four primary conditions to qualify, Table 12.13

Table 12.13 Criteria to define whether a property qualifies for insulation under the Noise Insulation Regulations 1975 (as amended 1988)

Provision	Criteria
NIR 7(1)	Distance < 300m from the nearest point of the carriageway to alter
NIR 2(1)/3(2)/4(1)	RNL ≥ 68 dB L _{A10,18h} façade (with 67.5 dB rounded up)
NIR 3(2)a	RNL – PNL ≥ +1 dB(A)
NIR 3(2)b	RNL – L'B ≥ +1 dB(A)

12.2.29 Table 12.14 illustrates the parameters used to determine eligibility.

12.2.30 Due to the relatively short duration of the construction works, the PNL is here estimated to be equal to the noise level in the DM opening year scenario.

Table 12.14 Noise level predicted for the Noise Insulation Regulations 1975 (as amended 1988)

NIR definition	Parameter used in this section
Prevailing noise level (PNL)	LA _{10,18h} DM opening year 2023
Relevant noise level (RNL)	LA _{10,18h} DS future year 2038
Maximum noise level from altered highways within 15 years (L'A)	LA _{10,18h} DS future year 2033 from the Scheme
Maximum noise level from all other highways within 15 years (L'B)	LA _{10,18h} DS future year 2038 from all other roads outside the Scheme

12.3 Limitations and Assumptions

12.3.1 Table 12.15 details the data-sources forming the basis of assessment.

Table 12.15 Data-sources for the noise and vibration assessment

Parameter or Object	Data-source	Version
Ground model	Ground model predominantly built from 2 m horizontal posting LiDAR DTM/DSM 'composite' from the Environment Agency. Results of topographical survey of Scheme area, provides sub 0.5 m horizontal positioning to approx. 50m from highway boundary	EA data 2015, Topographical survey data 2019
Building layouts and heights	Ordnance Survey (OS) Mastermap topography layer. Building height defined from Building Height Attribute (BHA) of the OS Mastermap.	Jan 2019
Road layout	<i>Existing</i> : OS Infrastructure Transport Network (ITN) layer	Dec 2018
	<i>Scheme</i> : CSLR-CAP-HML-00-MR-C-0004_S1_P02	P02
Road traffic	<i>Traffic data</i> "TrafficDataR6-1_18hr_weekday" for the majority of the roads. <i>Traffic data</i> "TrafficDataR6Core" and <i>traffic data</i> "TrafficData R6GV" for the few roads missing from the R6-1 version.	R6-1 (R6)
Rail traffic	<i>Calibrated from noise measurements</i> Measurement 10 – West Coast Mainline railway Measurement 12 – Cumbrian Coastline railway	See baseline section
Soundscape	<i>Road Noise</i> : CadnaA Road and rail traffic noise model produced by Capita Acoustics&Noise	V13 CORE V13 GV
	<i>Rail Noise</i> : Road and rail traffic noise model produced by Capita Acoustics&Noise	V13 CORE
	<i>Other</i> : Noise surveys: (12/10/17 – 19/10/17 / 21/01/19 - 03/02/19 (Table 11.7))	Oct 2017 Jan-Feb 2019
Sensitive receptors	<i>Existing</i> : OS AddressBase Premium	epoch 64 Jan 2019

Parameter or Object	Data-source	Version
	<i>Proposed:</i> Drawing CSLR-CAP-EGN-00-DR-Z-0082	P01.3
Construction tasks and stages	Carlisle Southern Link Road Construction Management Strategy (<i>SISK Builders Contractors' Construction Management Strategy (CMA)</i>). Drawing CSLR-CAP-LPN-00-DR-C-7001	Issue P01 Apr 2019 P02.2 of 24/05/2019

12.3.2 *SISK Builders Contractors' Construction Management Strategy (CMA)* defines the main construction stages as; site clearance, earthworks, drainage constructions, and structure's constructions (including bridges and culverts), detailing some plant for the movement of earth, but not all items of plant. Potential noise levels during construction have been estimated based on BS 5228-1, Tables C.2 (Sound level data on site preparation) and C.5 (Sound level data on road construction works).

12.3.3 The CMA states an expected construction period of 24 months from April 2021 to May 2022, with no explicit reference to daytime periods, instead referencing 10h shifts. This assessment assumes construction works will take place between 0700hrs and 1900hrs Monday to Friday, and 0700hrs and 1300hrs Saturdays, with no need for works outside these periods.

12.3.4 The following limitations and assumptions apply:

- Limitations and assumptions of the traffic model regarding weekday traffic flows, %HGVs and average speed apply to the noise model results.
- Strategic roads (managed by Highways England) are assumed to have a low noise surface, in accordance with the DMRB low road noise surface correction of - 2.5 dB. All other roads are assumed to be Hot Rolled Asphalt (HRA) with a texture depth of 2.0 mm.
- Ground cover has been assumed to be generally soft such as grass, brown land, etc.
- Noise Important Areas and Quiet Areas have been identified from the Department for Environment, Food and Rural Affairs' (Defra's) Strategic Noise Maps and Noise Action Plans Round 3 (2019).
- The façade reported in the DMRB assessment is the façade with the highest noise levels due to Scheme elements. For the NIR assessment, all façades have been reported, due to the influence of sensitivity tests

12.4 Consultations

12.4.1 Carlisle City Council⁸³ were consulted regarding the proposed locations for the noise surveys Appendix 12.3. No response from the Council has been received at the time of writing.

12.5 Regulatory and Policy Framework

12.5.1 Key legislation and policy shaping the assessment framework is listed below, with details regarding how these references have influenced the assessment of noise and vibration provided in Appendix 12.4.

- The Town and Country Planning (EIA) Regulations, 2017.
- The Environmental Protection Act, 1990 (as amended).
- The Environmental Noise (England) Regulations, 2006 (as amended).
- The Noise Policy Statement for England, 2010.
- The National Planning Policy Framework, 2019.
- The Land Compensation Act, 1973.
- The Noise Insulation Regulations, 1975 (as amended).
- The Highways Noise Payments and Movable Homes (England) Regulations 2000 (as amended).
- The Control of Pollution Act, 1974.
- The Control of Noise (Code of Practice for Construction and Open Sites) (England) Order, 2015.
- Noise in English Common Law.

12.6 Baseline Conditions

Acoustic character of the area

12.6.1 The study area can be split into three distinct areas in terms of the acoustic environment;

- Western - characterised by road traffic noise from the A595 Wigton Road, the B5299 Dalston Road, and Peter Lane.
- Central - predominantly rural, with faintly audible road traffic noise. Infrequent trains on the Cumbrian Coastline railway, through the centre of the study area, have a narrow noise footprint during the day and no effect on the overall level in this area at night.
- Eastern – predominantly affected by the M6 motorway, Newbiggin Road, and Durdar Road, which maintain constant traffic flows throughout the day. The Westcoast Mainline railway runs through the eastern side of the study area up towards Carlisle.

12.6.2 Acousticians carried out attended noise surveys on 12th and 19th October 2017 and unattended measurements between those dates. While the initial noise surveys

⁸³ Email sent by Jake Howarth (Capita) to Mathew.proudfoot@carlisle.gov.uk on 11 September 2018.

measured the road traffic noise levels, they did not capture the acoustic environment in its entirety, namely noise from the West Coast Mainline and the Cumbrian Coastline railways and the noise floor of the rural areas.

- 12.6.3 Consequently, an additional unattended noise survey was carried out between 21st January and 3rd February, in the vicinity of the West Coast Mainline, with supplementary attended measurements carried out on 28th January 2019 in a number of locations, including close to the Cumbrian Coastline railway.
- 12.6.4 Table 12.16 shows the noise survey results at specific locations as identified in drawing Figure 12.3. Detailed survey data is provided in Appendix 12.5. The results for road traffic noise ($L_{A10,18h}$) have been compared to results predicted in accordance with CRTN and DMRB, and it is reported whether they are within 2 standard deviations of the typical ones stated in DMRB Annex 4 (i.e. ± 3.8 dB), which provides a 95% confidence that road traffic noise dominates the acoustic character of the area. Measurements in positions 10 and 12 correspond to rail traffic noise.
- 12.6.5 The noise model shows a good correlation in the eastern part of the study area M6 motorway, Newbiggin Road, Brisco Road and Durdar Road whereas the correlation in most rural areas is suggest influence of sound sources other than infrastructure. To take into account the influence of natural and agricultural sounds a floor level of 42.5 dB $L_{A10,18h}$ (façade) and 35dB dB $L_{night,outside}$ (free-field) has been applied to the modelled results. The results near Peter Lane may have been influenced by nearby construction noise. This has been excluded from the assessment.

Table 12.16 Noise survey results and comparison to predicted road traffic noise

Monitoring position	$L_{Aeq,16h}$ (dB)	$L_{A10,18h}$ (dB)	L_{night} (dB)	Predicted $L_{A10,18h}$ (dB)	Within 95% confidence
1	55.9	56.7	50.5	56.4	-0.3 (Yes)
2	58.6	60.0	57.1	61.0	+1.0 (Yes)
3 ¹	---	70.0	---	67.6	-2.4 (Yes)
4 ¹	---	53.5	---	48.6	-4.9 (No)
5 ¹	---	44.7	---	41.0	-3.7 (Yes)
6 ¹	---	61.1	---	59.9	-1.2 (Yes)
7 ¹	---	56.3	---	57.0	+0.7 (Yes)
8 ¹	---	77.7	---	71.8	-5.9 (No)
9 ¹	---	73.9	---	67.6	-6.3 (No)
10 ²	61.4	68.2	59.9	---	---
11 ³	64.5dB $L_{Aeq,30min}$	69.1dB $L_{A10,30min}$	---	68.3	-0.8 (Yes)
12 ^{3,4}	44.4dB $L_{Aeq,30min}$	49.3 dB $L_{A10,30min}$	---	---	---
13 ³	41.5dB $L_{Aeq,30min}$	45.4 dB $L_{A10,30min}$	---	41.6	-3.8 (Yes)

Monitoring position	L _{Aeq,16h} (dB)	L _{A10,18h} (dB)	L _{night} (dB)	Predicted L _{A10,18h} (dB)	Within 95% confidence
¹ Results calculated from CRTN shortened method ² Measurement also used to measure West Coast Mainline ³ Spot measurements of 30 min duration ⁴ Measurement also used to measure Cumbrian Coastline					

12.7 Impact Assessment

Construction

- 12.7.1 Table 12.17 classifies receptors by sensitivity to construction noise (using the modelled baseline scenario Do-Minimum 2023), grouped by distance, in accordance with Table 12.6. Most receptors nearest the red boundary are close to construction access roads, or roads due to be resurfaced, such as Newbiggin Road, rather than close to the main works. The main works are typically located more than 100m from communities, with the exception of a few scattered properties. The majority of receptors are of high sensitivity to construction noise (Category A) due to the relatively low road traffic flows in the local roads, or the undisturbed character of the areas further from roads and rail.

Table 12.17 Classification of receptors by sensitivity to construction noise, grouped by distance

Sensitivity to construction noise	Number of sensitive receptors within marked distances					
	0-25m	25-50m	50-100m	100-300m	300-600m	Total
Category A	30	36	74	238	628	1,006
Category B	46	5	4	7	11	73
Category C	3	0	0	5	5	13
Total receptors	79	41	78	250	644	1,092

- 12.7.2 Table 12.18 outlines typical noise levels for during construction at different distances, with calculations provided in Appendix 12.6. Site clearance and road resurfacing are considered short duration construction tasks, which, with careful planning, should give rise to no adverse effects.

Table 12.18 Typical noise levels for potential construction stage works at different distances

Noise Source	Typical sound pressure level of source at marked distance (dB L _{Aeq,T})				
	25m	50m	100m	300m	600m
Site clearance	85	77	70	58	50
Earthworks	76	69	61	49	42
Drainage	75	68	60	48	41

Noise Source	Typical sound pressure level of source at marked distance (dB LAeq,T)				
	25m	50m	100m	300m	600m
Structures	79-83	68-77	61-71	49-61	52-54
Structures (piling)	75	71	65	55	48

12.7.3 Table 12.19 details the predicted noise impacts during construction, with moderate adverse effects expected at Oak Dene and Beech House, due to the Durdar Roundabout works, and at The Keep due to the Brisco Roundabout works. Slightly adverse effects are expected at West House and Thirlstane around the Newby West Roundabout, Peastree Farm around the Durdar Roundabout, for a short time at the connection of the new road section to the north arm of the Durdar Roundabout and Durdar Road in north edge of Durdar and at the properties by Newbiggin Road due to the HGV construction traffic carrying material from construction areas 4 and 5 to construction areas 6 and 7.

Table 12.19 Noise impacts assessment during construction

Receptor	Impact	Effect	Magnitude	Significance
Dwellings within 100m of Newby West Roundabout: West House / Thirlstane (Medium sensitivity)	Earthworks (Newby West Roundabout and A595 Overbridge construction), and other road construction works (ie road surfacing). Likely typical daytime construction noise levels: 70 - 75dB.	Construction noise likely perceived as <i>present and intrusive</i> .	Not defined	Slight adverse
Dwellings by Peter Lane / Dalton Road (Medium to high sensitivity)	Earthworks, typically at distances over 100m. Likely typical daytime construction noise levels: 60dB.	Construction noise likely perceived as <i>present and not intrusive</i> .	Not defined	Neutral
Park Fauld Farm / Park Fauld Barn / Park Fauld House (High sensitivity)	Earthworks, typically at distances well over 100m but less than 300m. Likely typical daytime construction noise levels: well below 60dB.	Construction noise likely perceived as <i>present and not intrusive</i> .	Not defined	Neutral
Peastree Farm (Medium to high sensitivity)	Earthworks and other works, at typical distances between 50 and 100m. Likely typical daytime construction noise levels: 65 - 70dB.	Construction noise likely perceived as <i>present and intrusive</i> .	Not defined	Slight adverse

Receptor	Impact	Effect	Magnitude	Significance
Oak Dene / Beech House (High sensitivity)	Earthworks and other works, at typical distances between 50 and 100m. Likely typical daytime construction noise levels: 65 - 70dB.	Construction noise likely perceived as <i>present and intrusive</i> .	Not defined	Moderate adverse
North Durdar (High sensitivity)	Closest construction works link between Durdar Roundabout and Durdar Road. Likely typical daytime construction noise levels: 70 - 75dB.	Construction noise likely perceived as <i>present and intrusive</i> but for a relatively short duration.	Not defined	Slight adverse
South Durdar (Medium to high sensitivity)	Earthworks, typically at distances over 100m. Likely typical daytime construction noise levels: 60dB .	Construction noise likely perceived as <i>present and not intrusive</i> .	Not defined	Neutral
Stoneraise / Durdar House / Burthwaite (High sensitivity)	Earthworks, typically at distances around 300m. Likely typical daytime construction noise levels: 50dB.	Construction noise likely perceived as <i>not present</i> or <i>present and not intrusive</i>	Not defined	Neutral
Dwellings to the north of the Brisco Roundabout including Langdale (Medium to high sensitivity)	Earthworks, typically at distances around 100m. Likely typical daytime construction noise levels: 60dB.	Construction noise likely perceived as <i>present and not intrusive</i> .	Not defined	Neutral
The Keep (High sensitivity)	Earthworks and other works at typical distances between 50 and 100m. Likely typical daytime construction noise levels: 65 - 70dB.	Construction noise likely perceived as <i>present and intrusive</i> .	Not defined	Moderate adverse
Woodside Logde / Woodside Park (High sensitivity)	Earthwork, typically at distances over 100m. Likely typical daytime construction noise levels: 60dB.	Construction noise likely perceived as <i>not present</i> or <i>present and not intrusive</i> .	Not defined	Neutral
Newbiggin Hall Farm / Newbiggin Hall / Newbiggin House (High sensitivity)	Earthworks, typically at distances around 300m. Likely typical daytime construction noise levels: 50dB.	Construction noise likely perceived as <i>not present</i> or <i>present and not intrusive</i>	Not defined	Neutral

Receptor	Impact	Effect	Magnitude	Significance
Dwellings by Newbiggin Road (Medium sensitivity)	Earthworks – 200 tipper trucks per day along Newbiggin Road moving cut/fill material from Areas 4 and 5 to Areas 6 and 7. Increase of HGV traffic from 5% to 7%, producing increase of 1 - 3dB.	Noise increase unlikely to be perceptible, but is likely to cause a feeling of intrusion.	Minor adverse	Slight adverse

Operation

The Do-Minimum

- 12.7.4 Figures 12.4 and 12.5 illustrate the long-term impact on the local area, including the LOAEL and SOAEL boundaries from road and rail traffic noise, under the 'Do-Minimum' option, for the daytime and night-time respectively. As shown, without the Scheme most receptors will be subject in the long term to either no changes (change less than 1 dB), or negligible increases (1 to 3 dB increase), see also Table 12.20. Negligible increases during both daytime and night-time are expected around Glaramara Drive, by the A595 and Brisco Road. Negligible increases during daytime are expected in the area of Newbiggin Road in Durdar.

Table 12.20 Magnitude of long term impact in 'Do-Minimum' scenario. (DM'38 – DM'23)

Noise change (dB)	Number of affected noise sensitive receptors		
	Daytime		Night-time
	Dwellings	Other	Dwellings
≥ + 10.0	0	0	0
+ 5.0 to +9.9	0	0	0
+ 3.0 to +4.9	0	0	0
+ 1.0 to +2.9	19	0	0
-0.9 to +0.9	1,073	1	104
-2.9 to – 1.0	0	0	0
-4.9 to -3.0	0	0	0
-9.9 to -5.0	0	0	0
≥ - 10.0	0	0	0

- 12.7.5 Table 12.21 compares the magnitude of impact (Table 12.20) against the sensitivity of receptors with the result the potential significance of effect, defined in Table 12.11.

- 12.7.6 Table 12.21 shows 803 dwellings within the study area experiencing noise levels below the LOAEL (low sensitivity), with 202 properties subject to levels between the

LOAEL and the SOAEL (medium sensitivity; transport noise defined as *present and intrusive*), and 84 properties subject to levels above the SOAEL (high sensitivity; transport noise defined as *present and disruptive*). With the Do-Minimum option, slight adverse effects would occur at highly sensitive first-row properties, primarily along Newbiggin Road, already subject to noise levels of at least the SOAEL.

Table 12.21 Long-term effect significance in Do-Minimum daytime scenario. (DM'38 – DM'23)

		Receptor sensitivity		
		Low	Medium	High
Magnitude of impact (dB)	≥ + 10.0	0	0	0
	+ 5.0 to + 9.9	0	0	0
	+ 3.0 to + 4.9	0	0	0
	+ 1.0 to + 2.9	10	9	0
	- 0.9 to + 0.9	793	193	84
	- 2.9 to - 1.0	0	0	0
	- 4.9 to - 3.0	0	0	0
	- 9.9 to - 5.0	0	0	0
	≥ - 10.0	0	0	0

The 'Do-Something' in the short term

- 12.7.7 Figure 12.6 illustrates the short-term impact of the Scheme, as well as the change to the daytime LOAEL and SOAEL areas between the Do-Minimum 2023 and the Do-Something 2023. Table 12.22 shows the magnitude of impact over this period.
- 12.7.8 As shown, the introduction of the Scheme increases noise levels to the south of Newbiggin Road, however the road is also relocated further from existing dwellings, resulting in a decrease in noise levels at these properties. An increase in noise levels is expected around the River Caldew, stretching as far as the village of Cummersdale. However, noise levels in Cummersdale will remain well below the LOAEL, so even if noise is present it is not likely to be intrusive. Properties at Meadow Lane and Foxglove Close, also show decreased noise levels.

Table 12.22 Short-term Do-Something magnitude of impact (DS'23 – DM'23)

Noise change (dB)	Number of affected noise sensitive receptors	
	Daytime	
	Dwellings	Others
≥+ 5.0	32	0
+ 3.0 to + 4.9	34	0
+ 1.0 to + 2.9	63	0

Noise change (dB)	Number of affected noise sensitive receptors	
	Daytime	
	Dwellings	Others
- 0.9 to + 0.9 dB	838	1
- 2.9 to - 1.0	43	0
- 4.9 to -3.0	47	0
≥ -5.0	35	0

The Do-Something in the long term

- 12.7.9 Figures 12.7 and 12.8 demonstrate the long-term impact of the Scheme, for day and night-time respectively, as well as the change to the LOAEL and SOAEL levels and locations between Do-Minimum 2023 and Do-Something 2038. Table 12.23 shows the magnitude of impact, which is similar to the short-term impact, but with addition of impact to Glaramara Drive which also occurred in the long term Do-Minimum.

Table 12.23 Magnitude of impact in the long term do-something. (DS'38 – DM'23)

Noise change (dB)	Number of affected noise sensitive receptors		
	Daytime		Night-time
	Dwellings	Others	Dwellings
≥ + 10.0	1	0	0
+ 5.0 to +9.9	41	0	0
+ 3.0 to +4.9	31	0	0
+ 1.0 to +2.9	214	1	3
- 0.9 to +0.9	695	0	65
- 2.9 to – 1.0	30	0	0
- 4.9 to -3.0	48	0	7
- 9.9 to -5.0	25	0	18
≥ - 10.0	7	0	2

- 12.7.10 Table 12.24 shows the percentage change in numbers of people bothered by noise, per DMRB HD 213/11 Annex 6. For the Do-Something option, there is a greater increase in the percentage of people bothered by noise. This is related to short term changes in noise levels which, according to DMRB HD 213/11, may last up to around 7 to 9 years after opening.

- 12.7.11 The number of dwellings in Table 12.24 consider all the dwellings within the study area. However, the method to assess noise nuisance as per DMRB was based in data from sites ranging from 65 to 78 dB $L_{A10,18h}$. The values between parenthesis in

Table 12.24 show the change in nuisance taking into account dwellings within 40m of roads, which are likely to be subject to noise levels more similar to the ones in the original methodology data.

Table 12.24 Change in percentage of people bothered by noise

Change in % of people affected by noise nuisance	Number of dwellings	
	Do-Minimum	Do-Something
≥ + 40%	0 (0)	7 (0)
+ 30 to + 40%	0 (0)	59 (1)
+ 20 to + 30%	0 (0)	72 (2)
+ 10 to + 20%	0 (0)	574 (15)
+ 0.5 to + 10%	272 (142)	152 (73)
- 0.5 to + 0.5%	820 (19)	102 (5)
- 10% to - 0.5%	0 (0)	95 (41)
- 20% to - 10%	0 (0)	29 (23)
- 30% to - 20%	0 (0)	2 (1)
- 40% to - 30%	0 (0)	0 (0)
≥ - 40%	0 (0)	0 (0)

12.7.12 Table 12.25 shows the percentage change in numbers of people affected by airborne vibration nuisance, for dwellings 40m from roads within study area. Three properties are expected to experience a 10% increase in nuisance from airborne vibration in the Do-Something, 28 properties are expected to show a decrease. This is in line with the fact that in general terms the Scheme moves road traffic away from dwellings.

Table 12.25 Change in percentage of people bothered by airborne vibration

Change in % of people affected by airborne vibration nuisance	Number of dwellings	
	Do-Minimum	Do-Something
≥ + 40%	0	0
+ 30 to + 40%	0	0
+ 20 to + 30%	0	0
+ 10 to + 20%	1	3
+ 0.5 to + 10%	131	76
- 0.5 to + 0.5%	29	25
- 10% to - 0.5%	0	29

Change in % of people affected by airborne vibration nuisance	Number of dwellings	
	Do-Minimum	Do-Something
- 20% to - 10%	0	23
- 30% to - 20%	0	4
- 40% to - 30%	0	1
≥ - 40%	0	0

12.7.13 Table 12.28 compares the daytime magnitude of impact, Table 12.23, against receptor sensitivity, resulting in the potential significance of effect (defined in Table 12.11), and shows that the Scheme has some **slight to large adverse** effects during daytime (highlighted yellow - red). However, the Scheme also has some **slight to large beneficial** effects during daytime (highlighted green). The significant beneficial effects are larger and in a greater number of dwellings than the significant adverse effects.

12.7.14 The Scheme (Table 12.26) has very large beneficial effects at 4 dwellings (reductions greater than 10dB at high sensitivity dwellings) and no very large adverse effects at any dwellings; large beneficial effects at 20 dwellings (reductions of 5 to 10dB at high sensitivity dwellings or greater than 10dB at medium sensitivity dwellings) and large adverse effects at 1 dwelling (increases of 5 to 10dB at high sensitivity dwellings or greater than 10dB at medium sensitivity dwellings); moderate beneficial effects at 13 dwellings (reductions of 3 to 5dB at high sensitivity dwellings or of 5 to 10dB at medium sensitivity dwellings) and moderate adverse effects at 4 dwellings (increases of 3 to 5dB at high sensitivity dwellings or of 5 to 10dB at medium sensitivity dwellings); and slight beneficial effects at 39 dwellings and potential slight adverse effects at 41 dwellings.

12.7.15 The Scheme largely reduces noise levels for areas currently subject to present and disruptive noise, and increases noise levels for areas currently subject to either no present, or present and not intrusive, transport noise. Focussing on the larger effects; the significant beneficial effects outnumber the significant adverse effects.

Table 12.26 Significance of effect in the long term do-something for residential receptors. Do-Something 2038 – Do-Minimum 2023. Daytime

		Receptor sensitivity		
		Low	Medium	High
Magnitude of impact (dB)	≥ + 10.0	0	1	0
	+ 5.0 to + 9.9	37	4	0
	+ 3.0 to + 4.9	29	2	0
	+ 1.0 to + 2.9	174	38	2
	- 0.9 to + 0.9	529	116	50
	- 2.9 to - 1.0	25	5	0
	- 4.9 to - 3.0	4	39	5
	- 9.9 to - 5.0	0	8	17
	≥ - 10	0	3	4

12.8 Mitigation, Enhancement and Monitoring

Mitigation

Construction

- 12.8.1 Significant adverse effects on communities could occur if works were to be carried out during evening and night-times. It is currently assumed that main works will be carried out between 0700hrs and 1900hrs on weekdays, and between 0700hrs and 1300hrs on Saturdays. However, it is recognised that demolition and construction near existing railway lines may be required outside these hours, though these tasks would not occur near noise sensitive receptors.
- 12.8.2 Non-significant adverse effects are likely to occur during the construction works as identified in Table 12.19. Consequently, the contractor should be required to follow general Best Practicable Means as per BS 5228, the approved code of practice under Section 71 of the CoPA, including communicating with local residents.
- 12.8.3 The earth bunds in front of Oak Dene and The Keep should be built at the earliest opportunity, to mitigate noise from construction. HGV construction traffic along Newbiggin Road will require careful planning to minimise intrusion.

Operation

- 12.8.4 *The proposed noise mitigation during operation is described in Table 12.27.*

Table 12.27 Noise and vibration mitigation during operation

Receptor	Without mitigation ⁸⁴		Mitigation type and reference	With mitigation	
	Magnitude	Effect		Magnitude	Effect
West House (southwest façade)	Minor adverse in the short term becoming negligible adverse in the long term.	Slight adverse (\geq 1dB increase in area subject to noise levels above the SOAEL). Noise insulation qualifier under the Noise Insulation Regulations (NIR).	NV01 – Noise insulation under the NIR.	Unclassified (depends on current windows at the property)	Neutral to slight beneficial (interior noise levels in sensitive rooms on the façade facing the scheme will decrease).
Properties by Peter Lane: 50 Peter Lane (southwest façade)	Minor adverse in the short term becoming negligible adverse in the long term.	Neutral	NV02 – Noise barrier in the form of an earth bund.	Minor adverse in the short term becoming negligible adverse in the long term (mitigation reduces noise levels around 1dB).	Neutral
Properties by Peter Lane: 49 Peter Lane and 13 to 31 Meadow Lane (even no.s)	Moderate to Major beneficial in the short term becoming Minor to Major beneficial in the long term.	Moderate to large beneficial.	NV02 – Noise barrier in the form of an earth bund.	Moderate to Major beneficial in the short term becoming Minor to Major beneficial in the long term (mitigation reduces noise levels around 1dB).	Moderate to large beneficial.
Properties at 42 to 43 Dalston Road	Major adverse (short term) becoming Moderate adverse (long term).	Moderate adverse	NV03 – Noise barrier in the form of an earth bund.	Major (No. 42) to moderate (No. 43) adverse (short term) becoming moderate (No. 42) to minor (No. 43) adverse (long term).	Moderate (No. 42) to slight (No. 43) adverse.
Park Fauld Farm	Major to moderate adverse (short term) becoming moderate to minor adverse (long term).	Slight adverse.	NV04 – Increase of the cutting depth from 2 to 3m above road level.	Major to moderate adverse (short term) becoming moderate to minor adverse (long term) (mitigation reduces noise levels around 1dB).	Neutral to slight adverse.

⁸⁴ Beyond mitigation already embedded in the design. Vertical and horizontal road realignments are types of mitigation embedded in the design.

Receptor	Without mitigation ⁸⁴		Mitigation type and reference	With mitigation	
	Magnitude	Effect		Magnitude	Effect
Oak Dene (north façade)	N façade: Major adverse. S façade: Major beneficial.	Slight adverse.	NV05 – Noise barrier in the form of an earth bund.	N façade: Major adverse. S façade: Major beneficial. (Mitigation reduces noise levels around 0.5dB).	Slight adverse.
Langdale (south façade)	N façade: Major beneficial (short term) becoming moderate beneficial (long term) S façade: Major adverse (short term) becoming moderate adverse (long term)	Moderate adverse	NV06 – Noise barrier in the form of an earth bund.	N façade: Major beneficial (short term) becoming moderate beneficial (long term) S façade: Moderate adverse (short term) becoming minor adverse (long term)	Slight adverse (S façade faces garden with amenity value).
The Keep (north façade)	Moderate adverse (short term) becoming minor adverse (long term)	Slight adverse	NV07 – Noise barrier in the form of an earth bund	Moderate adverse (short term) becoming minor adverse (long term) (mitigation reduces noise levels around 1dB).	Slight adverse.

Enhancement

- 12.8.5 Due to its temporary nature, no enhancement measures are planned during the construction phase. For the operation phase, enhancement measures have been embedded into the design in the form of horizontal and vertical alignments which keep respectively the route away and shielded from sensitive receptors, see Section 12.7.

Monitoring

Construction

- 12.8.6 Monitoring will be included as part of the outline CEMP to ensure that SOAEL levels as identified in Table 12.4 are not exceeded, and noise levels in locations identified with minor or moderated adverse effects in Table 12.19 are kept as low as reasonably practicable.

Operation

- 12.8.7 No monitoring is proposed for the operation phase beyond the regulatory requirements in the Noise Insulation Regulations and the Land Compensation Act.

12.9 Residual Impact Assessment

Construction

- 12.9.1 The implementation of Best Practicable Means (BPM) should ensure that slight and moderate adverse effects identified, Table 12.19, are mitigated and minimised in accordance with NPPF paragraph 180.

Operation

Table 12.28 shows the changes in the significance of effect with the introduction of mitigation measures NV-02 to NV-07,

- 12.9.2 Table 12.27. Mitigation reduces the slight adverse effects at 11 properties and the moderate adverse effects at 2 properties.

Table 12.28 Significance of effect in the residual long term do-something for residential receptors. Do-Something 2038 – Do-Minimum 2023. Daytime

		Receptor sensitivity		
		Low	Medium	High
Magnitude of impact (dB)	≥ + 10.0	0	1	0
	+ 5.0 to + 9.9	26	2	0
	+ 3.0 to + 4.9	36	3	0
	+ 1.0 to + 2.9	135	30	2
	- 0.9 to + 0.9	570	121	50
	- 2.9 to - 1.0	31	4	0
	- 4.9 to - 3.0	4	38	5
	- 9.9 to - 5.0	0	10	16
	≥ - 10.0	0	3	5

- 12.9.3 Table 12.29 discusses the residual significance of effect at communities, considered significant in the EIA Regulations, whereas Table 12.30 discusses the effects at individual properties which, although relevant in the planning process, are not considered significant in terms of the EIA Regulations due to the low number of receptors affected, unless they are subject to levels above the SOAEL.

Table 12.29 Significance of effect at communities (long term Do-Something)

Receptor(s)	Impact	Effect	Magnitude	Significance (EIA)
Current Garden Village (west of A595)	1 to 3 dB increase in noise levels (similar increases would occur in the Do-Minimum).	No change in acoustic character, noise still <i>present and intrusive</i> .	Negligible adverse	Neutral
Cummersdale Grange Farm development (properties adjacent Dalston Road only)	~ 1 dB increase in noise levels.	No change in acoustic character; noise still <i>present and intrusive</i> .	Negligible adverse	Neutral
Cummersdale Grange Farm development (properties by Peter Lane)	~ 10 dB decrease in noise levels	Change in acoustic character; reduced noise effect from <i>disruptive / intrusive</i> to <i>intrusive / not intrusive</i> .	Moderate to major beneficial	Moderate to large beneficial
Cummersdale	1 to 7 dB increase in noise levels	No change in acoustic character; noise still either <i>not present</i> or <i>present and not intrusive</i> .	Negligible to moderate adverse	Neutral
Durdar (properties by Newbiggin Road and Durdar Road)	1 to 10 dB decrease in noise levels	Change in acoustic character; reduced noise effects from <i>disruptive</i> to <i>intrusive</i>	Negligible to moderate beneficial	Slight to moderate beneficial
Durdar/Blackwell (properties by Durdar Road between Durdar and Blackwell)	1 to 2 dB increase in noise levels	No change in acoustic character; noise levels ranging from <i>not intrusive</i> to <i>intrusive</i> .	Negligible adverse	Neutral
Blackwell (properties by Durdar Road)	Less than 1dB increase in noise levels	No change in acoustic character; noise still <i>intrusive</i> to <i>disruptive</i> .	No change	Neutral
Scattered properties by north side Newbiggin Road (from Durdar to just past Brisco Road)	2 to 14 dB decrease in noise levels.	Similar acoustic character, however reduction in level of intrusion.	Minor to major beneficial	Slight to large beneficial

Table 12.30 Significance of effect at individual, isolated, properties

Receptor(s)	Impact	Effect	Magnitude	Significance (NPSE)
The Hobbit / West House (by A689)	Just over 1 dB increase in noise levels (in the Do-Minimum the increase would be of +0.6dB)	No change in acoustic character; noise still <i>disruptive</i> . Insulation under the NIR triggered for West House due to direct effects from the Scheme. NIR is not triggered at The Hobbit since the effects are indirect. The Do-Something levels at The Hobbit are +0.5dB higher than the Do-Minimum.	Negligible adverse	Neutral (The Hobbit) Neutral to slight beneficial (West House once insulation is considered)
42 / 43 Dalston Road	4 to 7 dB increase in noise levels.	Change in acoustic character; road traffic noise may become <i>intrusive</i> .	Minor to moderate adverse	(Non-significant) slight to moderate adverse
Park Fauld Farm / Peastree Farm	4 to 9 dB increase in noise levels	No change in acoustic character; road traffic noise still <i>not intrusive</i> .	Minor to moderate adverse	(Non-significant) slight adverse
Oak Dene	11 dB increase in noise levels	Change in acoustic character; road traffic noise may become <i>intrusive</i> .	Major adverse	(Non-significant) large adverse
Langdale / The Keep	4 to 5 dB increase in noise levels	No change in acoustic character; still <i>intrusive</i> . At Langdale north façade will see reduction in noise levels, whereas the south façade (which includes a garden) will see increases.	Minor adverse	(Non-significant) slight adverse

12.10 Cumulative Effects

Construction

12.10.1 If the Garden Village development around Durdar was built at the same time as the Scheme this could increase the slight adverse effects expected by Newbiggin Road to construction HGV traffic. Coordination between both developments would ensure that potential adverse effects are not made worse. However, at this stage there is no firm commitment or timetable for construction of the Garden Village. It is not considered that there will be cumulative effects during construction at any other areas.

Operation

12.10.2 Table 12.31 shows the significance of effects including the potential future flows from the proposed Garden Village development. The increase in traffic due to the Garden Village development would result in a general increase in the number of properties showing slight adverse effects, and therefore, decrease the number of properties showing slight beneficial effects. However, the number of properties with moderate or large beneficial effects would still outnumber the number of properties with moderate or large adverse effects. Therefore, the effect of the Scheme overall would still be classified between neutral and slight beneficial in terms of noise.

Table 12.31 Significance of effect in the cumulative long term do-something for residential receptors. Do-Something 2038 – Do-Minimum 2023. Daytime

		Receptor sensitivity		
		Low	Medium	High
Magnitude of impact (dB)	≥ + 10.0	1	1	0
	+ 5.0 to + 9.9	49	5	0
	+ 3.0 to + 4.9	28	7	22
	+ 1.0 to + 2.9	501	53	9
	- 0.9 to + 0.9	199	95	33
	- 2.9 to - 1.0	7	29	5
	- 4.9 to - 3.0	1	14	3
	- 9.9 to - 5.0	0	6	18
	≥ - 10.0	0	2	4

12.10.3 Figures 12.9 and 12.10 illustrate the long-term impact on the local area, including the LOAEL and SOAEL boundaries from road and rail traffic noise, under the 'Do-Something' option. These drawings show the potential effects on open areas which may correspond to sites for future development (see Chapter 16, Figure 16.1). Table 12.32 discusses the potential effects of the Scheme in the major future developments within the study area.

Table 12.32 Effects on areas to be occupied by future development

Development	Noise site risk to residential development
Residential development north of Peter Lane and west of Dalston Road (09/0413)	Mostly slightly to moderately benefited with most of the site noise levels either being kept or becoming below the LOAEL. A slight adverse effect on the closest properties to Dalton Road where the area within the LOAEL will slightly increase.
Garden village residential development east of Dalston Road and south west of Cummersdale	Neutral for most of the site but with some adverse effects in the southern and western areas of the site. <ul style="list-style-type: none"> West area closest to Dalston Road: the area will be slightly adversely affected with a small increase in the area within the LOAEL but will remain below the SOAEL.

Development	Noise site risk to residential development
	<ul style="list-style-type: none"> • South area closest to the Scheme: the area will be moderately affected with the noise areas in the area exceeding the LOAEL. However, remaining well below the SOAEL. • Central and north east area closest to Cummersdale: neutral effect. The area will remain below the LOAEL ensuring amenity.
Garden village residential development around Durdar	<p>Neutral for most of the site but with some adverse effects in the western area of the site.</p> <ul style="list-style-type: none"> • Area east and north-east of Durdar: the area will largely remain below the LOAEL. • Area south of Durdar: the area is slightly to largely benefited. Area will be mostly within the LOAEL improving the previous situation where some areas were subject to levels within the SOAEL. • Areas west of Durdar up to beyond Peastree Farm: the area is slightly to moderately adversely affected. Most of the area will be within the LOAEL but below SOAEL. It is not expected to compromise residential development, but good acoustic design will need to be applied to ensure amenity.
Garden village residential development north of Brisco	<p>Neutral</p> <p>Site still with noise levels within the LOAEL but below SOAEL.</p>
Garden village residential development around Carleton	<p>Neutral.</p> <p>Site still dominated by road traffic noise arising from the M6 and the A6 Roman Road, with noise level above the LOAEL but mostly below the SOAEL.</p>

12.10.4 Table 12.33 summarises the Scheme’s response to NPPF in terms of noise and vibration. The Scheme is considered compliant with the noise elements of NPPF paragraphs 170 and 180.

Table 12.33 Compliance with the NPPF

NPPF provisions	Scheme’s response
<p>NPPF paragraph 170</p> <p>“Planning policies and decisions should contribute to and enhance the natural and local environment by...e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of ... noise pollution... Development should, wherever possible, help to improve local environmental conditions... taking into account relevant information...”</p>	<p><u>Prevent unacceptable noise levels</u></p> <ul style="list-style-type: none"> • The Scheme does not give rise to unacceptable levels of noise which would be classified as present and very disruptive. For instance, taking as a reference dwellings at or above 73dB LA10,18h façade, the number of dwellings remains at 7 with changes in noise levels of less than 1dB.
<p>NPPF paragraph 180</p> <p>“Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential</p>	<p><u>Avoid significant adverse impacts</u></p> <ul style="list-style-type: none"> • No communities (groups of around 5 dwellings or more) are significantly adversely affected. • No individual dwellings are significantly adversely affected. • The number of dwellings at or above the SOAEL decreases from 87 to 78.

NPPF provisions	Scheme's response
<p>sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:</p> <p>a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life [See Explanatory Note to the NPSE (Defra 2010)];</p> <p>b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; ...”</p>	<p><u>Mitigate and minimise adverse impacts</u></p> <ul style="list-style-type: none"> • Oak Dene's north façade is (largely) adversely affected. Mitigation has been provided in the form of a cutting and an earth bund (false cutting). In order to avoid adverse effects on landscape and land taking, no further noise mitigation has been provided. • 42 and 43 Dalston Road as well as Langdale and The Keep are adversely affected. Mitigation in the form of earth bunds and horizontal realignment has been provided which has reduced the adverse effects from moderate to slight (43 Dalston Road and Langdale) or has reduced the level of moderate adverse effect (42 Dalston Road) or slight adverse effect (The Keep). • Park Fauld and Peastree Farm are slightly adversely affected. In order to avoid adverse effects on landscape and land taking, no further noise mitigation has been provided. • The number of dwellings at or above the LOAEL remains similar from 289 to 290. <p><u>Identify and protect tranquil areas</u></p> <ul style="list-style-type: none"> • The study area does not contain areas classified in national or local plans as quiet or tranquil areas.

12.11 Summary

Construction

12.11.1 Construction works at evening, night and weekends should be avoided as long as reasonably practicable, though may be required for works near existing railway lines.

12.11.2 The expected non-significant adverse effects due to construction noise have been identified as follows;

- Moderate adverse effects: Oak Dene, Beech House, and The Keep
- Slightly adverse effects: West House, Thirlstane, Peastree Farm, and short term at the new road connection to the Durdar Roundabout and Durdar Road.

12.11.3 Slight adverse effects due to construction noise have been identified at Newbiggin Road properties, due to HGV construction traffic carrying material from construction areas 4 and 5 to construction areas 6 and 7.

12.11.4 The above effects can be mitigated through the use of Best Practicable Means, as per BS 5228 which will ensure compliance with NPPF paragraph 180.

Operation

12.11.5 The Scheme increases noise levels to the south of Newbiggin Road, however the road is moved further away from the existing dwellings in this location, resulting in an overall decrease in noise levels for the existing dwellings including those in south and east Durdar.

- 12.11.6 The increase in noise levels around the River Caldew will cause increases as far as Cummersdale, however, Cummersdale remains well below the LOAEL, so if noise is present it is not intrusive and therefore not significant.
- 12.11.7 Meadow Lane and Foxglove Close (by Peter Lane) show decreases in noise.
- 12.11.8 The properties with moderate, or large, beneficial effects outnumber those with moderate, or large, adverse effects, though the number of properties with slight adverse effects is slightly greater than those with slight beneficial effects, especially if the cumulative effects of the Garden Village are considered.
- 12.11.9 In terms of noise, the effect of the overall Scheme is assessed as being between neutral and slight beneficial.

13 Outdoor Access and Recreation

13.1 Introduction

- 13.1.1 The assessment of Outdoor Access and Recreation considers activities undertaken by pedestrians, cyclists, equestrians and water users (i.e. anglers, kayakers); jointly referred to as 'non-motorised users' (WCHs). Effects on the routes available to WCHs are considered, specifically; the ability to make use of a route (the 'access') and the ease with which the access can be taken (the 'accessibility').
- 13.1.2 No impacts have been identified on areas of land used by the community for recreation (i.e. parks, open access land) and therefore further consideration of possible effects arising on community land and any economic impact on recreation facilities has been scoped out of the assessment.
- 13.1.3 The assessment is reported under the subtopics of: changes to journey length and community severance; and changes to amenity.

13.2 Assessment Methodology

Guidelines

- 13.2.1 The assessment of Outdoor Access and Recreation is principally carried out in accordance with guidance contained in DMRB Volume 11, Section 3, Part 8 'Pedestrians, Cyclists, Equestrians and Community Effects'. Additional guidance is drawn from SNH's 'Environmental Impact Assessment Handbook⁸⁵', specifically 'Appendix 6: Outdoor access impact assessment'.

Methodology

- 13.2.2 At Stage 3 DMRB prescribes the objective of the assessment is to:
- 'assess the number and location of pedestrians and others and their community facilities affected by the preferred route, taking proposed agreed mitigation into account. The report should also describe any benefits to pedestrians and others from the reductions in traffic along the existing route network. A map should be included which shows the community facilities, their catchment areas and routes used by pedestrian and others which are affected by the scheme'
- 13.2.3 The specific steps required to assess the impacts are as follows:
- Establish a baseline for the study area, confirming the key receptors and their value (or sensitivity). Refining information collated at Stage 2 through collection of further WCH counts and consultation with local interest groups;
 - Identify potential impacts from the Scheme and their effects on routes under the subtopics of: changes to journey length and community severance; and, changes to amenity;
 - Assess the magnitude and significance of any change;

⁸⁵ Scottish Natural Heritage, 2018 (Version 5). Environmental Impact Assessment Handbook: Guidance for competent authorities, consultation bodies, and others involved in the Environmental Impact Assessment Process in Scotland.

- Propose mitigation measures where appropriate, to mitigate any predicted significant adverse effects. Consider possible enhancement measures; and
- Assess the significance of any residual effects taking this mitigation into account.

Establishing the baseline

13.2.4 Baseline conditions were established by identifying community facilities and key routes between these facilities within a 'study area' extending to 500m from the Scheme footprint.

13.2.5 Community facilities and routes identified (the 'receptors') included:

- any facilities within the local communities that are provided by public authorities, charities or other Non-Governmental Organisations (i.e. public parks/greenspace, state schools, community centres and public realm);
- any facilities within the local communities provided by private or commercial organisations for the use of the whole community (i.e. shops, restaurants, B&Bs/hotels, bars, churches); or
- land, water and routes available for use by the whole community, or particular groups within the community (i.e. Public Rights of Way (PRoW), National Cycle Network Routes, permitted routes, pedestrianised footways and long-distance routes).

13.2.6 The following sources were reviewed in establishing baseline:

- Stage 2 Environmental Report, Capita 201886
- Ordnance Survey 1:25,000 maps, 2018
- Cumbria County Council 1976 Definitive Map digital (GIS) lines and post 1976 orders
- Sustran's National Cycle Network (NCN) GIS layer, 2018;
- Natural England's National Trails GIS layer, 2018
- Google Maps, 2019
- Carlisle District Local Plan, 2015–203087, Designated Open Space
- OS Address Base, 2018

13.2.7 A site visit was undertaken on 18th October 2018 and again on 6th March 2019 in order to refine the receptors identified through desktop study, determine any changes from those identified at Stage 2 and confirm their location, extent and establish if any factors were influencing their extent or potential use (i.e. temporary diversions on PRoW due to other construction work).

13.2.8 Counts of WCH flows across the study area were conducted on:

- Saturday 14th October 2017;
- Monday 27th August 2018 (Bank Holiday); and,

⁸⁶ DMRB Stage 2 Environmental Impact Assessment Volume 1 – Environmental Report, Capita, 2018,

⁸⁷ Carlisle District Local Plan, 2015-2030, Carlisle City Council, 2016,

- Thursday 6th August 2018.

- 13.2.9 Cameras were positioned at 17 sites covering 21 footpaths, bridleways and highways (see Figure 13.1, Appendix 13.1 and 13.2). Surveys were undertaken on a Saturday and Bank Holiday Monday in attempt to record maximum flows with leisure trips likely to be at their highest. Surveys were also undertaken on a Thursday in order to record numbers of trips on an average weekday, with utility trips captured.
- 13.2.10 Spot counts of WCHs were recorded at each site at 15-minute intervals between 7.00 am and 7.00 pm and information was collected on; the type of WCH on the route (i.e. pedestrians, cyclists, equestrians or other) and the direction of travel.
- 13.2.11 Receptors identified within the baseline were then assigned a value based on a five-point scale with descriptors for; *very high*, *high*, *medium*, *low* and *negligible* (Table 13.1).

Table 13.1 Value (or sensitivity) descriptors for outdoor access and recreation.

Sensitivity	Description
Very High	Nationally recognised or promoted routes i.e. National Trails, Long Distance Routes (LDRs), National Cycle Network Routes, Promoted Cycle Routes.
High	Locally defined routes i.e. Public Rights of Way
Medium	Informal or permitted routes providing links to nationally recognised routes or locally defined routes. Open access areas. Waterways (promoted routes only)
Low	Informal or permitted routes not linking nationally recognised routes or locally defined routes. Roadside footways. Waterways (not promoted)
Negligible	On road routes

Identifying impacts and effects: journey length and community severance

- 13.2.12 An assessment of how the proposed Scheme will affect the duration or distance of journeys undertaken by WCH's has been made. In making this assessment the location of key routes and community facilities were first plotted on a map in GIS. The proposed Scheme was then overlain on the map in GIS and used to identify where there could be potential impacts on the journeys made.
- 13.2.13 The assessment then established:
- Whether or not permanent or temporary closures/diversions will be required;
 - The impacts on journey lengths and times as a result; and,
 - The creation or relief of severance on any routes and the effect on accessibility to community facilities/between communities.
- 13.2.14 The magnitude of any change was determined and defined on a four-point scale with descriptors for; *major*, *moderate*, *minor (both positive and negative)* and *no change* as shown in Table 13.2.

Table 13.2 Magnitude descriptors for assessing change to journey length and the potential for community severance

Magnitude	Description
Major	<p>Negative; People are likely to be dissuaded from making trips to an extent sufficient to induce a change in their habits or there will be considerable hindrance caused to people making their journeys i.e. an at grade crossing of a road carrying >16000 vehicles per day, journey length increase by >500m.</p> <p>Positive; People are likely to be encouraged to make new trips to an extent sufficient to induce a change in their habits or journeys will be made considerably easier i.e. new infrastructure creating recreational or utility trips which were not previously possible, resulting in a change of transport mode.</p>
Moderate	<p>Negative; Some residents, particularly children and elderly people, are likely to be dissuaded from making trips. Trips will be made longer or less attractive i.e. an at grade crossing of a road carrying 8000–16000 vehicles per day, journeys increased by 250-500m.</p> <p>Positive; Some people, particularly existing users are likely to be encouraged to change their trips or make new trips with increased potential i.e. extended recreational trips / shortened utility trips for existing cyclists, walkers or equestrians.</p>
Minor	<p>Negative; The current journey pattern is likely to be maintained, but there will probably be some hindrance to movement i.e. an at grade crossing of a road carrying <8000 vehicles per day, a new bridge to be climbed or a subway traversed, journeys increased by >250m.</p> <p>Positive; The current journey pattern is likely to be maintained, but with some improvement to the existing movement i.e. improvements to an existing route making movement easier, for example a new carriageway crossing on an existing route.</p>
No Change	No change to a route.

Identifying impacts and effects: changes to amenity

- 13.2.15 Amenity can be defined as the relative pleasantness of a journey. There are close relationships between a route's amenity value and its visual or aural qualities however, these factors will be dealt with in more detail by the Visual Impact and Noise and Vibration topic chapters respectively. For the purposes of the assessment, amenity is considered to cover values of: solitude and isolation, challenge or hazard, sociability and the enjoyment of, or access to habitats and wildlife. Other factors include; path width (and the potential for conflicts between WCHs), proximity to motorised vehicles, clear signage and the provision of safe crossing points.
- 13.2.16 The relative importance of the factors listed above varies depending upon the type of activity being pursued and the type of WCH using the route. A qualitative approach to the assessment of amenity has therefore been applied.

Determining the significance of environmental effects

- 13.2.17 With the exception of changes to amenity, the significance of any environmental effects identified has been determined using a matrix-based approach with the value (or sensitivity) of any receptors identified on one axis and the magnitude of the impact (extent of change) on the other. As it is difficult to apply scales to impacts on amenity, a descriptive assessment has been applied rather than a matrix-based approach.
- 13.2.18 The scale for sensitivity accommodates use of routes following counts undertaken (i.e. a well-used route has a higher sensitivity than a route less well used). A distinction is also made as to whether the effects are 'positive' (beneficial) or 'negative' (adverse), 'permanent' or 'temporary' in nature.
- 13.2.19 When assessing the significance of environmental effects, best practice guidance has been referred to, specifically; SNH's handbook on EIA, Appendix 5, paragraph 20 which outlines four key characteristics of a project's effects which could be considered significant on outdoor access. Effects are likely to be significant where the Scheme leads to:
- Permanent or long-term effects;
 - Effects on recreational resources that are more than local use or importance, especially if that importance is national in significance;
 - Major constraints on or improvements to access or accessibility to designated sites; and
 - Where mitigation and/or compensatory or alternative recreational provision is considered to be inadequate.
- 13.2.20 An assessment of the significance of effects will be carried out during construction and operation, firstly without proposed mitigation (the 'Preliminary Impact Assessment') and then with proposed mitigation applied (the 'Residual Impact Assessment'). As the impact on outdoor access and recreation is unlikely to change over the course of the first 15 years, it is not appropriate to carry out a future year assessment which is deemed to be the same as in the operation phase.

Determining cumulative effects

- 13.2.21 Cumulative effects impacting on outdoor access and recreation arising from different approved (or committed) projects within proximity to the Scheme have been considered.

Determining potential mitigation and enhancement measures

- 13.2.22 Mitigation measures aim to avoid, minimise, remedy or compensate for the predicted impacts of the Scheme. Where an impact cannot be eliminated then steps should be taken to reduce its significance. If impacts still remain, then the next option should be to remedy the damage or compensate for it.
- 13.2.23 A series of mitigation measures were identified at Stage 2 of the assessment, following the assessment of potential effects. Upon a review of mitigation measures, the following agreed measures have been imbedded in the design and taken into consideration in the preliminary assessment at Stage 3.

Construction

- Caldew Valley Path - Period of closure to be kept to a minimum. Appropriate pedestrianised diversion put in place during closure with signage to direct walkers to alternative footpaths;
- On Road Cycling - Cyclists access retained on all roads with temporary traffic management in place and signage to inform cyclists;
- River Petteril and River Caldew - Closure of rivers kept to a minimum with appropriate signage to give notice of closure to river users.

Operation

- Caldew Valley Path - New bridge to provide underpass of sufficient width to accommodate existing path. Shared use link to be implemented between new road and Caldew Valley Path with shared use provision on north side of new highway providing enhanced provision. Design of bridge to be appropriate to surroundings to mitigate impact on amenity;
- PRow - Shared use footway / cycleway to be implemented along the alignment of new road on north side and on spur west of Durdar. FP 129004 to be stopped up. Access to FP 129024 to be retained. Caldew valley footpaths (129005, 129001) to be retained with underpass of new bridge;
- Miller's Way Walking Route - Vehicle access to car park to be retained via Brisco Road and Newbiggin Road. New bridge to provide underpass for existing path. Design of bridge to be appropriate to surroundings to mitigate impact on amenity.

13.2.24 In addition to the above agreed mitigation, a number of additional enhancements measures have been imbedded in the design since Stage 2. The following design measures have been taken into consideration in the preliminary assessment at Stage 3:

- Pedestrian / cycle bridges over side roads A595 Wigton Road, B5299 Dalston Road and new Durdar link (replacing at level crossing proposed in mitigation at Stage 2) to provide continuity of provision for pedestrians and cyclists on north side shared use;
- Construction of bridge over Durdar Road offset to allow access along the existing road during construction;
- Shared use path to be implemented linking Durdar Road with new shared use path on north side highway east of Durdar Road;
- Shared use path on Durdar Road between village and Stoneraise Primary School and between village and Racecourse / Durdar link;
- Newbiggin Road stopped up to vehicles west of Durdar Road, west of Brisco Road, east of West Coast Mainline and west of River Petteril with access for pedestrians and cyclists retained;
- Pedestrian / cycle bridge over main highway to west of Brisco Road;
- Construction of field access bridge (for use by pedestrians and cyclists) over new highway between Park Fauld and Peastree in close proximity to FP129004 negating severance of the PRow; and

- FP114053 to be stopped up with access to FP111005 provided from Cummersdale and a link to the new shared use path along the new highway implemented.

13.2.25 Additional mitigation is proposed at Stage 3 in order to compensate for any significant adverse effects. A significant effect is considered as moderate or above. Mitigation has been proposed which considers best practice design and as a result of mitigation workshops for the Scheme undertaken in March 2019 and June 2019.

13.2.26 In addition to proposed mitigation measures to compensate for significant adverse effects, a number of additional enhancement measures are considered which whilst not offsetting any adverse effects, are considered to bring additional benefits to outdoor access and recreation in the study area.

13.3 Limitations and Assumptions

13.3.1 The following limitations and assumptions of the assessment apply:

- Walker, Cyclist and Horserider (WCH) surveys will aim to establish representative 'peak flows' on the network. Weather conditions and other external factors are likely to have an influence on the counts recorded on the day of survey. Counts on both survey days were undertaken during stormy conditions which is likely to have an impact on flows of all WCH's, with counts expected to be higher in fine and dry conditions.
- A legal closure of footpath FP129018 at Wreay Woods was in place over the period both WCH surveys in 2018 were undertaken. This might have had an impact on the number of users recorded over the survey periods.
- A 500m study area has been applied however, it is noted that some users may travel long distances to access facilities or routes (i.e. WCHs on National Trails and long distance walking routes) and will therefore travel from outside the study area.
- For the purposes of this Stage 3 assessment, it is assumed that all agreed mitigation, as defined in the Stage 2 Report is applied to the design to be considered at preliminary assessment stage at Stage 3.

13.4 Consultations

13.4.1 Extensive consultation and engagement with stakeholders regarding outdoor access and recreation has taken place during the study as follows:

- A Regulatory Stakeholder Workshop for statutory consultees was held in July 2017, with representatives from the City and County Council in relation to outdoor access and recreation.
- Access Workshops were held in October 2017 and November 2017 with the PRow and Cycling Officers for Cumbria County Council. The views of Council Officers were consulted in order to gain local knowledge regarding routes and their usage within the study area.
- A Public Consultation was held in January/February 2018 to determine a preferred option.
- A mail merge was sent to local recreation groups in October 2018 and June 2019 inviting comments on proposals. The following groups were consulted:

- Sustrans
 - British Horse Society
 - Ramblers Association
 - Carlisle Reivers Cycling Club
 - Border City Wheelers Cycling Club
 - Cycle Carlisle
 - Cumbria Local Access Forum
 - Active Cumbria
 - Angling Trust
 - Carlisle Angling Association
 - Carlisle Canoe Club
 - Borderliners
 - Carlisle Racecourse
 - Disability Assoc. Carlisle and Eden
 - Kingrigg Farm Livery Stables
 - Lough Farm Livery Stables
 - Greenlands Equestrian Centre
- A Regulatory Stakeholder Workshop for statutory consultees in relation to outdoor access and recreation was held in July 2018 with a further workshop with Cumbria County Council officers (i.e. PRow Officer, Cycling Officer) in March 2019. The views of Council Officers were consulted in order to gain views on the most up to date design.
 - A Public Consultation was held in May/June 2019.

13.5 Regulatory and Policy Framework

13.5.1 The legislative framework for this assessment is set by the following:

- The Wildlife and Countryside Act 1981
- The Countryside and Rights of Way (CROW) Act 2000
- The Natural Environment and Rural Communities (NERC) Act 2006
- The Highway Act 1980

13.5.2 Relevant local authority planning policies and strategies include:

Cumbria Local Transport Plan (LTP) 2011-2026

13.5.3 The key priority of the LTP for the city of Carlisle is to encourage development that supports diversification of the city's economy, including its role as a Housing Growth Point. The plan states that *'the priority for rural Carlisle is to improve resident's ability to access jobs, services, and healthcare. This will be based around the demand responsive services and developing opportunities with local communities.'* The shared foot / cycleway by River Petteril and completion of a cycle route at Denton Holme in Carlisle are noted as highlights of works undertaken in the Carlisle area since 2006.

13.5.4 The plan states the great opportunities in Carlisle 'to increase the proportion of short journeys to work and school made on foot or by cycle'.

Cumbria Cycling Strategy 2017-2022

- 13.5.5 The Cumbria Cycling Strategy's vision is for Cumbria and the Lake District to be one of the best places to cycle in the UK with more people cycling more often. Emphasis is given by the Council to encouraging an increasing number of journeys by bike to school and work'
- 13.5.6 The strategy highlights the counties appeal to leisure cyclists noting 'a number of long-distance cycle routes pass through the County offering opportunities for leisure cycling'.
- 13.5.7 In its objective to improve cycling infrastructure the strategy notes it will 'seek funding to identify and develop multi user routes within the county's main towns and city of Carlisle. They will be traffic free wherever possible to improve cycle safety'. The strategy seeks to 'plug the gaps' in the cycle network stating, 'we will work with partners and landowners to improve the rights of way network for cyclists and improve the off-road cycling offer in Cumbria'.

Cumbria Countryside Access Strategy 2014-2019

- 13.5.8 The Countryside Access Strategy is a strategic framework for the management and improvement of countryside access and recreation in Cumbria. The goal of the strategy is for Cumbria to be 'a place where visitors and local people can explore, enjoy and develop an understanding of the diverse countryside, both on land and water, and are enabled to do so in a variety of sustainable and responsible ways.'

Carlisle District Local Plan, 2015–2030

- 13.5.9 The Carlisle District Local Plan sets out the long-term spatial vision and strategic objectives to support the development of the District. The Plan sets out the Council's policies with implications on development at Carlisle South (Garden Village), designations affecting Caldew Riverside and enhancing the riverside walk/cycle way, the Carlisle Green Infrastructure Strategy, including 'supporting and enhancing strategic green links' which include the Cumbria Way and the implications of development proposals on Public Rights of Way.

Carlisle Transport Improvement Study 2015

- 13.5.10 The Carlisle Transport Improvement Study was commissioned by Cumbria County Council in order to mitigate the impact of and support the proposed Carlisle District Local Plan. The study identifies a range of potential sustainable transport improvements that can be delivered in Carlisle with the aim of encouraging modal shift from the car to other means of transport and reduce the impact of vehicular traffic on the road network.
- 13.5.11 Specific issues identified as part of the review of cycle facilities include: 'Gaps in completeness of cycle lanes connecting the south-west and south-east of Carlisle to the city centre', 'a lack of cycle network connections to Local Plan sites' and 'low visibility of signage for cycle routes'. The study sets out a Cycle Network Plan highlighting the Petteril Valley Link and Caldew Cycleway as priority schemes. The closest proposed scheme to the study area is the proposed developer funded Currock Cycleway connecting Hammonds Pond with the Caldew Valley Path at Currock Bridge.

13.6 Baseline Conditions

- 13.6.1 Baseline conditions have been established through a review of Stage 2 baseline data (i.e. identified community facilities, PRow, pedestrian footways) and further WCH counts. Following the development of a preferred route from the options stage (Stage 2), a revised study area is established, extending to 500m from the extents of the Scheme as shown in in Figure 13.1.
- 13.6.2 The study area contains a network of Public Rights of Way (PRow), linking amongst others, the small villages of Durdar and Cummersdale located to the south of Carlisle. The PRow are rural in nature, crossing for the most part agricultural land or following the course of the River Caldew and River Petteril.
- 13.6.3 A total of 16 designated footpaths and 3 bridleways are located within the study area. Six designated footpaths are located between Durdar and the River Caldew, all rural in nature and crossing agricultural land linking farms at Floses, Peastree and Park Fauld with the river valley.
- 13.6.4 West of the Caldew, footpath FP111004 extends from the Caldew Valley Path through fields to Cummersdale. Footpaths FP114053 and FP111005 to the south of Cummersdale have no visible path on the ground, with access blocked by field boundary fences at Cummersdale.
- 13.6.5 Within the Caldew valley; the Cumbria Way promoted walking route, National Cycle Network Route 7 (NCN7), and Reiver's Route (NCN10) use the same PRow, leading between Carlisle and the village of Dalston to the south. For the most part the route is surfaced, 3m wide and traffic free. Whilst designated as a footpath, the route is promoted by Sustrans as National Cycle Network and used by both pedestrians and cyclists as well as horse riders. WCH counts taken on 27th August 2018 (August Bank Holiday) recorded 168 pedestrians, 63 cyclists and 4 equestrians using the route in a 12-hour period.
- 13.6.6 In the Petteril Valley a signed local walking route, The Miller's Way, follows a PRow between Carlisle and the village of Wreay. A small car park and picnic site are located adjacent to the path, accessed from Newbiggin Road. WCH counts recorded 16 pedestrians using the path in a 12-hour period on August Bank Holiday 2018.
- 13.6.7 There is no formal provision for cyclists on highways in proximity to the Scheme although, a number of minor roads (i.e. Brisco Road, Sclegate Road and Durdar Road) present good potential routes for on-road cyclists connecting Carlisle City Centre with countryside to the south. Peter Lane, B5299 Dalston Road and Newbiggin Road are also used by cyclists, with WCH counts suggesting use for both recreation and utility trips. 12-hour WCH counts recorded 43 cyclists on Peter Lane on August Bank Holiday and 34 on Thursday 6th September, with 45 and 62 respectively on B5299 Dalston Road and 26 and 6 on Newbiggin Road. 29 cyclists were recorded using Durdar Road on August Bank Holiday and 32 on Thursday 6th September, with 18 and 13 respectively on Sclegate Road and Brisco Road in October 2017.
- 13.6.8 The River Caldew and River Petteril provide opportunities for water-based recreation / travel i.e. canoeing and kayaking, although there was no evidence of these activities taking place during site visits. Carlisle Angling Association operate a permit scheme for game and course angling on the River Eden and its tributaries.

There are numerous pools located along the stretch of the River Caldw between Dalston and Cummersdale.

- 13.6.9 There are three PRow with bridleway status to the west of Cummersdale. Kingrigg Livery Stables is an equestrian facility of relevance located on the A595 near to Peter Lane. WCH Surveys show limited equestrian usage, with 4 equestrians recorded on August Bank Holiday using PRow in the Caldw valley but not at any other location. The September 2018 survey recorded only one equestrian on Durdar Road at Floses.
- 13.6.10 No areas of community land (i.e. parks, village greens, common) are located within proximity to the Scheme, with the effect on community land scoped out of the assessment.

WCH Surveys

- 13.6.11 Table 13.3 to Table 13.5 provide a summary of WCH surveys carried out. Full survey data is also included in Appendix 13.1 and 13.2.

Table 13.3 Walking, cycling and horse-riding user survey data – Saturday 14th October 2017 - Stormy weather recorded

Location	Count (12 Hour)			Total
	Pedestrians	Cyclists	Equestrians	
1-Peter Lane	2	10	0	12
2-B5299 nr. Peter Lane	3	12	0	15
3-Grace Lane BW 111005	13	0	0	13
5-FP111005 off Cumbria Way	10	0	0	10
6-Cumbria Way / NCN 7/10	135	38	0	173
7-FP 129005 Caldw valley	28	0	0	28
8-FP 129003 Peastree Farm	2	0	0	2
9-Durdar Road highway - Oak Dene	0	10	0	10
10-FP 129024	0	0	0	0
11-Durdar Rd. - Floses	26	25	0	51
12-FP 129006	0	0	0	0
13-Durdar Road -Bus Stop	8	27	0	35
14-Cat Wood	5	2	0	7
15-Nr Burthwaite	0	18	0	18

Location	Count (12 Hour)			Total
	Pedestrians	Cyclists	Equestrians	
16-Brisco Rd	6	4	0	10
17-FP129011	0	0	0	0
18-Durdar Crossroads	3	13	0	16
19-Newbiggin Hall	2	0	0	2
20-FP129017	10	0	0	10
21-River Petteril Road Bridge	1	22	0	23

Table 13.4 Walking, cycling & horse-riding user survey data Monday 27th August 2018 (Bank Holiday) – Stormy weather recorded

Location	Count (12 Hour)			Total
	Pedestrians	Cyclists	Equestrians	
1-Peter Lane	6	43	0	49
2-B5299 nr. Peter Lane	4	45	0	49
3-Grace Lane BW 111005	44	2	0	46
5-FP 111005 off Cumbria Way	10	1	0	11
6-Cumbria Way / NCN 7/10	168	63	4	235
7-FP 129005 Caldew valley	10	0	0	10
8-FP 129003 Peastree Farm	0	3	0	3
9-Durdar Road highway - Oak Dene	1	17	0	18
10-FP 129024	0	0	0	0
11-Durdar Rd. - Floses	44	29	0	73
12-FP 129006	0	0	0	0
13-Durdar Road -Bus Stop	4	21	0	25
14-Cat Wood	3	8	0	11
15-Nr Burthwaite	2	12	0	14
16-Brisco Rd	2	5	0	7

Location	Count (12 Hour)			Total
	Pedestrians	Cyclists	Equestrians	
17-FP129011	1	0	0	1
18-Durdar Crossroads	4	12	0	16
19-Newbiggin Hall	12	0	0	12
20-FP129017	16	0	0	16
21-River Petteril Road Bridge	1	26	0	27

Table 13.5 Walking, cycling & horse-riding user survey data Thursday 6th September 2018 – Stormy Weather recorded

Location	Count (12 Hour)			Total
	Pedestrians	Cyclists	Equestrians	
1-Peter Lane	12	34	0	46
2-B5299 nr. Peter Lane	3	62	0	65
3-Grace Lane BW 111005	13	2	0	15
5-FP 111005 off Cumbria Way	10	0	0	10
6-Cumbria Way / NCN 7/10	81	73	0	154
7-FP 129005 Caldew valley	10	0	0	10
8-FP 129003 Peastree Farm	0	3	0	3
9-Durdar Road highway - Oak Dene	0	6	0	6
10-FP 129024	0	0	0	0
11-Durdar Rd. - Floshes	61	32	1	94
12-FP 129006	0	0	0	0
13-Durdar Road -Bus Stop	3	24	0	27
14-Cat Wood	5	7	0	12
15-Nr Burthwaite	1	6	0	7
16-Brisco Rd	3	5	0	8
17-FP129011	1	0	0	0
18-Durdar Crossroads	3	9	0	12

Location	Count (12 Hour)			Total
	Pedestrians	Cyclists	Equestrians	
19-Newbiggin Hall	0	0	0	0
20-FP129017	15	2	0	17
21-River Petteril Road Bridge	0	6	0	6

Outdoor access and recreation receptors

13.6.12 Table 13.6 lists the outdoor access and recreation receptors and associated sensitivity to be applied in this Stage 3 assessment.

Table 13.6 Outdoor access and recreation sensitive receptors

Receptor	Description	Value (sensitivity)
Cumbria Way Walking Trail	A 72 mile locally promoted walking trail commencing in Carlisle and following paths south west through the Caldew valley.	Very High
NCN 7 / C2C / Reiver's Route	National / promoted cycle trail following traffic free surfaced paths through the Caldew valley	Very High
PRoW west of the River Caldew	7 PRoWs with 4 designated footpaths (FP111004, FP111005, FP114053, FP111008) and 3 designated bridleways (BW111007, BW111002(x2)) rural in nature and providing connectivity between the Caldew valley and B5299 via Cummersdale, between the A595 and B5299 and between Newby West farm and A595	High
PRoW between the River Caldew and Durdar Road	7 PRoW (FP129001, FP129005, FP129004, FP129024, FP129003, FP129006 and FP129002) providing connectivity through agricultural land between the Caldew valley and Park Fauld, Peastree and Floses farms linking to Durdar Road and Newbiggin Road.	High
PRoW east of Durdar Road	3 PRoW (FP129010, FP129021 and FP129018) designated as footpaths located to the south of Newbiggin Road. FP129010 connecting Durdar Road with Scalegate Road, FP129021 connecting Newbiggin Hall with Brisco Road and FP129018 connecting a car park and picnic site off Newbiggin Road with Wreay Woods and Wreay via an underpass of the M6 motorway	High
Miller's Way Walking Route	A local walking route commencing in Carlisle and following paths south-east through the Petteril Valley (FP129017).	Medium

Receptor	Description	Value (sensitivity)
Footways Durdar Road	Surfaced roadside footways providing pedestrian access to the Black Lion pub at Durdar and Carlisle Racecourse.	Low
Footways Dalston Road	Surfaced roadside footway providing pedestrian access to new housing development and Cummersdale Village.	Low
On road cycling on minor roads	Durdar Road, Peter Lane, B5299 Dalston Road, Newbiggin Road, Scalegate Road and other minor quiet roads presenting a facility for on road cyclists.	Medium
River Petteril	Watercourse opportunities for water based recreation/travel i.e. canoeing, kayaking and angling.	Low
River Caldew	Watercourse opportunities for water based recreation/travel i.e. canoeing, kayaking and angling.	Low

13.7 Impact Assessment

13.7.1 The following section summarises all potential impacts of the Scheme; beneficial or adverse, permanent or temporary. It considers impacts during the construction phase and the operation phase.

Construction Phase

Changes to journey length and potential for community severance

13.7.2 Table 13.7 summarises the potential impacts of the Scheme, their effects and an assessment of the significance of these effects (without accounting for any mitigation) on changes to journey length and potential for community severance during the construction phase.

Table 13.7 Changes to journey length and potential for community severance, preliminary assessment (construction phase)

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
Cumbria Way Walking Trail (Very High)	New bridge crossing introduced over the Caldew valley	Route closed for up to 12 months during construction of new bridge. Considerable disruption with pedestrians diverted to other footpaths. No obvious diversion north / south in the Caldew valley other than via FP129002 and Durdar Road. Walkers are likely to be dissuaded from making trips to an extent sufficient to induce a change in their habits with an increase in journey length by >3km.	Major	Large adverse
NCN 7 / C2C / Reiver's Route (Very High)	New bridge crossing introduced over the Caldew valley	Route closed for up to 12 months during construction of new bridge. Considerable disruption to cyclists on a well used National Cycle Network off road route. Cyclists diverted via Cummersdale to Dalston Road with an increase in journey length of 500m and using sections of road (Dalston Road). Cyclists, particularly vulnerable cyclists are likely to be dissuaded from making trips to an extent sufficient to induce a change in their habits.	Major	Large adverse
PRoW west of the River Caldew (High)	Negligible impact to existing footpaths and bridleways with FP111005 / FP114053 not in use	Negligible effect	No change	Neutral
PRoW between the River Caldew and Durdar Road (High)	Construction of new road across existing footpaths. Closure of sections of path during construction	5x footpaths severed during construction (129024, 129003, 129004, 129005, 129001) with no access for pedestrians likely. Diversions via FP129002 to the north of the Racecourse adding 4km between Durdar and the River Caldew path. Pedestrian counts very low, however considerable hindrance and change to journey times/ patterns.	Major	Moderate adverse
PRoW east of Durdar Road (High)	Construction of sections of footway on Durdar Road and construction works on Newbiggin Road.	Access to FP129010 from Durdar Road likely to be restricted for short period during construction. Vehicle access to car park and picnic site to access FP129018 likely to be restricted for periods during construction works on Newbiggin Road. Minimal effects on FP129021. The current journey pattern is likely to be maintained, but there will probably be some hindrance to movement.	Minor	Moderate adverse

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
Miller's Way Walking Route (Medium)	New bridge over Petteril Valley and FP 129017 (Miller's Way)	Route closed during construction of new bridge with pedestrians diverted to an existing path to the east of the Premier Inn Hotel with crossings of the M6 Junction 42 roundabout. Diversion adding 250m incorporating carriageway crossings. Walkers are likely to be dissuaded from making trips to an extent sufficient to induce a change in their habits.	Major	Moderate adverse
Footways Durdar Road (Low)	Construction of sections of footway / shared use on Durdar Road	Footways closed during construction works with pedestrians diverted to temporary footway adjacent to existing footway. Some disruption with temporary footway surfaces and ramps likely to effect vulnerable pedestrians. The current journey pattern is likely to be maintained, but there will probably be some hindrance to movement.	Minor	Moderate adverse
Footways Dalston Road (Low)	Negligible impact	Negligible effect	No change	Neutral
On road cycling on minor roads (Medium)	New road and roundabouts constructed over existing minor roads	6x minor roads affected (Dalston Road, Peter Lane, Newbiggin Road, Durdar Road, Scalegate Road and Brisco Road). Considerable hindrance to cyclists' access during construction with changes to journey patterns and times. Cyclists likely to be redirected onto alternative roads. Durdar Road to be kept open during construction, with construction of new overbridge offset from existing highway. Some people, particularly vulnerable cyclists are likely to be dissuaded from making trips with trips made longer and less attractive.	Moderate	Moderate adverse
River Petteril (Low)	Construction of a new river crossing	Use of river likely to be restricted during construction of bridge crossing. Some users, are likely to be dissuaded from making trips with trips made longer and less attractive.	Moderate	Moderate adverse
River Caldew (Low)	Construction of a new river crossing	Use of river likely to be restricted during construction of bridge crossing. Some users, are likely to be dissuaded from making trips with trips made longer and less attractive.	Moderate	Moderate adverse

Changes to Amenity

- 13.7.3 The proposed construction of a new bridge over the River Caldwew will have the greatest adverse effect on amenity, with key walking and cycling trails (Cumbria Way, NCN 7/10) affected. The existing shared use path provides users with a high-quality route of high landscape value, isolated from urban areas and traffic, with the exception of trains. Being flat, wide and with a good surface, the path is accessible to a variety of users including those that are more vulnerable, those in a wheelchair or with pushchairs and young / inexperienced cyclists. The route is likely to be closed for up to 12 months during the construction period, forcing cyclists to use an alternative un-designated on-road route with considerable change in elevation via Cummersdale and Dalston Road and with considerable impact on amenity. Cyclists will be exposed to traffic with no formal provision for cyclists resulting in cyclists feeling exposed with vulnerable cyclists most affected. WCH counts taken on 27th August 2018 (August Bank Holiday) recorded 63 cyclists in 12 hours, with 73 recorded on Thursday 6th September 2018.
- 13.7.4 Pedestrians will be diverted via FP129002 and Durdar Road with less accessible surfaces, incorporating changes in elevation, crossing Durdar Road carriageway and use of a footway along Durdar Road carriageway with resulting impact on amenity values due to exposure to traffic. Vulnerable users, particularly wheelchair users and pedestrians with pushchairs will be most affected with equestrians also affected. The Caldwew Valley Path is well used by pedestrians with 168 pedestrians and 4 equestrians recorded in a 12-hour period on 27th August 2018 (August Bank Holiday).
- 13.7.5 Between the Caldwew valley and Durdar, the proposed route extends through agricultural fields, intersecting 4 PRoW (129003, 129004, 129005, 129001) with a new bridge to be constructed over 2 Caldwew valley footpaths and coming in close proximity to FP129024 and 129006. These consist of footpaths across fields and farm access roads which are currently isolated from urban / built up areas with a rural feel. Whilst flows are low on these routes (a maximum of 28 pedestrians recorded over a 12-hour period on FP129001 in October 2017, with no pedestrians recorded using FP129024 over any survey period and 2 using FP129003 in October 2017), the routes are likely to experience considerable disruption during construction with exposure to construction vehicles and construction works impacting on feelings of isolation and remoteness.
- 13.7.6 Construction of a new bridge crossing over the River Petteril would intersect footpath FP129017 (Miller's Way) with temporary closure of the path and pedestrians diverted to cross A6 Roman Road to an existing path to the east of the Premier Inn Hotel with crossings of the M6 Junction 42 roundabout. The amenity value of the route would be impinged during construction works, with the diversion to footways alongside carriageways and carriageway crossings resulting in exposure to traffic. Whilst the impact on the amenity value is likely to be significant, the close proximity of the A6 and M6 junc. 42 to the existing path result in a lower amenity value than other paths of a more rural nature.
- 13.7.7 The construction of 3 roundabouts is proposed on 3 minor roads used by on road cyclists (Dalston Road, Scalegate Road and Brisco Road), with a bridge constructed over Durdar Road and the existing Newbiggin Road intersected west of Durdar and east of Brisco Road. Construction of the new highway and roundabouts is likely to detract from the pleasantness of the roads for use by recreational cyclists during construction. Cyclists are likely to be redirected onto alternative routes during construction with works and associated construction traffic having an adverse effect

on amenity and alternatives also subject to construction works. Cyclists using the relatively rural north / south routes of Brisco Road and Scalegate Road are likely to be diverted via Durdar Road which is to remain open during construction with associated impacts on amenity value in passing through housing at Blackwell and Durdar village.

Operation Phase

Changes to journey length and potential for community severance

- 13.7.8 Table 13.8 summarises the potential impacts of the Scheme, their effects and a preliminary assessment of the significance of these effects (without accounting for any mitigation) on changes to journey length and potential for community severance in operation.

Changes to amenity

- 13.7.9 During operation, feelings of solitude and remoteness on many rural routes will reduce due to the proximity of traffic and introduction of engineered structures giving more of an urban feel.
- 13.7.10 The proposed construction of a new bridge over the River Caldew will have the greatest adverse effect on amenity during operation with key walking and cycling trails (Cumbria Way, NCN 7/10) with a high number of users (maximum flows of 168 pedestrians, 73 cyclists and 4 equestrians recorded in a 12-hour period) affected. A new bridge over the valley is likely to have a significant effect on the amenity of the existing path which is of high landscape value, isolated from urban areas and traffic and with significant recreational use. Whilst the alignment of the existing path is unlikely to change significantly apart from the addition of a shared use link to the new highway, an underpass would be required under the new bridge structure. Views of the river and surroundings would be changed significantly, and the feelings of solitude and remoteness would be reduced.
- 13.7.11 As noted above, between the Caldew valley and Durdar, the proposed route extends through agricultural fields, intersecting 4 PRoW (129003, 129004, 129005, 129001) with a new bridge to be constructed over 2 Caldew valley footpaths and coming in close proximity to FP129024 and FP129006. These consist of footpaths across fields and farm access roads which are currently isolated from urban / built up areas with a rural feel. Whilst flows are low on these routes (a maximum of 28 pedestrians recorded over a 12-hour period on FP129001 in October 2017, with no pedestrians recorded using FP129024 over any survey period and 2 using FP129003 in October 2017), the amenity value in terms of pleasantness and isolation of these routes are likely to be adversely affected by exposure to the highway and bridge structure.
- 13.7.12 Whilst the existing alignment of the path is unlikely to be changed, the amenity value of FP129017 (Miller Way) through the Patteril Valley will be impacted upon due to the presence of the new bridge structure and associated underpass. Feelings of solitude and isolation will be impinged with views of the river and surroundings significantly changed. However, the impact on the route is likely to be less than on Caldew valley paths with significantly lower flows (maximum of 16 pedestrians recorded in 12-hour period on Bank Holiday Monday, 27th August) and due to the close proximity of the existing path to the A6 and M6 highways.

Table 13.8 Changes to journey length and potential for community severance, preliminary assessment (operation phase)

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
Cumbria Way Walking Trail (Very High)	New bridge crossing introduced over the Caldew valley with shared use path linking Caldew valley and new highway	Journey patterns along the path will be maintained but with positive impacts of enhanced access from the new highway and link to shared use path along the new highway improving connectivity to the wider WCH network. People are likely to be encouraged to make new trips to an extent sufficient to induce a change in their habits.	Major	Large positive
NCN 7 / C2C / Reiver's Route (Very High)	New bridge crossing introduced over the Caldew valley with shared use path linking Caldew valley and new highway	Journey patterns along the path will be maintained but with positive impacts of enhanced access from the new highway and link to shared use path along the new highway improving connectivity to the wider WCH network. People are likely to be encouraged to make new trips to an extent sufficient to induce a change in their habits.	Major	Large positive
PRoW west of the River Caldew (High)	Shared use path implemented along north side of new highway for full length. FP114053 to be stopped up with access to FP111005 to be provided from Cummersdale and a link to the new shared use path along the new highway implemented.	Enhanced provision for pedestrians and cyclists with a new east-west route along the new highway providing connectivity with the wider WCH network and shared use link between the new highway and Caldew valley. Improved connectivity south of Cummersdale, with creation of a footpath link to the new highway and potential for circular trips. People are likely to be encouraged to make new trips to an extent sufficient to induce a change in their habits.	Major	Large positive
PRoW between the River Caldew and Durdar Road (High)	New bridge crossing introduced over the Caldew valley. Construction of new road across existing footpaths with field access bridge over new highway between Park Fauld and Peastree in close proximity to FP129004. Durdar Link Road constructed over FP129003 with path diverted onto new shared use and pedestrian / cycle bridge over new highway.	Journey patterns maintained on Caldew valley paths (FP129005 and 129001) but with some change (underpass) FP129004 to be diverted via new bridge between Park Fauld and River Caldew with slight change in journey time and slight change in gradient to cross bridge. Diversion to FP129003 via a pedestrian / cycle bridge and new shared use adding an extra 100m with gradient change to cross bridge. Enhanced provision for pedestrians and cyclists with a new east-west route along the new highway providing connectivity with the wider WCH network. Shared use path	Major	Moderate positive

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
	Shared use path implemented along north side of new highway for full length. Shared use path on new Durdar Link Road connecting new highway with Durdar Road south of racecourse.	on Durdar Link Road enhancing provision for pedestrians and cyclists with potential for circular trips. People are likely to be encouraged to make new trips to an extent sufficient to induce a change in their habits.		
PRoW east of Durdar Road (High)	Shared use path implemented along north side of new highway for full length.	Enhanced provision for pedestrians and cyclists with a new east-west route along the new highway providing connectivity with the wider WCH network. Access to FP129010 from Durdar Road enhanced with new shared use path on Durdar Road to Stoneraise School. People are likely to be encouraged to make new trips to an extent sufficient to induce a change in their habits. Vehicle access to car park from west only on Newbiggin Road. Minimal effects on FP129021.	Major	Large positive
Miller's Way Walking Route (Medium)	New bridge over Petteril Valley and FP 129017 (Miller's Way). Vehicle access to existing car park from M6 junc. 42 stopped off with car park relocated to west of river and new access.	Slight deviation to existing path with underpass of new bridge structure. Revised access for pedestrians from relocated car park to FP129018 to Wreay Woods. Footpath link to FP129017 from shared use path on north side of new highway. The current journey pattern is likely to be maintained, but with some change to the existing movement.	Minor	Moderate adverse
Footways Durdar Road (Low)	New shared use path on Durdar Road between Durdar village and Racecourse New shared use path between Durdar village and Stoneraise School with shared use link to new highway	Enhanced provision for pedestrians and cyclists with shared use provision creating potential trips between Durdar village and the racecourse. Shared use provision to Stoneraise School and link to the new highway creating links for vulnerable WCH users (primary school students) and links to the wider WCH network. People are likely to be encouraged to make new trips to an extent sufficient to induce a change in their habits.	Major	Large positive

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
Footways Dalston Road (Low)	Shared use path implemented on west side of Dalston Road connecting existing footway to new shared use path on north side of new highway. Pedestrian and cycle bridge over Dalston Road	Enhanced provision for pedestrians and cyclists with linkage between existing footways north of Peter Lane and new shared use provision along the new highway creating potential for new trips. People are likely to be encouraged to make new trips to an extent sufficient to induce a change in their habits.	Major	Large positive
On road cycling on minor roads (Medium)	New roundabouts constructed over 3 existing roads (Dalston Road, Scalegate Road and Brisco Road) with a bridge constructed over Durdar Road. Peter Lane stopped up to vehicles with shared use link to new highway	Some hindrance to cyclists' access and slight increase in journey times with 3 new roundabouts to cross (Dalston Road, Scalegate Road and Brisco Road). The primary north / south route for cyclists (Durdar Road) retained with minimal impact on journey times. Cyclist access to Newbiggin Road retained between M6 and Durdar village. Cyclist access on Peter Lane to be retained with minimal conflict from vehicles and link to new shared use making it more attractive to vulnerable cyclists. Some residents are likely to be dissuaded from making trips with trips made longer or less attractive.	Moderate	Moderate adverse
River Petteril (Low)	Construction of a new river crossing	Negligible effect	Minor	Neutral
River Caldew (Low)	Construction of a new river crossing	Negligible effect	Minor	Neutral

- 13.7.13 With the stopping up of Newbiggin Road to traffic, and access to the existing car park and picnic area retained, there is likely to be a slight positive impact on the amenity value of the picnic area and footpath 129032 to Wreay Woods. Whilst the proximity to the new highway is likely to detract from feelings of remoteness and solitude, the removal of through traffic on Newbiggin Road is likely to lead to an over positive impact on the amenity value of the route.
- 13.7.14 The amenity value for on road cyclists will be negatively affected due to the proposed roundabouts on 3 minor roads used by on road cyclists (Dalston Road, Sclegate Road and Brisco Road), with a bridge constructed over Durdar Road and the existing Newbiggin Road intersected west of Durdar and east of Brisco Road. The amenity value affected in terms of feelings of solitude and remoteness are likely to be greater on Sclegate Road and Brisco Road where cyclists will be exposed to traffic at roundabouts. Due to unimpeded movement for cyclists on Durdar Road, there is likely to be less of an impact on its amenity value, however there will be some change to the pleasantness of recreational cycling due to the visual impact of the bridge structure.
- 13.7.15 Whilst there will be a negative impact on the amenity value on Dalston Road for on road cyclists with increased exposure to traffic at the proposed roundabout, cyclists will already be exposed to significant traffic flow and therefore the impact on amenity value will be less than other roads. Whilst there will be some negative impacts for on road cyclists using Newbiggin Road in exposure to traffic on the new highway running in close proximity, the amenity value will improve overall due to the removal of traffic from Newbiggin Road.

13.8 Mitigation, Enhancement and Monitoring

Mitigation

- 13.8.1 The implementation of mitigation through considered design will reduce the significance of adverse effects identified, both in relation to amenity and severance. Mitigation measures during construction and operation are described below. A schedule of mitigation summarising all measures is provided in Appendix 17.1.

Construction

- 13.8.2 The mitigation measures that are proposed to reduce the significant adverse effects of the Scheme during construction are summarised in Table 13.9.

Table 13.9 Temporary mitigation measures during construction

Receptor & Sensitivity	Impact	Effect	Mitigation
Cumbria Way National Trail (Very High)	New bridge crossing introduced over the Caldew valley	Route closed for up to 12 months during construction of new bridge. Considerable disruption with pedestrians diverted to other footpaths. No obvious diversion north / south in the Caldew valley other than via FP129002 and Durdar Road. Walkers are likely to be dissuaded from making trips to an extent sufficient to induce a change in their habits with an increase in journey length by >3km.	<u>Minimise</u> Ensure route is kept open for maximum amount of time possible during construction with existing proposed 12 month period reduced. Appropriate pedestrianised diversion put in place during closure with signage to direct walkers to an alternative footpath (new temporary footpath close to railway line to be considered or use of Footpath 129002 on east side of River Caldew).
NCN 7/ C2C / Reiver's Route (Very High)	New bridge crossing introduced over the Caldew valley	Route closed for up to 12 months during construction of new bridge. Considerable disruption to cyclists on a well used National Cycle Network off road route. Cyclists diverted via Cummersdale to Dalston Road with an increase in journey length of 500m and using sections of road (Dalston Road). Cyclists, particularly vulnerable cyclists are likely to be dissuaded from making trips to an extent sufficient to induce a change in their habits.	<u>Minimise</u> Ensure route is kept open for maximum amount of time possible during construction with existing proposed 12 month period reduced. Appropriate temporary diversion put in place during closure via Cummersdale and Dalston Road or new temporary footpath close to railway line to be considered, with signage to direct cyclists and warn motorists of cyclist's presence. Details of closure periods to be advertised on Sustrans website.
PRoW between the River Caldew and Durdar Road (High)	Construction of new road across existing footpaths. Closure of sections of path during construction	5x footpaths severed during construction (129024, 129003, 129004, 129005, 129001) with no access for pedestrians likely. with diversions via FP129002 to the north of the Racecourse adding 4km between Durdar and the River Caldew path. Pedestrian counts very low, however considerable hindrance and change to journey times/ patterns.	<u>Minimise</u> Appropriate pedestrianised diversion put in place during closure with signage to direct walkers to alternative footpaths Mitigation planting used to screen the Scheme and reduce impacts on landscape quality to reduce negative impacts on amenity value of PRoW.
PRoW east of Durdar Road	Construction of sections of footway on Durdar	Access to FP129010 from Durdar Road likely to be restricted for short period during construction.	<u>Minimise</u>

Receptor & Sensitivity	Impact	Effect	Mitigation
(High)	Road and construction works on Newbiggin Road.	Vehicle access to car park and picnic site to access FP129018 likely to be restricted for periods during construction works on Newbiggin Road. Minimal effects on FP129021. The current journey pattern is likely to be maintained, but there will probably be some hindrance to movement.	Appropriate pedestrianised diversion put in place during closure with signage to direct walkers to alternative footpaths. Vehicle access to car park and picnic site to access FP129018 kept open for maximum amount of time possible during construction. Mitigation planting used to screen the Scheme and reduce impacts on landscape quality to reduce negative impacts on amenity value of PRoW.
Miller's Way Walking Route (Medium)	New bridge over Petteril Valley and FP129017 (Miller's Way)	Slight deviation to existing path with underpass of new bridge structure. Revised access for pedestrians from relocated car park to FP129018 to Wreay Woods. Footpath link to FP129017 from shared use path on north side of new highway. The current journey pattern is likely to be maintained, but with some change to the existing movement.	<u>Minimise</u> Ensure route is kept open for maximum amount of time possible during construction. Appropriate pedestrianised diversion put in place during closure with signage to direct walkers to A6 Roman Road and Newbiggin Road and warning signs to motorists where any highway crossings are required.
Footways Durdar Road (Low)	Construction of sections of footway / shared use on Durdar Road	Footways closed during construction works with pedestrians diverted to temporary footway adjacent to existing footway. Some disruption with temporary footway surfaces and ramps likely to effect vulnerable pedestrians. The current journey pattern is likely to be maintained, but there will probably be some hindrance to movement.	<u>Minimise</u> Ensure pedestrian access is retained throughout construction with appropriate pedestrianised diversion put in place adjacent to existing footway with signage to direct pedestrians. Temporary footway surface to be suitable for vulnerable users, including wheelchair users and pedestrians with pushchairs.
On road cycling on minor roads (Medium)	New road and roundabouts constructed over existing minor roads	Some hindrance to cyclists' access and slight increase in journey times with 3 new roundabouts to cross (Dalston Road, Scalegate Road and Brisco Road).	<u>Minimise</u> Durdar Road to be kept open during construction with other north / south routes diverted to Durdar Road through appropriate signage.

Receptor & Sensitivity	Impact	Effect	Mitigation
		<p>The primary north / south route for cyclists (Durdar Road) retained with minimal impact on journey times.</p> <p>Cyclist access to Newbiggin Road retained between M6 and Durdar village. Cyclist access on Peter Lane to be retained with minimal conflict from vehicles and link to new shared use making it more attractive to vulnerable cyclists. Some residents are likely to be dissuaded from making trips with trips made longer or less attractive.</p>	<p>Appropriate traffic management to be implemented during construction on Dalston Road, Peter Lane, Newbiggin Road, Scalegate Road and Brisco Road with full closure periods kept to a minimum.</p>
River Petteril (Low)	Construction of a new river crossing	Use of river likely to be restricted during construction of bridge crossing. Some users are likely to be dissuaded from making trips with trips made longer and less attractive.	<p><u>Minimise</u></p> <p>Closure of river kept to a minimum with appropriate signage to give notice of closure to river users.</p> <p>Access to be retained during peak fishing periods wherever possible.</p>
River Caldew (Low)	Construction of a new river crossing	Use of river likely to be restricted during construction of bridge crossing. Some users, are likely to be dissuaded from making trips with trips made longer and less attractive.	<p><u>Minimise</u></p> <p>Closure of river kept to a minimum with appropriate signage to give notice of closure to river users.</p> <p>Access to be retained during peak fishing periods wherever possible.</p>

Operation

13.8.3 The mitigation measures that are proposed to reduce the significant adverse effects of the Scheme during operation are summarised in Table 13.10.

Table 13.10 Permanent mitigation measures during operation

Receptor & Sensitivity	Impact	Effect	Mitigation
Miller's Way Walking Route (Medium)	New bridge over Petteril Valley and FP129017 (Miller's Way). Vehicle access to existing car park from M6 junc. 42 stopped off with car park relocated to west of river and new access.	Slight deviation to existing path with underpass of new bridge structure. Revised access for pedestrians from relocated car park to FP129018 to Wreay Woods. Footpath link to FP129017 from shared use path on north side of new highway. The current journey pattern is likely to be maintained, but with some change to the existing movement.	New car park to offer improved vehicle access to the existing with enhanced facilities such as picnic tables / information board and new pedestrian access to FP129018.
On road cycling on minor roads (Medium)	New roundabouts constructed over 3 existing roads (Dalston Road, Scalegate Road and Brisco Road) with a bridge constructed over Durdar Road. Peter Lane stopped up to vehicles with shared use link to new highway	Some hindrance to cyclists' access and slight increase in journey times with 3 new roundabouts to cross (Dalston Road, Scalegate Road and Brisco Road). The primary north / south route for cyclists (Durdar Road) retained with minimal impact on journey times. Cyclist access to Newbiggin Road retained between M6 and Durdar village. Cyclist access on Peter Lane to be retained with minimal conflict from vehicles and link to new shared use making it more attractive to vulnerable cyclists. Some residents are likely to be dissuaded from making trips with trips made longer or less attractive.	Design of roundabouts to be sympathetic to cyclists in relation to deflection and sight lines in order to improve accessibility and safety for cyclists.

Enhancement

13.8.4 In addition to the above mitigation measures to compensate for adverse effects, the following enhancement measures are considered which are likely to bring additional benefits to outdoor access and recreation in the study area:

- Link from new shared use footway / cycleway to A6 Roman Road with shared use provision on west side of A6 and crossing.
- At grade crossings of new highway and southern and eastern arms of M6 Junction 42 with shared use footway / cycleway to provide link to the east.
- Shared use footway / cycleway link between stopped off Peter Lane (west end) to new highway.
- Cycle lane off and on slips from minor roads at roundabouts to enable cyclists to leave the carriageway and cross at grade crossings of new highway.
- Shared use footway / cycleway link between Newbiggin Road (east end) and new highway to improve connectivity between new highway and surrounding network.
- Shared use link between Buckabank Road and new highway west of Durdar to improve connectivity between new highway and Durdar village.
- Directional signage with distance markers implemented across the PRow network within the study area linking with the existing network.
- Improvements to existing PRow in terms of drainage, stiles and gates to enhance the existing network within the study area.
- Enhancement boards on local wildlife etc. and art installations to be considered along the Caldew Valley Path to enhance the visual impact of bridge structure and associated highway infrastructure.
- Relocated car park and picnic area off Newbiggin Road with enhanced landscaping, access and parking arrangements and facilities.
- Potential for additional paths within the study area to coincide with creation of ponds and associated wildlife planting creating additional recreation space. Pond D to the east of the River Caldew offers the greatest potential as the largest proposed pond and being close to existing PRow (FP129001 and FP129005) accessed from the Caldew valley.

Monitoring

- 13.8.5 Effective ongoing monitoring of the use of routes by WCH's will help to determine the effectiveness of provision and help determine areas for development and improvement.
- 13.8.6 As an effective means of determining numbers of users, automatic cycle counters should be considered in the design of shared use provision on key routes particularly on the main shared use path along the highway, the proposed shared use path connecting to the Caldew Valley Path and Durdar link.
- 13.8.7 Surveys of all WCH's could be undertaken with the aid of cameras, the positioning of which should also be considered in design.
- 13.8.8 Continued analysis of collision data relating to WCH's should be carried out in order to identify issues and help design out any road safety issues.

13.9 Residual Impact Assessment

Construction

- 13.9.1 Table 13.11 summarises the potential impacts of the Scheme, their effects and a residual assessment of the significance of these effects (accounting for the proposed mitigation) during the construction phase.

Operation

- 13.9.2 Table 13.12 summarises the potential impacts of the Scheme, their effects and a residual assessment of the significance of these effects (accounting for the proposed mitigation) during the operation phase.

Table 13.11 Summary of the residual impact assessment (construction phase)

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
Cumbria Way Walking Trail (Very High)	New bridge crossing introduced over the Caldew valley	Route closed for up to 12 months during construction of new bridge. Considerable disruption with pedestrians diverted to other footpaths. No obvious diversion north/south in the Caldew valley other than via FP129002 and Durdar Road. Walkers are likely to be dissuaded from making trips to an extent sufficient to induce a change in their habits with an increase in journey length by >3km.	Major	Large adverse
NCN 7 / C2C / Reiver's Route (Very High)	New bridge crossing introduced over the Caldew valley	Route closed for up to 12 months during construction of new bridge. Considerable disruption to cyclists on a well used National Cycle Network off road route. Cyclists diverted via Cummersdale to Dalston Road with an increase in journey length of 500m and using sections of road (Dalston Road). Cyclists, particularly vulnerable cyclists are likely to be dissuaded from making trips to an extent sufficient to induce a change in their habits.	Major	Large adverse
PRoW between the River Caldew and Durdar Road (High)	Construction of new road across existing footpaths. Closure of sections of path during construction	5x footpaths severed during construction (129024, 129003, 129004, 129005, 129001) with no access for pedestrians likely. with diversions via FP129002 to the north of the Racecourse adding 4km between Durdar and the River Caldew path. Pedestrian counts very low, however considerable hindrance and change to journey times/ patterns.	Major	Moderate adverse
PRoW east of Durdar Road (High)	Construction of sections of footway on Durdar Road and construction works on Newbiggin Road.	Access to FP129010 from Durdar Road likely to be restricted for short period during construction. Vehicle access to car park and picnic site to access FP129018 likely to be restricted for periods during construction works on Newbiggin Road. Minimal effects on FP129021. The current journey pattern is likely to be maintained, but there will probably be some hindrance to movement.	Minor	Neutral

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
Miller's Way Walking Route (Medium)	New bridge over Petteiril Valley and FP129017 (Miller's Way)	Route closed during construction of new bridge with pedestrians diverted to an existing path to the east of the Premier Inn Hotel with crossings of the M6 Junction 42 roundabout. Diversion adding 250m incorporating carriageway crossings. Walkers are likely to be dissuaded from making trips to an extent sufficient to induce a change in their habits.	Major	Moderate adverse
Footways Durdar Road (Low)	Construction of sections of footway / shared use on Durdar Road	Footways closed during construction works with pedestrians diverted to temporary footway adjacent to existing footway. Some disruption with temporary footway surfaces and ramps likely to effect vulnerable pedestrians. The current journey pattern is likely to be maintained, but there will probably be some hindrance to movement.	Minor	Moderate adverse
On road cycling on minor roads (Medium)	New road and roundabouts constructed over existing minor roads	6 minor roads affected (Dalston Road, Peter Lane, Newbiggin Road, Durdar Road, Scalegate Road and Brisco Road). Considerable hindrance to cyclists' access during construction with changes to journey patterns and times. Cyclists likely to be redirected onto alternative roads. Durdar Road to be kept open during construction, with construction of new overbridge offset from existing highway. Some people, particularly vulnerable cyclists are likely to be dissuaded from making trips with trips made longer and less attractive.	Moderate	Moderate adverse
River Petteiril (Low)	Construction of a new river crossing	Use of river likely to be restricted during construction of bridge crossing. Some users are likely to be dissuaded from making trips with trips made longer and less attractive.	Moderate	Moderate adverse
River Caldew (Low)	Construction of a new river crossing	Use of river likely to be restricted during construction of bridge crossing. Some users are likely to be dissuaded from making trips with trips made longer and less attractive.	Moderate	Moderate adverse

Table 13.12 Summary of the residual impact assessment (operation phase)

Receptor & Sensitivity	Impact	Effect	Magnitude	Significance
Miller's Way Walking Route (Medium)	New bridge over Petteril Valley and FP 129017 (Miller's Way). Vehicle access to existing car park from M6 junc. 42 stopped off with car park relocated to west of river and new access.	Slight deviation to existing path with underpass of new bridge structure. Revised access for pedestrians from relocated car park to FP129018 to Wreay Woods. Footpath link to FP129017 from shared use path on north side of new highway. The current journey pattern is likely to be maintained, but with some change to the existing movement.	Minor	Neutral
On road cycling on minor roads (Medium)	New roundabouts constructed over 3 existing roads (Dalston Road, Scalegate Road and Brisco Road) with a bridge constructed over Durdar Road. Peter Lane stopped up to vehicles with shared use link to new highway	Some hindrance to cyclists' access and slight increase in journey times with 3 new roundabouts to cross (Dalston Road, Scalegate Road and Brisco Road). The primary north/south route for cyclists (Durdar Road) retained with minimal impact on journey times. Cyclist access to Newbiggin Road retained between M6 and Durdar village. Cyclist access on Peter Lane to be retained with minimal conflict from vehicles and link to new shared use making it more attractive to vulnerable cyclists. Some residents are likely to be dissuaded from making trips with trips made longer or less attractive.	Moderate	Moderate adverse

13.10 Cumulative Effects

- 13.10.1 The assessment of cumulative effects considers multiple impacts on a receptor/resource arising from a single project (such as between different environmental topic area) and from different projects within the vicinity of the Scheme.
- 13.10.2 Those cumulative effects arising from a single project are discussed in more detail in the Cumulative Effects chapter of this Environmental Statement.
- 13.10.3 St. Cuthbert's Garden Village is a major mixed-use urban extension in South Carlisle identified in the Local Plan to commence from 2025. Delivery of this scheme is due to extend beyond 2030, accommodating as many as 10,000 new homes alongside new community facilities, schools and strategic employment opportunities. Sustainable travel is likely to be at the heart of the masterplan linking development with the existing network.
- 13.10.4 Whilst the Garden Village scheme is still in the master planning stage with much of the detail of development proposals unknown, the proposals are likely to have an effect on this scheme. The Masterplan for the Garden Village has been overlaid onto the Scheme proposals as shown in Figure 13.3.
- 13.10.5 The indicative proposals show the majority of residential land use surrounding Durdar to the south, east and west of the Racecourse, with additional residential areas to the west of Cummersdale, north of Brisco and south east of Carleton. Local centres are proposed to the east of Dalston Road Roundabout and on Durdar Road / Link, south of the Racecourse. A green corridor (St Cuthberts Greenway) is proposed, extending from east to west to the south of the Racecourse, connecting potential development sites and providing a link between existing routes in the Caldew valley and Petteril Valley.
- 13.10.6 The extent of development proposed within the Garden Village is likely to have a considerable effect on the amenity value of existing PRoW, with the area becoming more urban in nature. PRoW to the north of the CSLR, between the River Caldew and Durdar Village and to the south and west of Cummersdale, are likely to be most affected.
- 13.10.7 Development also presents considerable potential for improvements to existing provision for pedestrians and cyclists within the area, with the potential for developer funded pedestrian and cycle provision linking the proposed new highway alignment with new development sites, existing community receptors and the city centre. Development of pedestrian and cycle provision linking the new highway with residential, employment and retail development is key to providing effective sustainable development.
- 13.10.8 The indicative proposals show residential and mixed use development sites encompassing existing bridleways to the west of Cummersdale. Whilst surveys did not record any equestrians using the bridleways, consideration should be given to potential equestrian use of these routes in further development of the masterplan.
- 13.10.9 In addition to proposals for South Carlisle, the following planning approvals of relevance are:
- Development of 48 no. dwellings (for rent and shared ownership) at land at Westrigg Road/Wigton Road, Morton Park;

- Creation of vehicular site access to serve allocated housing site on land to south-west of Greenways, Garden Village, Newby West;
- Additional car parking, enhanced access and proposed demolition and replacement of canopy forecourt; with the introduction of a new petrol tank and two additional petrol islands at Golden Fleece Service Station, Carleton;
- Residential development to provide 42no. dwellings (33no. houses and 9no. apartments) including new build, the conversion of existing buildings and works to form two improved vehicular accesses at former stables, horsebox and lorry park at land adjacent Blackwell House, Durdar Road including the demolition of No.68 Durdar Road;
- Outline permission for erection of 9 dwellings at Durdar Farm, 516 Durdar Road;
- Outline permission for erection of 480 dwellings on land at New House Farm, Newby West;
- Erection of 17no. dwellings and associated infrastructure on land to the rear of Irvings Place, Dalston Road, Cummersdale;
- Erection of 9no. dwellings at Holly House Nurseries, Durdar Road (Reserved Matters);
- Development of a standby electricity generation plant in new portal framed building and installation of ancillary equipment to the east of A595 south of Peter Lane;
- Development for residential (maximum 825 dwellings), employment (40,000m² floorspace), and public open space purposes as well as associated works on land at South Morton bounded by Wigton Road, Peter Lane and Dalston Road;
- Erection of school and associated access, car parking, sports facilities, landscaping and substation on land at Scalegate Road, Brisco.

13.11 Summary

13.11.1 The assessment of outdoor access and recreation aims to identify any impacts likely to arise as a result of the Scheme on local community facilities, the routes used to access them and on the users who undertake this access.

13.11.2 Key community facilities and WCH routes were identified within and adjacent to the proposed route, up to a 500m study area boundary. A combination of desktop research, site visits, WCH surveys and consultation was then used to make an assessment on:

- Changes to journey length and the potential for community severance; and,
- Changes to amenity values.

13.11.3 The implementation of mitigation measures through considered design were then applied in order to reduce the significance of adverse effects identified during construction and operation, both in relation to amenity and severance. A residual assessment of the significance of these effects (accounting for the proposed mitigation) was then applied.

- 13.11.4 During the construction phase, key well-used walking and cycling routes through the Caldew valley (i.e. the Cumbria Way, NCN7, C2C and NCN10) will require temporary closures to enable the bridge structure to be safely built with the Miller's Way walking route also severed by the construction of the River Petteril Bridge. Five PRoW with a limited number of users between the River Caldew and Durdar Road will also be severed by the footprint of the Scheme. Despite mitigation (i.e. reducing closure periods, diversions and signage), journey lengths and times are likely to increase for users, with potential alternative routes also subject to disruption. There is likely to be a moderate to large adverse impact on users of these routes during construction. Cyclists using minor roads will also be disrupted by construction works where the Scheme intersects these routes with increased journey times due to diversions, however access to Durdar Road will be retained throughout construction.
- 13.11.5 To summarise, overall effects on outdoor access and recreation during the construction phase are likely to be moderate to large adverse.
- 13.11.6 During operation, there will be some negative impacts on the amenity value for WCH's with routes likely to be adversely affected by exposure to the new highway and bridge structures. There will be some slight changes to journeys on the PRoW network with footpaths diverted to underpasses of the main river bridges and via pedestrian / cycle bridges over the new highway. However, the Scheme is likely to have a large positive effect on connectivity to the wider WCH network with a 3m wide shared use footway / cycleway running the full length of the highway and additional links to key walking and cycling routes through the Caldew valley and Petteril Valley improving the overall provision for WCH's. The Scheme will have a moderate adverse effect on on-road cyclists due to the implementation of roundabouts on existing roads used by cyclists impacting on journey times and amenity values. However, Durdar Road the main north / south route will remain unrestricted and overall cyclists will benefit from improved provision across the network and connections to the existing network.
- 13.11.7 To summarise, overall effects on outdoor access and recreation during the operation phase are likely to be large positive.
- 13.11.8 The extent of development proposed within the South Carlisle area is likely to have a considerable effect on the amenity value of existing Public Rights of Way, with the area becoming more urban in nature. Development also presents considerable potential for improvements to existing provision for pedestrians and cyclists within the area, with the potential for developer funded pedestrian and cycle provision linking the proposed new highway alignment with new development sites, existing community receptors and the city centre.

14 Water Resources and Flood Risk

14.1 Introduction

- 14.1.1 This chapter assesses the significant impacts likely to arise on the water environment as a result of the Scheme; including water quality, geomorphology, flood risk and drainage.
- 14.1.2 For the purposes of this assessment, the geographical scope of this chapter (the 'study area') will cover the immediate extent of the proposed development area, incorporating any waterbodies contained within it. In some instances, it will be appropriate to extend the study area to consider the potential impacts of the Scheme on flood risk.
- 14.1.3 The principle water bodies within the study area are the River Caldew and River Petteril.
- 14.1.4 The River Caldew rises in the Lake District National Park and flows in a generally north-easterly direction, joined by its major tributaries Pow Beck, the River Ive, Roe Beck and Gillcambon Beck, all upstream of the study area. Within the study area the catchment is predominantly rural, characterised by a wide floodplain used for recreation and livestock grazing. The River Caldew is designated as a Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI).
- 14.1.5 The River Petteril rises near Penruddock and Greystoke and flows in a generally north-westerly direction joined by Blackrack Beck north of Penrith. Within the study area there is a relatively narrow floodplain used for a mixture of arable and pastoral purposes which is crossed by the M6 and Newbiggin Road a short distance upstream of The Scheme crossing location.
- 14.1.6 Other surface water bodies affected by the scheme include Fairy Beck (tributary of the River Caldew), an unnamed tributary of the River Caldew, Calfin's Beck (tributary of the River Caldew) and an unnamed tributary of Cammock Beck (tributary of the River Petteril).
- 14.1.7 The Scheme is underlain by the Eden Valley and Carlisle Basin Permo-Triassic Sandstone Aquifer. The aquifer is of strategic importance for public water supply and infrastructure as well as providing a base flow to rivers within the study area.
- 14.1.8 Maps showing the location of the key environmental features, and the key construction features of the Scheme can be found in Volume 2.
- 14.1.9 This assessment is based on desk study information, including information provided to date by consultees and stakeholders, as well as surveys of accessible water features.
- 14.1.10 Where surveys have not been undertaken a precautionary approach has been adopted in the assessments of receptor value and impact magnitude.
- 14.1.11 Geomorphological assessment was undertaken on the two main rivers crossed by the Scheme (the River Caldew and River Petteril) between 18th and 22nd February 2019. Geomorphological reports for each water course are found in Volume 3 (Appendices 14.1 and 14.2).

- 14.1.12 A Water Framework Directive (WFD) assessment has been undertaken in the Caldew d/s of Caldbeck (GB102076073880), Petteril downstream of Blackrack Beck (GB102076074030) WFD surface water catchments and the Eden Valley and Carlisle Basin Permo-Triassic Sandstone Aquifer (GB40201G100400) WFD groundwater catchment. The report is provided in (Appendix 14.3).
- 14.1.13 Hydraulic analysis has been undertaken of watercourses and key structures within flood risk areas. The modelling report is included in the Flood Risk Assessment which is provided in (Appendix 14.4).

14.2 Assessment Methodology

Guidelines

- 14.2.1 The Stage 3 assessment follows the guidance and methodologies set out in the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 10 – Road Drainage and the Water Environment (HD 45/09) (2019). It also follows guidance set out by the Water Framework Directive (WFD) (2000) and the National Planning Policy Framework (NPPF) (2019). The assessment takes into account the Carlisle Strategic Flood Risk Assessment (2011) and other associated plans.

Methodology

- 14.2.2 The study area for this impact assessment has been determined using linear distances and areas for surface water and groundwater respectively. The impacts on surface water bodies are considered 1km either side of the alignment and groundwater bodies are identified using a radius of 1km. A plan showing the extent of the study area is shown in (Figure 1.1).
- 14.2.3 Baseline conditions have, for the most part, been established during Stage 2. At Stage 3 the following sources have been reviewed, and any changes incorporated:
- **Flood Zone Maps** produced by the Environment Agency. These maps display the extent of flooding that would occur on the basis that no flood defences are in place and describe the extent to which land is afforded protection by the presence of defences.
 - **Surface Flood Water Maps** produced by the Environment Agency.
 - **Groundwater Vulnerability Maps** produced by the British Geological Society.
 - **River Basin Management Plan Interactive Maps** produced by the Environment Agency.
 - **Geology in Britain Viewer** produced by the British Geological Society.
 - **Reservoir Inundation Maps** produced by the Environment Agency.
- 14.2.4 A geomorphological survey of the surface water bodies has been undertaken to inform this assessment. As required by the Environment Agency (EA), a site survey of existing water features and a map of the location of all proposed engineering activities in the water environment are provided in Volume 3, Appendices 14.1 and 14.2).
- 14.2.5 The identification of the baseline conditions provides an understanding of the possible pathways and receptors. Following the identification of an impact, the

'magnitude' of that impact will be defined, followed by the 'sensitivity' of the receiving receptor.

- 14.2.6 The 'magnitude' of an impact may vary between receptors, depending on the nature of the pathway available for that impact to manifest itself (see Table 14.1).

Table 14.1 Magnitude of Impacts

Magnitude of impact	Descriptor	Typical example
Major Adverse	Results in loss of attribute and/or loss of quality and integrity of the attribute	<ul style="list-style-type: none"> - Potential reduction in WFD classification - Loss or extensive change to a fishery - Loss or extensive change to an aquifer Increase in peak flood level > 100mm - Adverse impacts on designated sites such as SSSI's and SAC's
Moderate Adverse	Results in effect on integrity of attribute or loss of part of attribute	<ul style="list-style-type: none"> - Reduction in one of the WFD attributes but no overall reduction. - Partial loss in productivity of a fishery - Partial loss or change to an aquifer - Increase in peak flood level > 50mm
Minor Adverse	Results in some measurable change in the quality or vulnerability of an attribute	<ul style="list-style-type: none"> - Impact on WFD attribute but no reduction in sub-classification or overall-classification - Potential low risk of pollution to groundwater - Increase in peak flood level > 10mm
Negligible	Results in effect on attribute but of insufficient magnitude to affect the use or integrity	<ul style="list-style-type: none"> - No risk identified to water quality or WFD classification - No measurable impact upon an aquifer - Negligible change in peak flood level < +/- 10mm
Minor Beneficial	Results in some beneficial effect on attribute or a reduced risk of negative effect occurring	<ul style="list-style-type: none"> - Minor reduction in existing pollution to surface or groundwater - Reduction in peak flood level >10mm
Moderate Beneficial	Results in moderate improvement of attribute quality	<ul style="list-style-type: none"> - Moderate reduction in existing pollution to surface or groundwater - Reduction in peak flood level >50mm
Major Beneficial	Results in major improvement of attribute quality	<ul style="list-style-type: none"> - Removal of existing polluting discharge - Reduction in peak flood level >100mm

- 14.2.7 The 'sensitivity' of a receptor may also vary depending on a wide range of attributes (see Table 14.2); for example, water quality, biodiversity and amenity. Multiple attributes could also be affected by one impact, for example suspended sediments can directly impact the water quality and biodiversity.

Table 14.2 Value and Sensitivity of Attributes

Value (sensitivity of resource)	Descriptor	Typical example
Very High	Attribute has a high quality and rarity on regional or national scale	<ul style="list-style-type: none"> - EC Designated Salmonid fishery - WFD Class 'High' - Principal Aquifer providing a regionally important resource - Floodplain or defence protecting more than 100 residential properties - Designated site i.e. a SSSI or SAC
High	Attribute has a high quality and rarity on local scale	<ul style="list-style-type: none"> - WFD Class 'Good' - Major Cyprinid fishery - Principal Aquifer providing a locally important resource - Floodplain or defence protecting between 1 and 100 residential properties
Medium	Attribute has a medium quality and rarity on local scale	<ul style="list-style-type: none"> - WFD Class 'Moderate' - Aquifer providing water for agricultural or industrial use - Floodplain or defence protecting 10 or fewer industrial properties
Low (or lower)	Attribute has a low quality and rarity on local scale	<ul style="list-style-type: none"> - WFD Class 'Poor' - Unproductive strata - Floodplain with limited constraints and a low probability of flooding

- 14.2.8 The prediction of effects is carried out with reference to the construction and operational phases of the proposed development. The assessment considers both adverse and beneficial effects on each of the relevant water environment components. These include the effects of: runoff on surface waters; runoff on groundwater; pollution from spillages; modification to the channel geomorphology and ecology; and flooding impacts.
- 14.2.9 Determining the significance of effects identified is essentially a function of the magnitude of an impact and the sensitivity of the receptor.
- 14.2.10 Cumulative effects of the proposed route and schemes within the area have been identified at Stage 2 and are considered in further detail at Stage 3. The study area has been extended to include any schemes with planning secured that could have impacts on the local flood risk, water quality, geomorphology, or aquatic ecology. The interactions between the effects have then been assessed.
- 14.2.11 Best practice is applied to develop measures to mitigate against the potential temporary and permanent impacts of the Scheme. Workshops with environmental specialists and engineers will be undertaken to identify the best possible methods. Ongoing consultation with specialists from statutory bodies will support this process.

14.3 Limitations and Assumptions

- 14.3.1 The assessments made regarding water quality impact should be based on baseline data derived from available published water quality information. The

assessment made on flood risk is based on data from the EA and other relevant plans.

- 14.3.2 The assessments made regarding hydro-geomorphological impacts should be based on best-practice methods which currently utilise empirical methods to assess the hydro-geomorphological baseline and the impact from encroachment on the water environment.

14.4 Consultations

- 14.4.1 During Stage 2, the Environment Agency and Natural England were consulted through workshops and site visits. Workshops with representatives from Cumbria County Council (the Lead Local Flood Authority (LFA)) were also carried out. Engagement with the Environment Agency and Natural England will continue throughout Stage 3 to discuss issues and potential impacts of the Scheme on the water environment (including WFD) and designations.

14.5 Regulatory and Policy Framework

- 14.5.1 The following list sets out the principle legislation and European, national, regional, and local policies of relevance to the assessment on the water environment.
- Water Framework Directive, EU Directive 2000/60/EC
 - National Planning Policy Framework (NPPF) 2019
 - Habitats Directive, 1992/43/EEC
 - Flood and Water Management Act, 2010
 - Solway Tweed River Basin Management Plan (RBMP), 2009-2015
 - River Eden Catchment Flood Management Plan (CFMP)
 - Carlisle Strategic Flood Risk Assessment (SFRA)

14.6 Baseline Conditions

Geomorphology and ecology

River Caldew and tributaries

- 14.6.1 The River Caldew rises in the Lake District National Park and flows in a generally north-easterly direction, joined by its major tributaries Pow Beck, the River Ive, Roe Beck and Gillcambon Beck upstream of the study area. Within the study area the catchment is predominantly rural, characterised by a wide floodplain used for recreation and livestock grazing. The river falls within Flood Zones 2 and 3 (Figure 14.1).
- 14.6.2 The River Caldew is part of the River Eden and Tributaries Site of Special Scientific Interest (SSSI) and the River Eden Special Area of Conservation (SAC). This site is designated for its rich diversity of flora and fauna, including a number of Annex I habitats and Annex II species. Some of the headwaters of the Eden comprise one of the most important British sites for the native white-clawed crayfish.
- 14.6.3 The Caldew downstream of Caldbeck WFD water body was classed as having poor ecological status in 2015. The poor status in 2015 was due to a poor status for fish,

which has been attributed to diffuse sources of sediments as a result of poor soil management on pastoral farmland. A further source of sediment within the study area is the continued erosion of the Great Easby Clay Formation.

- 14.6.4 The river is clearly highly active within the study area and comprises a mixture of transport, exchange, and depositional reaches, each with distinctive geomorphology. Natural processes have been significantly restrained by both historic and ongoing management techniques attempting to control the position of the river channel. The bed substrate is generally dominated by gravel and cobble.
- 14.6.5 Under the 'Do Minimum' scenario, the evolution of the baseline for the Caldew will be significant. The full geomorphology survey and the Caldew Fluvial Audit report concluded that the River Caldew will continue its pattern of lateral adjustment over the long term. Please refer to the Caldew Geomorphology Assessment Report for further details.
- 14.6.6 The Fairy Beck is a designated Main River and a tributary of the River Caldew. It is currently extensively modified and culverted in a number of places. This falls within Flood Zone 3.
- 14.6.7 A mill race which is designated Main River. It is located within the River Caldew Flood Zone 3 and is within the River Eden SAC.
- 14.6.8 Calfins Beck is a designated Ordinary Watercourse and tributary of the River Caldew. There is a small extent of Flood Zone 3 associated with this watercourse.

River Petteril and tributaries

- 14.6.9 The River Petteril rises near Penruddock and Greystoke and flows in a generally north-westerly direction to its confluence with the River Eden in Carlisle. It is joined by Blackrack Beck to the north of Penrith and drains a catchment of approximately 160km², which is predominantly agricultural with small areas of woodland and urbanisation. Within the study area there is a relatively narrow floodplain used for a mixture of arable and pastoral purposes. This is crossed by the M6 and Newbiggin Road a short distance upstream of the Scheme crossing location.
- 14.6.10 The Petteril Downstream Blackrack Beck is the WFD water body to be crossed by the Scheme. This water body was classified in 2015 (cycle 2) as being in good overall status. This is an improvement on the 2009 status, which was classified as poor ecological status. This was a result of the fish element being poor (no reason given) and the phosphate element moderate (diffuse source phosphate due to poor nutrient management).
- 14.6.11 The geomorphological survey of the Petteril undertaken in February 2019 identified an active watercourse, with exchange of materials occurring from ongoing erosional and depositional processes. This is particularly prominent in the reaches upstream and downstream of the crossing locations, where the processes appear to be driven by woody debris (upstream) and changes in geology (downstream reach). At the crossing location, the channel is lined with trees (mainly alders) and as a result appears relatively stable. Additionally, the road bridges immediately upstream of the crossing location have contributed to the stabilisation through straightening and revetment works.
- 14.6.12 Under the 'Do Minimum' scenario, the evolution of the baseline at the crossing point will be fairly insignificant. This is because the trees lining the bank appear to be maintaining a level of stability. However, downstream of the crossing location the

channel appears to be more active with many signs of erosion and deposition. Please refer to the Petteril Geomorphology Assessment Report for further details.

Groundwater bodies

- 14.6.13 The Scheme alignment falls within the Eden Valley and Carlisle Basin Permo-Triassic sandstone aquifers and the Carlisle Basin Triassic and Jurassic aquifers groundwater bodies.
- 14.6.14 The Eden Valley and Carlisle Basin Permo-Triassic sandstone aquifers groundwater body is a Drinking Water Protected Area and has three Nitrate Vulnerable Zones (NVZs). The water body was classed as having an overall status of poor in 2009 due to a combination of good quantitative status and poor chemical status. In 2015 these classifications had not changed and therefore indicated no improvements in the overall water body classification. Failure of the Chemical GWDTs and Chemical Drinking Water Protected Area have been attributed to poor nutrient management in the agriculture and rural land management sector.
- 14.6.15 The Carlisle Basin Triassic and Jurassic Aquifers groundwater body was classed as having good overall status in 2009 and 2015. All water body objectives were therefore achieved by Cycle 1. The water body is a Drinking Water Protected Area. Drinking water safeguard zones are designated areas in which the use of certain substances must be carefully managed to prevent the pollution of raw water sources that are used to provide drinking water. Any impacts to the designated areas would require full mitigation.
- 14.6.16 Ordnance Survey maps show that a spring is located within the study area to the north of the eastern end of the alignment. The extents of the study area are designated as a Major Aquifer by the EA. Groundwater vulnerability is primarily Low but increases to Intermediate adjacent to the River Petteril and High adjacent to the River Caldew.

Flood risk and drainage

Surface water

- 14.6.17 Flooding from land can be caused by rainfall being unable to infiltrate into the natural ground or entering the drainage system due to blockage, or flows being above design capacity. This can then result in (temporary) localised ponding and flooding. The natural topography and location of buildings/structures can influence the direction and depth of water flowing off impermeable and permeable surfaces.
- 14.6.18 The immediate area around the River Caldew and the River Petteril is at risk of surface water flooding. The presence of numerous drainage channels prevents large areas of the study area from flooding from surface water. However, when these exceed capacity there is a risk of flooding.
- 14.6.19 Rainfall from high intensity storms (often with a short duration) are sometimes unable to percolate into the ground or be drained by formal drainage systems. This is due to the capacity of the collection systems being insufficient to convey runoff to underground pipe systems (that might themselves be surcharged). Surface water flooding can also be associated with blockage and overflows of the drainage system and failure of sluice outfalls and pump systems. Flooding can also result when sewers, typically combined foul and surface water, are overwhelmed and surcharge water into the surrounding area.

14.6.20 A review of the National Critical Drainage Areas (June 2016) shows that the study site does not lie within these areas.

14.6.21 The EA Updated Flood Maps for Surface Water Flooding identifies that there are a number of small ditches/tributaries of the Caldew and Petteril which drain the land in the vicinity of the Carlisle Southern Link Road and provide a level of surface water flood risk (Figure 14.2).

Groundwater

14.6.22 Groundwater flooding occurs when water levels in the ground rise above surface elevations. It is most likely to occur in low-lying areas underlain by permeable rocks. The groundwater bodies that lie within the extents of this study area are the Eden Valley and Carlisle Basin Permo-Triassic sandstone aquifers (GB40201G100400) and the Carlisle Basin Triassic and Jurassic Aquifers (GB40202G100900).

14.6.23 A review of the Groundwater Susceptibility Mapping indicates that within the study area groundwater flooding is not known to be a major problem due to the geology of the catchment. The impermeable geology means that groundwater cannot build up. Instead sub-surface flow enters the river network rapidly or surface water flooding will occur when soils are saturated, as water cannot drain into the rock below.

14.6.24 There have been no major instances of groundwater flooding recorded in the catchment although it is recognised that the derivation of groundwater flooding from surface water flooding is complex and that there is hydrogeological continuity between each within the study area.

14.7 Impact Assessment

Construction Phase

14.7.1 A number of activities during construction will have the potential to cause temporary and permanent adverse impacts to the ecology, water quality, and geomorphology of the surface waterbodies. In the absence of mitigation, groundwater quality and quantity may also be at risk during construction. These effects are explained in this section and summarised in Table 14.3.

14.7.2 Earthworks could have the potential to result in sediment pollution to the River Caldew, River Petteril, and minor watercourses identified. Newly-disturbed ground will be vulnerable to erosion during rainfall events, potentially causing an increase in fine sediments smothering important in-channel habitats. Excavations have the potential to result in existing/historic contaminated land to be disturbed. Contaminants/pollutants could be mobilised and transported to the watercourses, causing potential permanent adverse impacts to ecological communities.

14.7.3 Building material for the construction of the new road link will be transported to site. Numerous heavy vehicle movements have the potential to temporarily mobilise soil, dust and pollutants, which could enter the watercourses as a result.

14.7.4 Vibration from piling and other intrusive construction activities has the potential to injure fish in the channel or mammals residing underground in close proximity to the works. Noise from construction machinery will also have the potential to temporarily disturb nesting and hibernating wildlife within the river corridor.

- 14.7.5 Construction works will require vegetation clearance in many areas along the river corridor and would have the potential to cause permanent damage to trees in close proximity to the works. This impact would be particularly significant on the River Petteril, where trees line the banks of the reach to be crossed by the Scheme. These trees provide bank stability and a diversity of marginal habitats within their root systems. Damage to or loss of these trees would therefore affect the geomorphology and habitat availability within the reach.
- 14.7.6 The use of machinery and presence of operatives at the site has the potential to result in the spread of invasive non-native flora and/or fauna, or diseases to or from other watercourses. These biosecurity impacts would be permanent, but the significance would depend on the species involved and the receiving watercourse that was affected.
- 14.7.7 A construction phase plan will be developed and assessed at detailed design.

Table 14.3 Summary of impacts of the Scheme on surface and groundwater bodies during construction.

Receptor	Impact	Effect	Magnitude	Significance
River Caldew (GB102076073880) (High)	Vibration from piling and intrusive construction activities near to watercourse	Potential injury to fish and mammals nearby. Damage to trees and vegetation within the vicinity.	Moderate	Adverse
River Petteril (GB102076074030) (Medium)	Soil, dust, and pollutants entering the watercourses from machinery or fuel tank leakages	Effects on water quality. This could result in the poisoning of animals and plants along the banks and in the channel.	Major	Adverse
Minor watercourses: Fairy Beck, trib of Caldew (Medium) Calfins Beck, trib of Caldew (Low) Unnamed tributary of the River Caldew (Low)	High sediment release from earthworks	Increased suspended sediment load, fine sediments settling on bed substrate, and effects on water quality. Effects on the ecology and in-channel habitat through potential smothering of gravel substrates and changes in water quality. Potential effect on flood risk downstream from additional sediment inputs.	Major	Adverse
Cammock Beck, trib of Petteril (Medium)	Disturbance of existing/ historic contaminated land	Contaminants and toxic substances could enter the watercourse and cause damage to ecological communities.	Major	Advers
	Riparian and marginal vegetation clearance and damage	Reduction in habitat availability. Potential damage to organisms taking refuge/nesting within the vegetation.	Moderate	Adverse

Receptor	Impact	Effect	Magnitude	Significance
		Potential changes to geomorphology as a result of reduced bank stability.		
	Noise and visual disturbance to wildlife	Activities may induce avoidance in organisms. Potential to affect animal nests and induce avoidance by the parents.	Moderate	Adverse
	Use of machinery between sites	Potential to spread non-native invasive species, such as bankside plants or the signal crayfish plague.	Major	Adverse
River Petteril (GB102076074030) (Medium)	Damage to trees lining the river banks through vibration or direct activities	<p>The trees and their root systems along the banks provide a variety of marginal and bankside habitats for fish, invertebrates, and mammals. Damage to these will reduce habitat availability within the river channel and riparian zone.</p> <p>The trees are maintaining the river's stability by preventing erosion. If trees are killed or removed, the river banks around the bridge abutments will become less stable.</p>	Major	Adverse
Eden Valley and Carlisle Basin Permo-Triassic sandstone aquifers (GB40201G100400) (High)	Piling activities to bedrock	Potential route for contaminants and pollutants to enter the aquifer	Major	Adverse
Carlisle Basin Triassic and Jurassic aquifers (GB40202G100900) (High)	Pollutants from machinery or fuel tank leakages	Potential for contaminants and pollutants to infiltrate the ground and enter the aquifer	Moderate	Adverse

Operation Phase

- 14.7.8 The watercourses identified in Section 14.6 will be affected by the Scheme. The operational impacts are explained in this section and summarised in Table 14.4.

Generic impacts on all watercourses

- 14.7.9 Installation of the new road means the volume of surface water runoff is likely to permanently increase. Spillages of pollutants and microplastics from road users could also be transported by the surface water runoff. Unmitigated this could have a negative impact upon ecology and fluvial flooding in the vicinity of the scheme and also downstream. Maintenance of the scheme such as repairing the road surface allows the potential for debris and pollutants to be transported to the identified water bodies via surface water flow paths.
- 14.7.10 The abutments or piers of the bridges and culverts have the potential to obstruct flow in the main channel of any watercourse which the scheme crosses. This could potentially result in a change of flow regime of the river and furthermore may affect the flood risk upstream and/or downstream.

River Petteril

- 14.7.11 The bridge abutments on the River Petteril will permanently increase the presence of hard materials along its banks. Currently, the river is lined with trees (mainly alders), which create a relatively dense river corridor and provide significant marginal habitats within their root systems suitable for fish (refuges) and otters (and suitable for white-clawed crayfish, although their presence is unconfirmed). Construction of the bridge will require localised removal of these trees, interrupting the river corridor and removing riparian and marginal habitats. If those to be left adjacent to the bridge are damaged, the banks are likely to become less stable and vulnerable to erosion and scour. This could result in an increased sediment load in the water column.
- 14.7.12 The bridge across the Petteril will bring additional shading to the channel potentially affecting temperatures within the channel. This impact will be less significant if the trees either side of the bridge are retained because this would provide a gradual increase in density and shading, rather than a 'block' of shaded channel.

River Caldew

- 14.7.13 The River Caldew has a highly active and responsive sediment regime, with a substantial volume of sediment in its upstream reach. The findings of the full geomorphology survey and the Caldew Fluvial Audit report are that the River Caldew will continue its pattern of lateral adjustment over the long term. Therefore, to protect the integrity of the proposed multi-span bridge and the embankment in this area, protection has been identified as a necessary measure. Effects will be minimised by ensuring protection of the east road embankment is set within the footprint of the embankment and won't require additional engineering in the future which would further restrict geomorphology.

Fairy Beck (tributary of the River Caldew)

- 14.7.14 The Fairy Beck will be affected by the Scheme. The watercourse is currently culverted under the A595-A689 roundabout, which is where the Scheme will be

joining the existing road network. Adjustments to the existing roundabout are likely to result in an alteration of the already highly modified geomorphology of Fairy Beck, and potentially cause an increase in existing culvert length and hard banks. This will increase the pressure on ecological communities within the watercourse.

Calfins Beck (tributary of the River Caldeu)

- 14.7.15 Adjustment to the existing culvert over Calfins Beck is likely to result in an increase in existing culvert length and hard banks. This will increase the pressure on ecological communities within the watercourse.

Unnamed tributary of the River Caldeu

- 14.7.16 An unnamed tributary of the River Caldeu will be affected by the Scheme. The watercourse rises to the west of Peastree at the location of a proposed embankment. Any impact on surface water flows as a result of the embankment will likely require mitigation to ensure adequate drainage as well as the potential diversion of the watercourse.

Cammock Beck (tributary of the River Petteril)

- 14.7.17 The existing culvert over Cammock Beck will be altered to accommodate an embankment to raise the height of the existing road crossing. This may result in an increase in the existing culvert length and hard banks. This will increase the pressure on ecological communities.

Groundwater bodies

- 14.7.18 An increase in hard surfaces from the road may affect the quantity of water infiltrating to the groundwater bodies. Additionally, without mitigation, pollutants from major fuel spillages in road accidents have the potential to infiltrate to the groundwater aquifers.
- 14.7.19 See Chapter 16 “Geology and Soils” for details of impacts and mitigation associated with groundwater bodies.

Table 14.4 Summary of impacts of the Scheme on surface and groundwater bodies during operation.

Receptor	Impact	Effect	Magnitude	Significance
River Caldw (GB102076073880) (High)	Addition of hard materials for bridges and culverts, Structures in floodplain	Direct alteration to existing geomorphology. This may also cause scour and erosion to occur around the hard structures, mobilising and releasing more sediment into the watercourses.	Moderate	Adverse
River Petteril (GB102076074030) (Medium)		Loss of marginal and riparian habitat.		
Minor watercourses: Fairy Beck, trib of Caldw (Medium)	Discharge of sediment and contaminants into the watercourses through road runoff	Increased suspended sediment load, fine sediments settling on bed substrate, and effects on water quality.	Moderate	Adverse
Calfins Beck, trib of Caldw (Low)		Effects on the ecology and in-channel habitat through potential smothering of gravel substrates and changes in water quality. Potential effect on flood risk downstream from additional sediment inputs.		
Unnamed tributary of the River Caldw (Low)	Changes to surface water runoff rates and volumes discharged into the watercourse	Potential increased rate, depth and velocity of flow in the rivers during flood conditions.	Moderate	Adverse
Cammock Beck, trib of Petteril (Medium)		Alteration of existing geomorphology through additional inflows from balancing ponds and the potential appearance of new surface water flow paths into the channel.		
	Amendments to natural flow paths through direct modification	Changes to existing geomorphology through addition of hard bank materials.	Moderate	Adverse

Receptor	Impact	Effect	Magnitude	Significance
		Reduction in the diversity of flow patterns and amendments to the sediment regime, resulting in reduced in-channel habitat diversity. Potential effect on flood risk upstream and downstream.		
River Petteril (GB102076074030) (Medium)	Addition of hard bank materials for bridge abutments	Direct alteration to existing geomorphology. This may also cause scour and erosion to occur around the hard structures, mobilising and releasing more sediment into the watercourses. Loss of marginal and riparian habitat, particularly trees and their marginal root systems lining the banks in this location. Interruption of green corridor and disruption to organisms using the river corridor to migrate or feed.	Moderate	Adverse
	Shading of river bed	Degradation of in-channel and riparian habitat and lack of sunlight for macrophytes to grow.	Minor	Adverse
	Isolation of riverside footpath	Effects on riverine landscape within the section of footpath to be isolated by the new road bridge and the Newbiggin Road bridge.	Minor	Adverse
River Caldew (GB102076073880) (High)	Addition of hard materials through embankment protection, and bridge piers in floodplain of an active river system.	Bridge piers and embankments will further restrict the movement of the river, which is clearly very active. This will add to the restriction of floodplain from the railway line running alongside in this reach.	Moderate	Adverse

Receptor	Impact	Effect	Magnitude	Significance
	Restriction on the development of hydromorphology in the crossed reach			
<p>Eden Valley and Carlisle Basin Permo-Triassic sandstone aquifers (GB40201G100400) (High)</p> <p>Carlisle Basin Triassic and Jurassic aquifers (GB40202G100900) (High)</p>	Changes to groundwater runoff and infiltration rates	Additional hard ground material on road surface will reduce the volume of surface water infiltration through to the groundwater.	Minor	Adverse
	Discharge of contaminants from the road	Potential for contaminants from the road surface to leach into groundwater (mainly likely to occur following road accidents)	Minor	Adverse
	Cuttings	Temporary dewatering / permanent groundwater control reducing groundwater levels and contributions to surface water bodies; 'damming' of groundwater flow and reduction in groundwater contributions; disturbing or mobilising existing poor-quality groundwater by temporary dewatering or permanent groundwater control; creating or altering of pathways along which existing poor quality groundwater can migrate.	Minor	Adverse
	Bridge foundations	'Damming' of groundwater flow and reduction in groundwater contributions; creating or altering of pathways along which existing poor quality groundwater can migrate.	Minor	Adverse
	Piers	Cause or exacerbate migration of contaminants in areas likely to be affected by historic or current land contamination.	Minor	Adverse

14.8 Mitigation, Enhancement and Monitoring

Mitigation

14.8.1 Several moderate adverse impacts on surface water bodies have been identified above. Mitigation measures proposed to eliminate or reduce these impacts are set out in Table 14.5. Please also refer to the mitigation schedule for full details.

Table 14.5 Summary of mitigation measures proposed to eliminate or reduce moderate adverse impacts from scheme components.

Impact	Receptor/s	Mitigation proposed
Addition of hard bank materials for bridge abutments	River Petteril	<p>Bioengineering either side of the bridge crossing (instead of hard bank revetments).</p> <p>Set back drainage pond (G&H) outfall to avoid erosion problems and provide monitoring point.</p> <p>Alders along the banks of the Petteril currently define the hydromorphology of the river. Tree root protection during and following construction to protect tree health and maintain bank stability.</p> <p>Tree planting near-banks upstream and downstream of the bridge crossing following construction to improve the resilience of the existing trees.</p>
Addition of hard bank materials for bridge abutments	Minor watercourses	<p>Minimise culverting and avoid straight channels. Culverts should be designed to cause minimal changes in sediment transport and designed to allow continued movement of species including fish, lamprey, eel and otter.</p>
Discharge of sediment and contaminants into the watercourses, changes to surface water runoff rates and volumes discharged to the watercourses. Effects on ecology, depth, flow velocities, flood risk, and geomorphology.	River Petteril River Caldew Minor watercourses	<p>The implementation of a Indicative Drainage Strategy as outlined below</p> <p>The road is divided into a number of catchments based on topography and the proposed vertical alignment of the carriageway. The basic strategy for each catchment will be the same. For a majority of its length the road will feature over the edge drainage to under-drained grass channels located in both verges. The resulting filtration will provide the first level of SuDS treatment and the channels and filter trench volume will provide additional capacity to manage exceedance.</p> <p>Where grass channels cannot be accommodated (primarily roundabouts and bridges although there may be other localised areas) the drainage will be via gullies or kerb/deck drainage units which will then discharge to the filter drainage system.</p> <p>Access chambers will be specified as catchpits to provide additional silt removal throughout the system.</p> <p>From the filter drains the flows will discharge to detention ponds within each catchment. These will incorporating permanent water storage and boundary reed planting to provide a secondary level of SuDS treatment via a mix of settlement and adsorption. Ponds will also incorporate</p>

Impact	Receptor/s	Mitigation proposed
		<p>flow controls (vortex or similar) to provide attenuation and limit discharge to greenfield equivalent rates.</p> <p>The ponds will discharge to existing watercourses. The ponds will be from 60m to 160m in length with permanent water for ecological benefits.'</p>
<p>Amendments to natural flow paths, potential changes to the flood risk up and downstream, effect on geomorphology, reduction in diversity of flow patterns, effects on ecology.</p>	<p>River Petteril River Caldw Minor watercourses</p>	<p>Suitable culverts, bridges or alternative structures implemented over watercourse shall be designed to minimise the impact on geomorphology and ecology in the vicinity of each of the structures.</p> <p>New bridges over the main rivers to be engineered to minimise changes to flood risk up and downstream of property. Scour assessment to be completed to ensure new structure is not undermined by large flows</p>
<p>Restriction on the development of hydromorphology in the crossed reach</p>	<p>River Caldw</p>	<p>Ensure the embankment is properly defended from flood flows and channel migration by including hard engineering within the footprint of the embankment. This is to prevent the need for emergency revetment works within the floodplain in the future.</p> <p>Set-aside areas of existing farmland in the vicinity of the embankment for re-naturalisation and scattered tree planting to offset losses associated with the presence of the embankment within the floodplain.</p> <p>Western pier would need to be protected to prevent the watercourse from migrating west and becoming trapped 'unnaturally' between the railway line and the pier.</p> <p>The modelling also suggests that an existing paleo-channel on the eastern edge of the floodplain is important for conveying flood flows. This should be considered for reinstatement although impacts due to the loss of this feature are currently anticipated to be negligible.</p>

Enhancement

- 14.8.2 In addition to the mitigation measures set out above, enhancement measures have been identified to encourage net biodiversity gain and to improve existing geomorphology.
- 14.8.3 The existing failing revetments historically included to protect the National Grid pylon and railway upstream of the Caldw crossing could be removed in places to reinstate natural geomorphological processes and bank habitat. By setting back the National Grid revetment around the pylon itself it would be possible to reduce the erosional pressures on the opposite bank, which is currently a source of fine sediments in the Caldw. By setting back the railway line revetment along the railway line itself, the Caldw would be able to function more naturally. These options would need to be further assessed if taken forward and should be considered in conjunction because each impacts on geomorphological process at the location of the other.

- 14.8.4 The daylighting of the culvert over Fairy Beck at the Newby West roundabout will improve conditions in the watercourse. The realignment should be designed to improve geomorphological processes and in-channel / bankside habitat diversity.

Monitoring

- 14.8.5 Surface water runoff pathways and quality should be monitored in the years following construction to ensure that the majority of contaminants or sediments from the highway are diverted to the detention ponds rather than the watercourses.

14.9 Residual Impact Assessment

- 14.9.1 Significant impacts are reassessed after taking mitigation into account in Table 14.6.

Table 14.6 Residual impacts expected following the inclusion of mitigation

Receptor	Impact	Residual Effect	Magnitude / Significance
River Caldew River Petteril Minor watercourses	Discharge of sediment and contaminants into the watercourses through road runoff	No residual effect predicted providing timely and appropriate maintenance is carried out to prevent the wash through of polluting materials	Negligible
	Changes to surface water runoff rates and volumes discharged into the watercourse	No residual effect if scour and flow pattern totals are the same pre and post construction.	Negligible
	Amendments to natural flow paths through direct modification	No residual effect if ecology and geomorphology feature totals are the same pre and post construction.	Negligible
River Petteril	Addition of hard bank materials for bridge abutments and bank protection	Premature death of trees may occur post construction leading to bank erosion not being prevented by natural succession. Direct loss of a small area of riparian zone and interruption to habitat corridor.	Minor adverse
Minor watercourses	Addition of hard bank materials for bridges, culverts, and/or bank protection. Structures in floodplain.	Direct alteration to existing geomorphology in affected area. Loss of marginal and riparian habitat.	Minor adverse
River Caldew	Addition of hard materials through embankment protection, and bridge piers in floodplain of an active river system. Restriction on the development of hydromorphology in the crossed reach	Locally induced erosion/scour will impact on the natural development cycle of marginal, bank and floodplain habitats. This is likely to occur with very large-scale events which will have a long residual impact. Due to the comparative infrequency of flood events large enough to create change, and their comparatively local nature compared to the full extent of similar habitat through this reach, the impact is considered to be minor, and with mitigation (set-aside of agricultural land either side of the embankment) this can be considered negligible	Negligible

14.10 Cumulative Effects

- 14.10.1 Seven residential housing developments are currently in planning in the vicinity of the CSLR Scheme. Four of these are relatively small developments, with less than 50 houses in each, while the remaining three will introduce approximately 12,000 new homes between them. The largest of these developments will be the Garden Village, which will introduce more than 10,000 residential dwellings to the south of Carlisle.
- 14.10.2 Each of these developments will result in introducing additional areas of hardstanding. In combination with the CSLR Scheme, these have the potential to significantly reduce surface water infiltration to groundwater, reducing groundwater recharge and potentially increasing flood risk.
- 14.10.3 Cumulative impacts associated with surface water run-off into the watercourses are also likely. Fine sediments, contaminants, and pollutants are likely to wash from the areas of hard standing during rainfall events. Additionally, the residential housing developments (particularly the Garden Village) will attract more residents and will result in increased road traffic within the area, which itself will increase the pressure associated with road run-off from the CSLR Scheme.
- 14.10.4 The information available at this stage suggests that none of the other developments will result in direct modification to the surface watercourses in the area. However, the residential housing developments will result in an increased pressure on surface watercourses associated with phosphates and other nutrients from domestic water use.

14.11 Summary

- 14.11.1 The results of the water and flood risk assessment can be summarised as follows:
- The Scheme will be carefully designed to ensure the fine sediments and contaminants from road run-off are filtered from the surface water in detention ponds before entering the watercourses. Therefore, impacts associated with surface water run-off from the Scheme are considered to be negligible. However, there is a potential for cumulative impacts from surface water run-off from other developments in the area to occur.
 - Culvert designs for the minor watercourses will need to ensure no change to sediment transport and exchange. Their lengths should be minimised, and natural bank and bed material should be retained where possible.
 - Bridge abutments over the River Petteril will interrupt the riparian corridor and will introduce hard materials to the banks within the reach.
 - The road embankment on the true right bank floodplain of the River Caldew encroaches on the floodplain disrupting larger flows sufficiently that scour may occur.
 - The Scheme has been assessed to be compliant with the Water Framework Directive (see WFD Compliance Assessment).
 - Flood risk is not impacted by the works as the modelling confirms that water levels are not changed at the 2%AEP (1:50-year) and only very minor changes within the upstream 100m with the 0.1%AEP (1:1000-year) flows.

- 14.11.2 The modelling also suggests that an existing paleo-channel on the eastern edge of the floodplain is important for conveying flood flows. This should be considered for reinstatement to reduce the floodplain flows around the embankment and to provide a safer outfall for the detention ponds to be constructed upstream of the embankment.
- 14.11.3 Further modelling is being undertaken and will be submitted as supplementary information to this ES. Consequently, the conclusions within this chapter are subject to the finalisation of the modelling process.

15 Geology and Soils

15.1 Introduction

- 15.1.1 This chapter assesses the effects of the Scheme on the Geology and Soils of the study area.
- 15.1.2 Soil related impacts have been assessed (i.e. contamination and the impact on soil condition during the construction phase). Hydrogeological conditions have also been assessed. This includes contamination, perched groundwater and aquifer groundwater.
- 15.1.3 The effect on geology has been scoped out of the Stage 3 assessment as no Regionally Important Geological and Geomorphological Sites (RIGS) exist within the study area.
- 15.1.4 At the time of preparation of the Stage 3 Environmental Impact Assessment, the first phase of the ground investigation has been completed. The second phase of the ground investigation will commence in June 2019. This assessment is based on the available results of the most recent ground investigation, and other published information. The current assessment may therefore need to be reviewed and amended as necessary following completion of the final phase of ground investigation.

15.2 Assessment Methodology

Guidelines

- 15.2.1 The assessment will follow the guidance outlined in the Highway's Agency's (HA) Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 11: Geology & Soils (June 1993).

Methodology

- 15.2.2 The route alignment has evolved from the consideration of several potential alternatives through a process of design, consultation, mitigation and re-design. The extent of the study area has been determined through desk-based research and a site walkover and is limited to the footprint of the scheme corridor.
- 15.2.3 Baseline conditions have been determined through a review of publicly available information and enquiries with following data suppliers:
- Environment Agency;
 - British Geological Survey;
 - Groundsure;
 - DEFRA.
- 15.2.4 In addition, reference has been made to the Preliminary Sources Study (Appendix 15.1). This was updated once a preferred route alignment was selected, and new information was incorporated into the baseline. Results of the desk study were also used to determine mitigation measures and to inform the design of the ground investigation.

- 15.2.5 The site walkover was carried out in 2015, to determine the wider topography of the study area. Geotechnical and geo-environmental features of note were recorded to supplement third party information obtained during the desk study phase. Photographs were taken during the walkover to highlight key areas of the site.
- 15.2.6 Following completion of the first phase of the ground investigation (October-December 2018), contaminant concentrations were analysed using a Generic Quantitative Risk Assessment (GQRA) based on safe levels for 'Public Open Space' end use. Results indicate that concentrations of organics and inorganics are below the Generic Assessment Criteria (GAC). Chrysotile Asbestos has been detected in soil samples taken adjacent to Peter Lane and the River Caldew. In accordance with CL:AIRE guidance, the nature and extent of contamination at the site will be fully assessed through a Phase 2 Contaminated Land Report which will be completed following the completion of all ground investigations at the site. A further and final ground investigation is scheduled to take place between June and September 2019.
- 15.2.7 A Ground Investigation Report (GIR) will also be compiled, following the completion of ground investigations, which will provide a summary of ground conditions, geotechnical testing results and ground related hazards.
- 15.2.8 The results of this assessment may need to be reviewed, and amended as necessary, once all ground investigation and chemical testing results are available.

Determination of Receptor Sensitivity

- 15.2.9 Desk based research was carried out to determine the sensitivity of each receptor at the site. The value or sensitivity of a receptor is based on a variety of factors (e.g. biodiversity value, social/community value and economic value). Values were assigned based on descriptors outlined in Table 15.1.

Table 15.1 Determination of receptor sensitivity

Value	Description	Examples
High	<p>Feature possessing key characteristics which contribute significantly to the distinctiveness, rarity and character of the site</p> <p>Feature possessing very significant biodiversity, social/community value and/or economic value at the national level.</p> <p>Feature is extremely rare.</p>	<p>Significant residential/industrial development.</p> <p>Strategic sites e.g. hospital, park.</p> <p>Surface Water: Salmonid/Cyprinid fishery River Ecological Quality High.</p> <p>Designated sites protected under International or UK wildlife legislation (SAC, SPA, SSSI, Ramsar site).</p> <p>Groundwater: Principal aquifer providing a regionally important resource, Public water supply abstractions, SPZ or supporting site protected under wildlife legislation.</p>

Value	Description	Examples
Medium	<p>Feature possessing key characteristics which contribute significantly to the distinctiveness, and character of the site.</p> <p>Feature possessing significant biodiversity, social/community value and / or economic value at the regional level.</p> <p>Feature is uncommon.</p>	<p>Regionally Important Geological Sites (RIGS).</p> <p>Significant transport links e.g. railway, airport.</p> <p>Significant utilities.</p> <p>Species protected under EU or UK wildlife legislation.</p> <p>Surface Water: River Ecological Quality Good.</p> <p>Groundwater: Secondary aquifer providing a locally important resource or supporting river ecosystem.</p> <p>High quality agricultural land.</p>
Low	<p>Feature possessing characteristics that are locally significant.</p> <p>Feature not designated or only designated at a regional / local level.</p> <p>Feature possesses moderate biodiversity, social/community value and / or economic value at the local level.</p> <p>Feature is relatively common.</p>	<p>Surface Water: River Ecological Quality Moderate.</p> <p>Groundwater: Secondary (Class A) Aquifer providing water for agricultural or industrial supply.</p>
Very Low	<p>Feature characteristics do not make a significant contribution to the character or distinctiveness locally.</p> <p>Feature not designated.</p> <p>Feature possesses low biodiversity, social/community value and / or economic value.</p> <p>Feature is common.</p>	<p>Minor residential / industrial development.</p> <p>Surface Water: River Ecological Quality Poor - Bad</p> <p>Secondary (Class B) Aquifer with limited connection to surface water.</p> <p>Low quality agricultural land.</p>

Determination of Impact and Magnitude

- 15.2.10 An assessment of information obtained during the desk study phase has been used to determine the impact of the Scheme on the soils and hydrogeology in the area. Environmental impacts have been predicted with reference to the standards and legislations outlined in Sections 6.2.1 and 6.2.2. Where it has not been possible to quantify effects, a qualitative assessment has been carried out based on available knowledge and professional judgement.
- 15.2.11 The magnitude refers to the 'size' or 'amount' of an impact. In terms of the identified receptors, magnitude has been determined using the descriptors outlined in Table 15.2.

Table 15.2 Determination of the magnitude of impacts

Magnitude	General Impact	Geology & Soils	Contaminated Land	Groundwater
Major	Significant, permanent loss / irreversible changes, to key characteristics, features or function of an environmental parameter. Impact may occur over a significant area (>50%). Significant Impact certain or likely to occur.	Total loss of a geological feature or rock exposure. Total loss of top soil over a wide area	An area where contaminated zones are present or likely. Impacts from contamination and disturbance will affect the surrounding built and natural environment during construction and operation. Extensive, long term mitigation measures required to avoid adverse impacts.	Pollution, damage or destruction of an aquifer within a Source Protection Zone (SPZ), public water supply or Principal Aquifer.
Moderate	Damaging significant changes to key characteristics or features or function over a moderate area (15%-50%). Likely to last for more than 2 years. Impact likely to occur.	Loss of a significant part of a geological feature or soil stratum. Partial loss of a rock exposure. Significant loss of top soil.	An area where contaminated zones are present or likely. Impacts that effect the surrounding natural environment will be prevalent during construction but are unlikely to affect the operation of the scheme. Moderate / short term mitigation measures to be incorporated.	Pollution or damage to Secondary (Class A) Aquifer providing local resource / base flow to rivers.
Minor	Noticeable but not significant changes (temporary / potentially reversible), over a partial area (<15%), to key characteristics or features of an environmental parameter. Impact will possibly occur.	Localised damage to a geological feature or rock exposure. Removal of a small section of a soil stratum or complete removal of a localised but insignificant soil type. Partial loss of topsoil	An area where contaminated zones are possible, but where it is considered very unlikely that contamination will affect the environment during construction or operation. No mitigation measures anticipated. Minor site investigation may be required.	Pollution or damage to a Secondary (Class B) aquifer or Secondary (Class A) Aquifer that is used for industrial or agricultural purposes.
Negligible	Noticeable temporary / reversible, changes for less than 6 months, or barely discernible changes for any length of time, over a small	Insignificant or temporary damage to exposed rock or geological feature. Minor changes to the soil	Potentially contaminated site in the study area that is sufficiently distant from the development that it will not	Minor pollution of Secondary (Class B) aquifer and/or where there is no significant groundwater resource.

	area, to key characteristics or features of an environmental parameter. Impact unlikely to occur	stratigraphy or excavation of an insignificant volume of superficial deposits.	affect, or be affected by, its construction or operation.	
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Determination of the Significance of Effects

- 15.2.12 The significance of identified impacts has been determined through assessment of the value of the environmental receptor and the determined magnitude of the impact. Consideration has also been given to the sensitivity of the receptor to change. An Impact Assessment Matrix (IAM) (Table 15.3) has been used to provide guidance on assessing the significance of impacts. The descriptors of various significance ratings are outlined in Table 15.4.
- 15.2.13 The rating assigned to the significance of the impact provides an indication as to whether mitigation measures are required.

Table 15.3 Impact assessment matrix

Magnitude	Value and Sensitivity of Receptor			
	Very Low	Low	Medium	High
Very Low	Negligible	Negligible	Minor	Minor
Low	Negligible	Minor	Minor	Moderate
Medium	Minor	Minor	Moderate	Major
High	Minor	Moderate	Major	Major

Table 15.4 Descriptors for significance ratings

Significance	Generic Significance Ratings
Large	Very large or large change in environmental or socio-economic conditions. Effects, both adverse and beneficial, which are important considerations at a national to regional level because they contribute to achieving national / regional objectives, or, likely to result in exceedance of statutory objectives and/or breaches of legislation.
Moderate	Intermediate change in environmental or socio-economic conditions. Effects that are likely to be important considerations at a district to local level because they contribute to achieving local objectives, or, may result in exceedance of local statutory objectives and/or breaches of legislation.
Slight	Small change in environmental or socio-economic conditions. These effects may be raised as local issues but are unlikely to be of importance in the decision making process.
Negligible	No discernible change in environmental or socio-economic conditions. An effect that is likely to have a negligible or neutral influence, irrespective of other effects.

- 15.2.14 It should be noted that the above tables consider adverse effects which negatively impact on receptors. Potential impacts from the development may also be beneficial and have a positive influence on receptors or provide opportunities for improvement. Therefore, final residual significance ratings may include both beneficial and adverse impacts. The rating of the impact significance may indicate whether mitigation measures are required.

Identification and Assessment of Cumulative Effects

- 15.2.15 At this time the exact layout of St Cuthbert's Garden Village is not known. As a result, a detailed assessment of the potential interactions with the Scheme is not possible. Therefore, the inter-project cumulative effects have been assessed at a high level using professional judgement and only where the assessment topic has been determined to have clear relevance to the proposed Garden Village development.'
- 15.2.16 It is considered unlikely that there will be any cumulative effects which will impact the geology or hydrogeology of the study area.

Identification of Mitigation and Monitoring Measures

- 15.2.17 Mitigation measures have been identified with the aim of reducing the adverse effects of the Scheme on the geology and soils of the study area.
- 15.2.18 Measures have been identified with a consideration of best practice and as a result of mitigation workshops which were undertaken between March and April 2018 and in March and June 2019.

15.3 Limitations and Assumptions

- 15.3.1 The site walkover carried out in 2015 was constrained to areas with public access. As such, the results and observations made during the walkover are limited to these areas only.
- 15.3.2 The Ground Investigation Report (GIR) will be compiled once the second phase of the investigation is complete and will provide an assessment of geotechnical and contamination hazards associated with the study area.
- 15.3.3 As stated in Section 15.2, the nature and extent of contamination at the site will be fully assessed through a Phase 2 Contaminated Land Report, which will be compiled following the completion of the final ground investigation.
- 15.3.4 A mitigation measure identified in Section 6.5 is related to completing a targeted site investigation at the suspected landfill adjacent to Kingrigg Farm (Figure 15.1). Permission for access was not granted during the first phase of the ground investigation. At the time of writing this report, negotiations are ongoing in relation to securing access during or immediately after the Phase 2 ground investigation.
- 15.3.5 At the time of conducting this assessment, several rounds of groundwater monitoring have taken place. It is expected that monitoring will be carried out for a period of one year to determine the nature of the groundwater regime. This will allow appropriate mitigation measures to be identified as necessary. It is unlikely that additional monitoring will be required following the Phase 2 investigation, however it will be possible to install further monitoring points during this phase.
- 15.3.6 Highways England are in the process of updating DMRB, which has the potential to alter the methodology proposed in this chapter if the relevant section is released prior to submission of the Environmental Statement. Updates to the current guidance are expected to be complete by March 2020.

15.4 Consultations

- 15.4.1 A consultation with the Environment Agency, Natural England and Cumbria County Council Flood Development Team was undertaken in July 2017.

- 15.4.2 A formal public and stakeholder consultation period was undertaken between 26th of January 2018 and 9th March 2018 to determine a preferred route alignment.
- 15.4.3 The information used during previous assessments has been obtained from the BGS (geological plans), Natural England (statutory sites) and the Environment Agency (groundwater designations and locations of former landfill sites).

15.5 Regulatory and Policy Framework

- 15.5.1 Protection of existing geological features is covered through national designation i.e. Sites of Special Scientific Interest (SSSI) and on a regional basis via Local Geodiversity Sites (formerly RIGS). There are no RIGS or geological SSSI's within the assessment area.
- 15.5.2 A number of policies currently provide some aspects of protection to soils. However, no one legislative or policy tool has been developed specifically with the protection of soils in mind. Where policy or legislation does relate to soil, it is generally limited to the protection of a specific impact or function of that soil.
- 15.5.3 Legislation regarding contaminated land is aimed at the identification and control of risks created by substances in the ground, in particular to human health and controlled waters. Control is implemented by regulations under the Environmental Protection Act (EPA) 1995. Section 57 of the EPA 1995 led to creation of Part 2A of the EPA, which establishes a legal framework for working with contaminated land in England. Part 2A was introduced on the 1st April 2000 with the aim of ensuring that land is 'suitable for use'.
- 15.5.4 Current guidance advises that a phased approach is taken when carrying out an assessment of potentially contaminated sites. In the UK, the identification and remediation of contaminated sites falls within two categories. Sites are identified via the Part 2A route, or alternatively through the planning process.
- 15.5.5 Part 2A is a statutory legal framework that local authorities in England follow to determine whether land is contaminated, whether remediation is required and who is liable from a financial perspective (DEFRA, 2012). "Remediation under Part 2A is intended to remove unacceptable risks to humans and the environment to make the land suitable for its current use" (EA, 2016). The other, and in current practice more frequently used, route for the identification and remediation of contaminated land is through the planning process. This occurs where a developer intends to develop a site and contamination is found to be present above a safe level. The developer is then responsible for remediating the site to ensure it is suitable for its proposed end use.
- 15.5.6 A site-specific risk assessment will be undertaken, following completion of the ground investigations at the site, to determine whether contamination exists. Remedial methods should be identified to ensure that no risks are posed to human health and the environment.

National, Regional and Local Planning Policies:

- 15.5.7 Several regional and local planning policy documents have been referred to for the purposes of the assessment. These include:
- National Planning Policy Framework (NPPF):
 - Achieving sustainable development

- Making effective use of land
- Achieving well designed places
- Conserving and enhancing the natural environment
- The Environmental Protection (Duty of Care) Regulations 1991 (amended 2003)
- The Cumbria Contaminated Land Office Group's Development of Potentially Contaminated Land and Sensitive End Uses (Investigation procedure)
- Carlisle District Local Plan 2015-2030 (Policy CM5- Environmental and Amenity Protection)
- Cumbria Minerals and Waste Local Plan 2015-2030 (Policies SP1 and SP8)

15.6 Baseline Conditions

Study Area

- 15.6.1 The study area is centred around the alignment of the proposed new road, with a buffer width of 500m on either side of the road centreline. The study area stretches from Newby Cross in the west, to the M6 Junction 42 in the east. Noteworthy features within the site include; a length of the River Caldew, a length of the River Petteril, Peastree Wood, the Cumbrian Coast Railway, West Coast Main Line Railway, part of Carlisle Racecourse, Durdar Village and Junction 42 of the M6. A plan of the study area is provided in Figure 1.1.

Statutory and Non-statutory Designations

- 15.6.2 The River Caldew forms part of the River Eden and Tributaries Site of Special Scientific Interest (SSSI) and Special Area of Conservation (SAC).
- 15.6.3 Agricultural land adjacent to Junction 42 of the M6 is within a Nitrate Vulnerable Zone (NVZ). The NVZ is located between Durdar Road to a location beyond the eastern boundary of the study area.
- 15.6.4 The Cumbria county Council Minerals and Waste Local Plan (2015-2030) indicates that there are mineral reserves located in the study area. The nearest minerals site is Cardewmire Quarry (sand and gravel), which is located at Cardewlees near Dalston. The River Caldew and Petteril river channels and tributaries located south of the scheme alignment are designated as Minerals Safeguarding and Minerals Consultation Areas (identified as potential future sand and gravel aggregate resources). The extent of the mineral reserves in relation to the route alignment is shown on Figure 15.2.

Made Ground

- 15.6.5 A limited amount of Made Ground is anticipated within the study area. Except for areas of housing and light industrial development, the most significant deposit of Made Ground is associated with the embankment supporting J42 of the M6. The maximum height of the embankment approaches eight metres.
- 15.6.6 Localised shallow deposits of Made Ground, associated with the existing highway infrastructure and building foundations, are expected throughout the study area.

Topsoils

- 15.6.7 The majority of the study area is located within agricultural land. The soils in this area are classified as slowly permeable, seasonally wet, slightly acidic, base-rich, loamy and clayey soils. A small section of the site contains freely draining floodplain soils which are present in close proximity to the River Petteril at the eastern section of the site.
- 15.6.8 During Stage 2 of the Environmental Impact Assessment, a site-specific agricultural land classification survey was undertaken. The report findings suggest that the majority of the site is Class 3b agricultural land. Class 3b is classified as moderate quality land.

Superficial Deposits

- 15.6.9 Superficial deposits at the site comprise the following:
- Alluvium (sand, silt and clay)
 - Devensian Till (clay, silt, sand and gravel)
 - Gretna Till Formation (clayey diamicton)
 - Glaciofluvial Deposits (sand and gravel)
 - Glaciolacustrine Deposits (silt, clay and sand)
 - River Terrace Deposits (sand and gravel)
 - Plumpe Sand and Gravel Formation (silt, sand and gravel)
 - Great Easby Clay Formation (silt and clay)
- 15.6.10 The majority of these deposits are Quaternary in age and complex interdigitations of sand, gravel, silt and clay may develop perched water tables above the deeper aquifer.

Solid Deposits

- 15.6.11 Maps produced by the British Geological Survey indicates that solid geology beneath the site is comprised of:
- The St. Bees Sandstone Member (fine to medium grained micaceous sandstone)
 - The Helsby Sandstone Formation (fine to medium grained micaceous sandstone)
 - The Mercia Mudstone Group (grey/green mudstones minor siltstone, sands and Halite)
- 15.6.12 The St Bees Sandstone Member conformably overlies the Eden Shale Formation and is similar in depositional environment and lithology to its equivalent in the Solway basin. The outcrop of the St Bees Sandstone is five kilometres wide. The Mercia Mudstone Group extends beneath the western section of the site and overlies the St Bees Sandstone.

Contaminated Land

15.6.13 The Preliminary Sources Study (Appendix 15.1) has identified several landfills in the wider study area. Significant thicknesses of Made Ground are expected at the landfill sites and are likely to be variable in composition. Made Ground may include building demolition waste, re-worked natural ground and domestic or industrial wastes. The landfill sites are related to:

- The Nestlé Factory (Dalston)
- Stead McAlpin (Cummersdale)
- Brisco Brickworks
- Durdar Farm
- Kingrigg Farm (Anecdotal evidence)

15.6.14 Aside from the Durdar and Kingrigg Farm landfill sites, the areas listed above are positioned away from the proposed route alignment and are unlikely to be affected by the scheme. A drainage pond is proposed in the Cummersdale area (approximately 1km offline from the proposed route. There is the potential for drainage paths to be affected between the Stead McAlpin landfill and the adjacent stream and River Caldew.

15.6.15 Potentially contaminative land uses and associated contaminants, identified at the desk study phase of the project, are summarised in Table 15.5.

Table 15.5 Potential contaminants and sources

Potential Source	Potential Contaminants
Made Ground	Heavy metals, semi-metals, inorganic and organic contaminants, sulphates and asbestos
Asbestos	Various types of asbestos from building demolition
Rail Infrastructure	Metals, sulphates, asbestos, oil/fuel hydrocarbons, PAH's, chlorinated aliphatic hydrocarbons, PCB's
Dye Works	Metals, cyanides, sulphates, asbestos, boron, propane, PAH's, chlorinated aliphatic hydrocarbons, PCB's, chlorinated organic solvents, sizing agents and bonding agents
Vehicle Garage	Metals, cyanides, sulphur, sulphates, asbestos, oil/fuel hydrocarbons, chlorinated aliphatic hydrocarbons, PCB's
Brick Works	PAH's, TPH's and heavy metals
Landfill Sites	Heavy metals, semi-metals, inorganic and organic contaminants, sulphates and asbestos
Petrol Filling Station	Metals, cyanides, sulphur, sulphates, asbestos, oil/fuel hydrocarbons, chlorinated aliphatic hydrocarbons and PCB's
Electricity Sub-station	PCB's and mineral oils

15.6.16 The landfill site at Durdar Farm is located within 50m of the proposed route. Anecdotal evidence (provided by landowners) suggests that the waste here is comprised of inert materials from the M6 motorway Southwaite Services

improvement works. The northern boundary of the landfill is reported to be further south from that shown on the source plan, which is based on the licensed site boundary. A plan of recorded and anecdotal landfill sites, in relation to the route alignment, is provided in Figure 15.1.

Future 'Do Minimum' Scenario

- 15.6.17 In determining the outcome of a future 'do minimum' scenario, it has been assumed that conditions identified through intrusive investigations and monitoring will remain the same, and that the land will continue to evolve in the same manner that it has done in the past.
- 15.6.18 Without implementation of the development, agricultural and superficial deposits will be retained across the study area. Depending on the results of groundwater monitoring, the groundwater regime may remain the same, with potential future impacts due to climate change.

15.7 Impact Assessment

- 15.7.1 The assessment of preliminary impacts related to the construction and operation phases of the project are summarised in Table 15.6. Mitigation has not been considered at this point.

Table 15.6 Potential impacts of the scheme

Receptor	Impact	Effect	Magnitude	Significance
Hydrogeology	Installation of drains below the existing groundwater level. Cuttings below the level of the principal aquifer bedrock. Cuttings adjacent to potential sources of leachate (Durdar Farm landfill)	Localised reduction in the groundwater level. Increased risk of surface water runoff containing contaminants which may enter the principal aquifer (only likely to occur where superficial soils are present in thin layers or are coarse in nature i.e. the river channels)	Major	Moderate / large adverse
Superficial Soils	Excavations for the purposes of cuttings, as well as to formation level for the proposed road	Reduction of superficial soils within the study area	Negligible	Neutral / slight adverse
Topsoil quality	Loss of agricultural land across the route corridor. Topsoil contact with potentially contaminated soils	Removal of topsoils and associated fauna and flora. Localised reduction in topsoil quality	Moderate	Slight adverse

Receptor	Impact	Effect	Magnitude	Significance
Mineral Reserves	Reduction in volume and quality of mineral reserves due to the proposed development	Loss of mineral reserves	Moderate	Slight adverse

- 15.7.2 The proposed works comprise the construction of embankments within and adjacent to the River Caldew and the River Petteril.
- 15.7.3 The construction of the highway will have a slight adverse effect on topsoil quality.
- 15.7.4 The effects of highway construction on the hydrogeology will be moderate/ large adverse.
- 15.7.5 The effects of construction on superficial soils at the site will be neutral/ slight adverse.
- 15.7.6 The Cumbria county Council Minerals and Waste Local Plan indicates that there are mineral reserves in the study area. The effects of highway construction on the mineral reserves is slight adverse. The footprint of the affected areas is expected to be confined to areas where the highway bisects the Rivers Petteril and Caldew.

15.8 Mitigation, Enhancement and Monitoring

Mitigation

- 15.8.1 The completion of a targeted site investigation at Kingrigg Farm will allow the development of risk assessments and appropriate mitigation measures to prevent adverse impacts from the exposure and disturbance of contaminated soils.
- 15.8.2 Depending on the nature of contamination found, it may be necessary to install cut-off drains or impermeable walls between the landfill and the proposed cutting. The nature and magnitude of contamination will be fully understood following completion of the Ground Investigation Report (GIR).
- 15.8.3 The highway drainage should not be allowed to discharge groundwater in an uncontrolled manner as there is the risk of pollutants from the highway entering the principal sandstone aquifer (e.g. fuel oils). Highway drains should discharge into either combined sewers or into controlled attenuation ponds designed for drainage.
- 15.8.4 Earthworks drainage shall be installed no deeper than the minimum required depth to minimise lowering of the groundwater level within the aquifer. The installation of groundwater monitoring points during the Phase 1 and 2 investigations, in areas where deep cuttings are anticipated, will permit the effects of the proposed cutting on the hydrogeology to be understood. Monitoring will be undertaken for a period of 12 months to allow seasonal variations to be understood. The likelihood of risks to the aquifer will be fully understood once depths to rockhead along the route alignment have been determined.
- 15.8.5 Adverse impacts on the integrity of soils and soil structure will be reduced by implementing a soil handling strategy and Soil Management Plan during the construction phase. The Soil Management Plan will include procedures for soil

stripping, handling, transportation, storing and reinstatement/re-use of soils to maintain soil viability and biological activity.

- 15.8.6 Topsoil should be stripped from the road formation along the length of the scheme and stockpiled for re-use in the landscaping works. The soil should be stripped, stockpiled and replaced in accordance with the Construction Code of Practice for the Sustainable Use of soils in construction (DEFRA, 2009) and the MAFF Good Practice Guide for Handling Soils by Machine (2000).
- 15.8.7 Stockpiles will be seeded with a neutral grassland mix to maintain slope stability and to prevent erosion or dust generation. Stockpiles will be managed and monitored throughout their lifetime.
- 15.8.8 The following actions should be avoided during construction:
- Contamination of soil
 - Mixing of topsoil with subsoils
 - Over-compaction or running over emplaced topsoil
 - Incorporation of vegetation in soil stockpiles.
- 15.8.9 The following actions are recommended during construction:
- Decompaction and aeration of soil prior to placement
 - Use of tracked plant to excavate, transport and replace soil
 - Implementation of designated haul routes to avoid damaging in-situ soils
 - Excavation and deposition during dry conditions.
- 15.8.10 Topsoil should not be removed from below the spread of trees that are to be retained and restoration plans for areas temporarily required during construction will be developed.
- 15.8.11 The risks to construction workers during the construction phase of the project will be mitigated by implementation of Health and Safety measures. This will include suitable working methods and the correct use of Personal Protective Equipment (PPE). These measures will be developed as part of the Construction Environmental Management Plan (CEMP) for the scheme.

Enhancement

- 15.8.12 An opportunity for the enhancement of the geological environment as part of the scheme is to reveal sandstone of the St. Bees Sandstone Formation in the cuttings proposed along the route. The feasibility of creating this feature will be confirmed through completion of targeted site investigations at the site.

15.9 Residual Impact Assessment

- 15.9.1 Prior to mitigation, the magnitude of impact to the hydrogeology was identified as major adverse. With mitigation measures in place, the magnitude of change is reduced to moderate adverse. Table 15.7 provides a summary of potential impacts, effects and the significance of effects (taking mitigation into account) on the hydrogeology of the study area.

Table 15.7 Significance of environmental effects on the hydrogeology

Receptor	Impact	Effect	Magnitude	Significance
Hydrogeology (Medium)	Installation of drains below the existing groundwater level. Cuttings below the level of the principal aquifer bedrock. Cuttings adjacent to potential sources of leachate (Kingrigg Farm)	Lowering of the groundwater table.	Moderate	Moderate adverse

15.10 Cumulative Effects

- 15.10.1 At this time the exact layout of St Cuthbert's Garden Village is not known. As a result, a detailed assessment of the potential interactions with the Scheme is not possible. Therefore, the inter-project cumulative effects have been assessed at a high level using professional judgement and only where the assessment topic has been determined to have clear relevance to the proposed Garden Village development. It is considered unlikely that there will be cumulative effects which will impact on the geology or hydrogeology.
- 15.10.2 Given the rural setting of the site, and the prevalence of agricultural activity, current and future projects in the area are unlikely to be of a scale and nature that would significantly affect the geology and soils of the area.

15.11 Summary

- 15.11.1 The study area is located between the Newby West Roundabout in the west and Junction 42 of the M6 in the east, The River Caldew and the River Petteril both intersect the route alignment. Land use surrounding the site is predominantly agricultural in nature.
- 15.11.2 The River Caldew forms part of the River Eden and Tributaries SSSI and SAC. A Nitrate Vulnerable Zone is located between Durdar Road and a location beyond the eastern boundary of the study area. The Rivers Petteril and Caldew are designated as mineral safeguarding areas.
- 15.11.3 There are no geological or geomorphological features of scientific interest or importance within or adjacent to the study area.
- 15.11.4 The route alignment bisects a suspected landfill in proximity to Kingrigg Farm (Figure 15.1). At present, there is not a detailed understanding of the nature of materials contained within the landfill, or the vertical and lateral extents of the landfill area. A ground investigation is required to fully characterise the nature of materials and their extent. Once this is complete, a better understanding of the risks can be gained.
- 15.11.5 If the correct procedures and guidance are followed, and appropriate techniques are adopted during construction, the potential effects can be controlled and managed, such that the significance of negative effects on the hydrogeology of the area can be limited to a neutral or slight adverse level.

16 Cumulative Effects

16.1 Introduction

- 16.1.1 Cumulative effects refer to the collective influence of the proposed scheme and any other developments, proposed or existing, on a particular aspect of the environment. This includes anthropogenic receptors. In each technical chapter of this ES, an assessment of cumulative effects has been made considering effects within the technical discipline based on the anticipated interactions with other developments (Figure 16.1). These are known as inter-project effects. In line with the Scoping Opinion, the cumulative effects assessment in each chapter has included St. Cuthbert's Garden Village, Local Development Plan land and consented developments. This chapter, however, addresses the cumulative effects of impacts across multiple environmental topics where they are likely to affect a single receptor. These are known as intra-project effects.
- 16.1.2 When considered in isolation, the environmental effects of any single project on a receptor may not be significant. However, where individual effects are considered in combination, the resulting cumulative effect may be significant. For example, residents in a community located within close proximity of a construction site may be adversely affected by changes to noise levels, air quality and visual aesthetics which, as assessed individually in the ES, are not significant but when considered together will cause a significant effect on that community that would not be picked up without a separate cumulative assessment.
- 16.1.3 It should be noted, however, that certain environmental topics are closely linked, for example, ecology and landscape. As such, as part of the iterative nature of EIA and design development, multiple impacts may already have been considered.
- 16.1.4 This chapter aims to highlight the combined intra-project effect of impacts across all technical disciplines and should be read in conjunction with the individual environmental topic chapters which address the potential from cumulative effects resulting from inter-project effects. It does not attempt to reiterate all effects on receptors as detailed in each of the topic chapters; instead it identifies where multiple effects on a receptor may combine to create an effect which is more significant.

16.2 Assessment Methodology

Guidelines

- 16.2.1 The assessment of cumulative effects is required at the project level in EIA's by the European Community Directive 2011/92/EU 'on the assessment of the effects of certain public and private projects on the environment', as amended by Directive 2014/52/EU (the 'EIA Directive').
- 16.2.2 The requirements of the Directive are implemented for the purposes of this EIA through the Town and Country Planning (Environmental Impact Assessment) Regulations 2017. Schedule 4, Part 1, Paragraph 5 of the Regulations states that an Environmental Statement should include a description of the likely significant effects of the development resulting from, among other items, *"the cumulation of effects with other existing and/or approved projects, taking into account any existing*

environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources”.

16.2.3 This chapter has been prepared in line with the following relevant legislation and guidance:

- Town and Country Planning (Environmental Impact Assessment) Regulations 2017⁸⁸
- Design Manual for Roads and Bridges;⁸⁹
 - - Volume 11, SECTION 2, Part 5, Chapter 1, Section III
 - - Volume 11, SECTION 2, Part 5, Chapter 1, Section IX
- Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions⁹⁰
- Cumulative Impact Assessment Guidelines: Guiding Principles for Cumulative Impacts Assessment in Offshore Wind Farms⁹¹

Consultation

16.2.4 The local planning authority, Cumbria County Council, were consulted in November 2018 for a Scoping Opinion and 31st January 2019 for details of planning applications to be considered for the assessment. The Scoping Opinion and approved planning applications list were received on 9th January and 13th February 2019 respectively.

16.2.5 This chapter has been prepared with reference to the relevant section of Cumbria County Council’s Scoping Opinion (SCO-1/18/02), which stated that the ES:

“should take into account existing development, approved but uncompleted development, development under construction. However, it is not agreed that this should be restricted to other EIA development proposals. A more appropriate approach is considered to be take into account all new stand-alone developments within a set radius of the scheme (such as 250-300m); and for permissions classed as major development (under Part 1 Article 2 f Town & Country Planning Development Management Procedure Order 2015) or Nationally Significant Infrastructure Projects (NSIPs) to be take into account for a larger radius. A list of agreed existing and approved developments for consideration in cumulative effects should be agreed in consultation with the LPA. Sites allocated within the Carlisle City Council Local Development Plan 2015-2030 should also be included in the consideration of potential cumulative effects.”

Types of Impact

Intra-project cumulative effects

16.2.6 Where a resource or receptor is affected by impacts from a single project and those impacts act together to create a combined impact greater than the individual components.

⁸⁸ UK Statutory Instruments 2017, Number 571

⁸⁹ Standards for Highways: Design Manual for Roads and Bridges, May 2007

⁹⁰ European Commission: Directorate-General XI (Environment, Nuclear Safety and Civil Protection) 1999

⁹¹ Renewable UK and NERC, June 2013

Inter-project cumulative effects

- 16.2.7 Where a resource or receptor is affected by impacts from multiple projects at the same time and those impacts act together to create a combined impact greater than the individual components.

Additive Effects

- 16.2.8 Where impacts from the same or different projects affect a resource or receptor in a similar way at the same time creating an 'in combination' impact.

Synergistic Effects

- 16.2.9 Where different types of impacts from either the same or different projects affect a resource or receptor and interact to create a new, separate impact whilst also increasing their significance.

Study Area

- 16.2.10 The study area for the assessment of environmental impacts is set for each individual technical discipline with reference to best practice guidance unique to each. As such, there is not always a common study area boundary across topics with those used ranging from a distance of 2km (i.e. visual impact) to within the confines of the development site (i.e. geology and soils). The assessment of intra-project cumulative effects therefore brings together all impacts identified on a receptor across the specialist topic chapters, regardless of the study area extent applied.

Impact Identification and Assessment

- 16.2.11 The cumulative impacts of the proposed development have been identified by cross referencing the individual receptors (or categories of receptors) affected and their residual impacts within each topic chapter. Therefore, any mitigation proposed is taken into account in the assessment of cumulative effects.
- 16.2.12 The receptors and impacts were combined using a matrix (Table 16.5), whereby receptors were listed against topic chapters and a mark placed in the matrix where an impact (beneficial or adverse) had been identified. The matrix was then evaluated to identify where multiple impacts apply to a receptor.
- 16.2.13 To ensure that the results of the cumulative assessment are reported in a concise manner, only those receptors subject to cumulative effects are detailed. In some cases, similar receptors have been grouped and the effects in relation to that group have been assessed. As a general guideline, receptors are grouped geographically e.g. the "Caldew Valley" incorporates the landscape character of the valley, the PRow's and other routes within the valley and the amenity value of the area.
- 16.2.14 This grouping has the effect of ensuring that potential cumulative effects are not masked by keeping receptors separate when they are in reality different aspects of the same local environment. Where grouping has not been justifiable on the grounds of geography or impact linkage, makes no difference in revealing cumulative effects, receptors have retained their identity from their topic chapter of origin e.g. the *Agricultural Brisco and historic parkland* Local Character Area from the landscape character chapter.

16.2.15 As some topic chapters use different scales of significance, reporting in the matrix has been simplified to the series of impacts types shown in Table 16.1.

Table 16.1 Impact descriptions used in the matrix of cumulative effects

Symbol	Description
•	Positive effect
○	Negative effect
/	No effect or Neutral effect
-	Not applicable or receptor not assessed

Determining the significance of Cumulative Effects

16.2.16 Where multiple impacts are identified on the same receptor there is potential for the combined significance of effects to be greater than the significance on its own. There is also potential for a receptor to be affected adversely under one topic but have beneficial effects under another. In such cases, a balance between the two has been established.

16.2.17 The significance of cumulative effects is determined by the extent to which the impacts can be accommodated by the receptor.

16.2.18 In determining significance, the following factors were considered:

- The receptors affected.
- How the activity or activities will affect the condition of the receptor/resource
- The probability of such effects occurring
- What capacity the receptor/resource has to absorb further effects before the change becomes irreversible.

16.2.19 Where cumulative effects were identified, their significance has been assessed against the framework outlined in Table 16.2.

Table 16.2 Framework for determining the significance of cumulative effects

Significance	Effect
Severe	Effects that the decision-maker must take into account as the receptor/resource is irretrievably compromised.
Major	Effects that may become a key decision-making issue.
Moderate	Effects that are unlikely to become issues on whether the project design should be selected, but where future work may be necessary to improve on current performance.
Minor	Effects that are locally significant.
Not significant	Effects that are beyond the current forecasting ability or are within the ability of the resource/receptor to adapt to such change.

16.3 Limitations and assumptions

- 16.3.1 The interaction of impacts on a receptor/resource can be complex and subjective, making the prediction and assessment of cumulative effects difficult. This is further complicated when final details of certain elements of the Scheme or other proposed developments are not known. The assessment of cumulative effects is therefore based on all agreed parameters and known details at the time of publication, but effects may be subject to change as detailed design progresses. However, where final detail is not known, a worst case has been assumed. Assessments will also require an element of professional judgement.
- 16.3.2 The study area for the assessment of environmental effects is set by best practice guidance for the individual topic areas covered in this ES. As such no common boundary was used to carry out the cumulative assessment.

16.4 Impact Assessment

- 16.4.1 As stated in Section 16.1 this chapter only assesses the intra-project cumulative effects, however, these effects have been broken down into those associated with the construction and operational phases of the Scheme. Only effects that are of a **moderate** level or higher are considered. Negligible and minor impacts have not been brought forward to the intra-project cumulative impact assessment.

Potential for Construction Related Intra-Project Effects

- 16.4.2 Table 16.3 sets out the receptors that are likely to be sensitive to construction phase effects. The residual effect column identifies effects from the technical assessment chapters that cause greater than negligible effects and identify whether there are any individual impacts that could combine as an effect upon a given receptor. Some receptors have been grouped under a common location and these are highlighted in the “Receptor” column.
- 16.4.3 As works progress across the Scheme, the magnitude of different impacts will vary, as different stages of construction works will generate variable impact magnitudes. These impacts will also be temporary and transient in nature.

Potential for Operational Related Intra-Project Effects

- 16.4.4 The Scheme will introduce a new bypass road to the south of Carlisle. Overall, this is expected to lead to greater benefits than potential adverse effects. Table 16.4 sets out the receptors that are likely to be sensitive to operational phase effects. The residual effect column identifies effects from the technical assessment chapters that cause greater than negligible effects and identify whether there are any individual impacts that could combine as an effect upon a given receptor.

Table 16.3 Construction phase receptors and residual/ cumulative effects

Receptor	Residual Effect	Potential for Cumulative Effect
Caldew Valley		
Caldew river valley green corridor, mill and print works (Landscape Character)	<p>Adverse effects will include:</p> <ul style="list-style-type: none"> The site compounds, construction vehicle movements and activity and temporary works features such as scaffold and temporary bridges will have a dramatic reduction in the sense of tranquillity and calm within this self-contained area, which is a key characteristic. A significant reduction in tree and vegetation loss which contribute to the character of this area. The scale of the Scheme in this valley is disproportionate to other features in this area and the landform is discordant with the natural topography of the area. Effects on landform will be significant, with engineered slopes of both cuttings and embankments appearing discordant with the natural topography of this open river valley. The ponds, if engineered in appearance, would also have an adverse effect on character, due to the valley floor having a much more natural character. The appearance of the varied parapets will also not compliment the character of this area, particularly with the 1.8m high solid parapets introducing a harsh feature in the landscape. 	All of these receptors are located within the Caldew Valley, in relatively close proximity. The valley is heavily used by the public for a variety of recreational and commuting uses, so the cumulative impacts of restricted/ impeded accessibility, changed landscape character and reduced visual amenity are considered to be a cumulative impact upon users of the valley e.g. walkers, cyclists, commuters between Carlisle/ Cummersdale and Dalston.
Cumbria Way Walking Trail (Outdoor Access and Recreation)	Route closed for up to 12 months during construction of the new bridge. Considerable disruption with pedestrians diverted to other footpaths. No obvious diversion north/south in the Caldew valley other than via FP129002 and Durdar Road. Walkers are likely to be dissuaded from making trips to an extent enough to induce a change in their habits with an increase in journey length by >3km.	
PRoW between the River Caldew and Durdar Road	5 nos. footpaths severed during construction (129024, 129003, 129004, 129005, 129001) with no access for pedestrians likely. with diversions via FP129002 to the north of the Racecourse adding 4km between Durdar and the River Caldew path. Pedestrian counts very	

(Outdoor Access and Recreation)	low, however considerable hindrance and change to journey times/ patterns.	
NCN 7 / C2C / Reiver's Route (Outdoor Access and Recreation)	Route closed for up to 12 months during construction of new bridge. Considerable disruption to cyclists on a well-used National Cycle Network off road route. Cyclists diverted via Cummersdale to Dalston Road with an increase in journey length of 500m and using sections of road (Dalston Road). Cyclists, particularly vulnerable cyclists are likely to be dissuaded from making trips to an extent sufficient to induce a change in their habits.	
River Caldew (Outdoor Access and Recreation)	Use of river likely to be restricted during construction of bridge crossing. Some users, are likely to be dissuaded from making trips with trips made longer and less attractive.	
Viewpoint 2: Cumbria Way/ NCN7 / River Caldew (Visual Impact)	Loss of visual amenity from removal of existing vegetation, construction works, and lighting.	
Cummersdale		
Viewpoint 1: Cummersdale (Visual Impact)	Loss of visual amenity from Removal of existing vegetation, construction works, and lighting.	The visual impact receptor is located within the Cummersdale landscape character area. The impacts of landscape changes and a loss of visual amenity are therefore considered to be a cumulative impact upon the local landscape and its residents/ users.
Gently rolling lowland ridge and valley farmland and industrial Cummersdale (Landscape Character)	<p>Adverse effects include;</p> <ul style="list-style-type: none"> • Damage to the quality of the agricultural landscape through construction and earthworks activities. • Damage to the quality of the hedgerow trees in the area which are key features in this landscape. • Severance and loss of hedgerows, which are a key characteristic of the area, will have an adverse effect on landscape character and the historic landscape. • An increase in urban features and traffic through this character area will have an adverse effect on the rural qualities of this character area. • Steeper earthworks connecting to the overbridge will appear discordant with the gently rolling topography of this character area 	

	<p>and wider landscape, as will the steep cuttings. They will also appear particularly prominent due to them being unvegetated at this phase.</p> <ul style="list-style-type: none"> • The site compound will become a dominant feature in this rural landscape and have an adverse effect on quality. 	
Durdar		
<p>Sub-urban Carlisle: Busy linear settlements, race course and irregular field patterns (Landscape Character)</p>	<p>Adverse effects will include:</p> <ul style="list-style-type: none"> • Damage to Ancient Woodland flora and loss of an area of this woodland. • Severance and loss of hedgerows, which are a key characteristic of the area, will have an adverse effect on landscape character and the historic landscape. • Loss of hedgerow trees, including high quality mature trees which are a key characteristic of this landscape. • The earthwork activities involved in creating the new road corridor, roundabouts, embankments and cuttings will have a dramatic change in the landscape type and will dominate this predominantly rural landscape. • The creation of large embankments and cuttings will be discordant with the existing, relatively flat landscape. • New urban features being installed such as large lighting columns and highway signage will increase the urban character of this area, particularly in the south-east where these are more concentrated. • A large site compound will be a prominent feature in this flat open landscape and will not be sensitive to the setting. • Construction activity in the area will have a damaging effect on tranquillity and the rural qualities of this area, increasing the urban qualities. • The overbridge at Durdar Road and associated embankments will have an adverse effect due to the curved alignment not fitting the typical linear grid pattern of the rural road network, as well as the elevated nature of the bridge and engineered embankments in this relatively flat landscape. 	<p>These receptors are all considered to be different aspects of the settlement of Durdar and its surrounds and as such the changes to the landscape, reduction of visual amenity and disruption to accessibility for residents are considered to be cumulative impacts upon the settlement.</p>

	<ul style="list-style-type: none"> The construction of three bridges within this character area will have an adverse effect as large vertical urban features of this nature are rare in this flat, open landscape. 	
Footways on Durdar Road (Outdoor Access and Recreation)	Footways closed during construction works with pedestrians diverted to temporary footway adjacent to existing footway. Some disruption with temporary footway surfaces and ramps likely to effect vulnerable pedestrians. The current journey pattern is likely to be maintained, but there will probably be some hindrance to movement.	
Viewpoint 3: Durdar North (Visual Impact)	Loss of visual amenity from removal of existing vegetation, construction works, compound area and lighting.	
Viewpoint 4: Durdar North (Visual Impact)	Loss of visual amenity from removal of existing vegetation, construction works, and lighting.	
Morton		
Sub-urban Carlisle: Urban fringe transport corridor and mixed residential (Landscape Character)	<p>Adverse effects include:</p> <ul style="list-style-type: none"> The construction of 6m high embankments and overbridge will increase the urban character and damage the quality of the landscape in this area, partially creating a visual barrier with the surrounding landscape to the south. The site compound will cause both damage to the agricultural land and will be discordant to the landscape in this area, with increased activity and disturbance. This will lower some of the quality of the landscape. Vegetation loss in this area during construction will be damaging to some of the key features in this character area, including hedgerows boundaries. 	These receptors are all considered to be different aspects of the settlement of Morton and its surrounds and as such the changes to the landscape and reduction of visual amenity are considered to be cumulative impacts upon the settlement.
Viewpoint 7: Morton (Visual Impact)	Loss of visual amenity from removal of existing vegetation, construction works, compound area and lighting.	

Petteril Valley		
<p>Petteril river valley green wedge and transport corridor (Landscape Character)</p>	<p>Adverse effects will include:</p> <ul style="list-style-type: none"> • Loss of vegetation within this green corridor will be damage the quality of this character area. • The introduction of the large earthworks and bridge structures will further damage the natural topography and landform within this open valley. • The site compound will be out of character with the rural nature of this open river valley and pastoral farmland. • Construction activity will increase the connection with the busy M6 transport corridor and damage the special qualities and remaining tranquil nature of this rural, riverside landscape. • An increase in urban features will be discordant from the rural qualities of this landscape. • Loss of vegetation will also have an adverse effect, with the loss of river bank trees and woodland resulting in damaging the character. • Severance and loss of hedgerows, which are a key characteristic of the area, will have an adverse effect on landscape character. • Excavation of new ponds in this area will appear uncharacteristic of a landscape of this type and will appear engineered compared to the river's natural gently meandering course. 	<p>All of these receptors are located within the Petteril Valley, in relatively close proximity. The valley is heavily used by the public for recreation, so the cumulative impacts of restricted/ impeded accessibility, changed landscape character and reduced visual amenity are considered to be a cumulative impact upon users of the valley e.g. walkers, dogwalkers.</p>
<p>Miller's Way Walking Route (Outdoor Access and Recreation)</p>	<p>Route closed during construction of new bridge with pedestrians diverted to an existing path to the east of the Premier Inn Hotel with crossings of the M6 Junction 42 roundabout. Diversion adding 250m incorporating carriageway crossings. Walkers are likely to be dissuaded from making trips to an extent sufficient to induce a change in their habits.</p>	
<p>River Petteril (Outdoor Access and Recreation)</p>	<p>Use of river likely to be restricted during construction of bridge crossing. Some users, are likely to be dissuaded from making trips with trips made longer and less attractive.</p>	

Viewpoint 5: River Petteril Public Right of Way	Loss of visual amenity from removal of existing vegetation, construction works, and lighting.	
Viewpoint 8: Newbiggin Hall Cottages	Loss of visual amenity from removal of existing vegetation, construction works, compound area and lighting.	
Carlisle urban fringe: lowland ridge and valley farmland and transport corridor	<p>Adverse effects include:</p> <ul style="list-style-type: none"> • Damage to the quality of the managed, agricultural landscapes. • Damage to the quality of the hedgerow trees in the area which are key features in this landscape. • Severance and loss of hedgerows, which are a key characteristic of the area, will have an adverse effect on landscape character and the historic landscape. • Severing of rectilinear field patterns will weaken this key characteristic. • Loss of a large proportion of plantation woodland will create a noticeable “scar” in the landscape here. • An increase in urban features and traffic through this character area will have an adverse effect on the rural qualities of this character area. • Broad corridors of earthwork activities, including the creation of new drainage ponds will have damaging effects to landscape quality. • Steeper earthworks connecting to the overbridges will appear discordant with the gently rolling topography of this character area and wider landscape. They will also appear particularly prominent due to them being unvegetated at this phase. 	None of the other receptors with significant residual impacts are considered to be linked to this receptor and as such there are not anticipated to be any intra- project cumulative impacts.
Agricultural Brisco and historic parkland	<p>Adverse effects will include:</p> <ul style="list-style-type: none"> • Construction of a broad road corridor within this open, rural landscape will increase the urban character of this area. • New urban features being installed such as large lighting columns and highway signage will increase the urban character of this area. • The construction of bridge and earthworks within this character area will have an adverse effect as large vertical urban features of this 	None of the other receptors with significant residual impacts are considered to be linked to this receptor and as such there are not anticipated to be any intra- project cumulative impacts.

	<p>nature are rare in this flat, open landscape.</p> <ul style="list-style-type: none"> • The excavations for the drainage pond will add to the damage to the quality of this rural landscape. • Severance and loss of hedgerows, which are a key characteristic of the area, will have an adverse effect on landscape character and the historic landscape. • Loss of individual, mature parkland trees which are key features in this landscape. • Hedgerow trees, including high quality mature trees which are a key characteristic of this landscape. • The scale of the site compounds and road corridor will become a dominant feature within this landscape that is discordance of the typical, rural characteristics of this landscape. • Tranquillity will be reduced due to construction activity. 	
On road cycling on minor roads	<p>6 minor roads affected (Dalston Road, Peter Lane, Newbiggin Road, Durdar Road, Scalegate Road and Brisco Road). Considerable hindrance to cyclists' access during construction with changes to journey patterns and times. Cyclists likely to be redirected onto alternative roads. Durdar Road to be kept open during construction, with construction of new overbridge offset from existing highway. Some people, particularly vulnerable cyclists are likely to be dissuaded from making trips with trips made longer and less attractive.</p>	<p>None of the other receptors with significant residual impacts are considered to be linked to this receptor and as such there are not anticipated to be any intra- project cumulative impacts.</p>
Hydrogeology	<p>Residual adverse effects (during both construction and operational phases) are:</p> <ul style="list-style-type: none"> • Lowering of the groundwater table caused by installation of drains below the existing groundwater level. • Potential contamination from cuttings adjacent to potential sources of leachate. 	<p>None of the other receptors with significant residual impacts are considered to be linked to this receptor and as such there are not anticipated to be any intra- project cumulative impacts.</p>

Table 16.4 Operational phase receptors and residual/ cumulative effects

Receptor	Residual Effect	Potential for Cumulative Effect
Viewpoint 2: Cumbria Way/ NCN7 / River Caldeu (Visual Impact)	Loss of visual amenity from removal of existing vegetation and new highway/ traffic lighting.	These receptors are not linked physically or geographically to any of the other receptors with significant impacts from other topics and as such there are not anticipated to be any intra- project cumulative impacts.
Viewpoint 5: River Petteril Public Right of Way (Visual Impact)	Loss of visual amenity from removal of existing vegetation and new highway/ traffic lighting.	
On road cycling on minor roads (Outdoor Access and Recreation)	<p>Some hindrance to cyclists' access and slight increase in journey times with 3 new roundabouts to cross (Dalston Road, Scalegate Road and Brisco Road).</p> <p>The primary north/south route for cyclists (Durdar Road) retained with minimal impact on journey times.</p> <p>Cyclist access to Newbiggin Road retained between M6 and Durdar village. Cyclist access on Peter Lane to be retained with minimal conflict from vehicles and link to new shared use making it more attractive to vulnerable cyclists. Some residents are likely to be dissuaded from making trips with trips made longer or less attractive.</p>	None of the other receptors with significant residual impacts are considered to be linked to this receptor and as such there are not anticipated to be any intra- project cumulative impacts.
Brisco Hall Farm (Agricultural Land Use)	<p>Loss of 5.62 ha of mixed use grazing/ arable land.</p> <p>Severed fields retain access from Wreay Road and Newbiggin Road via new gates and mitigation accommodation tracks in design, minor severance impact.</p> <p>Significant impact on farm business, but unlikely to threaten viability. Some business restructuring will be required.</p>	The impact of the scheme on farm business viability is not considered to be linked to the other receptors with significant residual impacts and as such there are not anticipated to be any intra- project cumulative impacts.
Durdar Farm (Agricultural Land Use)	<p>Loss of 3.65 ha of grazing land.</p> <p>Access maintained to severed fields via mitigation access points in design, but severance impact remains moderate.</p> <p>Significant impact on farm business, will become unviable.</p>	
High Brownelson Farm (Agricultural Land Use)	Loss of 6.81ha of mixed arable/ grazing land, of which 1.27 ha is due to permanent severance.	

Receptor	Residual Effect	Potential for Cumulative Effect
	<p>Access to land north and south of CSLR retained via accommodation access tracks in design, minor severance impact.</p> <p>Significant impact on farm business, but unlikely to threaten viability. Some business restructuring will be required.</p>	
Durdar House Farm (Agricultural Land Use)	<p>Loss of 5.29 ha of mixed use arable/ grazing land.</p> <p>Access maintained to severed fields from Newbiggen Road and Durdar Road, moderate severance impact.</p> <p>Significant impact on farm business, but unlikely to threaten viability. Some business restructuring will be required.</p>	
Peastree Farm (Agricultural Land Use)	<p>Loss of 7.59 ha of grazing land.</p> <p>Access retained to severed areas via accommodation bridge, underpass and gates, moderate severance impact.</p> <p>Significant impact on farm business, but unlikely to threaten viability. Some business restructuring will be required.</p>	
Hydrogeology (Geology and soils)	<p>Residual adverse effects (during both construction and operational phases) are:</p> <ul style="list-style-type: none"> Lowering of the groundwater table caused by installation of drains below the existing groundwater level. Potential contamination from cuttings adjacent to potential sources of leachate. 	None of the other receptors with significant residual impacts are considered to be linked to this receptor and as such there are not anticipated to be any intra- project cumulative impacts.
Badgers (Nature Conservation)	Operational phase lighting spilling beyond the road decking at Langdale and the Piggeries, between Durdar Road and Scalegate Road Roundabout, and Durdar Roundabout and Ashtip Wood will discourage badgers from using known commuting and foraging corridors.	As the impacts upon these receptors and the (mobile) receptors themselves are distributed across the site, it is not considered appropriate to link to other receptors geographically and as such there are not anticipated to be any intra- project cumulative impacts.
Bats (Nature Conservation)	Operational phase lighting spilling beyond the road decking at the River Petteril, Langdale and the Piggeries, between Durdar Road and Scalegate Road Roundabout, and Ashtip Wood is anticipated to cause fragmentation of commuting and foraging corridors.	

Receptor	Residual Effect	Potential for Cumulative Effect
Breeding Birds (Nature Conservation)	Operational phase lighting specifically in areas around the River Petteril will deter birds from roosting, and forming nests in these areas due to increased risk of predation. Furthermore, it may alter breeding behaviour, reducing the risk of successful breeding.	
Wintering Birds (Nature Conservation)	Operational lighting specifically in areas to the South of Newbiggin Road, and around the River Petteril may deter birds from using the area due to increased risk of predation.	

Table 16.5 Matrix of intra- project cumulative effects

Environmental Topics	Air Quality	Cultural Heritage	Nature Conservation	Landscape Character				Visual Impacts			Noise & Vibration	Land-Use: Agricultural	Outdoor Access & Recreation		Water Environment	Geology & Soils		Significance
				Disturbance from operational phase lighting	Construction of highway and associated earthworks	Construction activities and site compounds	Field pattern damage/ loss	Increase in urban features and traffic	Vegetation damage/ loss	Construction lighting			Carriageway/ vehicle lighting	Farm Viability		Temporary route closure	Changes to journey patterns/ times	
Construction																		
Caldew Valley	/	/	-	○	○	/	/	○	○	/	/	/	○	○	/	/	/	Moderate adverse effect
Cummersdale	/	/	-	○	○	/	○	○	○	/	/	/	/	/	/	/	/	Minor adverse effect
Durdar	/	/	-	○	○	○	○	○	○	/	/	/	○	/	/	/	/	Moderate adverse effect
Morton	/	/	-	○	○	/	/	○	○	/	/	/	/	/	/	/	/	Minor adverse effect
Petteril Valley	/	/	-	○	○	/	○	○	○	/	/	/	○	○	/	/	/	Moderate adverse effect
Carlisle urban fringe: lowland ridge and valley farmland and transport corridor	/	/	-	/	/	○	○	○	/	/	/	/	/	/	/	/	/	No cumulative effects
Agricultural Brisco and historic parkland	/	/	-	○	/	/	○	○	/	/	/	/	/	/	/	/	/	No cumulative effects
On road cycling on minor roads	/	/	-	/	/	/	/	/	/	/	/	/	/	○	/	/	/	No cumulative effects
Hydrogeology	/	/	-	/	/	/	/	/	/	/	/	/	/	/	/	○	○	No cumulative effects
Operation																		
Brisco Hall Farm	/	/	/	/	/	/	/	/	-	/	/	○	/	/	/	/	/	No cumulative effects
Durdar Farm	/	/	/	/	/	/	/	/	-	/	/	○	/	/	/	/	/	No cumulative effects
High Brownelson Farm	/	/	/	/	/	/	/	/	-	/	/	○	/	/	/	/	/	No cumulative effects
Durdar House Farm	/	/	/	/	/	/	/	/	-	/	/	○	/	/	/	/	/	No cumulative effects
Peastree Farm	/	/	/	/	/	/	/	/	-	/	/	○	/	/	/	/	/	No cumulative effects
Viewpoint 2. Cumbria Way/ NCN7 / River Caldew	/	/	/	/	/	/	/	○	-	○	/	-	/	/	/	/	/	No cumulative effects
Viewpoint 5. River Petteril	/	/	/	/	/	/	/	○	-	○	/	-	/	/	/	/	/	No cumulative effects

Environmental Topics	Air Quality	Cultural Heritage	Nature Conservation	Landscape Character				Visual Impacts			Noise & Vibration	Land-Use: Agricultural	Outdoor Access & Recreation		Water Environment	Geology & Soils		Significance	
Sub-Topics (if applicable)			Disturbance from operational phase lighting	Construction of highway and associated earthworks	Construction activities and site compounds	Field pattern damage/loss	Increase in urban features and traffic	Vegetation damage/loss	Construction lighting	Carriageway/vehicle lighting		Farm Viability	Temporary route closure	Changes to journey patterns/times		Lowering of groundwater table	Potential contamination from leachate sources		
Public Right of Way																			
On road cycling on minor roads	/	/	/	/	/	/	/	/	-	/	/	-	/	○	/	/	/	No cumulative effects	
Hydrogeology	/	/	/	/	/	/	/	/	-	/	/	-	/	/	/	○	○	No cumulative effects	
Badgers	/	/	○	/	/	/	/	/	-	/	/	-	/	/	/	/	/	No cumulative effects	
Bats	/	/	○	/	/	/	/	/	-	/	/	-	/	/	/	/	/	No cumulative effects	
Breeding birds	/	/	○	/	/	/	/	/	-	/	/	-	/	/	/	/	/	No cumulative effects	
Wintering birds	/	/	○	/	/	/	/	/	-	/	/	-	/	/	/	/	/	No cumulative effects	

○ - Negative effect ● - Positive effect / - No effects / neutral Effects -- Not applicable/ Receptors not assessed

16.5 Summary

16.5.1 During the construction phase, cumulative impacts will affect five geographic receptors as a result of the CSLR scheme:

- The Caldew Valley, Durdar and Petteril Valley – each receive a moderate adverse impact from the cumulative effects of changes to landscape character, visual amenity and outdoor access and recreation
- Cummersdale and Morton – each receive a minor adverse impact from the cumulative effects of changes to landscape character and visual amenity.

16.5.2 The assessment has not identified any intra-project cumulative effects during the operation phase.

Part Three Summary and Conclusions

CAPITA

17 Summary and Conclusions

17.1 Introduction

- 17.1.1 This chapter provides a summary of the significant residual effects associated with the operation of the proposed Scheme under each relevant individual assessment topic covered by the EIA at Stage 3.
- 17.1.2 The chapter also draws overall conclusions for the environmental implications of the Scheme based on the identified likely significant effects.

17.2 Summary of Residual Effects

Visual Impact

- 17.2.1 Overall it is anticipated that there will be a slight adverse residual effect as a result of the Scheme at the year 15 assessment, following the maturation of landscape mitigation. This assessment is based on the residual effects noted at the year 15 assessment.
- 17.2.2 However, prior to the establishment of the landscape mitigation the localised loss of vegetation, intrusion of manmade structures and the presence of lighting in the Caldew and Petteril river valleys (Viewpoints 2 and 5 respectively), will carry a moderate adverse impact on visual amenity at these locations.

Nature Conservation

- 17.2.3 Overall, the only significant adverse effects on biodiversity from the Scheme once all mitigation, compensation and enhancement are implemented, will be during the operational phase resulting from lighting on bats, badgers, otters and birds. However, these impacts can potentially be reduced during the design stage with minor changes to the lighting design proposals in the key areas where impact have been identified.
- 17.2.4 The total habitat loss resulting from the Scheme has been calculated at 89.24ha, of which 60.46ha is arable fields and improved grassland, which are of relatively low ecological value to many taxa. The Landscape Design Plans indicate approximately 91.16ha of new habitat will be created including 10.33ha of species rich native meadows and 23.33ha of native woodland planting. Overall the scheme will improve the east west connectivity of habitats and provide an increase in diversity and abundance of certain habitats above the current baseline conditions.

Agricultural Land Use

- 17.2.5 Overall there will be no significant residual effect on agriculture at the national and regional level. Locally there will be a moderate adverse residual effect. The following paragraphs describe significant impacts on farms local to the Scheme.
- 17.2.6 The construction of the Scheme will result in loss of 5.62 ha of mixed-use grazing/arable land for Brisco Hall Farm. To ensure severed fields will retain access from Wreay Road and Newbiggin Road through the operation of the Scheme mitigation has been embedded into the design to include new gates and accommodation tracks, resulting in a minor severance impact. A moderate adverse residual effect on Brisco Hall Farm remains and whilst some business restructuring will be required, it is unlikely to threaten viability.
- 17.2.7 The Scheme will also result in a loss of 3.65 ha of grazing land from Durdar Farm. Access will be maintained to severed fields via mitigation access points embedded in

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the design however the impact remains moderate adverse. Residual effects on Durdar Farm are major adverse residual effect and the farm will become unviable.

- 17.2.8 The construction of the Scheme will result in loss of 6.81 ha of mixed arable/ grazing land, of which 1.27 ha is due to permanent severance, at High Brownelson Farm. Access to land north and south of the Scheme is retained via accommodation access tracks in design. Overall there will be a moderate adverse residual effect on High Brownelson Farm and whilst some business restructuring will be required, it is unlikely to threaten viability.
- 17.2.9 An overall moderate adverse residual effect on Durdar House Farm will result and whilst some business restructuring will be required, it is unlikely to threaten viability.
- 17.2.10 The construction of the Scheme will result in loss of loss of 7.59 ha of grazing land at Peastree Farm, Access will be retained to severed areas via an accommodation bridge, underpass and gates. An overall moderate adverse residual effect on Peastree Farm will result and whilst some business restructuring will be required, it is unlikely to threaten viability.

Outdoor Access and Recreation

- 17.2.11 Overall there will be a major beneficial residual effect on outdoor access and recreation associated with the implementation of the Scheme, however, implementation of the Scheme will result in hindrance to cyclists' access to existing routes and a slight increase in journey times with three new roundabouts to cross; Dalston Road, Sclegate Road and Brisco Road. The primary north/south route for cyclists, Durdar Road, is retained with minimal impact on journey times and cyclist access to Newbiggin Road retained between Junction 42 of the M6 and Durdar village, although, some residents are likely to be dissuaded from making trips which have been made longer or less attractive.

17.3 Mitigation Schedule

- 17.3.1 A variety of mitigation measures have been identified to minimise the likely significant effects of the Scheme for each of the topic assessments. These are discussed in the relevant topic chapters.
- 17.3.2 A Mitigation Schedule has been compiled which brings together all of the proposed measures. This is provided in Appendix 17.1. A set of companion plans that illustrate the measures and their location are provided in Figures 17.1, 17.2 and 17.3.

17.4 Conclusions

- 17.4.1 The Scheme has been designed to provide enhanced connectivity between the M6 and the area to the west of Carlisle whilst reducing congestion within Carlisle city. It will have a positive effect on the vehicular and non-vehicular connectivity of the wider area and will facilitate future development for the region such as Cuthbert's Garden Village as identified in Carlisle City Council's Local Development Plan 2015-2030.
- 17.4.2 The Scheme is in-line with government policy and the principles embedded in NPPF to enhance connectivity and provide sustainable transport infrastructure through the provision of a Public Right of Way (PRoW) along its entire length for walkers and cyclists. The shared user path will link pre-existing PRoW further enhancing the interconnectivity and amenity value of settlements in the area.
- 17.4.3 Consultations with statutory consultees, land owners, interest groups and local residents have shaped the design of the Scheme. As a result, changes to alignment, infrastructure, mitigation and enhancement have been incorporated. Examples of this

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include reshaping of embankments, changes to location and form of infrastructure and its connectivity with landscape features and amendments to the composition and distribution of mitigation planting.

- 17.4.4 There will be significant impacts associated with the construction phase of the project; however, these will be temporary in nature and managed through mitigation and best practice working methods which will be detailed in a Construction Environmental Management Plan (CEMP). Once approved, the implementation of the CEMP will be monitored throughout the construction of the Scheme by a qualified Environmental Clerk of Works.
- 17.4.5 Operational residual effects include: a moderate adverse effect on farm businesses at a local level (although this effect is not replicated at a regional or national level) and a slight adverse effect reduction in visual amenity, primarily relating to viewpoints in the Caldew and Petteril river valleys. The remainder of the assessment topics have concluded no likely significant adverse effects or net positive environmental effects, for the respective receptors assessed, as a result of the development of the Scheme.
- 17.4.6 This EIA has been undertaken to support the application for outline planning consent for the Scheme. Where any uncertainty exists for any given topic, a 'worst case' has been assumed and assessed. As such this creates a 'Rochdale Envelope' for the Scheme. Opportunities exist to refine the Scheme during the detailed design stage where it may be possible to further mitigate or otherwise reduce the potential impacts from those reported in this ES.
- 17.4.7 Notwithstanding the above, taking into account all the predicted environmental impacts arising from the construction and operation of the Scheme, together with the committed mitigation measures, it is considered there are no residual effects of such significance that would preclude the Scheme from being taken forward.