

M5 Junction 10 Improvements Scheme

**Preliminary Environmental Information
Report (PEIR)**

Non-technical summary

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Notice

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1. Non-technical summary

1.1. Introduction

1.1.1. This document provides a Non-Technical Summary (NTS) of the Preliminary Environmental Information Report (PEIR) that has been produced for the M5 Junction 10 Improvements Scheme (the 'Scheme'). Within this summary report:

- Section 1.2 – presents details of the Scheme and its key infrastructure elements.
- Section 1.3 – sets out the purpose and structure of the PEIR.
- Section 1.4 – provides a summary of the environment in which the Scheme is located.
- Section 1.5 – summarises the assessments undertaken and the current preliminary findings for each environmental topic, including the relevant environments that may be affected, and how potential effects will be minimised or mitigated.
- Section 2 – provides a glossary of the technical terms and abbreviations used.

1.2. The Scheme

1.2.1. New housing and employment sites are proposed for development close to Junction 10 on the M5, including the west and north-west Cheltenham developments. To unlock these housing and job opportunities, there is a need to ensure that there is sufficient highway capacity to accommodate the increased motorised and non-motorised traffic these developments will generate. There is also a need to address existing pressure on the local highway network.

1.2.2. Several of Gloucestershire County Council's policy documents have identified improvements to Junction 10 on the M5 as a key component for delivering new housing and improvements sites for development to the west of Cheltenham.

1.2.3. Cheltenham currently experiences significant congestion at peak times, which has led to air quality issues at various locations across the town and led to the creation of an Air Quality Management Area (AQMA) within Cheltenham. The existing M5 Junction 10 only provides access and egress to and from the north, with no connectivity to M5 south. This drives existing traffic across Cheltenham through various routes to access and leave the M5 from the south, which contributes significantly to existing traffic flows in the town. To unlock the housing and job opportunities, a highways network is needed that has the capacity to accommodate the increased traffic it will generate, within a sustainable transport context.

1.2.4. An all-movements junction has been identified as a key infrastructure requirement, needed to enable the housing and economic development proposed by the Gloucestershire Local Enterprise Partnership's Strategic Economic Plan¹. It is also central to the transport network sought by the Council in our adopted Gloucestershire Local Transport Plan².

1.2.5. The planned housing and economic growth have been included by Cheltenham Borough, Tewkesbury Borough and Gloucester City Councils in the adopted Joint Core Strategy³.

1.2.6. In their Birmingham to Exeter Route Strategy, National Highways has also identified that improvements to M5 Junction 10 are a critical requirement to maintain the safe and efficient operation of the M5 corridor, whilst enabling the planned development and economic growth around Cheltenham, Gloucester, and Tewkesbury.

1.2.7. Gloucestershire County Council secured £249 million from Homes England for the Scheme in March 2020. Work has continued since the March 2020 announcement to

¹ www.gfirstlep.com/about-us/our-vision/strategic-economic-plan

² Gloucestershire LTP (2020-2041) - Gloucestershire County Council

³ www.jointcorestrategy.org

produce a preferred layout, which is the subject of this PEIR. The funding from Homes England has been ring-fenced for this purpose, so cannot be spent on other projects.

- 1.2.8. This Scheme is categorised as a Nationally Significant Infrastructure Project (NSIP) under the Planning Act 2008. As such, we're required to make an application for a Development Consent Order (DCO) to obtain planning permission to construct the Scheme rather than the traditional route of applying for planning permission, under the Town and Country Planning Act 1990, from the local planning authorities. For more information on this process, please visit: <http://infrastructure.planninginspectorate.gov.uk/>

Scheme objectives

- 1.2.9. The objectives for the Scheme are:
- Support economic growth and facilitate growth in jobs and housing by providing improved transport network connections in west and north-west Cheltenham.
 - Enhance the transport network in the west and north-west of Cheltenham area with the resilience to meet current and future needs.
 - Improve the connectivity between the Strategic Road Network (SRN) and the local transport network in west and north-west Cheltenham.
 - Deliver a package of measures which is in keeping with the local environment, establishes biodiversity net gain and meets climate change requirements.
 - Provide safe access to services for the local community and including for users of sustainable transport modes within and to west and north-west Cheltenham.

Scheme location

- 1.2.10. The location of the infrastructure improvements that make up the M5 Junction 10 Improvements Scheme are illustrated in Figure 1-1 below, as well as the proposed development sites (north-west Cheltenham and west Cheltenham) and the land safeguarded for development.



Figure 1-1 - Location of the Scheme and the component elements (Junction 10, A4019 and Link Road), and the proposed development sites

1.3. The Preliminary Environmental Information Report (PEIR)

- 1.3.1. The purpose of the PEIR is to enable consultees from the community and consultation bodies to understand the potential environmental effects of the Scheme. The effects have been predicted at this time for each environmental assessment topic (for example Air Quality and Biodiversity), to inform consultees as part of the statutory consultation stage.
- 1.3.2. The PEIR provides an initial account of the main environmental issues and may be subject to change as the Environmental Impact Assessment (EIA) of the Scheme progresses. The PEIR describes the known information available for the current Scheme, at this preliminary design stage and their environmental effects, timescales for delivery, and the alternatives that have been considered, as well as a number of uncertainties and assumptions. The PEIR will be updated next year to produce the Environmental Statement (ES), which will be submitted as part of the DCO.
- 1.3.3. For each environmental topic, the PEIR:
- Describes the study area and environmental baseline data collection work undertaken to date;
 - Identifies further work that is ongoing or that is likely to be undertaken to complete the EIA;
 - Provides an assessment of the likely environmental impacts of the Scheme based

on the current available information; and

- Describes the range of mitigation measures that will be considered to avoid, reduce, mitigate, or offset the identified environmental effect caused.

1.3.4. The design stage on which the assessment in this PEIR is based is referred to as the Design Fix 2 (DF2) stage. DF2 is the design plan that will be presented at the statutory consultation in late 2021. DF2 has been produced as a result of feedback received from our non-statutory consultation, held in late 2020, and following further work by our design team. The DF2 design builds on the Operational Concept design that was confirmed at Design Fix 1 (DF1) in February 2021.

1.3.5. Following the statutory consultation (winter 2021/2022), the DF2 design will be developed further to Design Fix 3 (DF3) stage. The DF3 stage will confirm the design of the Scheme (as set out in DF2) and capture any changes associated with further environmental assessments and design considerations, as well as feedback provided from the statutory consultation. The DF3 design represents the final Scheme proposal that will be submitted as part of our planning application. The ES will be produced in summer 2022 and will present the assessment of this DF3 design.

1.3.6. A precautionary approach has been applied to the assessment undertaken at this stage, so that the assessment detailed in the PEIR (and this NTS) is considered to present a 'worst case' scenario of the extent and impacts of the Scheme at this stage.

Structure of the PEIR

1.3.7. For the purposes of the statutory consultation, the PEIR is presented as separate volumes covering each of the environmental assessment topics (with supporting appendices). The structure of the PEIR, the topics, and key appendices covered is presented below:

- Non-technical summary
- Chapters 1-4 comprising Introduction, a Description of the Scheme, the Assessment of Alternatives, and the Environmental Assessment Methodology applied.
 - Appendix 2.1 – DF2 design figures
 - Appendix 2.2 – DF2 landscape design figures
- Chapter 5 – Air Quality
- Chapter 6 – Noise and Vibration
- Chapter 7 – Biodiversity
 - Appendix 7.1 – Phase 1 habitat survey
 - Appendices 7.2 – 7.12 – Protected species survey reports
 - Appendix 7.13 – Habitats Regulations Assessment
- Chapter 8 – Road Drainage and the Water Environment
 - Appendix 8.1 – Flood Risk Assessment (FRA)
 - Appendix 8.2 - Water Framework Directive (WFD) Compliance Assessment
- Chapter 9 – Landscape and Visual Impact
- Chapter 10 – Geology and Soils
- Chapter 11 – Cultural Heritage
- Chapter 12 – Materials and Waste
- Chapter 13 – Population and Human Health
- Chapter 14 – Climate – covering the effects of the Scheme on climate change, and an assessment of the vulnerability of the Scheme to climate change.
- Chapter 15 – Cumulative Effects Assessment

1.4. Summary of the surrounding environment

- 1.4.1. This section provides a summary of the environment within which the Scheme is located.
- 1.4.2. The area surrounding the Scheme includes a variety of different land uses, and whilst predominantly rural, there are clusters of residential properties throughout the area. Many of these lie within existing Noise Important Areas (NIAs) which have been designated due to traffic on the A4019 Tewkesbury Road. There are statutory Air Quality Management Areas (AQMAs) designated in Tewkesbury town centre and Cheltenham town centre. The majority of the Scheme lies within land designated as Green Belt.
- 1.4.3. The Scheme is located within an existing floodplain, and multiple watercourses cross the Scheme area, (notably the River Chelt, Leigh Brook, and River Swilgate) running from east to west, before draining into the River Severn (at least 7.5 km downstream of the Scheme).
- 1.4.4. Farmland (arable and grassland) represent the main habitats present. These are mixed with pockets of woodland, traditional orchards, and grassland. Along with the watercourses of the River Chelt, Leigh Brook and River Swilgate, these pockets of habitat provide the locations of greater nature conservation value within the Scheme area. There is confirmed evidence and records for the presence of protected and notable species within the Scheme area, including bats, badgers, otters, great crested newts, terrestrial invertebrates and 31 species of birds. There are therefore opportunities available to enhance the value of land within the Scheme area, for species biodiversity.
- 1.4.5. Whilst there are no locations designated for nature conservation at a national or international level that are adjacent to or overlapped by the Scheme, there are the following sites within the wider area:
- Severn Estuary SPA, SAC and Ramsar site (23 km south-west of the Scheme and Walmore Common SPA (17.5 km south-west of the Scheme), both designated for their internationally important populations of wintering wildfowl, including Bewick's swan and shelduck;
 - Bredon Hill (12.5 km to the north-east of the Scheme) is designated as a SAC for its internationally important population of violet click beetle;
 - Wye Valley and Forest of Dean SAC (21 km south-west of the Scheme) is designated for bats; and
 - Coombe Hill Canal SSSI (located 1.9 km west of the Scheme) is a disused canal designated for its groups of nationally rare and scarce invertebrates and nationally scarce plants.
- 1.4.6. Land just south of the A4019 and extending either side of the existing M5 Junction 10, is a floodplain for the River Chelt with a medium and high probability of flooding. To the immediate north of the A4019 is the floodplain of the Leigh Brook. There is also land in the floodplain of the River Swilgate (and the Dean Brook that feeds into it) near Stoke Orchard, to the north-east of M5 Junction 10. All parts of the Scheme are likely to have an element of increased flood risk, which therefore has required appropriate mitigation to be included in the design, such as the flood mitigation structures under the Link Road.
- 1.4.7. There are 31 designated heritage assets within the Scheme area and a further 65 non-designated heritage assets. The most notable of these are the Moat House, a moated site adjacent to the A4019, which is a Scheduled Monument, and the Grade 1 listed Chapel of St James the Great in Stoke Orchard. Previous investigations have identified the likelihood of buried archaeology across the Scheme area.

1.5. Summary of the preliminary environmental design

- 1.5.1. This section provides a summary of the key aims of the preliminary environmental design for the Scheme, and the features that have been included in the design at this stage to minimise the impacts of the Scheme to the environment (including people).
- 1.5.2. The key aspirations of the preliminary environmental design for the Scheme are:

- Ensure the design of the infrastructure components of the Scheme minimises direct impacts to the environment;
- Avoid the loss or damage to hedgerows, woodland and individual trees as far as possible by refining alignments of the Scheme elements;
- Retain or replace vegetation that contributes to the landscape character of the area, that is visually appealing and provides screening. In particular:
 - Replace woodland along the M5 corridor and the junction, for visual appeal and screening;
 - Add boundary hedgerow with occasional trees with wildflower grass to verges along the A4019 Tewkesbury Road and the Link Road. New woodland plots to be added along the Link Road where greater density of screening may be required;
 - The central reserves of the A4019 Tewkesbury Road to be wildflower grass seeded and with individual trees planted where safe and feasible; and
 - Slightly more formal planting towards the Gallagher Retail Park on A4019.
- Use planting to assist in integrating M5 Junction 10, the widened A4019 and the Link Road into the landscape;
- Retain, replace and enhance habitats for biodiversity and visual amenity value, so as to provide habitat corridors along the Scheme;
- Planting to be varied, species rich, non-invasive, and tolerant of climate change;
- Ensure the Scheme does not block the movement of wildlife through the provision of wildlife crossing points; and
- Retention of existing facilities for active travel, including bus stops and public rights of ways. The public footpaths between Uckington and Withybridge Lane, to the north of the River Chelt will be re-routed to cross the Link Road under the new River Chelt bridge for example.

1.5.3. The key features included in the preliminary (DF2) design to minimise impacts of the operation of the Scheme to the environment (including people) are:

- A segregated cycleway and footway along the northern side of the A4019 Tewkesbury Road, and extending for the full length of the Scheme, and along the Link Road, thereby providing improved facilities for cyclists and pedestrians and reducing reliance on vehicles for all journeys;
- The creation of new service roads to provide safe access to properties along the A4019 Tewkesbury Road;
- The new bridge over the River Chelt will be a single span structure (over the river) which means there will be no direct impacts of the bridge to the river and its banks;
- The embankments on the M5 at the point where the River Chelt passes under the motorway have been designed so, that the existing tunnel does not require extending on either side of the motorway, so that no more of the River Chelt is culverted;
- A series of culverts under the Link Road (to the north of the River Chelt bridge) so that the new Link Road does not impede the movement of floodwater across this area;
- Wildlife crossing points for bats (on the A4019) and badgers or otters (tunnels under the A4019 and Link Road); and
- The inclusion of noise mitigation barriers within the Scheme area, where such features would reduce noise levels in existing NIAs or reduce noise levels where noise levels are modelled to exceed the Significant Observed Adverse Effect Level (SOAEL).

1.6. Environmental assessment

1.6.1. This section summarises the preliminary environmental assessments presented in the PEIR for each of the topics. For each topic, a summary is provided of:

- What the existing environment is like for that topic (the baseline environment);
- What aspects of the Scheme will impact on that topic;
- What are the key environmental features (receptors) that will potentially be affected for that topic; and
- How the effects to the environment caused by the Scheme are being mitigated.

Air Quality

1.6.2. The air quality topic provides a preliminary assessment of the potential effects related to the construction and operation of the Scheme on the levels of pollutants in the air, both during construction and in operation, as a result of construction activities and road traffic.

1.6.3. The Scheme will provide the necessary infrastructure to support the planned development areas proposed by the Gloucestershire Local Enterprise Partnership's (GFirst LEP) Strategic Economic Plan. For this reason, the air quality, and the noise and vibration assessments have considered the potential impacts of the Scheme on its own, and the Scheme with these developments in use.

1.6.4. The key air quality pollutants of concern in the UK are nitrogen dioxide and particulate matter. Areas where air pollutant concentrations exceed UK air quality strategy objectives are designated as Air Quality Management Areas (AQMAs) by local authorities. There are AQMAs located within the closest town centres at central Cheltenham and in Tewkesbury town centre.

1.6.5. The Scheme has the potential to affect air quality both during construction and once the Scheme is complete and operational.

1.6.6. Any air quality impacts due to construction would be temporary and are expected to be minimised by the application of best practice and appropriate mitigation measures. With the adoption of suitable and proportionate mitigation, there is unlikely to be a significant effect on air quality from construction activities.

1.6.7. In operation, the redesign of the M5 Junction 10 will result in a redistribution of traffic on the existing road network. In addition, the developments unlocked by the Scheme will lead to an increase in traffic on the road network. However, the assessments undertaken at this stage show that the Scheme will not result in a significant effect on air quality.

Noise and Vibration

1.6.8. The noise and vibration topic provides a preliminary assessment of the potential effects related to the construction and operation of the Scheme on the potential noise and vibration impacts related to the construction and operation of the Scheme.

1.6.9. The dominant source of noise close to the Scheme is road traffic noise, generated primarily from vehicles using the M5 and the A4019 Tewkesbury Road.

1.6.10. There are eight NIAs within or close to the Scheme. These are areas where 1% of the population are affected by the highest noise levels from major roads and are designated according to the strategic noise mapping undertaken by Department for Environment, Food, and Rural Affairs (DEFRA).

1.6.11. The Scheme has the potential to have an impact on noise during its construction and operation. The construction noise impact will be dependent on the construction methods used, and the proximity of the works to residential properties and other noise sensitive buildings.

1.6.12. Once the Scheme is complete, the noise levels in the area could be affected by changes in traffic flows, speeds and composition. The biggest changes in noise levels are expected at the M5 Junction 10, the A4019 Tewkesbury Road and the Link Road where changes

in road layouts, as well as traffic flows, will contribute to the changes in noise levels experienced by receptors. Properties which are closer to the road are likely to experience an increase in noise, with those further away likely to experience a decrease.

- 1.6.13. In addition, there are likely to be changes in noise due to the traffic alone. On roads, such as Princess Elizabeth Way in Cheltenham, the traffic that would have travelled through the town will be able to enter onto, and exit from, the south of the M5 at Junction 10, thus reducing traffic, and therefore noise, along Princess Elizabeth Way. In contrast, the traffic from other areas will be drawn to Junction 10 and will increase the traffic on local roads, such as Stoke Road.
- 1.6.14. The potential impacts of noise during the construction stage will be minimised through the implementation of best practice measures during construction, and the siting of construction compounds away from properties where possible. During construction, local residents will be kept informed of the progress of the works, and when the noisiest activities will be taking place.
- 1.6.15. Noise barriers have been proposed within the NIAs to reduce noise impacts of the Scheme during operation. New road surfacing (that is free from potholes and other wear and tear) throughout the Scheme will also reduce noise and vibration levels from traffic during operation.

Biodiversity

- 1.6.16. The biodiversity topic provides a preliminary assessment of the potential effects related to the construction and operation of the Scheme on protected species and habitats. The assessment presented in the PEIR is based on the findings from desk study and field surveys. The purpose of the desk study and surveys is to:
- Ensure a robust baseline is established;
 - Enable refinement of the assessment;
 - Ensure that mitigation proposals are robust; and
 - Ensure that any biodiversity net gain targets are met.
- 1.6.17. Whilst there are no sites designated for nature conservation at a national or international level that are adjacent to or overlapped by the Scheme, there are a number of designated sites approximately 2 km or further away from the Scheme (described in Section 1.4 above). No non-statutory designated sites for nature conservation have been identified within the Scheme area.
- 1.6.18. There are a variety of habitats within 250 m of the Scheme, notably large fields and grassland, mixed with broadleaved and mixed woodland, traditional orchards, hedgerows and surface watercourses (rivers, streams and ditches).
- 1.6.19. The habitats within the Scheme have the potential to support protected species, in particular bats, badger, birds, otter and aquatic invertebrates. Extensive surveys have been undertaken to confirm the presence of populations of these (and other) protected species within or close to the Scheme, and other species that make use of the habitats within the Scheme, for foraging or travelling to other habitats.
- 1.6.20. During construction of the Scheme, the potential impacts to the species and habitats present include the physical loss of habitats (particularly from the construction of the new Link Road), or damage and fragmentation of habitats during site clearance works, and construction activities. During the operation of the Scheme, effects may occur as a result of traffic and the presence of new areas of street lighting.
- 1.6.21. These potential effects will be minimised through a design that will seek to reduce land take (both permanent and temporary) where possible and avoid losses of key features, such as hedgerows and woodlands. The new River Chelt bridge is designed specifically so that it crosses the river in a single span and does not impact directly onto the river channel. The design includes mitigation measures such as underpasses for badgers and otters under the Link Road and has a lighting design that avoids light spill outside of the road, in the sections of the Scheme that have lighting. The new drainage system and the

flood storage area designed for the Scheme are expected to result in the creation of new habitats.

- 1.6.22. At construction stage the effects on biodiversity will be minimised through the application of best practice environmental management, so that damage to habitats, soils and water quality are avoided where possible.

Road Drainage and the Water Environment

- 1.6.23. The road drainage and water environment topic provides a preliminary assessment of the potential effects related to the construction and operation of the Scheme on surface watercourses and groundwater. Flood risk is also considered in this topic, with both the effects of flood risk to the Scheme, and the effects of the Scheme to creating a flood risk further downstream, being considered.
- 1.6.24. Surface watercourses within the Scheme area generally flow from east to west and are located within the Severn River Basin District (RBD), as set out in the Severn River Basin Management Plan (RBMP).
- 1.6.25. There are five surface waterbodies that have been considered in this topic, namely the River Chelt, Leigh Brook, River Swilgate, Hatherley Brook and the River Severn. There are also a number of other smaller existing field drains, ponds, areas of springs and unnamed streams.
- 1.6.26. The Scheme area is underlain by two groundwater bodies, both of which are designated as Secondary Aquifers by the Environment Agency. These are the Charmouth Mudstone Formation bedrock in the east and the Rugby Limestone Member in the west.
- 1.6.27. The Scheme is located within an existing floodplain, and includes areas classified as having a medium probability and a high probability of flooding.
- 1.6.28. Impacts from the Scheme to the water environment may occur during both construction and the operation of the Scheme.
- 1.6.29. Construction activities have the potential to affect the water environment through the following:
- The excavation of materials, and the subsequent deposition of soils, sediment, or other construction materials;
 - Runoff from construction sites to surface water bodies;
 - The creation of temporary construction sites within the floodplain; and
 - Excavations changing groundwater flows.
- 1.6.30. The effects of these will be minimised through the application of best practice mitigation measures to manage construction activities, and the creation of floodplain compensation areas to allow for the temporary loss of floodplain caused by the creation of construction sites within the floodplain.
- 1.6.31. When constructed, the Scheme has the potential to change road runoff levels and therefore affect water quality. The creation of new roads within the floodplain has the potential to change the flood risk, elsewhere in the area.
- 1.6.32. The potential effects to water quality will be minimised through a drainage design that uses sustainable drainage systems, so that all water from the road surfaces is captured and treated before release into watercourses. The effects of the Scheme on flooding will be minimised through the inclusion of mitigation measures within the design, including a series of tunnels (culverts) under part of the new Link Road, and the creation a flood storage basin between the M5 motorway and Withybridge Lane. These will ensure that the new road does not block the movement of flood water, and reduce the Scheme causing further flooding.

Landscape and Visual Impact

- 1.6.33. The landscape and visual impact topic provides a preliminary assessment of the potential effects related to the construction and operation of the Scheme on how the Scheme will affect the landscape and particular views within the land surrounding the Scheme.
- 1.6.34. The landscape within the Scheme area is a gently undulating landscape, featuring a mixture of arable and grass fields. The M5 forms a major feature through the landscape, although this major transport corridor is often well screened in places by vegetation aligning the route. The A4019 at the junction with the M5 is raised up quite high above the surrounding landscape and although there is substantial vegetation to provide screening, views to the west are possible. The majority of the A4019 Tewkesbury Road is bordered by low field hedgerows, allowing open views across the landscape. To the east of Uckington the A4019 Tewkesbury Road becomes more enclosed by residential and community properties, and associated perimeter vegetation, becoming urban in character with retail and business parks appearing on the approach to the A4019 junction with the B4634. To the west of Uckington the carriageway is unlit, but to the east side it is lit on the approach to the outskirts of Cheltenham.
- 1.6.35. The majority of the Scheme lies within land designated as Green Belt. There are no other landscape designations for land within the Scheme area.
- 1.6.36. Impacts to landscape or visual amenity are likely to occur during the construction and operation of the Scheme, as a consequence of the construction and presence of the new infrastructure components that make up the Scheme.
- 1.6.37. To reduce effects during construction, the design will be developed to minimise the construction footprint and amount of vegetation clearance required. Sensitive working practices will be undertaken to protect adjacent vegetation. The lighting design would seek to minimise light pollution, and links to public footpaths will be reinstated and created (where severance or diversion has resulted from the Scheme construction).
- 1.6.38. To minimise the effects of the completed Scheme on the landscape, a preliminary landscape design has been developed with the objective of embedding the new Scheme into the landscape, using vegetation that contributes to the landscape character and/or is visually appealing and provides screening, to be retained or replaced. All new planting will be varied, species rich, non-invasive, and tolerant of climate change.

Geology and Soils

- 1.6.39. The geology and soils topic provides a preliminary assessment of the potential effects related to the construction and operation of the Scheme on the ground beneath the Scheme, and on agricultural land and soils, and potential effects from soil and ground contamination on human health, surface water and groundwater.
- 1.6.40. Charmouth Mudstone bedrock underlies the majority of the Scheme area, with the Rugby Limestone Member present in the south west of the Scheme area. Superficial deposits of Cheltenham Sand, Gravel, and Alluvium are present along the alignment of the existing watercourses, sections of the M5 and the A4019 Tewkesbury Road between the M5 Junction 10 and Cheltenham. The superficial Alluvium, Cheltenham Sand and Gravel strata are classified as high vulnerability, secondary A aquifers. The bedrock Charmouth Mudstone Formation is classified as a medium vulnerability secondary undifferentiated aquifer (unproductive) and the Rugby Limestone Member as a high vulnerability secondary A aquifer.
- 1.6.41. The majority of the agricultural land impacted by the Scheme is dominated by land categorised as best and most versatile (BMV).
- 1.6.42. Areas of deciduous woodland are present around M5 Junction 10, which are designated as Priority Habitats/National Forest Inventory sites. However, the soils within these areas are not considered to be significantly or uniquely important.

- 1.6.43. There are two historical landfill sites located close to the Scheme, at approximately 30 m north east of the Scheme adjacent to the A4019, and 200 m north of the Scheme adjacent to the M5 northbound carriageway (Colman's Farm landfill).
- 1.6.44. With the implementation of mitigation measures through the design and the construction phase, potential land contamination effects during construction are not expected to occur. The potential impacts of the Scheme on agricultural land during construction are considered to be:
- The physical removal of agricultural land where land is permanently required for the road and drainage features (major magnitude of impact);
 - The permanent restriction to future use of agricultural land due to flood compensation areas (moderate magnitude of impact); and
 - The temporary loss or the restriction to current agricultural land, due to land temporarily acquired during construction, to be returned to agricultural use (minor magnitude of impact).
- 1.6.45. The construction of the Scheme will result in the loss of agricultural land, and there is no mitigation for permanent losses. Effects will be mitigated slightly with surplus soils from agricultural land, generated from the footprint of the Scheme being stored and reused sustainably. Land occupied or disturbed during the construction process, that is not permanently acquired for engineering and landscaping, will be restored to a condition equivalent to its original state.

Cultural Heritage

- 1.6.46. The cultural heritage topic provides a preliminary assessment of the potential effects related to the construction and operation of the Scheme on the historic environment.
- 1.6.47. A total of 31 designated heritage assets are recorded within 1 km of the Scheme. Three groups of designated assets have been identified as having the potential to be affected by the Scheme:
- The Scheduled Monument and four Grade II Listed Buildings located at Moat House, approximately 100 m south of the A4019 Tewkesbury Road at Moat Lane;
 - Two Grade II Listed Buildings approximately 160 m north of the A4019 Tewkesbury Road near the Uckington & Elmstone Hardwicke Village Hall; and
 - Two Grade II Listed Buildings, approximately 200 m west of the new link road between the B4634 and the A4019 Tewkesbury Road and associated with archaeological remains of Withybridge Mill.
- 1.6.48. There are also a variety of non-designated heritage assets within 1 km of the Scheme, providing evidence of prehistoric settlement, as well as Bronze Age, Romano-British, and medieval activities. More recent heritage is seen in sites related to World War II defences of the area.
- 1.6.49. Impacts from the Scheme, to the historic environment, are expected as a result of construction activities, that would result in the removal of part, or all, of the remains associated with archaeological deposits, and also potential impacts to the setting of historic buildings from the operation of the Scheme.
- 1.6.50. Effects to archaeological remains, that will be removed as a result of the construction of the Scheme, will be mitigated through a programme of excavation and recording, in line with the significance of the remains.
- 1.6.51. It is anticipated that identified design and landscaping measures will be suitable to mitigate most effects caused by the introduction of new infrastructure, and the accompanying changes to noise and light levels during the operation of the Scheme.
- 1.6.52. Whilst adverse effects are anticipated, due to impacts to known and as-yet unknown archaeological remains, a robust programme of archaeological investigation and recording would mitigate these effects. This will be undertaken in consultation with the

local planning authority's archaeological advisor. Effects to the settings of heritage assets would be mitigated through design and landscaping.

Materials and Waste

- 1.6.53. The materials and waste topic provides a preliminary assessment of the potential effects related to the construction and operation of the Scheme on material use and waste generation associated with the Scheme during construction. Material use and waste generation during the operation of the Scheme is considered to be negligible and has therefore not been assessed.
- 1.6.54. The impacts from the Scheme during construction will occur as a result of the demand for construction materials and the creation of waste materials. The effects from these impacts will be minimised through the development of an efficient design and construction methodology that will reduce, reuse, recycle and recover materials and wastes so that volumes of materials required, and the quantities of wastes generated, are minimised.

Population and Human Health

- 1.6.55. The population and human health topic provides a preliminary assessment of the potential effects related to the construction and operation of the Scheme on people living and working within the Scheme area, and the opportunities for improving health and reducing inequalities.
- 1.6.56. With the exception of Cheltenham, there are few sizeable settlements that are located in and around the Scheme area. The smaller settlements present comprise Boddington to the west of the Scheme area, Uckington (in the east of the Scheme area), and the clusters of housing around the M5 Junction 10, along Withybridge Lane, and on the B4634. Whilst most of the community facilities are within Cheltenham, there is a village hall and place of worship in Uckington. There are also several small businesses within the Scheme area. Public footpaths and bridleways are present through the Scheme area.
- 1.6.57. It is possible that all aspects of the Scheme have the potential to impact people and communities, either temporarily or permanently. This could result from land take, severance of connectivity, access restrictions, effects to amenity and to human health.
- 1.6.58. The effects from these impacts will be minimised through the development of a design and construction strategy, that reduces land take (both temporary and permanent) and avoids restrictions to access to properties and businesses, during the construction and operation of the Scheme. Public footpaths and bridleways, for example, will be kept open where possible, and where this is not achievable, then short diversions will be put in place.
- 1.6.59. At construction stage, best practice construction methods will be implemented and managed through an Environmental Management Plan⁴ to reduce disruption experienced by the community, especially those susceptible or vulnerable to health issues.

Climate

- 1.6.60. The climate topic provides a preliminary assessment of the potential effects related to the construction and operation of the Scheme on effects on climate and its vulnerability to climate change. The topic is divided into two sub-sections:
- The potential effects of the Scheme on climate, in particular the level of greenhouse gas emissions during both construction and operation; and
 - The vulnerability of the Scheme to climate change, in particular the impacts of extreme weather (caused by climate change) during the operation and construction and adaptation to mitigate the effects of these impacts.
- 1.6.61. The effects on climate are measured by the emission of greenhouse gases produced from the Scheme. Sources of direct emissions are primarily vehicles using the existing road and nearby roads, and sources of indirect emissions, which include maintenance and

⁴ The Environmental Management Plan will mitigate effects of the construction of the project in all topic areas.

refurbishment activities, materials production and energy use by technology and lighting on the Scheme.

- 1.6.62. The assessment of the vulnerability of the Scheme to climate change depends on the sensitivity of the Scheme to climate hazards (extreme weather events) and the geographic exposure to these hazards. The assessment considers climate variables including extreme temperatures and rainfall and hazards (flooding, snowstorms), and how they are expected to change over the lifetime of the project (warmer and colder temperatures, higher rainfall).
- 1.6.63. The Scheme will lead to an increase in emissions of greenhouse gases during construction and operation, as construction activities will use processes and consume materials that emit carbon and greenhouse gases. Emissions during the construction stage will be minimised through a reduction (where possible) in the quantities of materials required, and the implementation on an efficient construction strategy that minimises construction traffic miles.
- 1.6.64. Once the Scheme is operational, traffic levels are expected to increase across the local network through forecast growth, although the uptake of electric vehicles will reduce the emissions of greenhouse gases as the operational phase of the Scheme progresses. The assessment completed⁵ at this PEIR stage has concluded that, the Scheme will not affect UK's ability to meet its carbon targets. This means that the emissions produced during the construction and operational phases of the Scheme will have a negligible impact on the country's overall carbon emissions.
- 1.6.65. In the UK, climate change is likely to result in hotter and drier summers and warmer and wetter winters. Construction of the Scheme is not expected to be affected, as the current climate in the Scheme area is unlikely to change significantly, between now and the construction of the Scheme. Vulnerability of the Scheme to climate change once it is operational, particularly in relation to flooding and the management of heavier rainfall, has been considered through the development of the design, so that adverse effects from climate change to the Scheme are unlikely to be significant.

Cumulative effects assessment

- 1.6.66. The cumulative effects assessment topic considers two other ways that impacts may arise and how this may change the effects overall:
- If the predicted effects of the Scheme on the environment will change when they are considered across all topics at the same time. These are called intra-Scheme impacts; and
 - How other developments planned near the Scheme (for example new housing developments) may interact with the Scheme and, working together, change the predicted effects on the environment. These are called inter-project impacts.
- 1.6.67. The cumulative effects assessment has not been undertaken at this PEIR stage. It will be reported in the ES.

⁵ The assessment was carried out against the UK's carbon budgets, including the most recent 6th budget.

2. Glossary

Term	Acronyms or abbreviations	Definition
Air Quality Management Area	AQMA	An area identified where the National Air Quality Strategy Objectives are not likely to be achieved. The Local Authority is required to produce a Local Air Quality Action Plan to plan how air quality in the area is to be improved.
Best and Most Versatile	BMV	Land defined as grades 1, 2 and 3a of the Agricultural Land Classification. This land is considered the most flexible, productive and efficient and is most capable of delivering crops for food and non-food uses.
Department for Environment, Food and Rural Affairs	DEFRA	Defra is the government department responsible for environmental protection, food production and standards, agriculture, fisheries and rural communities in the United Kingdom of Great Britain and Northern Ireland.
Designated Heritage Asset		A World Heritage Site, Scheduled Monument, Listed Building, Protected Wreck Site, Registered Park and Garden, Registered Battlefield or Conservation Area designated under the relevant legislation.
Development Consent Order	DCO	The means of applying for consent to undertake a Nationally Significant Infrastructure Project (NSIP). NSIPs include, for example, major energy and transport projects.
Environmental Statement	ES	A document produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations, to report the results of an Environmental Impact Assessment (EIA).
Flood Risk Assessment	FRA	An assessment that determines the risk of flooding to a proposed project.
Green Belt		The fundamental aim of Green Belt policy is to prevent urban sprawl by keeping land permanently open; the essential characteristics of Green Belts are their openness and their permanence.
Listed Buildings		Building included on the list of buildings of special architectural or historic interest and afforded statutory protection.
Local Geological Site		Non-statutory geological sites considered worthy of protection for their earth science or landscape importance. Formerly known as Regionally Important Geological Sites.
Local Nature Reserve	LNR	A statutory designation made under Section 21 of the National Parks and Access to the Countryside Act 1949 by principal local authorities for places with wildlife or geological features that are of special interest locally, which make an important contribution to England's biodiversity.
National Forest Inventory	NFI	The NFI provides an extensive record of key information about woodland and trees within Great Britain. It includes the most in depth survey carried out on Britain's woodland and trees to date.
Nationally Significant Infrastructure Project	NSIP	A project of a type and scale defined under the Planning Act 2008 and by order of the Secretary of State relating to energy, transport, water, wastewater and waste

Term	Acronyms or abbreviations	Definition
		generally. These projects require a single development consent.
Noise Important Area	NIA	These are areas where 1% of the population are affected by the highest noise levels from major roads and are designated according to the strategic noise mapping undertaken by Defra.
Non-Designated Heritage Asset		Buildings, monuments, sites, places, areas or landscapes identified by plan-making bodies as having a degree of heritage significance meriting consideration in planning decisions, but which do not meet the criteria for designated heritage assets.
Non-Statutory Designated Sites for Nature Conservation		Sites that receive protection from local planning policy (e.g. the Local Development Plan) rather than 'Statutory' legislation. These include Sites of Importance for Nature Conservation, Sites of Nature Conservation Importance and County Wildlife Sites.
Priority Habitat		Priority habitats are taken as principal habitats for the conservation of biodiversity listed under Section 41 of the Natural Environment and Rural Communities Act 2006.
Ramsar Site		Wetland sites that are of international importance, as designated under Article 2(1) of the Convention on Wetlands of International Importance especially as Waterfowl Habitat. Ramsar (Iran), 2 February 1971. UN Treaty Series No. 14583.
River Basin District	RBD	Area of land and sea, made up of one or more neighbouring river basins together with their associated groundwaters and coastal waters, identified under Article 3(1) of Directive 2000/60/EC as the main unit for management of river basins.
River Basin Management Plan	RBMP	Sets out how organisations, stakeholders and communities will work together to improve the water environment.
Scheme area		The area of the environment surrounding the M5 Junction 10 Improvements Scheme which may be relevant in considerations of potential effects. The Scheme area will vary according to the requirements of different topics.
Secondary A aquifer		These are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.
Secondary B aquifer		These are predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.
Secondary Undifferentiated Aquifer		Assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.
Special Area of Conservation	SAC	Sites designated under EU legislation for the protection of habitats and species considered to be of European interest.

Term	Acronyms or abbreviations	Definition
Scheduled Monument		A 'nationally important' archaeological site or historic building, given protection against unauthorised change and included in the Schedule of Monuments kept by the Secretary of State for Culture, Media and Sport. The protection given to scheduled monuments is given under the Ancient Monuments and Archaeological Areas Act 1979.
Significant Observed Adverse Effect Level	SOAEL	The level of noise exposure above which significant adverse effects on health and quality of life occur.
Special Protection Areas	SPA	Areas classified under regulation 15 of the Conservation of Habitats and Species Regulations 2017 which have been identified as being of international importance for the breeding, feeding, wintering or the migration of rare and vulnerable species of birds.
Site of Special Scientific Interest	SSSI	Area of land notified by Natural England under section 28 of the Wildlife and Countryside Act 1981 as being of special interest due to its flora, fauna or geological or physiological features.
Water Framework Directive	WFD	The WFD introduced a new system for monitoring and classifying the quality of surface and ground waters. The Directive requires that Environmental Objectives be set for all surface waters and groundwater to enable them to achieve Good Ecological Potential/ Status by a defined date.

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