

# A720 Sheriffhall Roundabout

DMRB Stage 2 Scheme Assessment Report

Part 2 – Environmental Assessment  
Volume 1 – Main Report

Transport Scotland

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## Abbreviations

AD	Anno Domini
AEP	Annual Exceedance Probability
AGLV	Area of Great Landscape Value
AQMA	Air Quality Management Area
AWI	Ancient Woodland Inventory
BC	Before Christ
BGS	British Geological Survey
BoCC	Birds of Conservation Concern
CAFE	Clean Air For Europe
CEC	City of Edinburgh Council
CEMD	Construction Environmental Management Document
CEMP	Construction Environmental Management Plan
CIfA	Chartered Institute for Archaeologists
Defra	Department for Environment, Food and Rural Affairs
DM	Do Minimum
DS	Do Something
DMRB	Design Manual for Roads and Bridges
EFT	Emissions Factor Toolkit
EIA	Environmental Impact Assessment
EPS	European Protected Species
EU	European Union
GDL	Gardens and Designed Landscape
GES	Good Ecological Status
GLVIA	Guidelines for Landscape and Visual Impact Assessment
GWDTE	Groundwater-Dependent Terrestrial Ecosystems
HAP	Habitat Action Plan
HER	Historic Environment Record
HES	Historic Environment Scotland
HLA	Historic Land-use Assessment
HRA	Habitats Regulations Appraisal
HSI	Habitat Suitability Index
IAN	Interim Advice Note
INNS	Invasive Non-native Species
IP	Inter Peak
LAQM	Local Air Quality Management
LBAP	Local Biodiversity Action Plan
LCA	Landscape Character Area
LDP	Local Development Plan
LNR	Local Nature Reserve
LNCS	Local Nature Conservation Sites
LP	Local Plan
LWS	Local Wildlife Sites
MLC	Midlothian Council
NPF	National Planning Framework
NO <sub>2</sub>	Nitrogen Dioxide
OP	Off-peak
PAN	Planning Advice Note
PCM	Pollution Climate Mapping (model)
PM <sub>2.5</sub>	Fine particulate matter (less than 2.5 µm in diameter)
PM <sub>10</sub>	Fine particulate matter (less than 10 µm in diameter)
RCAHMS	Royal Commission on the Ancient and Historical Monuments of Scotland
RMSE	Root Mean Square Error
SAC	Special Area of Conservation
SBL	Scottish Biodiversity List
ScARF	Scottish Archaeological Research Framework
SDA	Strategic Development Area
SDP	Strategic Development Plan
SEPA	Scottish Environment Protection Agency

SESplan	Edinburgh and South East Scotland Strategic Development Plan
SNH	Scottish Natural Heritage
SPA	Special Protection Area
SPP	Scottish Planning Policy
SSSI	Site of Special Scientific Interest
STAG	Scottish Transport Appraisal Guidance
STW	Sewage Treatment Works
WFD	Water Framework Directive
WHS	World Heritage Sites
UK	United Kingdom
UKBAP	UK Biological Action Plan

# 1. Overview of Environmental Assessment

## 1.1 Introduction

Reporting of the A720 Sheriffhall Roundabout DMRB Stage 2 Scheme Assessment has been split into three parts;

- Part 1 – Engineering Assessment;
- Part 2 – Environmental Assessment; and,
- Part 3 – Assessment Summary and Recommendation.

This first chapter of Volume 1- Main Report provides an overview of Part 2 – Environmental Assessment which is also supported by a number of volumes;

- Volume 2 – Drawings
- Volume 3 - Appendices

This Stage 2 Environmental Assessment has been prepared in accordance with the Design Manual for Roads and Bridges (DMRB) Volume 5, Section 1, Part 2, '*Scheme Assessment Reporting*' (TD 37) and DMRB Volume 11 '*Environmental Assessment*'. The topics for assessment are identified in Table 1.1 in 'The Aims and Objectives of Environmental Assessment (DMRB, Vol. 11, Section 1, Part 1: HA 200/08).

Volume 11 ('*Environmental Assessment*') of the DMRB is currently being modernised. At present, only some of the topics have published updated guidance while some topics still rely on previous historic guidance. It was agreed with Transport Scotland that this report would follow the structure set out in HA 200/08 (DMRB, Vol 11, S1, P1). It should be noted that there is no published guidance available for the new topic heading, Materials, however draft guidance was made available by Transport Scotland to enable a Materials assessment to be undertaken.

The structure of this Part 2, Volume 1- Main Report of the Environmental Assessment is detailed in Table 1.1 below:

**Table 1.1 – Main Report Structure and DMRB Guidance**

Chapter Structure	DMRB Guidance Followed	
Chapter 1 – Overview of Environmental Assessment	Volume 5, Section 1, Part 2: Scheme Assessment Reporting (TD 37)	
Chapter 2- Landscape and Visual	Volume 11, Section 3, Part 5: Landscape Effects	
Chapter 3 – Nature Conservation	Volume 11, Section 3, Part 2: Ecology and Nature Conservation	
Chapter 4 – Cultural Heritage	Volume 11, Section 3, Part 2: Cultural Heritage (HA 208/07)	
Chapter 5 – Road Drainage and the Water Environment	Volume 11, Section 3, Part 10: Road Drainage and the Water Environment (HA 45/09)	Chapters 2-11 have also made reference to Volume 11, Section 3, Part 3: 'Disruption due to Construction' and Volume 11, Section 3, Part 12: 'Impact of Road Schemes on Policies and Plans' as these are now absorbed into each topic assessment.
Chapter 6 – Noise and Vibration	Volume 11, Section 3, Part 7: Noise and Vibration (HA 213/11)	
Chapter 7 – Air Quality	Volume 11, Section 3, Part 1: Air Quality (HA 207/07)	
Chapter 8 – Effects on All Travellers	Volume 11, Section 3, Part 8: Pedestrians, Equestrians and Community Effects Volume 11, Section 3, Part 9: Vehicle Travellers	
Chapter 9 Community and Private Assets	Volume 11, Section 3, Part 8: Pedestrians, Equestrians and Community Effects Volume 11, Section 3, Part 6: Land Use	

Chapter Structure	DMRB Guidance Followed
Chapter 10 – Geology and Soils	Volume 11, Section 3, Part 11: Geology and Soils
Chapter 11- Materials	Draft Volume 11, Section 3, Part 6: Materials (HD 212/11).
Chapter 12 – Summary of Effects	Volume 5, Section 1, Part 2: Scheme Assessment Reporting (TD 37)

Each chapter details the approach and methodology undertaken and where necessary refer to any other guidance used to support the assessments.

An overview has been provided including the background to the proposed A720 Sheriffhall Roundabout Improvement, the development of options, a description of the general study area along and an outline of the environmental assessment methodology. The national, regional and local transportation strategies and planning policies that may have an impact the proposed scheme are discussed.

## 1.2 Background

The Strategic Transport Projects Review (STPR) published in December 2008 included reference to improvements at Sheriffhall Roundabout. Intervention 22 - Targeted Road Congestion / Environmental Relief Schemes recognised a number of corridors throughout Scotland that have been identified to reduce conflicts between strategic and local traffic. Section A222 targets specific locations on the road network where improvements would address these issues and includes measures such as junction improvements for the A720 Edinburgh City Bypass such as at Sheriffhall Roundabout. A225 also recognises that the A720 improvements would help to maintain the 60-min commutable labour market area around Edinburgh, and would provide benefits for journeys to or between two of Edinburgh's areas of economic activity, West Edinburgh and the Shawfair development. Journey time reductions of approximately 5 minutes are forecast with this improvement for all elements.

### 1.2.1 Scheme Objectives

The following scheme objectives have been set to address the main issues encountered at Sheriffhall Roundabout and will be used in the assessment to help determine the performance of the options.

- Improve the movement of traffic on the A720 between Gilmerton and Old Craighall by providing grade-separation of the A720 at the existing Sheriffhall Roundabout.
- Reduce the conflict between strategic and local traffic.
- Minimise traffic impact of local proposed developments in Midlothian, East Lothian and City of Edinburgh on the A720 between Gilmerton Junction and Old Craighall Junction and approach roads.
- Improve road safety for all users on the A720 and approach roads between Gilmerton Junction and Dalkeith Northern Bypass
- Minimise intrusion of the new works on the natural environment, cultural heritage and people whilst enhancing the local environment where opportunities arise
- Facilitate integration for different modes of transport along and across the A720 corridor between Gilmerton Junction and the Dalkeith Northern Bypass.
- Reduce severance by improving accessibility across the A720 for all users.

## 1.3 Development of Options

Part 1 – Engineering Assessment, Volume 1, Chapter 3 provides a detailed description of the development of the options, only a brief summary has been provided here.

### 1.3.1 DMRB Stage 1 Scheme Assessment

Eight junction options underwent DMRB Stage 1 Scheme Assessment (Published September 2014), six options were based on those considered during an earlier study, and two options were developed at the Inception Workshop (4<sup>th</sup> September 2013).

The Stage 1 Scheme Assessment recommended that four options go forward to Stage 2:

- Option 1 – Dumbbell grade separation at Sheriffhall
- Option 2 – All slip roads provided at Gilmerton, no connection at Sheriffhall
- Option 6 – Grade separation at Sheriffhall
- Option 8 – Dumbbell grade separation west of Sheriffhall

The Stage 1 Scheme Assessment recommended that Options 1, 2, 6 and 8 were taken forward for further assessment at Stage 2. Further details can be found in the DMRB Stage 1 Scheme Assessment Report.

### 1.3.2 DMRB Stage 2 Option Development

A significant level of design development was undertaken to refine the layouts that progressed from Stage 1 and enable a detailed comparative assessment towards an overall preferred junction layout at the end of the Stage 2 Scheme Assessment process.

A further sifting exercise was carried out early in Stage 2. Option 2 did not perform well when considered against the scheme objectives; therefore the Stage 2 Options were narrowed down to the three emerging options listed below:

- Option A – Dumbbell grade separation at Sheriffhall (previously Option 1)
- Option B – Grade separation at Sheriffhall (previously Option 6)
- Option C – Dumbbell grade separation west of Sheriffhall (previously Option 8).

## 1.4 Description of Options

Three options for the A720 Sheriffhall Roundabout Junction Improvement are being considered for the Environmental Assessment; these are shown in Figures 1.1 to 1.3 – Aerial Plan of Options. Further detail can be found in Part 1 – Engineering Assessment, Volume 1, Chapter 3. A brief description of each option is provided below:

**Option A:** A grade separated dumbbell arrangement with the A720 elevated and passing over the A7 carried by a new overbridge with a span of approximately 35m. The north roundabout is a 5-arm 3 lane roundabout, which connects the A720 eastbound off slip, the A7 north, the A6106 Millerhill Road, the A720 eastbound on slip and the A7 South. The south roundabout is a 5-arm 3-lane roundabout, which connects the A720 westbound on slip, the A7 North, the A720 westbound off slip, the A6106 Old Dalkeith Road, and the A7 South (see Figure 1.1 – Aerial Plan of Option A).

**Option B:** A grade separated roundabout with vertical and horizontal realignment of the A720 would be required over an approximate length of 1600m. The A720 would be carried across the Sheriffhall Roundabout by two new bridges each with a span of approximately 40m. The Sheriffhall Roundabout would be enlarged and become an 8-arm roundabout but is retained at its existing location, and would be reduced to three lanes (see Figure 1.2 – Aerial Plan of Option B).

**Option C:** A grade separated dumbbell arrangement with the A7 elevated and passing over the A720 by a new overbridge located approximately 250m west of Sheriffhall Roundabout and with an approximate span of 40m. The dumbbell roundabouts located north and south of the A720 would be raised on embankments. The 3 lane dumbbell roundabout to the north of the A720 would be a 4-arm roundabout, connecting the A720 eastbound off-slip, the A7 North, the A720 eastbound on-slip and the A7 South. The A7 North would be realigned for an approximate length of 585m tying in to the existing Shawfair Park roundabout. The 3-lane roundabout to the south of the A720 would be a 5-arm roundabout, connecting the A720 westbound on-slip, the A7 North, the A720 westbound off-slip, the realigned A6106 Old Dalkeith Road, and the realigned A7 South. A 2-lane 3-arm roundabout would be provided at the junction of the A6106 Millerhill Road and the realigned A7 North (see Figure 1.3 – Aerial Plan of Option C).

## 1.5 Description of the General Study Area

The scheme is located on the A720 Edinburgh Bypass near the urban areas of Dalkeith, Danderhall, Millerhill and Lasswade. A general study area was defined as a 500m boundary from the centre point of the existing Sheriffhall Roundabout. Where topic assessments have used a different study area, this is explained within chapters.

### 1.5.1 Key Environmental Constraints

The key environmental constraints are shown on Figure 1.4 - Key Environmental Constraints (Sheets 1 & 2). These are described in more detail in relevant topic chapters; however, topic areas identify further environmental constraints relevant to their assessments. These key constraints include:

- Listed buildings
- Scheduled Monuments
- Garden and Designed Landscapes
- Conservation Areas
- Sites of Special Scientific Interest
- Special Landscape Areas
- Core Paths
- Surface Water
- Ancient Woodland

### 1.5.2 Existing Junction and Surrounding Roads

Sheriffhall Roundabout is a junction on the A720 Edinburgh City Bypass and connects to six A-class roads of local and regional importance, namely the A7 North, the A6106 Millerhill Road, A720 Edinburgh City Bypass (East), the A6106 Old Dalkeith Road, A7 South, and A720 Edinburgh City Bypass (West). Sheriffhall Roundabout is a signalised roundabout and has four lanes on the circulatory carriageway. Sheriffhall Roundabout has an Inscribed Circle Diameter (ICD) of 100m.

Sheriffhall Roundabout is the only at-grade junction on the A720 Edinburgh City Bypass. The six-arm roundabout has undergone various improvements including localised widening, signalisation and the provision of additional lanes to try to alleviate the delays that occur at the junction. Despite the improvements, a congestion problem persists; particularly during peak hours.

Millerhill Junction is located approximately 1.9km east of Sheriffhall Roundabout at the junction of A720 and A68 Dalkeith Road. Millerhill Junction is a dumbbell grade separated junction. Gilmerton Junction is approximately 1.5km to the west of Sheriffhall Roundabout and is a grade separated junction with west facing slips.

The A7 is a single carriageway road that connects central Edinburgh to Carlisle in the North of England. The A6106 connects Dalkeith to Portobello to the east of central Edinburgh.

### 1.5.3 Borders Railway

The Borders Railway passes under the A720 Edinburgh City Bypass via an underbridge approximately 250m east of Sheriffhall Roundabout. The underbridge has been designed such that it can accommodate a depth of up to 5m of additional fill associated with improvements for grade separation of Sheriffhall.

### 1.5.4 Non-Motorised Users (NMU) Provision

NMU provision includes core paths, rights of way, and cycle routes. There are several routes within the study area, including a number of core paths as shown in Figure 8.1 – Baseline - All Travellers. Current NMU provision across the existing Sheriffhall Roundabout is poor with pedestrians and cyclists having to cross the arms of the roundabout without a dedicated traffic phase.

Further detail on existing NMU provision is included in Chapter 8 – Effects on All Travellers.



### 1.5.5 Bus Routes

The main bus routes at the existing Sheriffhall and Gilmerton Junctions are along the A7 North and South, along the A6106 Old Dalkeith Road and along the A772 Gilmerton Road. A bus route also leaves/ joins the A720 from the west at Gilmerton Junction. Furthermore, stakeholder consultation responses highlighted the development of an Edinburgh orbital bus service, which would be accommodated on segregated bus lanes on the A720 Edinburgh City Bypass.

Further details on existing bus routes are included in Chapter 8 – Effects on All Travellers.

### 1.5.6 Topography and Ground Conditions

The topography of the study area mainly consists of gently undulating ground. The land surrounding the site mainly consists of arable farmland with occasional small residential or industrial properties. The Borders Railway line runs north-south to the east of the roundabout. The road infrastructure is in cutting to the west of Sheriffhall and on embankment to the east.

The ground conditions comprise superficial deposits of glacial till, fluvio-glacial deposits, and glacial sands and gravels. Local deposits of alluvium may be expected along the course of Dean Burn to the south of the A720. Made ground is present at isolated locations, in particular associated with the existing road and railway earthworks, the area's historic mining activity and any existing development activity.

The bedrock underlying the site has been extensively mined in the past and all route options are expected to be underlain to some extent by historic abandoned shallow mine workings. Numerous mine entries also occur across a large proportion of the study area.

A major geological fault zone, the Sheriffhall Fault, coincides with the existing location of the Sheriffhall roundabout and trends broadly east-west, down throwing the strata to the north by approximately 175m. Other minor faults also underlie the site. As a result the bedrock near the faulted zone is recorded to be disturbed.

In summary, the roundabout is located above a geological fault and historic mine workings. The constraints imposed by these ground conditions were a key factor in grade separation not being considered for the junction at the time of A720 construction due to the effects of anticipated deep mining operations. The deep mining operations planned at that time did not take place, and there are no plans as such for the future.

Further details of ground conditions can be found in Chapter 10 - Geology and Soils.

### 1.5.7 Hydrology and Drainage

There is one watercourse within the study area, the Dean Burn which is a minor tributary of the River Esk. It runs west to east, crossing the A772 Gilmerton Road via a culvert just south of Gilmerton Junction. It then runs south of the A720 crossing the A7 South and the A6106 old Dalkeith Road via road culvert, passing south of Old Sheriffhall Farmhouse, before continuing through Dalkeith Country Park. There is also a small pond south of the A720 between Gilmerton and Sheriffhall Junctions.

Further hydrology and drainage information can be found in Chapter 5 – Road Drainage and the Water Environment.

### 1.5.8 Public Utilities

Numerous services are present within the study area forming potential constraints upon the junction improvements. These include high voltage electricity cables, gas mains and water mains. The utility infrastructure present within the area serves not only the adjacent residential, commercial and industrial development but also similarly serves developments beyond the study area. There are also services (electricity, sewerage, cable, water, etc.) associated with all the properties within the study area and these will need to be protected or diverted as appropriate when construction takes place.

## 1.6 Environmental Assessment

### **Relevant Guidance**

As discussed in Section 1.1, DMRB sets out guidance on the development of trunk road schemes and is applicable to the A720 Sheriffhall Roundabout Improvements. Volume 11 of the DMRB specifically provides guidance on environmental assessment including the level of assessment required at key stages of development and the requirements for reporting environmental effects.

The objectives of the DMRB Stage 2 Assessment are to identify factors and effects to be taken into account in the selection of a preferred option and to identify the environmental advantages, disadvantages and constraints associated with options under consideration.

## 1.6.1 Environmental Reporting

### **Chapter Structure**

Each environmental chapter listed above will provide the following information:

- an introduction to the subject area;
- the approach and methodology used in the options assessment;
- an overview of relevant policies and plans;
- a summary of relevant consultations;
- the baseline conditions of the site;
- potential effects of the options;
- potential mitigation measures to reduce impacts on the options;
- a summary of the effects of each option
- compliance with policies and plans;
- a conclusion;
- scope of the DMRB Stage 3 Assessment; and,
- any references used.

### **General Approach**

#### Baseline Conditions

The assessment of impacts on each environmental topic is carried out by comparing the baseline conditions of the environment in the study area with the potential impacts on it. Baseline conditions describe the existing environmental conditions in the study area as determined through field surveys, desk-based review and consultation.

#### Assessment of Potential Effects

The general approach to the options assessment is based on the quantitative determination of impact significance from a combination of the sensitivity of the baseline conditions and the magnitude of the impact on it. This process is described in the respective environmental chapters. Where this approach was not appropriate alternative approaches are described and justified.

#### Potential Mitigation

The design at DMRB Stage 2 has not been sufficiently developed to allow mitigation measures to be developed in detail. The assessment therefore identifies potential mitigation taking into account mitigation measures to be developed in detail. Potential mitigation measures are proposed taking into account best practice, legislation and appropriate guidance, which would be developed further and refined during the DMRB Stage 3 Assessment. Where mitigation is 'embedded' in the option design this is considered before impact assessment is determined.

#### Summary of Effects

This section provides a summary of the environmental assessment for the route options, and where possible, takes into account potential mitigation to provide an indication of the potential residual impacts.

### Compliance with Policy and Plans Assessment

The approach used within this DMRB Stage 2 Assessment to assess compliance with policies and plans involved the following:

- describing the existing and, where appropriate, emerging planning policy guidance and development plan framework as applicable to the route options;
- assessing the likely impacts of the proposed route options on the achievement of the objectives and policies identified; and,
- reporting the likely conflicts or compliance of the route options on key strategic and local planning policy objectives.

#### 1.6.2 Cumulative Effects

Reporting of cumulative effects is a requirement of environmental assessment. The A720 Sheriffhall Roundabout is located in the South East Edinburgh Strategic Development Area (allocated in SESplan) where there is significant development proposals planned for the next 20-30 years. As the purpose of the Stage 2 Environmental Assessment is to compare the effects of the options against each other the cumulative effects of the options in combination with other developments have been scoped out of this assessment. Cumulative effects will be a significant consideration for the Stage 3 Assessment and the scope of this will be agreed in consultation with the City of Edinburgh Council, Midlothian Council and East Lothian Council. Where there is the potential for in-scheme cumulative effects, i.e. the combination of a number of effects on specific receptors (i.e. on a property in terms of visual, noise, air quality effects for example) there are reported in Chapter 12 - Summary of Environmental Assessment.

## 1.7 Planning Policy Context

### 1.7.1 National Policy

The relevant policies and plans for each environmental assessment have been discussed in their relevant chapters. However, to provide context to the proposed A720 Sheriffhall Roundabout Improvements, an overview of relevant national, regional and local transportation strategies and planning policies are provided below.

#### **Infrastructure Investment Plan (2015)**

The Infrastructure Investment Plan (IIP) published in 2015 sets out why the Scottish Government invests, how it invests and what it intends to invest in up to 2035 by sector. It is intended to support the objectives set out in Scotland's Economic Strategy and the Programme for Government. The IIP recognises that *"investment in transport across Scotland will deliver the best possible connectivity across the roads and public transport network, improving journey times and tackling inequality by improving accessibility of services and opportunities"*.

#### **National Planning Policy 3**

The National Planning Framework (NPF3) was published in 2014 by the Scottish Government and outlines the key principles that guide the wider planning system in Scotland. NPF 3 guides Scotland's spatial development for the next 20 to 30 years, setting out strategic development priorities to support the Scottish Governments central purpose of promoting sustainable economic growth. Plans that are beneath the NPF 3 in the planning policy hierarchy are directly influenced by the goals and themes in the document.

NPF 3 directly influences the content of Scottish Planning Policy (SPP), Circulars, Planning Advice Notes (PANs) and Development Plans produced by Local Authorities.

With regard to transport and infrastructure the NPF 3 acknowledges that improved internal and international transport links are necessary to facilitate growth. Particular attention is given to the A720 and Sheriffhall Roundabout on page 13 and the NPF 3 states:

- *'the longer-term spatial strategy for delivering housing land will need to acknowledge and address the region's infrastructure constraints. To help unlock effective housing land in the city-region, strategic, cross-boundary transport infrastructure improvements are required'.*

- 'road network capacity, including the A720 where interventions are being taken forward at Sheriffhall Roundabout, has particular implications for future development'.

### **Scottish Planning Policy (2014)**

The Scottish Planning Policy (SPP) document is a statement of the Scottish Government's policy on nationally important land use matters.

SPP facilitates development while at the same time "protecting and enhancing the natural and built environment" and is considered to be central to the Scottish Government's central purpose of achieving sustainable economic growth (paragraph 2).

Transport is addressed as a subject policy within SPP at paragraphs 269 – 291 and it is recognised that the relationship between transport and land use has a strong influence on sustainable economic growth. The strategic transport network, which includes trunk roads, is identified as being critical to support a level of national connectivity that facilitates sustainable economic growth.

SPP also contains a number of other subject policies including but not limited to; economic development, historic environment, landscape and natural heritage, flooding and drainage and waste management.

### **Planning Advice Notes and Circulars**

Planning Advice Notes support the SPP providing advice on good practice and other relevant information. Planning Circulars contain policy on the implementation of legislation or procedures. Where relevant these have been discussed in the topic chapters.

## **1.7.2 Regional and Local Plans and Strategies**

The Planning etc. (Scotland) Act 2006 introduced a new statutory basis for development planning in Scotland. It inserted a new Part 2 into the Town and Country Planning (Scotland) Act 1997 ("the Act") requiring the replacement of structure plans and local plans with strategic development plans (SDPs) and local development plans (LDPs). The development plan comprises a local development plan supported by supplementary guidance. In the four largest city regions, the development plan also includes a strategic development plan, which may also be supported by supplementary guidance.

Sheriffhall Roundabout is in both Midlothian Council and City of Edinburgh Council Local Authority areas. Where relevant, nearby East Lothian Council have been consulted and the plans and policies reviewed for potential impacts on the development (e.g. housing allocations). Table 1.2 below identifies the relevant plans and their current status.

**Table 1.2 - Relevant Local Development Plan Documents**

<b>Status</b>	<b>City of Edinburgh Council</b>	<b>Midlothian Council</b>	<b>East Lothian Council</b>
LP/ LDP Adopted	Nov 2016	2008	2008
LDP expected to be adopted	N/A	spring 2017	end 2017 / early 2018

A significant number of developments are included within both adopted and proposed plans in all three local authority areas and many may have direct traffic impact on the development. These developments are considered in Chapter 9 – Community and Private Assets and a wider proposed development context is provided in Appendix 9.1 – Planning Proposals and Applications.

### **Strategic Development Plan: SESplan (June 2013)**

The Edinburgh and South East Scotland Strategic Development Plan (SESplan), was approved by Scottish Ministers on 27 June 2013 and comprises the City of Edinburgh, East Lothian, Midlothian, Fife, Scottish Borders and West Lothian Councils.

The Plan highlights that the South East Edinburgh Strategic Development Area (SDA) is served by the A720 City Bypass and the Sheriffhall Roundabout. It is recognised that the road infrastructure at this location is operating close to capacity and is severely congested at peak times. SESPlan identifies the grade separation of the Sheriffhall Roundabout as a key transport infrastructure project which is required for existing and future development within Midlothian/Borders SDA and the Regional Core (Paragraph 74). Paragraph 45 also notes that *'The upgrading of Sheriffhall Roundabout has been identified as an intervention within the STPR'* and the expansion of park and ride facilities at Sheriffhall is an aspiration as well.

### ***Proposed Strategic Development Plan: SESplan (October 2016)***

The Proposed Plan sets out the vision for the city region over 20 years from 2018. When approved in 2018 it will replace the current Strategic Development Plan and will inform the next set of Local Development Plans. The Proposed Plan is based on the options in, and responses to, the 2015 Main Issues Report. The approach to some issues remains unchanged from the 2013 Strategic Development Plan. The formal period of representations on the Proposed Plan ran from 13 October to 24 November 2016.

The proposed plan highlights A720 Improvements, including Sheriffhall Junction – Junction Upgrades as a potential strategic “cross-boundary” project supporting the vision for the Plan of a “better connected place”.

### ***City of Edinburgh Council Local Development Plan (Adopted November 2016)***

The Local Development Plan (LDP) notes through policy TRA 10 that planning permission will not be granted for development which would prejudice the proposed new roads and road network improvements listed in Table 9 and shown indicatively on the Proposals Map. The Proposals Map included in the 2016 Local Development Plan contains a number of “Transport Proposals and Safeguards” and includes a direction on the Sheriffhall Junction Upgrade (Ref: T13) which states *“Grade separation of existing roundabout junction on city bypass should incorporate bus priority and safe crossing of the bypass for pedestrians and cyclists”*.

The plan also makes reference to ‘Developer Contributions and Infrastructure Delivery’ relating to Sheriffhall Roundabout (Policy Del1). Proposals will be required to contribute to this development where relevant. Contribution zones will apply to address cumulative impacts. It is also noted that *“the BioQuarter may require to contribute to improvements to the A720 Sheriffhall Junction”*.

### ***Midlothian Council Local Plan (Adopted December 2008)***

Policy TRAN3 of the existing Midlothian Local Plan, ‘Trunk Roads (Proposal)’ supports the early implementation of the upgrading of the A720 Sheriffhall Junction grade separation.

Policy TRAN4, ‘Safeguards for Transportation Schemes’ includes provision for safeguarding the Sheriffhall Roundabout. It also states that Midlothian Council attaches a *“high priority to the grade separation of the A720/A7 Sheriffhall Roundabout”* as the current levels of congestion at the roundabout have *“a major impact on access to and from Midlothian and repercussions for its prospects for future growth and prosperity”*.

The area around the Sheriffhall Roundabout within the Midlothian Council region is primarily designated as Greenbelt. The Dalkeith Conservation Area lies directly to the east and the route of the ‘Waverley Rail Line’ (Borders Rail Link) runs north to south adjacent to the roundabout.

### ***Midlothian Council Proposed Local Development Plan (2014)***

The Midlothian proposed LDP will replace the current Midlothian adopted Local Plan and is scheduled to be adopted in spring 2017. Upgrading Sheriffhall roundabout is included in the proposed LDP under Policy TRAN2: Transport Network Interventions. A park and ride extension at Sheriffhall is also identified under this policy. Policy TRAN3: Strategic Transport Network further supports the upgrading of Sheriffhall Roundabout and states *‘The Council supports the early implementation of the grade separation of the A720 Sheriffhall Junction’*. Paragraphs 7.1.21 and 8.1.6 include reference to the necessity of the grade separation at Sheriffhall to allow new development in the area, as do a number of the ‘settlement statements’ in the proposed LDP. Paragraph 8.1.6 also noted that contributions from committed development are being sought for the upgrade of the A720 Sheriffhall Junction.

Six housing allocation sites in the proposed plan specifically make reference to *“contributions to the wider Shawfair infrastructure upgrade, such as the... Sheriffhall Upgrade”*. These sites are Cauldcoats (Hs0), Newton

Farm (Hs1), Shawfair Park Extension 2 (Ec1), Shawfair (h43), North Danderhall (h44) and South Danderhall (h45). These designations are discussed in more detail in Chapter 9 – Community and Private Assets.

The Midlothian LDP proposals map identifies a significant number of housing and business/industrial developments in close proximity to Sheriffhall Roundabout.

## 1.8 Consultations

A stakeholder register was prepared to ensure that all relevant consultees were included throughout the DMRB Stage 2 Assessment process.

A stakeholder workshop was held on the 25<sup>th</sup> of November 2016 to present the options to key stakeholders and to discuss local and key environmental issues and non-motorised user/ public transport provisions. Representatives from City of Edinburgh Council, East Lothian Council, Midlothian Council, Sustrans, SEStran, Transport Scotland and AECOM attended the workshop.

A public exhibition was also carried out at the Sheriffhall Park and Ride on the 6<sup>th</sup> and 7<sup>th</sup> of December 2016. The exhibition presented the three options under consideration and provided an opportunity for members of the public to provide comment and feedback. Queries and comments raised by the public either during the exhibition by post/ email following the exhibition have, where appropriate, been taken into account during the development of the design and the environmental assessment process.

A number of consultation letters were originally issued to environmental consultees in February 2015 for the Stage 2 Assessment. Due to the length of time between this and the final production of the Stage 2 Assessment, consultation letters were reissued in November 2016. The responses received are summarised in Table 1.3 below along with a list of consultees for the environmental assessment. A full copy of all responses can be found in Appendix 1.1 - Copy of Consultation Responses.

Some assessment topics may refer to the DMRB Stage 1 Responses carried out in 2013 and where these are referred to copies are included in Appendix 1.1 - Copy of Consultation Responses.

**Table 1.3 - Consultation Summary**

Consultee	Summary of 2015 Response	Summary of 2016 Response
AA Customer Service	No Response	No Response
Access & Cycling - CEC	No Response	No Response
Access & Cycling - MLC	No Response	No Response
Access & Cycling - ELC	No Response	<p><b>Dated 08/12/2016</b></p> <p>Concerned about perceived lack of provision for NMUs in the proposed scheme options – specifically the lack of a clear, prioritised shared use (walking/cycling) route providing safe access across the A720 into the west of East Lothian. A shared-use route would benefit active travel commuting and recreational walking/cycling.</p> <p>Requests that detailed Active Travel proposals are provided in the Sheriffhall scheme proposals e.g. provision of an underpass to take NMUs under the A720, without the need to interact with traffic “would be ideal”. Connectivity with the surrounding path/active travel network should also be explored during Stage 2. (Outdoor Access Officer)</p>
Amey	No Response	No Response
Architecture and Design Scotland	No Response	No Response
Biodiversity and Landscape - CEC	No Response	No Response

Consultee	Summary of 2015 Response	Summary of 2016 Response
Biodiversity and Landscape - ELC	<b>Dated 10/02/2015</b> Hold no relevant information and have no concerns regarding the proposed improvement. (Environmental Protection Officer)	<b>Dated 29/11/2016</b> Advised that The Wildlife Information Centre (local record centre) should be contacted regarding species records and information on any locally designated sites in the area. A data request had already previously been made to TWIC to support this Stage 2 assessment. (Biodiversity Officer)
Biodiversity and Landscape - MLC	No Response	No Response
British Horse Society	<b>Dated 01/04/2015</b> The BHS welcomed the scheme and expressed desire for segregated multi-use access tracks for NMUs.	<b>Dated 14/12/2016</b> The BHS repeated its desire for off-road, multi-use provision to be included in the Stage 2 scheme considerations.
Buccleuch Estates (Dalkeith Country Park)	<b>Dated 17/03/2015</b> A response on behalf of Dalkeith Country Park which is in Buccleuch Estates ownership, viewed the proposed A720 Sheriffhall roundabout works as "a positive development to the roads network and in enhancing the accessibility to the Park". Buccleuch Estates are keen to explore the opportunity to provide directional signage to Dalkeith Park sited on the bypass as part of the Sheriffhall Junction works, and also further at the A68 access point at the mid-point of the Estate as part of, or in advance of the works. Buccleuch Estates will view any requests for intrusive ground investigation works positively and not obstruct any reasonable requests to access Buccleuch land, should the resultant information be openly presented to them for review once completed. Buccleuch Estates preference in terms of the tabled options would be Option 6A (now Option B).	No Response
Coalfield Resources	No Response	No Response
Conservation Officer - CEC	No Response	No Response
Conservation Officer - ELC	No Response	No Response
Conservation Officer - MLC	No Response	No Response
Donald Urquart - CTC	No Response	No Response
E&M Horsburgh	No Response	No Response
Edinburgh Archaeological Field Society	No Response	No Response
Edinburgh Bioquarter	No Response	No Response
Edinburgh Chamber of Commerce	No Response	No Response
Edinburgh Coach Lines	No Response	No Response
Environmental Health - CEC	No Response	No Response

Consultee	Summary of 2015 Response	Summary of 2016 Response
Environmental Health - ELC	No Response	No Response
Environmental Health - MLC	No Response	<b>Dated 28/11/2016</b> Looking for information relating to modelling of noise emissions and air quality impacts.
First Group	No Response	No Response
Flood Prevention - CEC	No Response	<b>Dated 13/01/2017</b> Dean Burn is wholly within Midlothian area. Note from the SEPA flood maps that it doesn't look like the risk of flooding from the burn greatly affects the road; however it does identify several areas of potential surface water flooding that would need to be assessed.
Flood Prevention - ELC	No Response	No Response
Flood Prevention - MLC	No Response	<b>Dated 13/01/2017</b> MLC don't have any flooding data in the vicinity of Sheriffhall Roundabout. Approximately five years ago there was a recurring flooding issue on the A7 near Campend. No flooding in the area since the insertion of a larger carrier pipe.
Forestry Commission Scotland	No Response	No Response
Freight Transportation Association	No Response	No Response
Historic Environment Scotland	<b>Dated 12/03/2015</b> There are a number of heritage assets in the vicinity of the Sheriffhall Junction that should be identified in constraint mapping: Elginhaugh, Roman camp, native fort and palisaded enclosure 600m NE of (Scheduled Monument, Index No. 6202) Elginhaugh, Roman fort, annexe and bathhouse 200m NE of (Scheduled Monument, Index No. 5684) Melville Grange, homestead and pit alignments 600m ESE of (Scheduled Monument, Index No. 4592) Dalkeith Park, King's Gate, Walls And Lodge (Category A listed building, HB Num 1437) Dalkeith House (Palace) GDL It appears unlikely at this stage that any of the proposed schemes would have a significant impact on the settings of these heritage assets. Minor alterations to the scheme might result in direct impacts on Elginhaugh Roman Camp or Dalkeith house GDL.	<b>Dated 06/12/2016</b> Recommended that both City of Edinburgh and Midlothian Councils' archaeological and conservation advisors be consulted regarding potential impacts on the historic environment, including undesignated assets. No further comments or advice. The previous comments made at DMRB Stage 1 remain valid.
John Gray Centre	No Response	No Response
L&B Fire & Rescue	No Response	No Response
Lothian Buses	No Response	<b>Dated 27/01/2017</b> Lothian Buses support the proposal to create a grade separated junction at Sheriffhall as it should improve journey time for its services that use the A7 (N)-A6106(S) corridor. Lothian Buses preference is for Option B because it does not require additional roundabouts.



Consultee	Summary of 2015 Response	Summary of 2016 Response
		<p>Roundabouts cause a reduced level of comfort for bus passengers. Option A and C both replace one large diameter roundabout with two smaller roundabouts, with Option C introducing an additional even smaller roundabout between the dumbbell roundabouts and the roundabout at Sheriffhall Park and Ride. Option C is also undesirable because of the additional traffic heading to/from The Wisp/Fort Kinnaird/Shawfair added to the A7 north of Sheriffhall junction. With the level of development in that area this traffic flow will only increase creating the potential for southbound traffic on the A7 to be blocked at the new roundabout during busy times which will have a negative effect on our services.</p> <p>Lothian Buses note that the proposals do not detail whether any of the Options include traffic signals at Sheriffhall Junction. They state that it would assist in the southbound flow of traffic if signals were retained to control as a minimum the flow of traffic leaving the by-pass to avoid the traffic queueing situation that occurs at A720 Lothianburn junction.</p> <p>The consideration of the effect of the A720 on north-south traffic flows needs to be extended to the Lasswade Junction because of the high proportion of traffic that currently uses it to avoid Sheriffhall junction and congestion on the A720.</p> <p>An objective for this scheme should be to encourage modal shift from car by improving the attractiveness of public transport and other non-car modes.</p>
Lothian Community Transport Services	No Response	No Response
Lothian NHS Board	No Response	No Response
The National Trust for Scotland	No Response	No Response
Network Rail	No Response	No Response
Oakvale Garage Bongate	No Response	No Response
Planning - CEC	<p><b>Dated 24/02/2015</b></p> <p>Officers from a number of different Council Services may hold relevant information; I would therefore suggest that the most efficient way for the Council to contribute to this stage of the process would initially be for relevant Officers from these Services to meet with AECOM to discuss the proposals and any issues arising from them.</p>	No Response
Planning - ELC	No Response	No Response

Consultee	Summary of 2015 Response	Summary of 2016 Response
Planning - MLC	<p><b>Dated 13/03/2015</b></p> <p>Welcome the improvement works and have provided detailed general and option specific comments for consideration. Require clarification on modelling, SUDs requirements, drainage, proposed Tram Line 3 extension impacts, and active travel provision. The bus operators overall preferred option is 6A (now Option B). Visual Impact less where A720 is on embankment. Suggest segregated cycle lanes, over/under passes and continental style roundabouts (TRL) for NMUs. May have light pollution impacts on Dalkeith Palace GDL.</p>	No Response
Police Scotland	No Response	No Response
RAC Monitoring Services	No Response	No Response
RCAHMS	No Response	No Response
Road Haulage Association	<p><b>Dated 11/03/2015</b></p> <p>The RHA have no preference at this stage (in respect of the Sheriffhall Junction options) but would be happy to gain any improvements from which ever option is selected.</p> <p>In addition, the RHA provided the following information/advice:-</p> <p>Consider the potential changes to vehicle dimensions and other matters in relation to plans for road designs and layouts.</p> <p>The future possibility of increased lorry speed limits on single and dual carriageways.</p> <p>Lorries getting longer as well as higher – factors which can affect stability and road safety when entering and exiting roundabouts.</p>	No Response
Scottish Ambulance Services	No Response	No Response
Scottish Citylink Coaches	No Response	No Response
Scottish Environmental Protection Agency (SEPA)	<p><b>Dated 05/03/2015</b></p> <p>Stated that they have any comments to offer at this stage but would highlight that the issues outlined in their Stage 1 correspondence should be appropriately considered during the identification of a preferred option. (A summary of the Stage 1 consultation response is provided below and is included in Appendix 1.1 – Copy of Consultation Responses for reference )</p> <p><b>DMRB Stage 1 Response Dated 27/11/13</b></p> <p><i>SEPA's consultation response provided general advice suitable for consideration at DMRB Stage 1. Advice and guidance on flood risk, drainage, pollution prevention and environmental management, engineering activities in the water environment and regulatory advice was provided and SEPA have requested to be kept informed throughout the Scheme Development phases.</i></p>	<p><b>Dated 06/12/2016</b></p> <p>Sheriffhall Roundabout is at risk of flooding from surface water ponding. Consider vulnerable receptors when extending/replacing culverts.</p> <p>Ensure diversions/realignment of watercourses are assessed to understand changes in capacity, velocity and sediment erosion/deposition. Ensure alterations to watercourse/floodplain should be detailed through the submission of a Flood Risk Assessment.</p> <p>Install SUDs or other bio-retention areas to enhance the local environment.</p> <p>Identify all aspects of works that may impact upon the environment and potential pollution risks, and then identify principals of preventative measures and mitigation.</p> <p>Recommend Environmental Health officers in the relevant local authorities be consulted.</p>
Scottish Enterprise	No Response	No Response
SESplan	<p><b>Dated 08/03/2015</b></p> <p>Major development planned in northern Midlothian, East Lothian and Southern Edinburgh and the</p>	No Response

Consultee	Summary of 2015 Response	Summary of 2016 Response
	congestion and delay at Sheriffhall will hamper connectivity between these developments. Could the feasibility study have looked at the entire A720? Any redesign must include safe dedicated solutions to allow crossing of the A720. Active travel and public transport options require further consideration in the options. Any redesign should be future proofed.	
SEStran	<p><b>Dated 03/03/2015</b></p> <p>SEStran highlighted several issues for consideration:-</p> <p>The potential for bus priority through the upgraded Sheriffhall junction to encourage residents in Midlothian and beyond to use public transport when travelling to and from Edinburgh. There is also the need to consider the bus and car linkages to the Orbital Bus proposals.</p> <p>Improving the efficiency of bus linked to park and ride and cycle links across the bypass will help to reduce the impact of increased ease of access by car to and from Edinburgh.</p> <p>SEStran is carrying out a study looking at missing links in the strategic cycle network especially cross-boundary links. Initial findings are that there is a missing link in this area across the A720 bypass.</p> <p>SEStran state that "Option 6 or 6a seems to provide the best solution", (now Option B) but that the ability to accommodate priority bus lanes and segregated cycle links is of prime importance.</p>	No Response
Scottish Natural Heritage	<p><b>Dated 19/02/2015</b></p> <p>SNH welcomes the commitment to improve active travel provision across the A720. SNH recommended that the Stage 2 Report highlight whether there are any differences in active travel outcomes between the options that are being taken forward, or, whether they will all result in the same level of provision.</p> <p>SNH also noted that a core path crosses Sheriffhall roundabout from the A7 in the north onwards to the A6106 in the south and recommended consideration of maintaining access along this core path during the Scheme construction. If not, the Stage 2 report should explore the provision of an alternate, temporary, active travel route.</p>	<p><b>Dated 08/12/2016</b></p> <p>SNH repeated its response from Stage 1 that access (how the scheme will accommodate active travel or non-motorised users); protected species (that work will have to be done to assess any impacts upon protected species); and landscape and visual impacts are the three most relevant topics within that should be considered in this project.</p>
Scottish Rights of Way and Accesses Society (Scotways)	No Response	<p><b>Dated 08/12/2016</b></p> <p>Scotways is concerned that access to the Right of Way (LM97) is maintained during both the construction and operation of the chosen revised option (following Stage 3 assessment). Scotways provided a "marked-up" map highlighting LM97. This RoW is a Midlothian Council core path (section 4-8) and runs north-east from the A7 (north) between Campend and the Sheriffhall P + R site.</p> <p>Scotways also wishes to see how the Sheriffhall Roundabout improvement scheme will improve NMU access between the Edinburgh and its hinterland beyond the A720 City Bypass (and vice versa).</p>
Stagecoach	No Response	No Response
Sustrans	No Response	<p><b>Dated 27/01/2017</b></p> <p>In terms of the Hierarchy of measures, Sustrans Scotland agree that off-carriageway facilities need to be provided for walking, cycling and other non-motorised users as part of the redesign, given the speed and volume of traffic at the A720 Sheriffhall</p>

Consultee	Summary of 2015 Response	Summary of 2016 Response
		<p>Roundabout.</p> <p>Sustrans Scotland feel demand for walking and cycling is suppressed by current conditions at the Sheriffhall Roundabout and that it is important that new paths are included across and around the junction linking all the roads leading to/from it (with the exception of the A720, on which cycling and walking are prohibited). This will enable people to make local journeys across the junction on foot and by bike, reducing the severance caused by the A720. Sustrans Scotland also state that there are many potential active travel journeys which require a safe crossing of the A720 Sheriffhall Roundabout.</p> <p>Sustrans Scotland have assessed the 3 options presented (A, B and C) against the five Core Design Principles in Cycling by Design (Safety, Coherence, Directness, Comfort and Attractiveness) and conclude that Option C is the best for active travel (walking, cycling and non-motorised users). This is primarily because it is the most direct in terms of both distance and time and also likely to be the safest option for users. Option C is also likely to be the most attractive for users - albeit steps must be taken to make sure that user's feelings of personal security are maximised.</p> <p>Although Sustrans Scotland consider Option C to be the best outline design, a number of proposals are made which Sustrans Scotland believe should be included in the detailed design to create the best facilities for walking and cycling.</p> <p>Sustrans Scotland are keen to discuss the designs of active travel infrastructure in the Sheriffhall project with AECOM and Transport Scotland, as it progresses towards construction.</p>
Traffic Scotland	No Response	No Response
Transport - CEC	No Response	No Response
Transport - ELC	<p><b>Dated 19/03/2015</b></p> <p>No particular preference to any of the Sheriffhall Junction option proposals but concerns that the improvement works at Sheriffhall will result in more free flowing traffic on the A720 potentially resulting in more traffic arriving in a constant flow at the A720/A1 Old Craighall Junction and creating more congestion at this junction – particularly during peak weekday periods.</p> <p>In particular, concerns that the Sheriffhall Junction improvements will result in increased queuing of A1 southbound traffic exiting at the Old Craighall Junction to join the A720 leading to increased queue lengths back onto the East Lothian Council section of the A1 with the potential for vehicle collisions.</p> <p>The consultation response requests that “this is modelled and potential impacts (as highlighted above) mitigated against particularly on the ELC section of the A1”.</p>	No Response
Transport - MLC	No Response	No Response
Transport Scotland - Maintenance Control	No Response	No Response

Consultee	Summary of 2015 Response	Summary of 2016 Response
Transport Scotland - Network Operations & Development Control	<p><b>Dated 23/03/2015</b></p> <p>Most of the development management issues in and around Sheriffhall have not changed since the Stage 1 Report was published. You are aware of the Millerhill Road permanent closure issues which lie with Midlothian Council to clarify. Most matters where pre-application discussions have been taking place will have been captured within development planning including Newton Farm (proposed connection to A68 junction) and other emerging proposals in around Craighall.</p>	No Response
Visit Scotland	<p><b>Dated 18/02/2015</b></p> <p>The national tourism body is pleased that the following are being considered as part of the scheme objectives:</p> <p>Minimising intrusion of the new works on the natural environment, cultural heritage and people whilst enhancing the local environment where opportunities arise</p> <p>Facilitating integration for different modes of transport along and across the A 720 corridor between Gilmerton Junction and Dalkeith Northern Bypass.</p> <p>VisitScotland also noted AECOM's awareness of the Borders Railway project.</p> <p>In terms of access to Edinburgh from the A720 and to East and Midlothian from Edinburgh/A720, VisitScotland suggests that clear directional signage is a key component and some consideration should be given if there is opportunity for tourism signage that does not distract from the main directional signage and traffic regulation signage.</p>	No Response

## 2. Landscape and Visual

### 2.1 Introduction

The following section provides an appraisal of potential landscape and visual effects relating to the identified route options for the A720 Sheriffhall Roundabout.

The assessments describe and evaluate the landscape resource and visual amenity of the study area, report on the proposed change and highlight the potential effects of the options.

### 2.2 Approach and Methodology

The landscape and visual options assessments have been undertaken in accordance with the Guidelines for Landscape and Visual Impact Assessment (GLVIA), Third Edition, 2013 published by the Landscape Institute and the Institute of Environmental Management and Assessment. Reference has also been made to the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 5.

For the purpose of this assessment, the approach taken has primarily been informed by that set out in GLVIA as this is considered to represent current best practice. However, in order to be consistent with other sections within this report, the categories for sensitivity, magnitude of impact and significance of effect are consistent with those set out in DMRB and the associated Interim Advice Note 135/10.

As recommended in GLVIA, the assessments of landscape character and visual amenity, although closely related, are undertaken separately. A brief description of landscape and visual impacts is provided below:

- Landscape impacts can be physical or can relate to the landscape character and how this resource is perceived as a result of the proposed development.
- Visual impacts are a consequence of a change in the view as a result of the introduction of the proposed development and the effect on the overall visual amenity.

The assessment has been undertaken in the following broad stages:

- Establishment of the baseline;
- Appreciation of the route options; and
- Evaluation of the potential significance of effects.

#### 2.2.1 Study Area

A study area of 1km from the proposed junction options has been identified for the landscape and visual assessments. This extent, as shown on Figure 2.1 – Landscape Designations, has been defined through a review of maps and aerial photographs, in conjunction with on-site appraisal. The 1km extent allows for an overview of the local landscape and visual context to be achieved and covers all receptors considered to have the potential to be significantly affected by the proposed junction options.

#### 2.2.2 Establishment of the Baseline

A baseline study has been undertaken through a combination of desk based research and on site appraisal in order to establish the existing conditions of the landscape and visual resources of the study area. The landscape baseline study identifies landscape designations and distinct landscape types within the study area and helps define their key characteristics. The visual baseline aids in the identification of potential visual receptor locations and provides a description of the nature of the existing views.

#### 2.2.3 Appreciation of the Route Options

In order to be able to assess the potential impacts of the proposed options on landscape character and visual amenity it is important to develop a thorough understanding of each option. This includes a review of the location and potential alignment of each route and the requirement for earthworks, structures or other elements and is achieved through a review of drawings and information and on site appraisal. This helps to establish the potential extent of visibility and influence of each option and supports the identification of areas for further targeted survey

and analysis. A detailed description of the proposed options is provided in Chapter 1 - Overview of Environmental Assessment.

## 2.2.4 Evaluation of the Potential Significance of Effects

The landscape and visual assessments seek to identify, predict and evaluate the potential significance of effects to landscape characteristics and established views. The assessments are based on an evaluation of the sensitivity to change and the magnitude of impact for each landscape or visual receptor.

### ***Landscape Sensitivity to Change***

The evaluation of landscape sensitivity to change involves consideration of the nature of the landscape and its ability to accommodate change without compromising its key elements or characteristics. Appraisal of the baseline landscape involves consideration of landscape value, quality, condition and rarity. The ability of a landscape to accommodate change is informed through consideration of the baseline characteristics of the landscape, and in particular, the scale or complexity of a given landscape.

Landscape sensitivity to change is defined and described using the three point scale outlined in Table 2.1.

**Table 2.1 – Landscape Sensitivity to Change**

<b>Sensitivity</b>	<b>Classification Criteria</b>
High	Landscape of particularly highly valued character, considered very susceptible to relatively small change without fundamentally altering the key characteristics.
Moderate	Landscape of regional or local value, or rarity, exhibiting some distinct elements/features, considered tolerant of some degree of change without fundamentally altering the key characteristics.
Low	Landscape with few distinctive elements/features or valued characteristics and considered tolerant of a large degree of change without fundamentally altering the key characteristics.

### ***Magnitude of Landscape Impact***

Magnitude of landscape impact refers to the extent to which the route option would alter the existing characteristics of the landscape. Changes to landscape characteristics can be both direct and indirect. Direct change occurs where the route option would result in a physical change to the landscape. Indirect change occurs where the route option would become a feature in the landscape but would be physically located in a different landscape area.

Magnitude of landscape impact has been evaluated using the four point scale and criteria outlined in Table 2.2.

**Table 2.2 – Magnitude of Landscape Impact**

<b>Magnitude</b>	<b>Classification Criteria</b>
Major	The route option would result in considerable change over an extensive area, altering the key characteristics and the overall experience of the landscape.
Moderate	The route option would result in noticeable change over a large area, or more intensive change over a limited area, altering some key characteristics and/or the experience of the landscape.
Minor	The route option would result in a small change over a limited area affecting few characteristics, resulting in little or no change to the overall character.
Negligible	The route option would result in barely perceptible or not discernible change to the landscape character.

### ***Significance of Landscape Effects***

Determination of the significance of landscape effects has been undertaken by employing professional judgement to combine and analyse the magnitude of impact, against the identified sensitivity to change. The assessment takes account of direct and indirect change on existing landscape elements, features and key characteristics and evaluates the extent to which these would be lost or modified, in the context of their importance in defining the baseline landscape character.

The significance of landscape effects are described with reference to the five point scale outlined in Table 2.3.

**Table 2.3 – Significance of Landscape Effects**

Effect	Classification Criteria
Very Large	Considerable change over an extensive area of a highly sensitive landscape, fundamentally affecting the key characteristics and the overall impression of its character.
Large	Noticeable change to a highly sensitive landscape or more intensive change to a less sensitive landscape, affecting some key characteristics and the overall impression of its character.
Moderate	Noticeable change to a limited area of a moderately sensitive landscape or a more widespread area of a less sensitive landscape, affecting few key characteristics and not altering the overall impression of its character.
Slight	Small change over a limited area, affecting few characteristics and not altering the overall impression of its character.
Neutral	No discernible change to characteristics or the impression of the landscape.

For the purposes of this assessment, effects that are Large or Very Large are considered to represent key factors in the decision making process. Those that are moderate are considered to be important but not likely to be key decision making factors. Effects which are slight are unlikely to be critical in the decision making process but are important in enhancing the subsequent design of the project. Neutral refers to those effects which are beneath levels of perception.

### **Visual Sensitivity to Change**

The evaluation of visual sensitivity to change involves consideration of the viewing expectation, existing composition and the ability for change to be accommodated without compromising the key elements or focus of the view. Visual sensitivity to change is defined and described using the three point scale outlined in Table 2.4.

**Table 2.4 – Visual Sensitivity to Change**

Sensitivity	Classification Criteria
High	Locations where receptors experience a highly valued, impressive or well composed view, with very few, if any, detracting features and where even minor change is likely to be noticed.
Moderate	Locations where receptors experience a valued view which generally represents a pleasing composition but may include some detracting features and is tolerant of a degree of change.
Low	Locations where the view is incidental or not important to the receptors and the nature of the view is of limited value or poorly composed with numerous detracting features and is tolerant of a large degree of change.

### **Magnitude of Visual Impact**

Magnitude of visual impact relates to the extent to which the route option would alter the existing view and is an expression of the size or scale of change in the view and the geographical extent of the area influenced. Magnitude of visual impact has been evaluated using the four point scale and criteria outlined in Table 2.5.

**Table 2.5 – Magnitude of Visual Impact**

Magnitude	Classification Criteria
Major	The route option would result in very noticeable change, occupying a wide extent of the view and/or becoming a prominent feature and /or main focus of the view.
Moderate	The route option would result in noticeable change, occupying a more limited but important part of the view, distracting from the existing focus.
Minor	The route option would result in a small change, occupying a limited or unimportant part of the view, unlikely to distract from the existing focus.
Negligible	The route option would result in barely perceptible or no discernible change to the view.

### **Significance of Visual Effects**



Determination of the significance of landscape effects has been undertaken by employing professional judgement to combine and analyse the magnitude of impact, against the identified sensitivity to change. The assessment takes into account likely changes to the visual composition, including the extent to which new features would distract or screen existing elements in the view or disrupt the scale, structure or focus of the existing view.

The significance of visual effects are described with reference to the five point scale outlined in Table 2.6.

**Table 2.6 – Significance of Visual Effects**

Effect	Classification Criteria
Very Large	The route option would become a prominent feature and would result in a very noticeable change to a highly sensitive and well composed view.
Large	The route option would introduce some noticeable features to a highly sensitive and well composed view, or would be prominent within a less well composed and less sensitive view, resulting in a noticeable deterioration or improvement of the existing view.
Moderate	The route option would form a perceptible feature within a highly sensitivity view or would be a more prominent feature within a poorly composed view of lesser sensitivity, resulting in a small deterioration or improvement of the existing view.
Slight	The route option would form a perceptible but unimportant feature within a view, resulting in a limited deterioration or improvement of the existing view.
Neutral	No discernible change to the existing view.

For the purposes of this assessment, effects that are Large or Very Large are considered to represent key factors in the decision making process. Those that are moderate are considered to be important but not likely to be key decision making factors. Effects which are slight are unlikely to be critical in the decision making process but are important in enhancing the subsequent design of the project. Neutral refers to those effects which are beneath levels of perception.

## 2.3 Planning Policy Context

The landscape and visual assessments of the route options have been undertaken with reference to the following national policy and guidance:

### 2.3.1 National Policy and Guidance

#### **National Planning Framework 3 (2014)**

National Planning Framework 3 (NPF 3) provides a long term vision for the development of Scotland, identifying national and strategically important developments. The framework vision identifies the following four outcomes:

- A successful sustainable place.
- A low carbon place.
- A natural resilient place.
- A connected place.

One of the visions set out in NPF 3 is that of ‘*a natural, resilient place*’. NPF 3 recognises that landscape quality is found all across Scotland and landscape supports place making. ‘*Closer to settlements landscapes have an important role to play in sustaining local distinctiveness and cultural identity, and in supporting health and well-being (pg. 42).*’

#### **Scottish Planning Policy (2014)**

Scottish Planning Policy (SPP) is the statement of the Scottish Government’s policy on nationally important land use planning matters and sets out policy that will help to deliver the objectives of NPF 3.

SPP sets out a series of subject policies, the most relevant of which to landscape and visual considerations are included under the heading of *A Natural, Resilient Place*.

Paragraph 194 states that ‘The siting and design of development should take account of local landscape character. Development management decisions should take account of potential effects on landscapes and the natural and water environment, including cumulative effects. Developers should seek to minimise adverse impacts through careful planning and design, considering the services that the natural environment is providing and maximising the potential for enhancement’.

With regard to statutory designated landscapes, paragraph 203 states ‘Planning permission should be refused where the nature or scale of proposed development would have an unacceptable impact on the natural environment. Direct or indirect effects on statutorily protected sites will be an important consideration, but designation does not impose an automatic prohibition on development’.

Paragraphs 216 to 218 (Trees and Woodland) outlines the desire to protect woodland, hedgerows and trees, recognising their value for nature conservation and landscape value.

### ***Planning Advice Note 60: Planning for Natural Heritage (2008)***

PAN 60 provides advice on how development and the planning system can contribute to the conservation, enhancement, enjoyment and understanding of Scotland's natural environment. It advocates a positive and creative approach to addressing natural heritage issues in relation to development. PAN 60 outlines good planning practice in relation to natural heritage and includes a number of case study examples.

### ***Fitting Landscapes – Securing More Sustainable landscapes (2014)***

Fitting landscapes provides a policy statement of the Scottish Government’s approach to landscape design and management of transport corridors. It identifies the importance of landscape design in ensuring that road corridors fit within the landscape, reflecting local features and conserving and enhancing areas of high quality. It identifies four key policy aims, as follows:

- Ensure high quality of design and place;
- Enhance and protect natural heritage;
- Use resources wisely; and
- Build in adaptability to change.

## **2.3.2 Regional policy**

### **2.3.2.1 SESplan**

#### ***Strategic Development Plan: SESplan (June 2013)***

The Edinburgh and South East Scotland Strategic Development Plan (SESplan), was approved by Scottish Ministers on 27 June 2013 and covers the City of Edinburgh, East Lothian, Midlothian, Fife, Scottish Borders and West Lothian Councils.

The Plan highlights that the South East Edinburgh Strategic Development Area (SDA) is served by the A720 City Bypass and the Sheriffhall Roundabout.

The following policies are of relevance to landscape character and visual amenity:

- Policy 1B states that:

*‘Local Development Plans will:*

*ensure that there are no significant adverse impacts on the integrity of international, national and local designations and classifications, in particular National Scenic Areas... and Areas of Great landscape value...Gardens and Designed Landscapes.’*

*Conserve and enhance ‘the natural and built environment to create more healthy and attractive places to live’.*

#### ***Proposed Strategic Development Plan: SESplan (October 2016)***

The Proposed Plan sets out the vision for the city region over 20 years from 2018. When approved in 2018 it will replace the current Strategic Development Plan and will inform the next set of Local Development Plans. The Proposed Plan is based on the options in, and responses to, the 2015 Main Issues Report. The approach to some issues remains unchanged from the 2013 Strategic Development Plan. The formal period of representations on the Proposed Plan ran from 13 October to 24 November 2016.

The following principals are of relevance to landscape character and visual amenity:

- Table 3.1 Placemaking Principles

*'Areas important for maintaining the character, landscape setting and distinctive identity of existing and proposed settlements should be protected and enhanced...The contribution of the natural and historic environment to making distinctive places should be maximised. Key views of the surrounding landscape should be integrated into developments...Views of... the Pentland Hills... and the key landmarks of Edinburgh are particularly important in supporting a sense of place.'*

### 2.3.3 Local Policy

In addition to the above national policy and advice, a review of the City of Edinburgh and Midlothian Council planning policy has been undertaken. The following provides an overview of the key objectives and policies set out in the local plans of relevance to the proposed route options and specifically in relation to landscape character and visual amenity aspects.

#### 2.3.3.1 City of Edinburgh Council

##### **Edinburgh Local Development Plan (Adopted November 2016)**

- Policy Des 1 Design Quality and Context

*'Planning permission will be granted for development where it is demonstrated that the proposal will create or contribute towards a sense of place. Design should be based on an overall design concept that draws upon positive characteristics of the surrounding area. Planning permission will not be granted for poor quality or inappropriate design or for proposals that would be damaging to the character or appearance of the area around it, particularly where this has special importance.'*

- Policy Des 3 Development Design - Incorporating and Enhancing Existing and Potential Features

*'Planning permission will be granted for development where it is demonstrated that existing characteristics and features worthy of retention on the site and in the surrounding area have been identified, incorporated and enhanced through its design.'*

*Incorporation of existing features would include 'trees and woodland, landscape character, views...'*

- Policy Des 4 Development Design - Impact on Setting

*'Planning permission will be granted for development where it is demonstrated that it will have a positive impact on its surroundings, including the character of the wider townscape and landscape, and impact on existing views, having regard to: Height and form; Scale and proportions...'*

- Policy Des 8 Public Realm and Landscape Design

*'Planning permission will be granted where... 'Particular consideration has been given, if appropriate, to the planting of trees to... road sides and creates a robust landscape structure... and... a satisfactory scheme of maintenance will be put in place.'*

- Policy Des 9 Urban Edge Development

*'Planning permission will only be granted for development on sites at the greenbelt boundary where it conserves and enhances the landscape setting and special character of the city... and... includes landscape improvement proposals that will strengthen the greenbelt boundary.'*

- Policy Env 7 Historic Gardens and Designed Landscapes

*'Development will only be permitted where there is no detrimental impact on the character of a site, adverse effects on its setting or upon component features which contribute to its value.'*

- Policy Env 11 Special Landscape Areas  
*'Planning permission will not be granted for development which would have a significant adverse impact on the special character of qualities of the Special Landscape Areas'.*
- Policy Env 18 Open Space Protection  
*'Proposals involving the loss of open space will not be permitted unless it is demonstrated that: there will be no significant impact on the quality or character of the local environment'*

### 2.3.3.2 Midlothian Council

#### **Midlothian Local Plan (Adopted December 2008)**

- Policy RP1 Protection of the Countryside  
*'Development in the countryside will only be permitted if... it would be of 'a scale and character appropriate to the rural one'.*
- Policy RP6 Areas of Great Landscape Value  
*Development would not be permitted where it may adversely affect the special scenic qualities and integrity of the Areas of Great Landscape Value (AGLV).*
- Policy RP7 Landscape Character  
*'Development will not be permitted where it may adversely affect the quality of the local landscape. Where development is acceptable, it will respect the local landscape character and contribute towards its maintenance and enhancement. New developments will incorporate proposals to:*  
  
*Maintain the local diversity and distinctiveness of landscape character... and*  
  
*Enhance landscape characteristics where they have been weakened and need improvement...'*
- RP25 Nationally Important Gardens and Designed Landscapes  
*Development will not be permitted which would harm the character, appearance or setting of a garden or designed landscape which is included in the Inventory of historic Gardens and Designed Landscapes.*

#### **Midlothian Proposed Local Development Plan (2014)**

The Midlothian LDP will replace the current Midlothian adopted Local Plan and is scheduled to be adopted in spring 2017.

The following policies are of relevance to landscape character and visual amenity:

- Policy Dev 6 Layout and Design of New Development  
*'The Council will require good design and high quality of architecture, in both the overall layout of development proposals and their constituent parts. The layout and design of development proposals should meet the following criteria:*  
  
*The layout of development proposals should complement or enhance the character of any adjoining or nearby urban area...'*
- Policy Dev 7 Landscaping in New Development  
*'The Council will require development proposals to be accompanied by a comprehensive scheme of landscaping. The design of the scheme should:*  
  
*Complement the existing landscape both within and in the vicinity of the site...*  
  
*Make use of tree and shrub species that are of a good appearance, hardy and require low maintenance, with a preference for indigenous species;*

*Where a site abuts the countryside, incorporate tree belts of at least 30 metres in width to define the urban edge, allow for future growth of the trees and promote pedestrian access to the countryside beyond and wider path networks;*

*Ensure that, where roads are to be lined with trees, these are given adequate room to grow and mature;*

*Make use of trees to define the edge of development areas within sites;*

*Landscaping schemes should be implemented at an early stage in the development to allow adequate time to become successfully established. Maintenance proposals must accompany schemes of landscaping’.*

- Policy RD 1 Development in the Countryside

*Development in the countryside will need to be ‘Of a scale and character appropriate to the rural area and well integrated into the rural landscape’.*

- Policy Env 6 Special Landscape Areas

*‘Development proposals within Special Landscape Areas will only be permitted where they incorporate high standards of siting and design and where they will not have significant adverse effect on the special landscape qualities of the area. Developments affecting the setting of Special Landscape Areas will be subject to the same considerations.’*

- Policy Env 7 Landscape Character

*‘Development will not be permitted where it may significantly and adversely affect local landscape character. Where development is acceptable, it should respect such character and be compatible in terms of scale, siting and design. New developments will normally be required to incorporate proposals to maintain the diversity and distinctness of local landscapes and to enhance landscape characteristics where they have been weakened.’*

- Policy Env 11 Woodland Trees and Hedges

*‘Development will not be permitted where it could lead directly or indirectly to the loss of, or damage to, woodland, groups of trees... and hedges which have particular amenity... (or) landscape value or are of other importance. Where an exception to this policy is agreed, any woodland, trees or hedges lost will be replaced with equivalent.’*

- Policy Env 20 Nationally Important Gardens and Designed Landscapes

*‘Development will not be permitted which would harm the character, appearance and/ or setting of a garden or designed landscape as identified in the Inventory of Historic Gardens and Designed Landscapes.’*

## 2.4 Consultation

Initial consultation with Scottish Natural Heritage (SNH), City of Edinburgh Council and Midlothian Council was undertaken in February 2015 and again in November 2016 regarding the options proposed. Specific consultation regarding the viewpoint locations was undertaken in August 2015. Copies of these consultation responses are provided in Appendix 1.1 – Copies of Consultation Responses. A summary of the specific landscape and visual consultation responses are provided in Table 2.7 below (including additional specific consultation to discuss and agree viewpoint locations):

**Table 2.7 – Summary of Consultation Responses**

Consultee	Response
Scottish Natural Heritage (SNH)	<p><b>Dated 25/08/15</b></p> <p>SNH agreed that the majority of the impacts are likely to arise in a very small area around Sheriffhall. SNH noted that the list of viewpoints looked thorough and appropriate, however suggested that some of the viewpoints could be removed.</p> <p><i>Previous responses from SNH did not address landscape issues.</i></p>
City of Edinburgh Council	<p><b>Dated 02/09/15</b></p>

Consultee	Response
	<p>The Council noted that the 3 viewpoints relating to the City of Edinburgh Council's boundary appeared to be logical locations from which to assess the visual effects of route options. The viewpoints would cover both commuter routes and residential receptors i.e. the southern sections of Gilmerton Rd and Old Dalkeith Road. The Council also referred to landscape effects highlighting that the land to the northwest of the proposed junction lies within the green belt, which plays a role in maintaining the landscape setting of the City.</p> <p><i>Previous responses from the City of Edinburgh Council did not address landscape issues.</i></p>
Midlothian Council	<p><b>Dated 25/08/15</b></p> <p>The Council suggested reducing the number of viewpoints around the Melville Nurseries. They recommended replacing the Melville Grange viewpoint with a viewpoint located on the new railway cycle/walkway near Lasswade Road and moving the Melville Nurseries viewpoint to the A7/A772 roundabout.</p> <p>They also recommended the additional of a further viewpoint at Newton House. Subsequent to this consultation the options have been refined, resulting in Newton House and the railway cycle/walkway falling outside the study area. These viewpoints have therefore been omitted.</p> <p><b>Dated 13/03/15</b></p> <p>The Council commented on the landscape effects of all options under consideration.</p> <ul style="list-style-type: none"> <li>• Option A - <i>Will have some impact on the existing vegetation associated with the A720 but this could easily be remedied by incorporating replacement planting into the design. The main landscape visual impact would be in connection with the raised roadway of the A720 and the slip roads (especially the eastbound off slips) and the views in and out towards the Pentland Hills as well as towards the Dalkeith Palace ground.</i></li> <li>• Option B - <i>There will be significant landscape and visual impacts as a result of these proposals due to the large area of new roadway being proposed from the roundabout at Dobbies to the proposed new roadway on the northern side of the Gilmerton junction. This option furthermore requires the removal of woodland to accommodate the new roundabout and the new section of the A772 Gilmerton Road. This new piece of roadway would scar the landscape as it cuts across the fields to link up with the new and larger roundabout on the southern side of the Gilmerton junction. There are extensive views to and from the Pentland hills at this point.</i></li> <li>• Option C - <i>There will be significant landscape and visual impacts as a result of these proposals due to the large area of new roadway being proposed including three new roundabouts. The proposed line of the A7 south would also cut through a visually important woodland strip which contains the immediately adjacent economic development. The large areas of new roadway on both sides of the A720 would scar the landscape. There are extensive views to and from the Pentland Hills on the northern side of the A720.</i></li> </ul>

## 2.5 Baseline Conditions

The following section provides a description of the existing landscape character and visual resource of the study area. The baseline has been established through a combination of desk based study and on site appraisal.

### 2.5.1 Landscape Designations

Landscapes can be given international, national, regional or local designations in recognition of their importance, outstanding scenic interest or attractiveness. The study area contains a number of landscape designations which are shown on Figure 2.1 – Landscape Designations.

#### **Gardens and Designed Landscapes**

An inventory of Gardens and Designed Landscapes (GDL) was first compiled in 1987 in order to identify nationally important sites, to raise awareness of their significance and provide information for future management. The Scottish Historic Environment Policy 2011 sets out criteria for the selection of sites for the inclusion in the inventory and provides statutory protection to those selected.

The following three GDLs have been identified within the study area:

- Dalkeith House;
- Melville Castle; and,
- The Drum.

Newbattle Abbey, located outwith the south eastern edge of the study area, is also designated as a GDL.

### **Local Landscape Designations**

Special Landscape Areas (SLA) are designated for their local landscape value and importance and are identified and given policy protection within Local Plans and Local Development Plans. There are two such landscape designations found within the study area:

- North Esk Valley Area of Great Landscape Value/proposed SLA (pSLA); and
- The Drum SLA.

### **2.5.2 Landscape Character**

The desk study revealed three landscape character assessments concerned with the study area, namely:

- The Lothians Landscape Character Assessment, 1998, ASH Consulting Group;
- The Edinburgh Landscape Character Assessment, 2010, Land Use Consultants; and
- Edinburgh Green Belt: Landscape Character Assessment, 2008, Land Use Consultants.

Each of these documents has been referred to in establishing the baseline landscape character for the study area. The Landscape Character Areas (LCAs) identified within the Edinburgh Green Belt: Landscape Character Assessment have been utilised for the purpose of this assessment as they are identified at a local scale, are more recent than the Lothian Landscape Character Assessment, and cover the whole study area.

The Edinburgh Green Belt Assessment identifies 12 landscape character types (LCTs) and 96 smaller scale LCAs. The following eight LCAs are located within the study area, as shown on Figure 2.2 – Landscape Character:

- Danderhall Settled Farmland
- Melville Nurseries
- Dalkeith Palace
- Burdiehouse Farmland
- Drum Estate
- Edgefield
- Melville North Esk Valley
- South Melville

In addition to the above, parts of the study area are identified as of urban character.

The boundary of Danderhall Settled Farmland LCA has been slightly extended to include small areas outwith the published Landscape Character Assessment. AECOM's site visits confirmed these extensions to be representative of the characteristics set out in the character descriptions. The original map can be found in the published assessment online.

GLVIA states that the scope of the landscape assessment may “*be based on the extent of the area from which the development is potentially visible*”. An initial site appraisal identified that the visual envelope of the three route options would be limited in the south and west of the study area by topography and woodland, resulting in very limited or no visibility from four of the eight identified LCAs (Drum Estate, Edgefield, Melville North Esk Valley, and South Melville). On the basis that these LCAs are unlikely to experience significant effects they have not been considered further in this assessment.

### ***Danderhall Settled Farmland LCA***

The Danderhall Settled Farmland LCA covers a large portion of the northern half of the study area and is characterised by flat or gently undulating landform that rises to the northwest forming a distinct ridge of higher ground. Infrastructure elements including the A720 corridor and Sheriffhall roundabout, the A7, the Borders Railway and a double line of pylons cut across this landscape and have a strong influence on its character. The agricultural fields located within the study area have lost, to some extent, their original character as a result of becoming fragmented and influenced by encroaching settlement, former industrial development and derelict land. The LCA has a variable sense of openness and enclosure as a result of the combination of open agricultural land and remnant policy woodland. Poplar trees and shelterbelt planting associated with linear infrastructure and estates provide structure to the landscape.

There are a number of national and local level landscape designations (GDL/pSLA) within this LCA, indicating a locally high value. However, the presence of existing large scale infrastructure and industrial and urban elements reduces the overall value of the landscape.

### ***Melville Nurseries LCA***

Covering an area in the south west of the study area, Melville Nurseries LCA is gently undulating and comprises a series of pastoral fields divided by belts of mixed species policy woodland and beech stands. A network of busy roads and pylon lines along with Melville Nursery and associated commercial development has resulted in a complex, fragmented landscape. Shelterbelts and woodland are key features within this landscape and they provide local containment and enclosure, limiting outward views.

There is a local level landscape designation (pSLA) within this LCA, indicating a locally high value. However, the strong influence of infrastructure and development and the fragmented nature of this LCA indicates a limited value.

### ***Dalkeith Palace LCA***

Located in the east of the study area, Dalkeith Palace LCA is an extensive designed landscape which forms the setting of Dalkeith House. The LCA is heavily wooded, particularly around the estate's perimeter, resulting in a strong impression of enclosure and limited outward views. Dean Burn, a tributary to the River North Esk, flows through the wooded valley. Remnants of the designed landscape are evident in the form of ornamental specimen trees, estate walls and buildings and areas of parkland. Infrastructure crosses the LCA in the form of a high voltage power line and major roads, although these are located further east, outside of the study area.

This LCA is covered by a number of national and local level landscape designations (GDL/pSLA), indicating a high value. However, the presence of existing large scale infrastructure and the influence of transport corridors diminish the overall impression and value of the landscape.

### ***Burdiehouse Farmland LCA***

The Burdiehouse Farmland LCA covers land in the west of the study area and is characterised by rolling landform which forms a distinct ridge rising toward the southeast. Within the study area, this LCA comprises level or even sloped arable fields, enclosed by post and wire fences and stone walls. The relative lack of woodland and low roadside vegetation results in an open landscape affording views to the Pentland Hills. The landscape is bisected by the A720, a division that is highlighted by the double row of pylons that generally run parallel. Settlement is limited to isolated farmsteads.

Although this landscape is generally of good condition, providing a setting and contrast to adjacent LCAs to the north and east, the strong influence of existing road corridors and power lines reduces the overall value.

## **2.5.3 Visual Amenity**

Although the study area is relatively well settled, the majority of residential properties are located along the northern and southern extents. Potential visibility from these settlements is generally restricted by intervening topography and woodland. Beyond these areas there are a number of smaller settlements and groups of residential properties scattered throughout the study area. The following outlines the key receptor groups and



provides a brief description of the existing baseline views from each location. A representative viewpoint has been located in close proximity to each of these receptor groups. Viewpoint locations are shown on Figure 2.3- Viewpoint Locations and baseline photography for each of the seven viewpoints (VP- 1 – VP-7) is provided in Figures 2.4.1 to 2.4.7.

#### ***Sheriffhall Mains, Newton and Millerhill (Represented by VP 1)***

This is a group of scattered residential properties and villages located to the north of Sheriffhall Roundabout and include Sheriffhall Mains and the villages of Newton, Wester Millerhill and Easter Millerhill. The main orientation of views from these areas is to the southwest, across the relatively flat, open arable farmland. Traffic on the A6106 would be in the foreground of many views, with the A720 more distant. Views from these properties are variable but often include detracting elements and are generally considered to be of limited value.

#### ***Campend (Represented by VP 2)***

This is a group of residential properties, adjacent to Lowes Fruit Farm and the Sheriffhall Café located along the A7 to the north of Sheriffhall Roundabout. The main orientation of the view is to the southwest, across the A7 to the fields beyond. Mature planting and a hedgerow partially restricts views from most of the residential properties, with more open views from more elevated areas. Traffic on the A7 can be prominent in views, as are the large scale OHL towers. Views in other directions are largely screened by surrounding trees and adjacent buildings. The existing influence of traffic and power lines indicates a limited value of the view.

#### ***Summerside (Represented by VP 3)***

This is a group of residential properties located off the A7 to the northwest of Sheriffhall roundabout. The main orientation of the view is to the north and south, with some views to the northeast. Most views are restricted by surrounding mature vegetation, particularly to the south. There are some filtered views across the farmland to the north. The existing roundabout and A720 is largely screened, with only glimpses of traffic from some locations. The enclosed nature of the view and presence of detracting elements where outward views are available indicates that views are of limited value.

#### ***Old Sheriffhall (Represented by VP 4)***

This is a group of two residential properties with adjacent outbuildings, located in close proximity to the east of Sheriffhall Roundabout. The main orientation of the views is to the southeast and northwest. Views to the southeast are across the railway and towards the woodland which surrounds Dalkeith House estate. Views to the northwest are partially restricted and include traffic on the existing A720. The limited nature of the views and the presence of infrastructure in the foreground indicate that views are of limited value.

#### ***Melville Grange Cottages (Represented by VP 5)***

This is a row of four residential properties located immediately adjacent to the A720 and the Gilmerton Junction. The main orientation of the view is to the southeast and is partially restricted by sheds and vegetation. Although in very close proximity, the A720 is largely screened from view by topography and mature vegetation. Views in other directions are limited and include the A772 and large scale electricity pylons in close proximity. The enclosed nature of the main views and the numerous detracting elements in other views indicate an overall limited value.

#### ***Burnside (Represented by VP 6)***

This is a single dwelling with several adjacent outbuildings, located along the A772 to the east of the Gilmerton junction. The main orientation of the view is to the northwest and southeast, with some views to the northeast. Views tend to be partially restricted by planting and include traffic on the A772, particularly in views northeast. Although in relative close proximity to the A720, substantial roadside planting restricts and screens most visibility. The short range nature of views and the presence of detracting elements, including the adjacent traffic on the A772, result in a limited value of the view.

### **Melville Nurseries (Dobbies, Butterfly Farm etc.) (Represented by VP 7)**

This is a large group of residential properties, retail and catering developments located along the A772 and A7 to the south of Sheriffhall Roundabout. There is no clear principal orientation from the majority of receptors and many are inward looking. Where outward views are possible they tend to be relatively short range and restricted by adjacent woodland. These views also tend to include traffic on the A772 and A7 which can be prominent in the foreground, indicating a limited value of the view.

## **2.6 Assessment of Potential Effects**

The following provides an assessment of the potential landscape and visual effects resulting from each of the three route options.

The assessments focus on potential operational effects, as although construction activity would potentially result in adverse effects, they would be temporary in nature.

### **2.6.1 Limitations of the Assessment**

The landscape and visual assessments have been undertaken under the assumption that the land take and associated vegetation removal for each option would be kept to a minimum in order to reduce potential effects.

The visual assessment is based on a series of key receptors groups established in the baseline. The evaluation of magnitude of impact and significance of effects has been undertaken from the nearest publicly accessible location, and as such, assumptions as to the orientation of the main views from receptor locations have been made. The evaluation is based on an assumed worst case location within each receptor group and as such the significance of effects on individual receptors may differ locally from that stated.

In predicting the potential residual significance of effect assumptions as to the nature and extent of mitigation planting have been made, including the extent of land available and the suitability of planting on embankment slopes.

### **2.6.2 Potential Construction Effects**

As with any development of this nature, there is potential for effects on the landscape character and visual amenity during construction. Although the precise details of construction activities are not available at this stage of options development, it is considered that potential construction effects of the options would be broadly similar for the majority of the identified landscape and visual receptors.

With regards to landscape character and visual amenity, potential construction effects would be a result of vegetation clearance, temporary construction compounds, temporary storage of materials, earthworks operations and movement of construction equipment and vehicles.

Potential direct change to landscape character during construction is likely to be confined to relatively small areas of the Danderhall Settled Farmland and Melville Nurseries LCAs, with indirect change more widespread, particularly within the Danderhall Settled Farmland LCA. Depending on the detailed requirements of construction, and particularly the extent of land take and vegetation removal, the resulting magnitude of impact from each option on these two LCAs would be major and the potential significance of effect Large.

Potential change to the character of Dalkeith Palace LCA and Burdiehouse Farmland LCA during construction would be relatively limited and be the result of increased activity and movement within the adjacent LCAs. Magnitude of impact on these two LCA is anticipated to be minor and the potential significance of effects Slight.

Potential visual change during construction from the majority of the identified visual receptors within the study area would be relatively small and localised. Depending on the locations of temporary compounds and the extent of tree removal required, the magnitude of impact and the potential significance of effects on the majority of visual receptors, including those at Sheriffhall Mains, Newton and Millerhill, Melville Grange Cottages, Burnside, and Melville Nurseries (Dobbies, Butterfly Farm etc.) would be Moderate or less. Due to the close proximity of the proposed options to receptors at Campend, Summerside and Old Sheriffhall, magnitude of impact would be Major and the potential significance of effects Large.

Construction effects will be considered in more detail during the Stage 3 Assessment.

### 2.6.3 Landscape Designations

It is anticipated that the route options would result in minor or negligible impacts on the character of the landscape designations including (GDLs, AGLV/pSLA and SLA) found within the study area. This is largely due to the prevalence of woodland and the nature of the topography, limiting potential visibility of the route options, and the existing context of the A720, other transport infrastructure and associated traffic. It is therefore considered that potential effects on landscape designation would not influence the relative assessment of options or the selection of a preferred option and therefore have not been considered further in this assessment.

### 2.6.4 Landscape Character

#### 2.6.4.1 Danderhall Settled Farmland LCA

On account of the pronounced influence that existing largescale infrastructure, including the A720 corridor, has on this LCA, it is considered to be relatively tolerant of change. Sensitivity to landscape change is considered to be low.

##### **Option A**

Option A would involve replacement of the existing roundabout with two new roundabouts, an elevated section of carriageway and realignment of short sections of other roads. The majority of the changes would be located within this LCA, resulting in an intensive change over a localised area. Due to the existing context of the junction, roads and associated traffic, change on the impression of the character of the wider extent of this LCA would be limited, indicating a moderate magnitude of impact. It is anticipated that Option A would result in a **Moderate** significance of effect.

##### **Option B**

The majority of Option B would be located within this LCA and therefore there will be a number of physical effects. However, other than the new alignment of the A6106, Option B would largely follow the existing road alignment, albeit the total footprint of the junction would increase slightly. The proposed bridge and embankments of the A720 would increase the vertical prominence of the junction within the LCA. However, overall, Option B would cause a moderate magnitude of impact to the character of the landscape. The significance of effect is anticipated to be **Moderate**.

##### **Option C**

Option C would be located to the west of the existing roundabout and would increase the overall footprint, and therefore influence, of infrastructure within this LCA. This route option would result in some fragmentation of the landscape pattern through loss of field boundaries and associated trees and hedges. The combined influence of the new road bridge, raised southern roundabout and the pedestrian bridge would increase the vertical prominence of the junction and associated traffic within the LCA. Although the presence of the existing A720 corridor and other infrastructure has a strong influence on this LCA, the increased area occupied by Option C would cause a major magnitude of impact. Significance of effect is anticipated to be **Large**.

#### 2.6.4.2 Melville Nurseries LCA

Infrastructure and commercial development currently have a strong influence on the character of this LCA, mostly resultant from Melville Nurseries and the influence of the A772, A7 and A720 corridors. Due to the existing context this LCA is considered to be tolerant of change and of low sensitivity to change of the type proposed.

##### **Option A**

Option A would involve the construction of a new roundabout and realignment of short sections of road within this LCA and additional infrastructure in the neighbouring LCA to the north. Existing bands of woodland would limit the influence of change to a small part of this LCA, adjacent to the existing A720 corridor and Sheriffhall junction. Option A is therefore anticipated to result in a minor magnitude of impact and a **Slight** significance of effect.

##### **Option B**

Option B would largely be located outwith this LCA, although it would be in close proximity to the north, along the existing A720 corridor, resulting in indirect change. The increased height of the A720 carriageway and the slightly larger footprint would result in a small change, but as with Option A, this would be limited to a very small area of this LCA. The largely indirect and limited nature of change results in a minor magnitude of impact and a **Slight** significance of effect.

### **Option C**

Option C would result in a considerable increase in the amount of infrastructure within the LCA. The size of the proposed southern roundabout and associated roads and earthworks would likely cause considerable change to the experience of the landscape. This option would also involve the removal of parts of a woodland block which is an important feature within this LCA. Although the influence of this option would be limited to a relatively small area, the change would be intensive, resulting in a moderate magnitude of impact. The significance of effect is anticipated to be **Moderate**.

### **2.6.4.3 Dalkeith Palace LCA**

This LCA consists largely of policy woodland and parkland and contains little existing infrastructure and development, indicating a limited tolerance for change. However the context of the existing A720 corridor and other infrastructure in adjacent LCAs leads to a moderate sensitivity to change.

### **Options A, B and C**

Each of the options would predominantly be located outwith this LCA and as such direct change would be very limited. In addition, the wooded nature of this landscape would considerably limit potential indirect change to a very small part of this LCA which is already influenced by existing infrastructure. Magnitude of landscape change resulting from each of the options on this LCA would therefore be negligible and the significance of effect anticipated to be **Neutral**.

### **2.6.4.4 Burdiehouse Farmland LCA**

Due to the strong influence that existing largescale infrastructure, including the A720 corridor, has on this LCA, it is considered to be relatively tolerant of change. Sensitivity to landscape change is considered to be low.

### **Options A, B and C**

Each of the options would be located outwith this LCA and as such would not result in any direct physical change. Potential change would therefore be indirect in the form of visibility of the new infrastructure elements. The existing A720 corridor and other infrastructure provide a context to potential indirect change. Although the options are likely to be perceptible from the LCA, they would not represent a noticeable change and as such magnitude of impact would be minor and the significance of effect is anticipated to be **Slight**.

## **2.6.5 Visual Amenity**

### **2.6.5.1 Sheriffhall Mains, Newton and Millerhill (Represented by VP 1)**

As stated in the baseline, views from these receptors are generally considered to be of limited value. However, as this group of receptors includes residential properties views are considered to be important and of lower tolerance to change. Sensitivity to change is considered to be moderate.

### **Option A, B and C**

The majority of receptors within this group would gain very little or no visibility of all three options. However, a small number of receptors may gain some partial visibility of the raised carriage way of the A720 in Option A and Option B. The realignment of the A6106 in each option would result in the loss of poplar trees that cross part of the view and therefore open opportunities for glimpsed views of the junction, albeit this would be located over half a kilometre from the viewpoint. Due to the limited nature of visibility all three options are anticipated to result in a minor magnitude of impact and a **Slight** significance of effect.

### 2.6.5.2 Campend (Represented by VP 2)

As stated in the baseline, views from these receptors are generally considered to be of limited value. However, as this group of receptors includes residential properties views are considered to be important and of lower tolerance to change. Sensitivity to change is considered to be moderate.

#### **Option A**

Option A would involve the realignment and widening of the A7 in the foreground of the main southwest views from this group of receptors. This would involve loss of the hedgerow along the opposite side of the existing road, opening up views across the adjacent fields and slightly increasing the visibility of the A720 to the south. The majority of the changes resulting from Option A would be located to the southeast and east, side on to the main view, and largely screened by intervening vegetation and topography. Option A would involve the removal of a line of mature trees between Campend and the junction, slightly increasing the visibility of infrastructure and traffic. Due to the limited increase in visibility of infrastructure from this location, the magnitude of impact would be moderate. The significance of effect is anticipated to be **Moderate**.

#### **Option B**

Option B would largely be located outwith the main view and would generally be screened by intervening vegetation. There would be close range views of widening and realignment of the A7 from some of the receptors in this group, but this would represent a very minor change to the existing view which already includes traffic in the foreground. In addition, traffic on a short section of the A720 to the southwest of Summerside would potentially be visible, oblique to the main view. The limited nature of change indicates a minor magnitude of impact and a **Slight** significance of effect.

#### **Option C**

Option C would involve replacing the existing A7 with a new carriageway further west, within the main view. This would move the existing traffic slightly further away from the receptors. However, the new carriageway would be wider and would include new roundabouts and slip roads on embankment, increasing the influence of infrastructure in the view. The majority of the change would be oblique to the main view, with some partial screening. Magnitude of impact would be major and the significance of effect is anticipated to be **Large**.

### 2.6.5.3 Summerside (Represented by VP 3)

As set out in the baseline views from these receptors are generally of low value. However, the residential nature of receptors indicates an importance and lower tolerance of change to the views. On balance, sensitivity to change is considered to be moderate.

#### **Option A**

This option would introduce new road infrastructure and traffic in closer proximity to the southeast, but also slightly increase the distance to traffic in views northeast. However, the new roundabout and associated traffic would increase the influence of road infrastructure in views northeast. Views southeast are largely contained, but there is potential for close range glimpsed views of the A720 eastbound off slip, the raised A720 carriageway and associated traffic from a small number of locations. It is anticipated that the magnitude of impact would be moderate and the significance of effect would also be **Moderate**.

#### **Option B**

Option B largely follows the existing alignment but increases the footprint and height of the junction. The addition of an eastbound off slip from the A720 would extend road infrastructure and traffic slightly closer to the southeast of these receptors and would also result in the loss of existing planting along the A720. This in combination with the increased height of the A720 carriageway and associated traffic would potentially increase visibility of such infrastructure from some locations. However, views in this direction would be screened from the majority of receptors. There may also be a marginal increase in visibility of traffic from a small number of receptors in views east, although this is not anticipated to be a notable change. Due to the limited nature of change the magnitude of impact would be moderate and the significance of change is anticipated to be **Moderate**.

### **Option C**

The proposed realignment of the A7 North would introduce new features into westerly and northerly views from many of the residential receptors at Summerside. The introduction of the eastbound on slip to the A720, and the resultant loss of vegetation, would also increase the visibility and influence of road infrastructure and traffic in views south from some locations. Conversely, views east would benefit from the removal of traffic which is currently prominent in the foreground from some receptors. Overall, it is anticipated that the magnitude of impact would be major and the significance of effect would be **Large**.

#### **2.6.5.4 Old Sheriffhall (Represented by VP 4)**

As stated in the baseline, views from these receptors are generally considered to be of limited value. However, as these are residential receptors, views are important and of lower tolerance to change. On balance, views from these receptors are considered to be of moderate sensitivity to change.

### **Option A and B**

The proposed westbound off slip from the A720 for Options A and B would occupy the foreground of an important section of views from Old Sheriffhall. The block of woodland that currently screens the existing junction would largely be lost, increasing visibility of the road infrastructure and traffic. The increased height of the A720 would further increase the influence of road infrastructure and traffic in the foreground of views from this location. The magnitude of impact would be major and the significance of effect is anticipated to be **Large**.

### **Option C**

Option C would replace the existing roundabout with a new junction further west and therefore further from the viewpoint. The proposed embankments on the southern side of the A720 would be visible in the foreground of views, although this would be considered to be largely a reconfiguration of existing conditions. Filtered views of the proposed pedestrian bridge would likely be possible through the existing woodland clump to the southeast of the existing junction. There would also be potential for glimpsed views of the raised structure of the A7 to the west, particularly from Sheriffhall Farmhouse, although these would be side on to the main view. Overall, the route option is anticipated to result in a moderate magnitude of impact and a **Moderate** significance of effect.

#### **2.6.5.5 Melville Grange Cottages (Represented by VP 5)**

As stated in the baseline, views from this receptor group are generally considered to be of limited value. Being representative of residential receptors indicates that the view is important, with less tolerance of change and so, on balance, the sensitivity of the view is considered to be moderate.

### **Option A, B and C**

The main orientation of views from the cottages is to the southeast and northwest, with very limited views in other directions. The route options would be located to the east and as such potential visibility would be very oblique to the main view. Views from the cottages in this direction are very limited, although the access to the properties has slightly more open views. Visibility of each of the route options is anticipated to be limited to glimpsed or partially screened views of the elevated carriageways and an increase in visibility of traffic due to the loss of existing vegetation. Option C is likely to be slightly more visible than options A and B. However, the limited nature of the change resulting from all three options, oblique to the main view, indicates a minor magnitude of impact. It is anticipated that the significance of effect would be **Slight**.

#### **2.6.5.6 Burnside (Represented by VP 6)**

As outlined in the baseline the view from this receptor location is of limited value. However, as it is a residential property the view is considered to be important and less tolerant of change. On balance, the sensitivity to change is considered to be moderate.

### **Option A, B and C**

No visibility of the options is anticipated from this location due to intervening topography and vegetation, as such there would be no effects.

### 2.6.5.7 Melville Nurseries (Dobbies, Butterfly Farm etc.) (Represented by VP 7)

As stated in the baseline, views from this receptor group are generally considered to be of limited value. This group includes a range of receptor types and as such the viewing expectation and importance is variable. Overall, the sensitivity to change is considered to be low.

#### **Option A and B**

The majority of receptors in this group would experience no change as a result of options A and B. However, there may be a slight increase in visibility of road infrastructure and traffic in views northeast from the Melville Inn due to the loss of vegetation resulting from the realignment of the A7 South. The slight increase in visibility would be seen in the context of a view already heavily influenced by infrastructure and traffic and as such there would be limited apparent change. The overall magnitude of impact on this receptor group for Option A and B would be minor, and the significance of effect is anticipated to be **Slight**.

#### **Option C**

As with Option A and B, the majority of receptors in this group would experience no change as a result of Option C. However, there may be a slight increase in visibility of road infrastructure and traffic in views northeast from the Melville Inn due to the loss of vegetation resulting from the realignment of the A7 South. Option C would result in the greatest loss of vegetation as it would cut a new path through the prominent woodland block. The loss of trees and increased visibility of infrastructure would result in a moderate magnitude of impact. The significance of effect is anticipated to be **Moderate**.

## 2.7 Potential Mitigation

The following provides a number of broad design and mitigation recommendations to take forward to the detailed design stage in order to help reduce potential negative landscape and visual effects of the selected route option:

- Careful siting of construction compounds and minimising the required extent of land take and vegetation removal during construction;
- Make use of existing topographical features, landform and woodland where possible to help restrict the visual envelope;
- Incorporate woodland or scrub planting along the route corridors, particularly where on embankment, to help minimise visual effect and help tie the scheme into the surrounding landscape character;
- Minimise the need for structures and road furniture elements, such as signs or barriers as far as practical, and where possible rationalise existing elements;
- Grade out and round off embankment and cutting slopes, and use variable gradients to help tie them into the surrounding landscape;
- Explore opportunities for additional on and off-site mitigation planting to further reduce potential effects.

## 2.8 Summary of Effects

Table 2.8 provides a summary of anticipated effects, identifying potential mitigation measures and the resultant potential residual effects. The residual effects are assessed at summer year 15 of operation, once proposed mitigation planting has established in order to give an indication of potential long term effects.

**Table 2.8– Potential Construction and Operational Effects**

	Option	Predicted Impacts	Magnitude of Predicted Impact	Sensitivity of Receptor	Significance of Effect	Potential Mitigation Measures	Residual Effects
<b>Danderhall Settled Farmland LCA and Melville Nurseries LCA</b>							
Construction	Common to all Options	Intensive direct change over a relatively small area, with potential for more widespread indirect change resulting primarily from loss of vegetation and increased movement and activity.	Major	Low	Large	Careful siting of construction compounds. Minimise required extent of land take and vegetation removal for construction.	Large
<b>Dalkeith Palace LCA and Burdiehouse Farmland LCA</b>							
Construction	Common to all Options	Potential limited indirect change resulting from increased activity and movement within adjacent LCAs	Minor	Moderate/ Low	Slight	Careful siting of construction compounds. Minimise required vegetation removal for construction.	Slight
<b>Danderhall Settled Farmland LCA</b>							
Operation	A	The majority of change would be located within this LCA, resulting in an intensive change over a localised area. Due to the existing context of the junction, roads and associated traffic, change on the impression of the character of the wider extent of this LCA would be limited.	Moderate	Low	Moderate	Minimise loss of existing woodland, trees and hedgerows. Incorporate mitigation planting where possible to improve landscape fit and minimise potential indirect effects. Vary gradients of embankments to provide more natural, less engineered appearance.	Slight (at summer of year 15)
	B	Predominantly within this LCA and therefore change would be both direct and indirect. With exceptions of realigned A6106, this option largely follows existing alignment of A720, although with a slightly larger footprint and increased height. The proposed bridge and embankments of the A720 would increase the vertical prominence of the junction within the LCA.	Moderate	Low	Moderate		Slight (at summer of year 15)



Option	Predicted Impacts	Magnitude of Predicted Impact	Sensitivity of Receptor	Significance of Effect	Potential Mitigation Measures	Residual Effects	
C	Increase in overall footprint, and therefore influence, of infrastructure within this LCA. Some fragmentation of the landscape pattern through loss of field boundaries and associated trees and hedges. Combined influence of new road bridge, raised southern roundabout and pedestrian bridge would increase vertical prominence of the junction and associated traffic within the LCA.	Major	Low	Large		Moderate (at summer of year 15)	
<b>Melville Nurseries LCA</b>							
Operation	A	New roundabout and realignment of short sections of road within this LCA and additional infrastructure in the neighbouring LCA to the north. Existing bands of woodland would limit the influence of change to a small part of this LCA, adjacent to the existing A720 corridor and Sheriffhall junction.	Minor	Low	Slight	Minimise loss of existing woodland, trees and hedgerows. Incorporate mitigation planting where possible to improve landscape fit and minimise potential indirect effects. Vary gradients of embankments to provide more natural, less engineered appearance.	Slight (at summer of year 15)
	B	Largely located outwith this LCA, although it would be in close proximity to the north, along the existing A720 corridor, resulting in indirect change. The increased height of the A720 carriageway and the slightly larger footprint would result in a small change, limited to a very small area of this LCA.	Minor	Low	Slight		Slight (at summer of year 15)
	C	Considerable increase in the amount of infrastructure within the LCA. Size of the proposed southern roundabout and associated roads and earthworks would likely cause considerable change to the experience of a small part of this LCA. Removal of parts of a woodland block which is an important feature within this LCA.	Moderate	Low	Moderate		Slight (at summer of year 15)
<b>Dalkeith Palace LCA</b>							

	Option	Predicted Impacts	Magnitude of Predicted Impact	Sensitivity of Receptor	Significance of Effect	Potential Mitigation Measures	Residual Effects
Operation	Common to all Options	Predominantly located outwith this LCA and as such direct change would be very limited.  Wooded nature of this landscape would considerably limit potential indirect change to a very small area already influenced by existing infrastructure.	Negligible	Moderate	Neutral	Minimise loss of existing woodland and incorporate new planting to help minimise potential indirect effects.	Neutral
<b>Burdiehouse Farmland LCA</b>							
Operation	Common to all options	Located outwith this LCA and as such would not result in any direct physical change.  The existing A720 corridor and other infrastructure provide a context to potential indirect change.  Options are likely to be perceptible from the LCA, but not anticipated to result in a noticeable change.	Minor	Low	Slight	Minimise loss of existing woodland and incorporate new planting to help minimise potential indirect effects.	Slight (at summer of year 15)
<b>Sheriffhall Mains, Newton and Millerhill, Melville Grange Cottages, Burnside, Melville Nurseries (Dobbies, Butterfly Farm etc.)</b>							
Construction	Common to all Options	Change likely to be relatively limited, with a perceptible increase in activity, infrastructure or traffic visible from some locations.	Moderate or less	Moderate/ Low	Moderate or less	Careful siting of construction compounds.  Minimise required vegetation removal for construction.	Moderate or less
<b>Campend, Summerside, and Old Sheriffhall</b>							
Construction	Common to all Options	Potential for close range views of construction activity and temporary compounds. Potential increased visibility of infrastructure and traffic resulting from removal of trees.	Major	Moderate	Large	Careful siting of construction compounds.  Minimise required vegetation removal for construction.	Large
<b>Sheriffhall Mains, Newton and Millerhill (Viewpoint 1)</b>							
Operation	Common to all options	The majority of receptors within this group would gain very little or no visibility of all three options.  A small number of receptors may gain some partial visibility of the raised carriage way of the A720 in Option A and Option B.  Realignment of A6106 would result in the loss of poplar trees that cross part of the	Minor	Moderate	Slight	Minimise loss of existing trees.  Incorporate mitigation planting where possible to help screen traffic, particularly where on elevated section of carriageway.	Neutral (at summer of year 15)

	Option	Predicted Impacts	Magnitude of Predicted Impact	Sensitivity of Receptor	Significance of Effect	Potential Mitigation Measures	Residual Effects
		view, opening potential for glimpsed views of junction.					
<b>Campend (Viewpoint 2)</b>							
Operation	A	<p>Realignment and widening of the A7 in the foreground of the main views, resulting in loss of hedgerow and opening up of views to traffic on A720.</p> <p>Majority of change side on to main view and partially screened by shelterbelt trees.</p> <p>Removal of a line of mature trees to southeast would potentially increase the visibility of infrastructure and traffic.</p>	Moderate	Moderate	Moderate	<p>Minimise loss of existing trees and hedgerows.</p> <p>Replant hedgerow along south side of A7 North.</p> <p>Incorporate planting to screen views of traffic, particularly where on elevated section of carriageway.</p>	Slight (at summer of year 15)
	B	<p>Largely located outwith the main view and generally screened by intervening vegetation.</p> <p>Close range views of widening and realignment of the A7 from some receptors but change would be very minor.</p> <p>Potential increase in visibility of traffic on short section of A720, southwest of Summerside, oblique to main view.</p>	Minor	Moderate	Slight	<p>Minimise loss of existing trees and hedgerows.</p> <p>Replant hedgerow along south side of A7 North.</p> <p>Incorporate planting to screen views of traffic, particularly where on elevated section of carriageway.</p>	Neutral (at summer of year 15)
	C	<p>Replacing existing A7 with a new carriageway further west, within the main view. Traffic would be slightly further away but new carriageway would be wider and include roundabouts and slip roads on embankment.</p> <p>Majority of change would be oblique to the main view, with some partial screening.</p>	Major	Moderate	Large	<p>Minimise loss of existing trees and hedgerows.</p> <p>Replant hedgerow along south side of A7 North.</p> <p>Incorporate planting to screen views of traffic, particularly on the realigned A7 North and other elevated sections of carriageway.</p>	Moderate (at summer of year 15)
<b>Summerside (Viewpoint 3)</b>							
Operation	A	<p>New road infrastructure and traffic in closer proximity to the southeast, but traffic in northeast views more distant.</p> <p>New roundabout and associated traffic would increase influence of road infrastructure in views northeast.</p> <p>Views southeast largely contained, but potential for close range glimpsed views of</p>	Moderate	Moderate	Moderate	<p>Minimise loss of existing trees and hedgerows.</p> <p>Incorporate screen planting where possible, and particularly on embankments, to minimise visual prominence of infrastructure and traffic.</p>	Slight (at summer of year 15)

Option	Predicted Impacts	Magnitude of Predicted Impact	Sensitivity of Receptor	Significance of Effect	Potential Mitigation Measures	Residual Effects	
	the A720 eastbound off slip, the raised A720 carriageway and associated traffic from small number of locations.						
B	<p>Largely follows existing alignment of A720 but increases the footprint and height of the junction.</p> <p>Eastbound off slip would extend road infrastructure and traffic slightly closer to the southeast and result in the loss of existing planting along the A720. This and increased height of the A720 carriageway and associated traffic would potentially increase visibility from some locations. However, views in this direction are screened from majority of receptors.</p> <p>Potential for marginal increase in visibility of traffic from a small number of receptors in views east.</p>	Moderate	Moderate	Moderate	<p>Minimise loss of existing trees and hedgerows.</p> <p>Incorporate screen planting where possible, and particularly on embankments, to minimise visual prominence of infrastructure and traffic.</p>	Slight (at summer of year 15)	
C	<p>Realignment of A7 North would introduce new features into westerly and northerly views.</p> <p>Eastbound on slip, and resultant loss of vegetation, would increase the visibility and influence of road infrastructure and traffic to south.</p> <p>Views east would benefit from removal of traffic which is currently prominent in the foreground.</p>	Major	Moderate	Large	<p>Minimise loss of existing trees and hedgerows.</p> <p>Incorporate screen planting where possible, and particularly on embankments of realigned A7 North and eastbound on slip, to minimise visual prominence of infrastructure and traffic.</p>	Moderate (at summer of year 15)	
<b>Old Sheriffhall (Viewpoint 4)</b>							
Operation	A & B	<p>Westbound off slip from the A720 would occupy the foreground of important section of views.</p> <p>Loss of block of woodland that currently screens the existing junction would increase visibility of road infrastructure and traffic.</p> <p>Increased height of the A720 would further increase the influence of road infrastructure and traffic in the foreground of views.</p>	Major	Moderate	Large	<p>Minimise loss of existing trees and hedgerows.</p> <p>Incorporate screen planting, particularly on embankments for westbound off slip and raised A720 carriageway.</p>	Moderate (at summer year 15)

Option	Predicted Impacts	Magnitude of Predicted Impact	Sensitivity of Receptor	Significance of Effect	Potential Mitigation Measures	Residual Effects
C	<p>New junction would be more distant than existing.</p> <p>Proposed embankments on south side of A720 would be visible in the foreground, although this would largely appear as a reconfiguration of existing.</p> <p>Potential filtered views of proposed pedestrian bridge through existing woodland to northeast.</p> <p>Potential for glimpsed, side on views of raised structure of A7 to the west, particularly from Sheriffhall Farmhouse.</p>	Moderate	Moderate	Moderate	<p>Minimise loss of existing trees and hedgerows.</p> <p>Incorporate screen planting on road embankments, particularly on the new westbound off slip, southern roundabout, and the realigned sections of the A7 and A6106 Old Dalkeith Road.</p>	Slight (at summer year 15)
<b>Melville Grange Cottages (Viewpoint 5)</b>						
Operation	<p>Common to all Options</p> <p>Potential visibility would be very oblique to the main view, with little visibility from cottages.</p> <p>Visibility is anticipated to be limited to glimpsed or partially screened views of the elevated carriageways and traffic due to loss of existing vegetation.</p>	Minor	Moderate	Slight	<p>Minimise loss of existing trees and hedgerows and incorporate planting where possible.</p>	Neutral (at summer year 15)
<b>Burnside (Viewpoint 6)</b>						
Operation	<p>Common to all Options</p> <p>No visibility of options anticipated due to intervening topography and vegetation.</p>	No Change	Moderate	Neutral	Not required	Neutral
<b>Melville Nurseries (Dobbies, Butterfly Farm etc.) (Viewpoint 7)</b>						
Operation	<p>A &amp; B</p> <p>Majority of receptors in this group would experience no change.</p> <p>Potential for slight increase in visibility of road infrastructure and traffic in views northeast from the Melville Inn due to the loss of vegetation along A7 South.</p> <p>These views already heavily influenced by infrastructure and traffic and as such there would be limited apparent change.</p>	Minor	Low	Slight	<p>Minimise loss of existing trees, particularly where A7 South passes through block of woodland.</p> <p>Incorporate new planting, particularly adjacent to the realigned A7 South.</p>	Neutral (at summer year 15)
C	<p>Majority of receptors in this group would experience no change.</p> <p>Increase in visibility of road infrastructure and traffic from some locations due to</p>	Moderate	Low	Moderate	<p>Minimise loss of existing trees, particularly where A7 South would pass through block of woodland.</p> <p>Incorporate new planting, particularly</p>	Slight (at summer year 15)

Option	Predicted Impacts	Magnitude of Predicted Impact	Sensitivity of Receptor	Significance of Effect	Potential Mitigation Measures	Residual Effects
	removal of trees to accommodate realignment of A7 South.				adjacent to the realigned A7 South and the southern roundabout.	

## 2.9 Compliance with Policies and Plans

The following section provides a judgement of potential compliance or conflict with policies and plans, from a landscape and visual standpoint.

Without appropriate mitigation measures it is considered that each of the route options have the potential to conflict with the following policies:

- National Planning Framework 3 (2014)
- Scottish Planning Policy (2014)
- Planning Advice Note 60: Planning for Natural Heritage (2008)
- Fitting Landscapes (2014)
- Strategic Development Plan: SESplan (June 2013)
- Policy 1B The Spatial Strategy Development Principles
- City of Edinburgh Council Local Development Plan (November 2016)
- Policy Des 1 Design Quality and Context
- Policy Des 3 Development Design- Incorporating and Enhancing Existing and Potential Features
- Policy Des 4 Development Design- Impact on Setting
- Policy Des 8 Public Realm and Landscape Design
- Policy Des 9 Urban Edge Development
- Policy Env 18 Open Space Protection
- Midlothian Adopted Local Plan (2008)
- Policy RP1 Protection of the Countryside
- Policy RP7 Landscape Character
- Midlothian Local Development Plan- Proposed Plan (2014)
- Policy Dev 6 Layout and Design of New Development
- Policy Dev 7 Landscaping in New Development
- Policy RD 1 Development in the Countryside
- Policy Env 7 Landscape Character
- Policy Env 11 Woodland Trees and Hedges

The above listed policies are broadly concerned with: quality of design; protection of the countryside and landscape character; and the protection of woodland, trees and hedges.

In each case, the mitigation measures outlined in Section 2.7 would help to reduce or remove potential conflicts with these policies. Proposed planting would enhance the design of each option, helping to improve the landscape fit, provide screening of structures and associated traffic, and compensate for the loss of any existing trees or hedgerows. The approach to mitigation design would be to utilise and enhance existing landscape features so to be consistent with the existing character of the local area, and is likely to include hedgerows along field boundaries and woodland and scrub planting along embankments and adjacent to existing woodland blocks.

## 2.10 Conclusions

### 2.10.1 Landscape Character

The potential effects of each of the options on landscape character during construction are anticipated to be largely similar. The majority of potential change during construction would occur within the Danderhall Settled Farmland and Melville Nurseries LCAs, potentially resulting in a Large significance of effect. Potential change to the character of the Dalkeith Palace and Burdiehouse Farmland LCAs during construction would be relatively

limited and therefore the significance of effect is anticipated to be Slight. Potential construction effects would be temporary and of short duration.

During the operational phase, the landscape character assessment has identified that Options A and B are anticipated to result in slight or neutral significance of effects on the Melville Nurseries, Dalkeith Palace and Burdiehouse Farmland LCAs, with moderate significance of effect anticipated on the Danderhall Settled Farmland LCA. Although the increased height of the carriageway for these options would locally increase the influence of road infrastructure and traffic within the landscape, the existing context of the A720 corridor and roundabout and the alignment being broadly similar to the existing would limit the apparent scale of change. Although the assessment has indicated that the levels of significance of effect would be the same for Option A and B, on balance Option B would result in slightly lesser effects as a result of it largely following the existing alignment and requiring a smaller land take.

Option C would require the greatest LCA land take and result in an increased loss and/or fragmentation of landscape features and as such it would result in the greatest significance of effect of the three options. It is anticipated that Option C would result in a large significance of effect on the Danderhall Settled Farmland LCA, with effects on the Melville Nurseries, Dalkeith Palace and Burdiehouse Farmland LCAs ranging from moderate to neutral.

For all options the inclusion of mitigation planting, particularly on embankment slopes, would be important to help minimise potential residual and long term effects on the local landscape character. It is anticipated that Option A and C would have the greatest scope for mitigation planting, although planting of embankments of Option B would also greatly assist with reducing potential long term effects. It is anticipated that Option A and B would result in slight or neutral significance of effect on all LCA in the long term, with Option C resulting in moderate significance of effect on the Danderhall Settled Farmland LCA and slight or neutral on the Melville Nurseries, Dalkeith Palace and Burdiehouse Farmland LCAs in the long term.

## 2.10.2 Visual Amenity

In general, the majority of residential properties and settlements within the study area would not be affected by the options as a result of screening from topography and woodland.

As with landscape character, the potential visual effects of each of the options during construction are anticipated to be largely similar. The potential significance of effects on the majority of visual receptors, including those at Sheriffhall Mains, Newton and Millerhill, Melville Grange Cottages, Burnside, and Melville Nurseries would be moderate or less. Due to the close proximity of the proposed options to receptors at Campend, Summerside and Old Sheriffhall, the potential significance of effects are anticipated to be Large. Potential construction effects would be temporary and of short duration.

During the operational phase, the visual assessment has identified that Option A has the potential to result in a large significance of effect on the Old Sheriffhall receptor group, moderate significance of effect on the Campend and Summerside receptor groups and slight or neutral on the Sheriffhall Mains, Newton and Millerhill, Melville Grange Cottages, Burnside, and Melville Nurseries receptor groups.

The levels of effect on most receptors groups resulting from Option B would be broadly similar to those for Option A, with the exception of the receptor grouping at Campend which would experience a reduction of significance of effect from moderate to slight.

Option C is anticipated to result in the greatest level of effects, with the Campend and Summerside receptor groups receiving a large significance of effect, and the Sheriffhall Mains, Old Sheriffhall, Newton and Millerhill, Melville Grange Cottages, Burnside, and Melville Nurseries receptor ranging from moderate to neutral. This increase is largely due to the more extensive realignment of the A7 North, in close proximity and within the main view from several receptors at Campend and Summerside.

In the long term, with the inclusion of extensive mitigation planting, it is anticipated that the significance of effects for all options would be moderate or lower. Option B is anticipated to result in the lowest level of effects, followed by Option A, with Option C anticipated to result in the greatest level of effects.

## 2.11 Scope of DMRB Stage 3 Assessment

The DMRB Stage 3 assessment should be based on the following tasks



- Update the baseline landscape assessment, if necessary;
- Work with the design team to ensure as the design progresses it minimises landscape and visual effects where possible;
- Identify detailed mitigation and compulsory purchase order land requirements, incorporating mitigation;
- Update the impact assessment to take account of detailed mitigation proposals.
- Photomontages should also be prepared in consultation with SNH, City of Edinburgh Council and Midlothian Council.

## 3. Nature Conservation

### 3.1 Introduction

This Chapter addresses the potential impacts on nature conservation receptors of the options for the A720 Sheriffhall Roundabout Junction Improvement. The chapter is supported by Figure 3.1 – Designated Areas of Conservation Interest, and Figure 3.2 – Extended Phase 1 Habitat Survey (which includes protected species information). Sensitive badger data has been placed in Appendix 3.1 – Badger Survey Data (Confidential).

### 3.2 Approach and Methodology

#### 3.2.1 General Approach

The assessment process in this Chapter utilises, in combination with professional judgement, guidance on impact assessment set out in the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 4 – ‘Ecology & Nature Conservation’, DMRB Volume 11, Section. 2, Part 2 - *Environmental Impact Assessment*, and Interim Advice Note (IAN) 130/10 – *Ecology and Nature Conservation: Criteria for Impact Assessment*. Note that although IAN 130/10 has not yet been assessed for use in Scotland, it is the most recent Highways Agency advice concerning ecological impact assessment and aligns more closely (but does not correspond) to the Guidelines for Ecological Impact Assessment in the UK & Ireland published by the Chartered Institute of Ecology & Environmental Management (CIEEM 2016). The assessment also took into consideration Scottish Transport Appraisal Guidance (Scottish Government 2008).

The objective for DMRB Stage 2 assessment is “to undertake sufficient assessment to identify the nature conservation factors, and the significance of effects upon them, to be taken into account by the Design Organisation in developing and refining route options” (DMRB Vol. 11 S. 3, P. 4 ‘Ecology & Nature Conservation’ Pg. 7/1). The specific nature conservation objectives for all stages of DMRB assessment are:

- “The maintenance of the diversity and character of the countryside, including its wildlife communities and important geological and physical features”; and
- The maintenance of viable populations of wildlife species, throughout their traditional ranges, and the improvement of the status of rare and vulnerable species.” (DMRB Vol. 11, S. 3, P. 4 ‘Ecology & Nature Conservation’ Pg. 1/1).

For the purposes of this options assessment, and in view of the relatively small size of the construction footprint, it was considered sufficient to undertake an Extended Phase 1 Habitat survey incorporating search for evidence of and potential for protected and notable species (including invasive species), together with a desk study including a data request to the local biological records centre. It is expected that further detailed ecological surveys will be undertaken for the Stage 3 assessment.

#### 3.2.2 Desk Study

Baseline information has been collated through desktop research using a number of sources. Details on statutory site designations and ancient woodland were obtained via the SNH SiteLink and Natural Spaces webpages and are provided in Figure 3.1 – Designated Areas of Conservation Interest. Sites deemed of relevance were those within 2km of the scheme for statutory designated sites, and within 500m for non-statutory sites and features.

Information regarding relevant protected and notable species within 2km of the scheme was gained via a data request (provided on the 17<sup>th</sup> December 2014) to the local biological records centre (The Wildlife Information Centre, TWIC). Due to the time passed since this request, and the possibility of further notable species being present in the area, a further data search was made on the 31<sup>st</sup> January 2017 using the Atlas of Living Scotland web resource.

#### 3.2.3 Field Survey Area

The survey area for fieldwork encompassed the footprint of all options plus a 500m buffer.

### 3.2.4 Field Survey Methods

An Extended Phase 1 Habitat Survey was undertaken by AECOM (then URS) on the 18th and 19th of February 2015. The standard Phase 1 habitat survey methodology was used (JNCC, 2010), the extended aspect comprising close attention to species composition of all habitats, assessment of habitat potential for protected species, search for protected species evidence, mapping of non-native invasive plant species, and any other relevant ecological information. A Phase 1 habitat map is provided in Figure 3.2 – Extended Phase 1 Habitat Survey which also includes recorded protected and invasive species information.

Search for protected species potential and evidence during the Extended Phase 1 Habitat Survey was undertaken by surveyors familiar with guidance for full protected species surveys, including guidance for badger (Harris et al., 1998), otter (Chanin, 2003, Liles, 2003 and Strachan, 2007, where applicable to site survey), water vole (Strachan, 2011), red squirrel and pine marten (Cresswell et al., 2012) and bat roost potential (Collins, 2016).

### 3.2.5 Impact Assessment

This impact assessment involves three steps: assignment of sensitivity (valuation), characterisation of impact, and determination of significance.

The sensitivity or valuation of ecological receptors is considered on a geographic scale as set out in Table 3.1 below. This is informed by IAN 130/10 (Highways Agency, 2010) and CIEEM guidance (CIEEM, 2016).

**Table 3.1 – Ecological Receptor Sensitivity**

Sensitivity	Examples of types of receptor (subject to professional judgement)
International or European	<p>Internationally-designated sites including: Special Protection Areas (SPAs); potential SPAs (pSPAs); Special Areas of Conservation (SACs); candidate &amp; possible SACs (cSACs &amp; pSACs); Wetlands of International Importance (Ramsar sites); Biogenetic Reserves; World Heritage Sites; and Biosphere Reserves.</p> <p>Areas meeting the selection criteria for the above designations but not themselves designated, including viable or restorable areas (or parts thereof essential to overall viability) of Annex I habitat.</p> <p>Resident or regularly occurring species population (or site supporting one) considered significant at an International or European level where: i) its loss would adversely affect conservation status or distribution on an International/European scale; or ii) it forms a critical part of a wider population on an International/European scale; or iii) the species is at a critical life cycle phase.</p>
UK or National	<p>Nationally-designated sites including: Sites of Special Scientific Interest (SSSIs); National Nature Reserves (NNRs); Marine Protected Areas (MPAs); and Marine Conservation Zones (MCZs).</p> <p>Areas meeting the selection criteria for the above designations but not themselves designated.</p> <p>Viable or restorable areas (or parts thereof essential to overall viability) of Priority habitats or Ancient Woodland identified in the Scottish Biodiversity List (SBL) or SNH Ancient Woodland Inventory.</p> <p>Resident or regularly occurring species population (or site supporting one) considered significant at National level (e.g. 1% of national resource) or higher level where: i) its loss would adversely affect conservation status or distribution on a national scale; or ii) it forms a critical part of a wider population on a national scale; or iii) the species is at a critical life cycle phase.</p>
Regional	<p>Areas of priority habitats identified in the Regional BAP (if available) or SNH Natural Heritage Future zone.</p> <p>Viable or restorable areas (or parts thereof essential to overall viability) of priority habitats identified in the Regional BAP, or of habitats judged to have ecological value at this scale.</p> <p>Resident or regularly occurring species population (or site supporting one) considered significant at Regional level (e.g. 1% of regional resource) or higher level where: i) its loss would adversely affect conservation status or distribution on a regional scale; or ii) it forms a critical part of a wider population on a regional scale; or iii) the species is at a critical life cycle phase.</p>
County or Unitary Authority Area	<p>Sites designated at county/unitary authority level including: Local Nature Reserves (LNRs), Local Nature Conservation Sites (LNCSs) and County Wildlife Sites (CWSs).</p> <p>Areas meeting the selection criteria for the above designations but not themselves designated.</p> <p>Viable or restorable areas (or parts thereof essential to overall viability) of priority habitats identified in the Local BAP, or of other habitats judged to have ecological value at this scale.</p> <p>Resident or regularly occurring species population (or site supporting one) considered significant at County/Unitary Authority level (e.g. 1% of county resource) or higher level where: i) its loss would adversely affect conservation status or distribution on a county/unitary authority scale; or ii) it forms a critical part of a wider population on a county/unitary authority scale; or iii) the species is at a critical life cycle phase.</p>
Local	<p>Areas of habitat or populations of species considered to appreciably enrich the local ecological resource including veteran trees and features of value for migration, dispersal or genetic exchange.</p>

**Sensitivity**    **Examples of types of receptor (subject to professional judgement)**

Viable or restorable areas (or parts thereof essential to overall viability) of priority habitats identified in the Local BAP, or of other habitats judged to have ecological value at this scale.

Resident or regularly occurring species population (or site supporting one) considered significant at County/Unitary Authority level (e.g. 1% of county resource) or higher level where: i) its loss would adversely affect conservation status or distribution on a county/unitary authority scale; or ii) it forms a critical part of a wider population on a county/unitary authority scale; or iii) the species is at a critical life cycle phase.

For the purposes of this options assessment, the various impact parameters employed in characterisation of impact as set out in IAN 130/10 and CIEEM 2016 (including impact scale, extent, duration, timing, frequency and reversibility) are jointly considered, and the impacts are then assigned the standard magnitude levels set out in DMRB Vol. 11, S. 2, 'Assessment and Management of Environmental Effects' P. 5, in accordance with professional judgement. Impact magnitude levels are set out in Table 3.2 below.

**Table 3.2 – Impact Magnitude**

Magnitude	Typical Criteria Descriptors
Major	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements ( <i>Adverse</i> ).
	Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality ( <i>Beneficial</i> ).
Moderate	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements ( <i>Adverse</i> ).
	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality ( <i>Beneficial</i> ).
Minor	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements ( <i>Adverse</i> ).
	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring ( <i>Beneficial</i> ).
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements ( <i>Adverse</i> ).
	Very minor benefit to or positive addition of one or more characteristics, features or elements ( <i>Beneficial</i> ).
No Change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

Finally, impact magnitude (Table 3.2) and receptor sensitivity (Table 3.1) have been combined to determine impact significance, taking into account professional judgement, and as shown in Table 3.3 below. Note that impact significance can be beneficial as well as adverse.

**Table 3.3 – Impact Significance (subject to professional judgement)**

Significance	Descriptor	Relevance to Decision-making
Very Large	Significant impact on ecological integrity or conservation status at International or National scale.	Key factor
Large	Significant impact on ecological integrity or conservation status at Regional scale	Very important and likely to be material
Moderate	Significant impact on ecological integrity or conservation status at County or Unitary Authority scale	Important but not likely to be a key factor.
Slight	Significant impact on ecological integrity or conservation status at Local scale	Unlikely to be critical but important in enhancing design.
Neutral	No significant impact on ecological integrity or conservation status at any scale	Not relevant.

## 3.3 Planning Policy Context

### 3.3.1 Summary of Key Nature Conservation Legislation

#### **Conservation (Natural Habitats, &c.) Regulations 1994 (as amended in Scotland)**

The 'Habitats Regulations' protect European Protected Species (EPS) and European designated sites (Special Areas of Conservation and Special Protection Areas). For EPS (e.g. all bats, otter *Lutra lutra*, great crested newt *Triturus cristatus* and natterjack toad *Bufo calamita*) it is an offence to:

- Deliberately or recklessly kill, injure or take an EPS (or its eggs where applicable);
- Deliberately or recklessly disturb an EPS at a place of shelter, or elsewhere if this could impair its ability to breed or affect its local distribution;
- Damage, destroy or obstruct access to an EPS place of shelter (whether occupied or not).

Places of shelter include all bat roosts, otter holts and laying-up areas, and great crested newt foraging/hibernation habitat up to 500m from breeding ponds where connective habitat exists.

Actions which would be EPS offences can be licensed, but only if the reason is one of the specified purposes in Regulation 44(2), there is no satisfactory alternative, and the action is not detrimental to the 'favourable conservation status' of the species. Developments affecting European protected sites must be subject to a Habitats Regulations Appraisal (HRA) and site integrity must be maintained.

#### **Wildlife & Countryside Act 1981, Nature Conservation (Scotland) Act 2004 and Wildlife & Natural Environment (Scotland) Act 2011 (as amended in Scotland)**

Together, these Acts protect birds and certain animals/plants that are not European Protected Species (see above), regulate non-native species, protect Sites of Special Scientific Interest (SSSIs), and place a duty on public bodies to further the conservation of biodiversity. For Schedule 5 animals (e.g. red squirrel *Sciurus vulgaris*, water vole *Arvicola amphibius*, pine marten *Martes martes* and wildcat *Felis sylvestris*) it is an offence to intentionally or recklessly (or knowingly cause/permit another person to):

- Kill, injure or take the animal (not currently applicable to water vole);
- Damage, destroy or obstruct access to the animal's places of shelter;
- Disturb the animal whilst at a place of shelter.

Common reptiles are protected from intentional or reckless killing/injuring, and together with common amphibians from sale/trade. For birds it is an offence to intentionally or recklessly:

- Kill, injure or take any wild bird or its eggs;
- Take, damage, destroy or interfere with the nest of any wild bird whilst in use or being built (or at any time for eagles), or obstruct/prevent any wild bird from using its nest;
- Disturb Schedule 1 birds at or near an active nest or lek, or their dependent young (or harass eagles, hen harrier or red kite at any time).

Some actions affecting Schedule 5 species which would be offences can be licensed, including for development where there is significant social, economic or environmental benefit and no satisfactory alternative. Licensing is not possible for wild birds to enable development proposals.

Under this legislation, it is an offence to spread any non-native species in the wild.

Developments affecting SSSIs are generally only allowed if there are reasons of national importance and site integrity will be maintained.

#### **Protection of Badgers Act 1992 (as amended in Scotland)**

It is an offence to: wilfully kill, injure or take a badger *Meles meles*; intentionally or recklessly damage, destroy or obstruct a badger sett, or disturb a badger in a sett (or allow someone to do these things). A sett is any structure

or place with signs of current use by badger. Some actions which would be offences can be licensed, but for development it is not possible to licence direct removal or killing of badgers.

### **Water Framework Directive ('WFD')**

Through the WFD, SEPA require that developers identify groundwater-dependent terrestrial ecosystems (GWDTES) within 100m of roads/trenches or 250m of substantial constructions, and assess the pressures on them. If avoidance is not possible, mitigation should be developed to minimise impacts, particularly from drainage, pollution and waste management. SEPA may request conditions to be attached to any development consent to guarantee mitigation.

## **3.3.2 National Policy and Guidance**

### **3.3.3 Ancient Woodland**

Although there is no legislation specifically protecting ancient woodland, Scottish Planning Policy 2014 (SPP) identifies it as an important and irreplaceable national resource that should be protected and enhanced, along with other native and long-established woodlands with high nature conservation value. Scottish ancient woodland is defined as land that is currently wooded and has been continually wooded since 1750 or the mid-1800s, depending on the earliest mapping available. The Ancient Woodland Inventory (AWI) is a provisional guide to the location of ancient woodland in Scotland, which has important biodiversity and cultural value by virtue of its antiquity. It is described as provisional because not all ancient woodland is guaranteed to have been identified, especially small patches. Thus any woodland not in the AWI that is demonstrably ancient (by presence on early mapping and/or appropriate ecological characteristics) should be treated as ancient woodland.

### **3.3.4 Scottish Planning Policy (2014)**

Scottish Planning Policy (SPP) recognises the environment as a national asset offering opportunities for enjoyment, recreation and sustainable economic activity. The key principles relevant to nature conservation are set out under SPP paragraph 194, and can be summarised as:

- facilitate positive change while maintaining/enhancing distinctive landscape character;
- conserve and enhance protected sites and species, while maintaining the healthy ecosystems and natural processes which provide important services to communities;
- protect and improve all parts of the water and soil environment in a sustainable way;
- protect and enhance ancient woodland, hedgerows and individual trees with high ecology or landscape value; and,
- seek biodiversity benefits from new development where possible, including habitat restoration and avoiding fragmentation.

SPP emphasises the biodiversity duty of public bodies (paragraph 195) and the policy and legislative requirements for protected sites and species (paragraphs 207-214). This includes Habitats Regulation Appraisal (HRA) of European sites whereby plans or projects potentially affecting them can only be approved if there will be no adverse effect on site integrity; derogation is possible only if there are no alternatives and there are imperative reasons of overriding public interest, in which case sufficient compensation is required to maintain coherence of the European site network. SPP also sets out policy for woodland, including ancient woodland and veteran trees (paragraphs 216-219).

Other parts of SPP often relevant to nature conservation include policy on green infrastructure (key principles in paragraph 221), and management of flood risk and drainage (key principles in paragraph 255), including avoidance of culverting, development on floodplains and use of Sustainable Drainage Systems (SuDS).

### **3.3.5 Scottish Biodiversity List**

The Scottish Biodiversity List (SBL) includes lists of national priority habitats and species. The priority habitat descriptions are based on those of the former UK Biological Action Plan (UK BAP). The following SBL priorities are either present or have the potential to occur in the survey area: rivers, ponds, hedgerows, lowland mixed

deciduous woodland, common toad, bats, otter, red squirrel and several bird species including lapwing, curlew, tree sparrow, grey partridge and yellowhammer.

### 3.3.6 Local Policy

Policies and documents within the City of Edinburgh Council and Midlothian Council Local Development Plans (2016 and 2008 respectively) and Midlothian Council Proposed Plan (2014, proposed to be adopted Spring/Summer 2017) set out legal and planning requirements concerning biodiversity, protected sites and species, and protection of the countryside including Green Belt and open space.

#### 3.3.6.1 City of Edinburgh Council

##### ***Edinburgh Local Development Plan (Adopted November 2016)***

The City of Edinburgh Council Local Development Plan includes the following policies relevant to nature conservation:

- Env13: Sites of International Importance.
- Env14: Sites of National Importance.
- Env15: Sites of Local Importance.
- Env16: Species Protection.
- Env21: Flood Protection (this includes avoidance of culverting and deculverting).
- Des6: Sustainable Buildings (this includes Sustainable Urban Drainage Systems (SUDS)).

##### ***City of Edinburgh Council Local Biodiversity Action Plan***

Edinburgh LBAP (2016, which recently replaced the 2010 LBAP) outlines an extensive series of Action Plans which detail biodiversity objectives, actions and timescales. Habitats are encompassed under Green and Blue Networks and certain species/general biodiversity are included in Species Action Plans. General action plan topics include: Local Biodiversity Sites, grasslands and meadows, hedgerows, invasive species, woodland, riparian networks, SUDS schemes, protected mammals, birds, invertebrates and plants.

#### 3.3.6.2 Midlothian Council

##### ***Midlothian Council Local Plan (Adopted December 2008)***

The current Midlothian Council Local Plan includes the following policies relevant to nature conservation:

- RP5 Woodland, Trees and Hedges
- RP10 Internationally Important Nature Conservation Sites
- RP11 Nationally Important Nature Conservation Sites
- RP12 Regionally & Locally Important Nature Conservation Sites
- RP13 Species Protection
- RP14 Habitat Protection Outwith Formally Designated Areas
- RP15 Biodiversity Action Plan
- DP3 Protection of the Water Environment

##### ***Midlothian Proposed Local Development Plan (2014)***

The proposed Midlothian Council Local Development Plan includes the following policies relevant to nature conservation:

- ENV2: Midlothian Green Network

- ENV4: Peat & Carbon Rich Soil
- ENV10: Water Environment (including presumption against culverting)
- ENV11: Woodland, Trees & Hedges (including presumption against notable woodland loss)
- ENV12: Internationally Important Nature Conservation Sites
- ENV13: Nationally Important Nature Conservation Sites
- ENV14: Regionally and Locally Important Nature Conservation Sites
- ENV 15: Species and Habitat Protection and Enhancement

### 3.4 Consultation

Initial consultation for the Stage 2 assessment was undertaken in February 2015. Given the time that elapsed between this and the final production of the Stage 2 Assessment, consultation letters were re-issued in November 2016. Consultees relevant to Nature Conservation were SEPA, SNH and East Lothian Biodiversity, whose responses are summarised in Table 3.4 below (full details of all consultation can be found in Chapter 1 – Overview of Environmental Assessment).

**Table 3.4 – Summary of Consultation Responses**

Consultee	Response
Scottish Natural Heritage (SNH)	<p><b>Dated 19/02/2015</b></p> <p>With regard to species and designated sites, SNH recommended that up-to-date species records from the local biological records centre (note that a data request had already previously been made to The Wildlife Information Centre to support this Stage 2 assessment)</p> <p>SNH anticipated that there will be no impacts on nearby conservation designation sites.</p> <p><b>Dated 08/12/2016</b></p> <p>The 2016 response re-iterated that impacts upon protected species should be assessed.</p> <p>It should also be noted that in their response to the Stage 1 Consultation (<b>Dated 13/11/2013</b>) SNH stated that they would encourage any measures to improve air quality in this area. This was with regard to the Dalkeith Oakwood SSSI and one of its special features protected by the SSSI designation is the range of lichen species, including many rare species. Lichens are particularly sensitive to airborne pollution, of which the nearby A720 is a known source. Impacts of improvements of air quality should be measured, and take in to account in-combination effects with other proposed developments nearby.</p> <p>They also stated that protected species may be present within the study area and should be taken into consideration, particularly otters on the Dean Burn, badgers and breeding birds.</p>
	<p><b>Dated 05/03/2015</b></p> <p>SEPA referred to their previous Stage 1 Consultation (<b>Dated 28/11/2013</b>) which stated:</p> <p>Vulnerable receptors should be considered when extending/replacing culverts. Ensure they are of equal size/shape/slope.</p> <p>Ensure diversions/realignment of watercourses are assessed to understand changes in capacity, velocity and sediment erosion/deposition.</p> <p>Install SUDs or other bio-retention areas to enhance the local environment.</p> <p>Identify all aspects of works that may impact upon the environment and potential pollution risks, then identify principals of preventative measures and mitigation. A CEMD (Construction Environment Management Document) is a key tool to implement this.</p> <p><b>Dated 29/11/2016</b></p> <p>This consultation response reiterated the key points from the previous consultations.</p>
Biodiversity and Landscape – East Lothian Council	<p><b>Dated 29/11/2016</b></p> <p>The 2015 consultation response from East Lothian Biodiversity (ELB) stated that they held no relevant information. They further advised that The Wildlife Information Centre (TWIC, the local biological records centre) should be contacted regarding species records and information on any locally designated sites in the area (note that a data request had already previously been made to TWIC to</p>



## Consultee

## Response

support this Stage 2 assessment).

## 3.5 Baseline Conditions

### 3.5.1 Desk Study

#### 3.5.1.1 Statutory Designated Sites

##### ***Dalkeith Oakwood SSSI***

There is one national statutory designated site within 2km of the scheme. This is Dalkeith Oakwood SSSI which is designated for the lichen assemblage (including scarce and rare species), beetle fauna (including scarce species, the majority dependent on dead wood) and the habitat of wood pasture and parkland. This is an area of ancient oakwood listed in the Ancient Woodland Inventory (AWI) and one of only two ancient park woodlands remaining in Scotland. Both pedunculate *Quercus rober* and sessile *Q. petraea* oaks are present amongst ash *Fraxinus excelsior* and elm *Ulmus glabra*, with some of the oaks of medieval origin. The age of this woodland and therefore the range of micro-habitats it supports, including deadwood, allows a species-rich beetle fauna and lichen flora to exist. The notified features of this SSSI are: wood pasture and parkland, lichen assemblage (including several scarce and one nationally rare species, *Lecania suavis*) and species-rich beetle fauna (including scarce species).

The proposed works are a minimum of 1050m from the closest boundary of this SSSI (where all options tie into the A720 north-east of Sheriffhall), as illustrated on Figure 3.1 – Designated Areas of Conservation Interest.

##### ***International/National Statutory Sites Further Afield with Potential Connectivity***

The closest point of the Firth of Forth SSSI, Special Protection Area (SPA) and Ramsar site lies on the coast approximately 4.5km to the north of the proposed works. The biological notified features of the SSSI include the vascular plant assemblage, beetle fauna, habitats such as mudflats and sand dunes and a list of 30 breeding and non-breeding bird species (such as non-breeding red throated diver, slavoian grebe and lapwing; plus breeding eider, shelduck and ringed plover). The SPA and Ramsar qualifying features are wintering and passage bird populations including wintering red-throated diver, pink-footed goose and knot and a passage population of sandwich tern. This is an extremely important international site and is connected to the survey area by the River North Esk. This meets the South Esk 1.5km east of the proposed works and thereon flows to the sea as the River Esk.

##### ***Burdiehouse Burn Valley Park Local Nature Reserve***

The Burdiehouse Burn Valley Park Local Nature Reserve (LNR) is a recently-designated LNR approximately 2km north-west of the options. Features of interest include meadows, young native woodland, mature woodland, old limestone quarries and the Burdiehouse burn.

#### 3.5.1.2 Non-statutory Designated Sites

Three locally designated sites for nature conservation occur within 1km of the scheme, but none are within the footprint of any Option. They comprise Local Wildlife Sites (LWSs) managed by Midlothian Council as detailed in Table 3.5 below.

**Table 3.5 – Locally Designated Nature Conservation Sites**

Site	Designation	Feature of Interest
Dalkeith Estate	LWS	Ecologically notable features of this designation include Dalkeith Oakwood SSSI (see above) and mature woodlands and other semi-natural habitats in the Dalkeith Country Park.
Melville Castle	LWS	Ecologically notable features of this designation include mature woodland and other semi-natural habitats including the River North Esk.
River North Esk	LWS	The River North Esk and associate riparian habitats including mature woodland.

Other designated Local Nature Conservation Sites (LNCSs) are detailed on the Edinburgh Local Development Plan Proposals Map (November 2016) but are not described further. This includes an area near Drum Wood which was a Local Biodiversity Site under the previous Local Development Plan. This is approximately 930m from Options A & C and is an area of ornamental and native tree species.

### 3.5.1.3 Ancient Woodland

There are approximately 287 hectares of Ancient Woodland within 2km of the Sheriffhall Roundabout, of which 112ha is of semi-natural origin; these areas are mapped in Figure 3.1 – Designated Sites within 2km. The ancient woodland present includes ancient semi-natural woodland in Dalkeith Oakwood SSSI (see above) and along the River North Esk. Other ancient woodland, including all ancient woodland in the scheme vicinity, is ancient woodland of plantation origin. There is no legislation specifically protecting ancient woodland (unless it is within a protected site such as the SSSI), but SPP identifies it as “an important and irreplaceable national resource that should be protected and enhanced”, and it is best practice to avoid impacts on such habitat wherever possible. The important status of ancient woodland, and the ability of this habitat to support rare species, is an important consideration in this Stage 2 Options Assessment.

### 3.5.1.4 Notable species

The local record centre (TWIC) provided records of 95 notable species within 2km of the proposed works. Species were regarded as notable if they are included in a relevant Local Biodiversity Action Plan (LBAP), the Scottish Biodiversity List (SBL), are subject to national or international protection (on Schedule 5 of the Wildlife & Countryside Act or a European Protected Species), or are considered Nationally Rare and Nationally Scarce. All records are post-1990. Species which are notable and considered likely to be present in the area affected by the scheme, given the habitats present, are included in Table 3.5 below. The scarce and rare lichen records (and probably also the scarce invertebrate records) are likely to have been recorded from Dalkeith Oakwood SSSI. This designation is within the 2km desk study area, is designated for rare lichens, and is also likely support scarce invertebrates; conversely, high quality habitat likely to support such scarce and rare species is lacking within the scheme footprint. However, they have been included in the table since they could be subject to indirect pollution effects.

In order to supplement the 2014 data request with more recent data a search was made of the Atlas of Living Scotland on the 31<sup>st</sup> January 2016. This search provided up dated records of bird species, of which all species likely to occur in or near the footprints of all options are already included in Table 3.5. Additionally, the search provided seven recent records of grey squirrel, *Sciurus carolinensis*; this species was not present in the 2014 search results. Although not notable as defined above, records of grey squirrel are useful in the assessment of habitat potential for red squirrel which is a notable species.

Table 3.6 includes red/amber listing for birds. This is from the fourth Birds of Conservation Concern list (BoCC4, Eaton et al., 2015). Species on the BoCC4 Red List show severe declines in population or range, or are globally threatened. Species on the BoCC4 Amber List show moderate declines in population or range, or are rare/localised breeders, on the European Red List, or have internationally important populations in the UK. Species on the Green List are not of conservation concern. BoCC4 confers no legal status but assists in evaluating impacts and determining proportionate mitigation. Also in this table are notes of protected species status (e.g. Schedule 5) which are explained in the legislation section 3.3.1.

**Table 3.6 – Notable Desk Study Records Potentially Present in the Area Affected by the Scheme**

Taxon	Common name	Latin	LBAP <sup>1</sup>	Designations <sup>2</sup>
amphibian	Common Frog	Rana temporaria	M	
amphibian	Common Toad	Bufo bufo	C M	
amphibian	Great Crested Newt	Triturus cristatus	M	SBL, Sch5, EPS
bird	Barn owl	Tyto alba	C M	Sch1, Amber listed, SBL

<sup>1</sup> LBAP: C – City of Edinburgh, E – East Lothian, M – Midlothian, S – Scottish Borders, W – West Lothian  
Note that CEC LBAP refers to the 2006 plan as this was current at the time of the TWIC data request.

<sup>2</sup> EPS - European protected species, Sch1 – Schedule 1 of the Wildlife and Countryside Act ; Sch5 - Schedule 5 of the Wildlife and Countryside Act, SBL - Scottish biodiversity list.

Taxon	Common name	Latin	LBAP <sup>1</sup>	Designations <sup>2</sup>
bird	Lesser Black-Backed Gull	Larus fuscus		Amber listed
bird	Bullfinch	Pyrrhula pyrrhula	C	Amber listed, SBL
bird	Great Spotted Woodpecker	Dendrocopos major	C	
bird	Grey Partridge	Perdix perdix	C	Red listed, SBL
bird	Greylag Goose	Anser anser	M S	Amber listed
bird	Kingfisher	Alcedo atthis	C M	Sch1, Amber listed, SBL
bird	Linnet	Linaria cannabina	C	Red listed, SBL
bird	Little Grebe	Tachybaptus ruficollis		Amber listed
bird	Mallard	Anas platyrhynchos		Amber listed
bird	Redwing	Turdus iliacus	C	Red listed, SBL
bird	Reed Bunting	Emberiza schoeniclus	C	Amber listed, SBL
bird	Sand Martin	Riparia riparia	C	Amber listed
bird	Siskin	Spinus spinus		SBL
bird	Skylark	Alauda arvensis	C	Red listed, SBL
bird	Song Thrush	Turdus philomelos	C	Red listed, SBL
bird	Sparrowhawk	Accipiter nisus	C	
bird	Spotted Flycatcher	Muscicapa striata	C	Red listed, SBL
bird	Swift	Apus apus	C	Amber listed, SBL
bird	Tree Sparrow	Passer montanus	C	Red listed, SBL
bird	Tufted Duck	Aythya fuligula		Amber listed
bird	Whitethroat	Sylvia communis		Amber listed
bird	Yellowhammer	Emberiza citrinella	C	Red listed
flowering plant	Bluebell	Hyacinthoides non-scripta	C	
flowering plant	Broad-leaved Helleborine	Epipactis helleborine	M	
flowering plant	Common Centaury	Centaurium erythraea	C	
flowering plant	Creeping Yellow-cress	Rorippa sylvestris	M	
flowering plant	Giant Bellflower	Campanula latifolia	C	
flowering plant	Goldilocks Buttercup	Ranunculus auricomus	M	
flowering plant	Hedge Bedstraw	Galium album	M	
flowering plant	Imperforate St John's-wort	Hypericum maculatum	M	
flowering plant	Marsh Yellow-cress	Rorippa palustris	C	
flowering plant	Purple Willow	Salix purpurea	M	
flowering plant	Ragged-Robin	Silene flos-cuculi	C	
flowering plant	Yellow Water-lily	Nuphar lutea	M	
horsetail	Great Horsetail	Equisetum telmateia	M	
insect - beetle (Coleoptera)	Oxypoda recondita	Oxypoda recondita	M	
insect - beetle (Coleoptera)	Philonthus mannerheimi	Philonthus mannerheimi	M	
insect - butterfly	Common Blue	Polyommatus icarus	C	
insect - dragonfly (Odonata)	Large Red Damselfly	Pyrrhosoma nymphula	C	

Taxon	Common name	Latin	LBAP <sup>1</sup>	Designations <sup>2</sup>
insect - hymenopteran	Wool-Carder Bee	Anthidium (Anthidium) manicatum		SBL
insect - moth	Mother of Pearl	Pleuroptya ruralis	M	
lichen	Bacidia friesiana	Bacidia friesiana		Nationally scarce
lichen	Caloplaca cerinella	Caloplaca cerinella	M	
lichen	Chaenotheca hispidula	Chaenotheca hispidula		Nationally scarce
lichen	Cladonia chlorophaea	Cladonia chlorophaea		Nationally rare, Nationally scarce
lichen	Lecania cyrtella	Lecania cyrtella		Nationally rare, SBL
lichen	Lecania cyrtellina	Lecania cyrtellina	M	Nationally scarce
lichen	Lecania suavis	Lecania suavis		Nationally rare
lichen	Lecanora compallens	Lecanora compallens		Nationally scarce
lichen	Lecanora persimilis	Lecanora persimilis		Nationally scarce
lichen	Micarea misella	Micarea misella		Nationally scarce
lichen	Ochrolechia microstictoides	Ochrolechia microstictoides		Nationally scarce
lichen	Opegrapha mougeotii	Opegrapha mougeotii		Nationally scarce
lichen	Protoparmelia oleagina	Protoparmelia oleagina		Nationally scarce
lichen	Punctelia jeckeri	Punctelia jeckeri		Nationally scarce
lichen	Usnea wasmuthii	Usnea wasmuthii		Nationally scarce
moss	Fissidens pusillus	Fissidens pusillus	M	
moth	Sandy Case-bearer	Coleophora lithargyrinella	M	
spider (Araneae)	Clubiona brevipes	Clubiona brevipes	M	
spider (Araneae)	Pachygnatha listeri	Pachygnatha listeri	M	
spider (Araneae)	Walnut Orb-Weaver Spider	Nuctenea umbratica	M	
terrestrial mammal	Brown Hare	Lepus europaeus	C	SBL
terrestrial mammal	Daubenton's Bat	Myotis daubentonii	C	SBL, Sch5, EPS
terrestrial mammal	Eurasian Badger	Meles meles	C M	SBL
terrestrial mammal	European Otter	Lutra lutra	C M	SBL, Sch 5, EPS
terrestrial mammal	Pipistrelle Bat species	Pipistrellus spp		SBL, Sch 5, EPS
terrestrial mammal	West European Hedgehog	Erinaceus europaeus	C	

### 3.5.2 Field Survey

#### 3.5.2.1 Habitat Survey

An Extended Phase 1 Habitat map is provided in Figure 3.2 – Extended Phase 1 Habitat Survey, and details of these habitats are provided below. The most extensive habitats within the survey area are, in descending order of abundance: arable fields, improved grassland (including amenity areas/golf courses), other species-poor neutral grassland, plantation woodland (including ancient woodland of plantation origin and non-ancient woodland plantation), scrub, bare ground/ built-up areas (including a large plant nursery in the centre of the survey area), tall ruderal, running/standing water and small areas of swamp/marginal habitats.

#### **Arable**

Cultivated arable land covers a very large area of the site (214ha); this is intensively managed with little set-aside land and occasional, narrow, species-poor hedgerows largely composed of hawthorn *Crataegus monogyna*.

### **Grassland**

The majority of grassland in the survey area is improved pasture with very limited ecological interest. Some areas have been mapped as species poor semi-improved grassland where not overwhelmingly dominated by perennial rye-grass *Lolium perenne* but nevertheless species-poor; additional species included fescues *Festuca spp.*, white clover *Trifolium repens* and soft rush *Juncus effusus* in damper areas.

Three very small areas were identified as having a slightly richer grassland flora. The first is an area to the east of the 'park & ride' in the north part of the survey area (see Figure 3.2 – Extended Phase 1 Habitat Survey). This surrounds a pond and contains species such as cock's foot *Dactylis glomerata*, common knapweed *Centaurea nigra*, docks *Rumex spp.* and scattered teasel *Dipsacus fullonum*.

The other two small areas of semi-improved neutral grassland are on the banks of the upper parts of the Dean Burn, either side of the A772, west of the centre of the survey area (see Figure 3.2 – Extended Phase 1 Habitat Survey). The neutral grassland on the north side of the A772 is a narrow strip on the bank of the burn dominated by tufted-hair grass *Deschampsia caespitosa*, with a number of tall *Rubus* shrubs; these were thought to be salmonberry *Rubus spectabilis*, although since the survey was undertaken early in the year a definitive identification was not possible. Further upstream and on the south side of the A772, the third area of neutral grassland is a fenced enclosure on both sides of the burn largely dominated by soft rush; also present are rosebay willow herb *Chamerion angustifolium* and a large number of giant hogweed *Heracleum mantegazzianum* plants (see below under Invasive Non-Native Species).

Other poor quality grassland habitat includes amenity areas such as parkland and golf courses, and narrow areas of roadside verge.

### **Woodland**

The woodland in the survey area can largely be split into four broad areas: a very small amount of semi-natural woodland; mature plantation woodland along the River North Esk; younger plantations of beech *Fagus sylvatica* in the centre of the site; and areas of young, recently planted birch *Betula spp.*

The small amount of semi-natural woodland occurs as two narrow strips to the west of the garden centre/nursery (see Figure 3.2 – Extended Phase 1 Habitat Survey). The western-most strip is particularly thin and discontinuous. Tree species present include beech and oak of significant age, scattered yew *Taxus baccata*, Scots pine *Pinus sylvestris* and wych elm *Ulmus glabra*. Regeneration is largely absent with little understory or ground vegetation present (although this may partly reflect the time of year of survey).

Mature plantation woodland bordering the River North Esk contains frequent sycamore *Acer pseudoplatanus*, ash *Fraxinus excelsior* and lime *Tilia sp.* Again there is little regeneration or ground flora in most areas, the understory consisting largely of non-native species such as *Rhododendron ponticum*, snowberry *Symphoricarpos alba* and probable salmonberry (see Invasive Non-Native Species below). Where this woodland continues north to meet woodland in Dalkeith Country Park, slightly more species-rich areas were recorded. Some patches contained an understory, predominantly of elder *Sambucus nigra*, and a more developed ground flora with species such as broad buckler-fern *Dryopteris dilatata*, ivy *Helix hedera* and lesser celandine *Ranunculus ficaria*.

Other wooded areas of the Country Park in the survey area comprise mature/semi-mature broadleaf plantation with beech, birch and occasional conifers. North of the garden centre there is a large block of immature beech plantation, partly mapped as mixed plantation due to a high proportion of Scots pine. Again understory and ground vegetation was almost absent, and it appears this woodland is used for recreation (Edinburgh Combat Challenge as a laser tag gaming location) and is highly disturbed. A block of beech plantation continues eastwards and is bisected by the A7; the eastern section supports a sparse understory of holly *Ilex aquifolium*.

In the north-east of the survey area there are several areas of immature plantation woodland comprising recently planted birch with some ash. These are located around the 'park & ride' and associated business park, and along the disused railway. Some scattered trees are also present in the survey area, including a row of poplar *Populus sp.*, scattered mature sycamores amongst arable land and small regenerating ash trees on road verges.

### **Scrub and Tall Ruderal**

The majority of scrub habitat occurs as roadside verges along the A720 bypass. The dominant species are hawthorn, willow *Salix sp.* and small ash, and in some areas this scrub forms extensive patches. Small areas of scattered scrub occur along the Dean Burn and amongst woodland with species including bramble *Rubus fruticosus* and broom *Cytisus scoparius*.

Tall ruderal habitats are present on some disturbed areas, including an area of recent development north of the garden centre. The dominant species are typically rosebay willow herb *Chamerion angustifolium* and nettle *Urtica dioica*.

### **Water, Marginal Vegetation and Swamp**

Water courses within the survey area include the Dean Burn which runs through the centre of the survey area, and the River North Esk which clips the south of the survey area. The water quality in the burn appeared poor with discoloration along some lengths. This watercourse is too small to have been assessed in the SEPA River Basin Management Plan interactive website. Marginal vegetation was sparse, with scrub vegetation on the banks, mainly bramble. Where the burn runs through arable land/pasture this predominantly runs to the burn edge with no marginal/riparian vegetation.

The North Esk is a large river within a steep, wooded valley. It is very unlikely to be affected directly by the proposed works due to the distance (380m minimum) and the intervening habitat/topography. The condition of the River North Esk is 'moderate' according to the SEPA River Basin Management Plan interactive website.

Standing water comprised four man-made ponds, all with no or little marginal vegetation. The first pond, and the only one likely to be affected by the scheme, is located immediately to the south of the A720 in the centre of the survey area; it appears to be used for duck-shooting and has no obvious marginal vegetation, although the presence of a mute swan *Cygnus olor* and some mallard ducks *Anas platyrhynchos* suggest there may be pondweeds and other aquatic vegetation. A second pond east of the Park and Ride, in the north part of the survey area, contains a small patch of reed canary grass *Phalaris arundinacea*. A third pond further north at the very edge of the survey area contains common reedmace *Typha latifolia* with peripheral ornamental planting. A fourth rectangular pond north of the bypass towards the west edge of the survey area has marginal reed canary grass and may provide filtration for possible mine waste.

### **Invasive Non-Native Species**

Four plant species regarded as invasive non-native species (INNS) were recorded within the survey area. Of these, three (salmonberry, snowberry and rhododendron) are considered likely to be part of or escapes from the ornamental planting of the Melville Estate. Of these, rhododendron is regarded as an INNS of UK concern<sup>3</sup> but as it is contained within the plantation woodland in which it was planted; it is not considered to be an immediate threat to biodiversity in the area. This is also the case with the snowberry recorded. Salmonberry occurs within the plantation south of the Dean Burn, but has also spread to the banks of the Dean Burn itself and is likely to extend this distribution with the burn providing an efficient infestation pathway. This species can form dense stands which out-compete native species, and may have a detrimental effect on biodiversity.

Also recorded was giant hogweed, another INNS of UK concern. It occurred frequently along the Dean Burn, on roadside verges in two locations and along a pathway through arable fields. These locations are shown on Figure 3.1 – Designated Sites within 2 km. This species was identifiable by dead material from the previous season, with only limited growth from the current season at the time of survey. It is likely that stands of giant hogweed are larger than they appeared during the survey because the survey timing early in the year, and that may spread outwards and to other locations (this species disperses very efficiently by seed). As the seeds of giant hogweed are the primary method of dispersal their spread must be tightly controlled. The plant also presents health and safety considerations because physical contact with the plant can cause photodermatitis.

Note that because the surveys were undertaken early in the year, it is possible that some other invasive species (such as Himalayan balsam *Impatiens glandulifera*) that develop later in the season were present but not recorded.

Currently, the INNS salmonberry and giant hogweed are known to occur within the direct footprint of all options. All reasonable steps must be taken and all due diligence exercised to avoid illegal spread of these species in the

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<sup>3</sup> These are those identified in Schedule 9 of the WCA (although this now legally applies in England only) and the 14 high-impact plant species identified by Invasive Species Scotland.

wild. Further surveys will be required to map the detailed locations of INNS in late spring/summer to inform the Stage 3 report and allow responsible management of these species prior to works commencing.

### 3.5.2.2 Protected Species

Protected species data collected during the Extended Phase 1 Habitat Survey is shown on Figure 3.2 - Extended Phase 1 Habitat Survey (with the exception of sensitive badger data which has been placed in Appendix 3.1 – Badger Survey Data (Confidential)). This is supplemented with information from the 2014 and 2017 desk study, and summarised below.

#### **Otter**

During the Extended Phase 1 Habitat Survey evidence of otter activity was recorded comprising of two spraint sites and one lie-up, all in the vicinity of the Dean Burn. These are detailed in Table 3.7 below and shown on Figure 3.2 – Extended Phase 1 Habitat Survey. Data centre records confirm otters to be active in the wider surrounding area, including on the River North Esk and the Dean Burn. Records also exist of otter crossing the A7 road and of a dead otter at the side of the A720 carriageway.

**Table 3.7 – Evidence of Otter Activity in the Survey Area**

Reference	Feature	Description
PS01	Spraint site (multiple)	Well used spraint site with large build-up of spraints of varying age on piece of rotting wood. Many other well-used spraint sites similar to this round this pond, often located on tufts of grass. Fox scats also present.
PS02	Lie-up	Lie-up in undercut bank by stone wall. Six spraints of varying age, old to new, anal jelly secretions also present. Prints present in muddy burn bank. Fox scat and prints present. Water quality in burn here looks poor.
PS03	Spraint site	2 old otter spraints on the walls of culvert entrance.

It is very likely that the Dean Burn which runs through arable/improved land is an otter commuting route. Due to the surrounding landscape, this is the only feature which connects foraging resource, such as the pond (to the south of the A720) to which PS01 related, to other suitable habitat features. No specific otter surveys have been undertaken and these will be required to support the Stage 3 assessment. This is particularly important as all options cross the Dean burn and the adjacent pond where otter activity has been recorded, and will disturb or destroy the refuge PS02.). Depending on the findings of these further surveys, licensing of the works and employment of artificial refuges and appropriately designed culverts may be required.

#### **Badger**

During the Extended Phase 1 Habitat Survey, several badger signs (one badger sett and one potential badger set) and one dead badger were recorded. These are described in Table 3.8 below. Data centre records show high badger activity in the wider (2km) area, including sett complexes, however within the survey area only one record exists. This is of a dead animal by the carriage way at the Sheriffhall Roundabout.

**Table 3.8 – Evidence of Badger Located in Survey Area**

Reference	Feature	Description
PS04	Potential sett	Numerous rabbit holes in sandy bank. 1 badger sized hole and 1 badger track in soil of nearby hole. No other evidence found.
PS05	Dropping	One recent badger dropping at side of well-worn trail along field edge.
PS06	Dead badger	Dead adult badger lying approx. 1m from the Melville Gate Road. Highly likely to be a road traffic collision based on the injuries present.
PS07	Sett	Single entrance active sett, guard hairs present on a large spoil heap. The sett was on an embankment amongst ivy.

Based on the limited data obtained during the Extended Phase 1 Habitat Survey, it is not possible to discern how badgers are utilising the survey area or classify any particular setts.

There is good habitat for badgers with the scheme vicinity, including long-established woodlands providing cover and long-term habitat for sett construction, and woodland/grassland foraging habitat. Option C would require the destruction of the sett PS07. A full badger survey will be required to support the Stage 3 assessment for any of the options taken forward. Depending on the findings, licensing of the works, provision of artificial setts, employment of mammal fencing and mammal underpasses might be required.

### **Bats**

Three bat species are likely to occur in the scheme vicinity: soprano pipistrelle, common pipistrelle, and Daubenton's bat with brown long-eared bats also possible. Data centre records showed pipistrelle bats to be prevalent in the surrounding area with several roost sites, however none were located within the 500m buffer survey area. There is also a record of one Daubenton's bat roost over the River Esk, again out with the survey area for this project. During the Extended Phase 1 Habitat Survey an observation was made of three trees with high bat roost potential (illustrated in Figure 3.2, referenced as PS08). Currently, these trees are not affected by any Option, but it is likely based on the habitats present that there will be other trees/ feature with potential to support bat roosts. Full bat surveys will be required to inform the stage 3 assessment. All the above species are at least likely to forage in the area (particularly around/ in the woodlands and over/ beside watercourses) and may roost in the scheme vicinity.

### **Other Mammals**

No squirrels (red or grey) or definitive evidence of them were noted during the Extended Phase 1 habitat survey. No records were returned from the original data request, but the 2017 data search using the Atlas of Living Scotland (AoLS) returned seven records of grey squirrel from the 10 kilometre square (NT6832) north east of Sheriffhall Junction. One potential drey was recorded near the dual carriageway (at Target Note 5 in Figure 3.2) and some stands of Scots pine and scattered non-native ornamental conifers (e.g. hemlock) were recorded during the Extended Phase 1 habitat survey which provides some appropriate habitat. However, there are no large stands of conifer woodland required to support a significant population of red squirrels, particularly since grey squirrel are confirmed to be present in the area and are likely to outcompete red squirrel in broadleaved woodland.

There are no desk study records of water vole in the 2km search area. No signs of water vole were recorded during the Extended Phase 1 habitat survey, but this was conducted during a suboptimal season for water vole survey. However, a limited extent of suitable habitat with potential for water vole is considered to exist along the Dean Burn west (upstream) of the A7, with suitable banks and marginal vegetation for burrows and foraging habitat. Conversely, there are other lengths of burn running through arable and pasture fields where there is no marginal vegetation and limited bankside habitat, which are not suitable for water vole.

There are no desk study records of pine marten in the 2km search area, and no evidence of pine marten (such as scats) was found during the Extended Phase 1 Habitat Survey.

### **Amphibians and Reptiles**

Common toad, common frog, palmate newt, smooth newt and great crested newt have all been recorded within 2km of the scheme; no records exist within the smaller 500m buffer survey area. No reptile records were included in the TWIC data provided. Little habitat exists that is considered suitable for reptiles however suitable amphibian habitat exists in the form of back waters of the burn and one large pond. Here, although there were ducks and swans present, frog spawn and frog remains were recorded during the Extended Phase 1 Habitat Survey (likely to have been left by foraging otter).

The suitability of the pond described above for amphibians, and the record of great crested newt approximately 2.5km from the pond, suggest there is a possibility of this species occurring and it is recommended that great crested newt surveys (including Habitat Suitability Index (HSI) in spring/ summer followed by presence/ absence surveys such as eDNA tests) are carried out in order to inform the Stage 3 Assessment.

### **Breeding Birds**

There is likely to be a wide range of breeding birds in the area owing to the variety of habitats present which includes woodland, dense scrub habitats and tall ruderal vegetation. Bird diversity is likely to be higher in the south of the survey area where woodland habitat is more extensive. The semi-improved grassland patches which



occur throughout the survey area may support breeding waders such as curlew and lapwing (these species are amber/red listed respectively although no records of either were included in TWIC data provided). Other species known to occur in the area and likely to breed are detailed in the desk study section above. This includes other UKBAP and BOCC Red List species, such as yellowhammer and grey partridge. Both of these species were recorded during the walkover survey, and could also breed in the survey area.

### 3.6 Assessment of the Potential Effects

There are three design options for the improvement of the Sheriffhall Junction: Option A, Option B and Option C. Further detail on these options can be found in Chapter 1 – Overview of Environmental Assessment.

Likely impacts are based on data gathered from the desk study, field data from the Extended Phase 1 Habitat Survey (which does not constitute full protected species surveys) and professional judgement of the possible value of the various ecological receptors.

Potential general impacts on protected species could include the following:

- death or injury (from e.g. construction activity, pollution, traffic during road operation);
- disturbance of species (during construction or operation) or to places of shelter;
- habitat or foraging resource loss/fragmentation/pollution;
- barriers to dispersal;
- facilitated predation.

A more rigorous assessment of impacts on habitats is possible because these receptors are sufficiently well-described in the Phase 1 habitat survey data.

#### 3.6.1 Limitations to the Assessment

Observations of protected species and evidence of them were gathered during the Extended Phase 1 Habitat Survey, but do not represent full protected species surveys and do not cover all relevant species, and further detailed surveys will be required for Stage 3 assessment. Additionally, the absence of desk study information on protected species in a given area does not necessarily equate with their absence.

The desk study data used in this assessment was collected in December 2014 (with supplementary data added in 2017), and the field survey was undertaken in February 2015. However, given: i) the scope of this Stage 2 assessment; ii) the 2017 supplement to the desk study; iii) the small size and location of the scheme on or beside an existing bypass, and the recorded habitat types; iii) the usual validity of habitat data for several years; and iv) the lack of new development in the survey area, it is unlikely that ecological receptors will have sufficiently changed to materially affect this ecological assessment.

Due to the time of year that the surveys were undertaken, it is possible that some other invasive species, such as Himalayan balsam *Impatiens glandulifera*, which develop later in the season, were present but were not recorded. This should be rectified by undertaking invasive species surveys for Stage 3 in spring/summer.

#### 3.6.2 Assignment of Receptor Sensitivity

Table 3.9 below gives the sensitivity (value) and rationale for each ecological receptor.

With regard to pine marten, no evidence has been found during desk study or survey and pine marten is unlikely to occur in this location, therefore it has been screened out of further assessment

**Table 3.9 – Evidence of Otter Activity in the Survey Area**

Receptor	Sensitivity	Rationale
Dalkeith Oakwood SSSI & Firth of Forth SSSI	National	National sensitivity by virtue of designation at national level.
Firth of Forth SPA/Ramsar site	International	International sensitivity by virtue of designation at international level.
Burdiehouse Burn Valley Park LNR	County	County sensitivity by virtue of designation at county level.

Receptor	Sensitivity	Rationale
Dalkeith Estate, Melville Castle & River North Esk Local Wildlife Sites	County	County sensitivity by virtue of designation at county level
Ancient Woodland	National	Ancient Woodland is considered to be of national significance.
Non-ancient semi-natural woodland	County	Semi-natural woodland is scarce at county scale.
Other woodland (plantation not in the Ancient Woodland inventory)	Local	The remaining woodland is plantation and therefore not (by definition) semi-natural, and is also not included in the Ancient Woodland inventory (as 'long-established woodland of plantation origin'). As such, it cannot be valued at county-scale or above, but does have local value through the local biodiversity benefits it provides.
Other terrestrial habitat	Local	None of the other semi-natural terrestrial habitats are particularly notable ecologically, and are of very limited extent. However, they appreciably enrich the local ecological resource. Arable, improved pasture and small areas of species-poor semi-improved grassland have no botanical value and are very extensive and widespread in the county, and thus have negligible value.
Ponds	Local	At least the nearest pond to the scheme is used by otter, and all the ponds (although the other three are not likely to be affected) will provide significant local biodiversity benefits for amphibians, birds, invertebrates and plants.
Dean Burn	County	This small short watercourse is not assessed in the SEPA River Basin Management Plan interactive website, but was noted to suffer discoloration along parts of its length, and appears to be in partly poor condition. However, it is used by protected species including at least otter.
River North Esk	County	The River North Esk has been classed by SEPA as of 'moderate' condition. Given the presence of several 'poor' condition rivers in Midlothian, a river of 'moderate' condition is considered to be significant at county level.
Invasive Non-Native Species of plant	Regional	It would potentially be of regional significance (in an adverse sense) if giant hogweed (a species of UK concern) was spread elsewhere in Midlothian.
Otter	County	There is a known otter refuge in the survey area, and evidence shows that otters use the Dean Burn and nearest pond to the scheme. A negative change in otter distribution or numbers in the scheme vicinity could be significant at the scale of Midlothian, but not more given the widespread distribution of otter in lowland Scotland. This does not reduce obligations arising from the strict legal protection of otter.
Badger	County	Possible and actual small setts have been found close to the scheme and others could exist or be created. A negative change in badger distribution or numbers in the scheme vicinity could be significant at the scale of Midlothian, but not more given the widespread distribution of badger in lowland Scotland. This does not reduce obligations arising from the strict legal protection of badger.
Bats	County	Habitats in the scheme vicinity (subject to more detailed Stage 3 assessment) including trees and woodland provide potential for roost features. However, current desk study evidence does not indicate any scarce or rare species of bat in area, therefore valuation above county level is not (subject to further Stage 3 survey) appropriate, and following the Stage 3 surveys this valuation could easily be reduced.
Water vole	Regional	There is a limited extent of suitable habitat for water vole along parts of the Dean Burn. If detailed survey at Stage 3 found water vole, this would of regional significance since water vole is now scarce in lowland Scotland.
Red squirrel	County	A potential drey was noted in plantation close to the scheme. Although limited impact is expected on woodland, if detailed Stage 3 surveys determined that red squirrel was present, this would exceed local significance, but would not be of regional or higher significance given the distribution of red squirrel in Scotland.
Breeding birds	Local	Although more notable species such as grey partridge have occurred in the survey area, current evidence from the desk study and the potential of Phase 1 habitats for breeding birds suggests that the breeding bird assemblage close to the scheme footprint is not likely to exceed local significance.
Amphibians	County	If detailed Stage 3 surveys established the presence of great crested newt in the pond closest to the bypass (and at least partly within the scheme footprint), this would be of county-level significance. Valuation would only

Receptor	Sensitivity	Rationale
		be local if great crested newt are not present.
Lichens	National	Notable lichens (which could be affected by air pollution) in Dalkeith Oakwood SSSI will be addressed through that designation (see above) and have the same level of value. Scarce lichens occurring also along the River North Esk and near Melville Castle would be of similar value.
Invertebrates	National	Notable invertebrates (including beetles) either do or are likely to occur in Dalkeith Oakwood SSSI and are therefore addressed through that designation (see above) and have the same level of value.
Plant species	Local	The more notable plants returned from the desk study are either not rare in the county and/or are unlikely to occur close to scheme footprint, given the habitats present. Pending further detailed Stage 3 survey, it is likely that plants close to the scheme footprint are widespread, but enrich the local biodiversity resource.

### 3.6.3 Potential Construction Effects

#### 3.6.3.1 Statutory Designated Sites

##### *Dalkeith Oakwood SSSI*

The most credible potential construction effects on statutory designated sites concern Dalkeith Oakwood SSSI. This is located just over 1km (1050m) from the nearest extent of the proposed improvement works (where all options tie into the A720 north-east of Sheriffhall). Its boundaries are largely defined by the Rivers North and South Esk. There is no direct connection between the footprint of the options and the River North Esk, however pollution from the construction or operation may potentially enter the river via roads and through movement of surface water and groundwater. This could in theory have a major adverse impact upon habitats downstream, including the constituent habitats of the SSSI. Given the national value of SSSIs, if this occurred it would represent an impact of **very large** significance.

Construction effects are considered highly unlikely on more remote statutory sites, including the multiple Firth of Forth designations. Whilst construction pollution events or operational pollution could in theory be transferred to the River Esk via the Dean Burn, and then to the Firth of Forth, effects are likely to be minor because of the large dilution effect of the Firth of Forth. However, the combination of minor impact on a receptor of high geographic value would result in an impact of **Moderate** significance for all options.

##### *Burdiehouse Burn Valley Park LNR*

There is considered to be no credible construction impact pathway to Burdiehouse Burn Valley Park LNR for the following reasons: i) the static nature of the features of interest (generally woodland/grassland habitat), ii) distance from all options (minimum 1800m), iii) lack of connectivity to the Site (there is no evidence of rare lichens here therefore no likely significant air pollution effects), and iv) the buffering effect of intervening habitat (improved grassland, arable fields and residential housing). Therefore no significant impacts are likely on Burdiehouse Burn Valley Park LNR, and this results in **Neutral** significance for all options.

#### 3.6.3.2 Non-statutory Designated Sites

None of the three identified non-statutory designated Local Wildlife Sites (LWSs) are within the footprint of any Option, and no direct impacts are possible.

Dalkeith Estate, Melville Castle and The River North Esk LWSs could be impacted by pollution from the development passing to them via surface waters (including the Dean Burn) or ground waters. Impacts on Dalkeith Estate and Melville Castle LWSs would be via the River North Esk. Pollution of these sites (which could occur if unmitigated) may result in a major adverse impact upon them, and given the county-level designation this would be of **Moderate** significance for all options.

As noted above, during the consultation process SNH commented that lichen communities considered highly sensitive to airborne pollution were a component of the SSSI (and therefore also the Dalkeith Estate LWS). Records of scarce lichen species have also been returned from the Melville Castle and River North Esk area and may occur within the boundaries of the LWS. It is concluded in Chapter 7 - Air Quality that effects on air quality

will be negligible or neutral (no significant effect) for all options; as such it is likely that impacts of air pollution on the lichen communities of these LWS will not differ from the baseline. Therefore, this effect results in **Neutral** significance for all options.

### 3.6.3.3 Terrestrial Habitat Loss

Table 3.10 below shows the areas of each Phase 1 Habitat that would be lost to the footprint of each design option. The table does not include areas of hardstanding such as existing roads, as this habitat has no ecological value, thus the totals. The area calculations incorporate the land take of the option footprints plus a 5m buffer to encompass a general working area. It does not account for additional losses which may be incurred by construction activity outwith this buffer or for temporary site compounds etc.

**Table 3.10 – Land Take of Phase 1 Habitats for Each Option (ha), in Approximate Decreasing Extent**

Habitat Code	Habitat type	A (ha)	B (ha)	C (ha)
B4	Improved grassland	7.132	6.714	5.074
J1.1	Arable	3.359	1.948	8.270
B6	Species poor semi-improved grassland	3.114	2.021	1.899
A2.1	Dense scrub	2.089	1.756	1.598
A1.1.2	Broadleaved plantation woodland	0.744	0.658	0.787
J1.4	Introduced shrub	0.360	0.258	0.382
C3.1	Tall ruderal	0.102	0.114	0.355
G1	Standing water	0.071	0.069	0.100
G2	Running water (Dean/Park Burn)	0.037	0.025	0.043
J1.2	Amenity grassland	0.005	0.010	0.000
Total		17.014	13.574	18.508

As shown in Table 3.10, the summed area of the habitats in the table is similar for all options except Option B, which entails c.20% less loss of mapped Phase 1 habitats.

By far the greatest habitat loss involves improved pasture with negligible ecological value. The second or third highest losses (depending on option) involve arable land (without recorded set-aside or similar fallow areas) and species-poor semi-improved grassland, both also of negligible value given their widespread occurrence across the county and/or species-poor nature. The limited losses to these habitats, and also to very small amounts of introduced shrub, tall ruderal and amenity grassland, are considered to be minor or negligible adverse impacts, upon habitat of less than local value, resulting in impacts of **Neutral** significance. Impacts on scrub, involving areas of hawthorn etc. on existing road verges represent a minor adverse impact, and in view of the local value this small loss (which is replaceable on new road verges) is therefore also of **Neutral** significance.

Despite the smaller areas involved, the most significant losses involve plantation woodland and running/standing water, owing to the greater ecological value of these habitats. Loss of plantation as a whole is similar in area and location for all options. However, this disguises the difference in impact on ancient woodland between the options. This arises because the affected ancient woodland is of plantation origin (despite the plantation origin, such woodland still constitutes ancient woodland since it is included in the Ancient Woodland Inventory, and must be considered as such). The difference with regard to ancient woodland are as follows:

- Option C impacts upon 0.59ha of ancient woodland of plantation origin. This relatively small loss is considered a minor adverse impact, but given the national value of ancient woodland it is considered to be of **Moderate** significance for Option C, but of significantly greater extent than Options A and B.
- Options A and B only impact upon 0.17ha of ancient woodland of plantation origin. This is considered to be minor adverse impact, but given the national value of ancient woodland it is considered to be of **Moderate** significance for Options A and B, but of significantly less extent than Option C.

Losses to non-ancient woodland plantation represent minor adverse impacts in all cases and involve broadleaved plantation of local value only, resulting in impacts of **Neutral** significance for all options.

### 3.6.3.4 Running water

Running water habitat represented by the Dean Burn will be lost to a similar extent for Options A and B, but a greater extent will be affected by Option C. These impacts will potentially and differentially reduce the ecological value of the Dean Burn, and also impact protected species including at least otter. The differences between options regarding impacts on the Dean Burn are as follows:

- Option B will impact a single long length of the burn (up to 165m) in an arable/improved grassland habitat. Depending on design specifics, the 165m length may be re-routed, or routed through a brand new culvert. Alternatively, the burn may be avoided but it will exist at the base of a new road embankment with possible pollution implications. Two locations where the burn is currently culverted under a road will require extension up to 50m. Culverting of this length of the burn is considered a moderate adverse impact. There is potential for impacts on otter (and other riparian species if present) (e.g. discouraging use of the burn and encouraging passage across the busy A7 and A6106 instead). A moderate adverse impact on a county-level resource results in an impact of **Slight** significance for Option B.
- Option A will impact four separate lengths of burn (the longest sections 165m and 145m) in an arable/improved grassland habitat. Depending on design specifics, up to four lengths of the burn may be re-routed, routed through new culverts, or existing culverts extended. Culverting of these lengths of the burn in multiple places is considered a major adverse impact. There is potential for impact on otter (and other riparian species if present) (e.g. discouraging use of the burn and encouraging passage across the busy A7 and A6106 instead). A major adverse impact on a county-level resource results in an impact of **Moderate** significance for Option A.
- Option C will impact two very long lengths of the burn (up to 400m and 220m) in an arable/improved grassland habitat. Depending on design specifics, it is likely that both these lengths of burn will be routed through a brand new culvert. Culverting of very long lengths of the burn constitutes a major adverse impact. There is potential for impact on otter (and other riparian species if present) (e.g. discouraging use of the burn and encouraging passage across the busy A7 and A6106 instead). A major adverse impact on a county-level resource results in an impact of **Moderate** significance for Option C. This impact is significantly more severe for Option C because of the much greater lengths of culverting involved.

Impacts are also possible on the River North Esk, via pollution during construction or operation passing via the Dean Burn to River North Esk. If such pollution occurred, this would be a major adverse impact, and given the county value of the River North Esk this would result in an impact of **Moderate** significance. However, as noted this is considered very unlikely to occur with standard mitigation in place.

### 3.6.3.5 Ponds

The only pond likely to be impacted is the central one lying very close to the south side of the existing bypass. Owing to the differing option footprints, Option C appears to affect a larger area of this pond. However, enabling works may result in loss of the pond, or substantial reduction, for all options. This would be a major adverse impact, and given the apparent use of the pond by otters the impact is considered significant at the county rather than local level, this constitutes an impact of **Moderate** significance for all options.

### 3.6.3.6 Invasive Non-Native Species

All options will directly impact upon populations of the invasive non-native species of UK concern giant hogweed. If such non-native invasive plants were spread during construction, this would constitute a major adverse impact at a regional level, resulting in an impact of **Large** significance for all options.

### 3.6.3.7 Protected species

#### ***Otter and Badger***

All options will disturb/destroy a known otter lie-up, and there is potential for further otter refuges to be present within or in close proximity to the works footprint. An otter foraging resource in the form of the pond closest to and immediately south of the existing bypass, and connecting part of the Dean Burn, will be affected by and potentially lost to all options. Impacts on the Dean Burn (see Running Water above) may also reduce foraging

suitability. Should otter distribution and number be negatively affected by these effects, this would constitute a major adverse impact on a county-level resource, resulting in an impact of **Moderate** significance for all options, but likely to be more severe for Option C (because of greater culverting, and potentially greater impact on the pond if the pond is retained).

Habitats used by badger for foraging will be equally adversely affected by all options. Options A and B will disturb and Option C will destroy a known badger sett (small in nature but of as yet undetermined significance to the local population). There is potential for further badger refuges to occur within or near the works footprint of all options. Damage or destruction of setts without proper mitigation would constitute major adverse impacts on a county-level resource, resulting in an impact of **Moderate** significance.

### **Bats**

There is potential for all options to impact upon trees with potential to support bat roosts within the suitable woodland habitats described above. Given the maximum county-level significance of the bat resource (according to current information and subject to further survey for Stage 3), the loss of significant roosts (if present, and that loss representing major adverse impact) would result in an impact of **Moderate** significance.

### **Water Vole**

Limited suitable habitat is considered to exist for water vole along the Dean Burn west of the A7 with suitable banks for burrows and marginal vegetation to provide foraging habitat. This habitat is highly isolated however as the burn runs through arable fields and mature woodland to the east and west. The suitable habitat recorded will be impacted upon by all options, although impacts of Option C upon the Dean Burn may significantly affect this area (as discussed in the Otter section above). If water voles were present (to be determined by detailed survey for Stage 3), the permanent culverting of long lengths of the Dean Burn for Option C, and potentially to a lesser degree for Option A, would not be easily mitigated and, given that this would be a major adverse impact on a receptor of regional value, would result in an impact of **Large** significance for Option C. For Option B, the smaller length of culverting would leave some suitable lengths of the Dean Burn unaffected, so the impacts would likely be of lower **Moderate** significance for Option B, and may be able to be mitigated through habitat recreation or enhancement in the immediate area.

### **Red Squirrel**

It is not currently known if red squirrel is present. The potential drey recorded during the Extended Phase 1 Habitat survey is not within the footprint of any option. The expected losses of woodland, and type of woodland, is not considered sufficient to have a significant effect on red squirrel numbers locally, even if a drey was destroyed (squirrels typically have multiple dreys). Thus despite valuation at county level, actual impact is not thought likely to exceed local significance, which could not result in an impact of more than **Slight** significance for all options. This does not reduce possible licensing obligations resulting from the legal protection of red squirrels and their dreys.

### **Breeding Birds**

Breeding birds will be adversely impacted by all options through nest destruction if vegetation clearance is not undertaken outside the breeding season, and potentially through construction disturbance if notable breeding bird species are found to be present (however, this is not considered likely).

There will be loss of nesting/foraging habitat within appropriate scrub/ruderal/woodland areas, as detailed in the habitat loss section above which is similar for all options. Grey partridge and skylark along with other less notable bird species may breed within arable fields, but again the loss of arable areas will be similar for all options. Records of barn owl, a specially protected schedule 1 bird species, were returned during the desk study; no suitable roosting/breeding features were noted during the Extended Phase 1 Habitat Survey, but further surveys may be required at Stage 3 to determine any potential impacts in detail. Preferred foraging habitat for barn owl includes semi-improved grassland, a similar small area of which will be affected by all options. With the assumptions that barn owl is not present in the immediate area, and that grey partridge and skylark will not be significantly affected given that they were recorded well outside the footprints of all options and arable habitat is common in the area, impacts on breeding birds are only likely to be significant locally and therefore would not exceed **Slight** significance.

### ***Amphibians***

Suitable amphibian habitat mainly exists at ponds, of which the only one likely to be affected is the pond closest to and immediately south of the existing bypass. All options will have impact this pond, and may destroy it completely; if retained in smaller size, Option C would remove a larger part of this pond. Although this is a major adverse impact, the significance of this impact depends on whether great crested newt is found during the Stage 3 detailed surveys. If great crested newt is present, loss or damage to the pond would be of county significance constituting an impact of **Moderate** significance; otherwise, the impact would be of slight significance because only common amphibians would be expected to be involved.

### ***Notable Lichens and Invertebrates***

As noted under the designated sites section above, the notable lichens and invertebrates returned from the desk study are thought to occur in Dalkeith Oakwood SSSI and, in some cases, along the River North Esk and near Melville Castle. These locations are well beyond the footprint of all options and no direct impact is possible. Potential air pollution effects on pollutant sensitive lichens are addressed in the operational effects section 3.6.4.

### ***Plant Species***

Pending further Stage 3 surveys, and in view of the habitats recorded during the Extended Phase 1 Habitat survey, it is not thought that any of the scarcer plants returned from the desk study are likely to occur within or near the footprint of any of the options. As such, impacts on plants species are likely to be negligible, and given the local value of such plants, the resulting impacts would be of **Neutral** significance for all options.

## **3.6.4 Potential Operational Effects**

### **3.6.4.1 Statutory Designated Sites**

#### ***Dalkeith Oakwood SSSI***

The most credible potential effects on statutory designated sites concern Dalkeith Oakwood SSSI. This is located just over 1km (1050m) from the nearest extent of the proposed improvement works (where all options tie into the A720 north-east of Sheriffhall). Its boundaries are largely defined by the Rivers North and South Esk. There is no direct connection between the footprint of the options and the River North Esk, however pollution during construction could potentially enter the river via roads and through movement of surface water (the Dean Burn flows into the River North Esk) and groundwater. This could in theory have a major adverse impact upon habitats downstream, including the constituent habitats of the SSSI. Given the national value of SSSIs, if this occurred it would represent an impact of **Very Large** significance.

During the consultation process Scottish Natural Heritage (SNH) commented that one of the designated features of this SSSI is its lichen community which is considered highly sensitive to airborne pollution, of which the nearby A720 is a known source. It is concluded in Chapter 7 - Air Quality that effects on air quality will be negligible or neutral (no significant effect) for all options. As such, the lichen community of the SSSI will not be impacted (positively or negatively) by changes in airborne pollution, and this results in an impact of **Neutral** significance for all options.

#### ***Firth of Forth Designations***

Effects are considered highly unlikely on more remote statutory sites, including the multiple Firth of Forth designations. Whilst operational pollution could in theory be transferred to the River Esk via the Dean Burn, and then to the Firth of Forth, effects are likely to be minor because of the large dilution effect of the Firth of Forth. However, the combination of minor impact on a receptor of high geographic value is considered to result in an impact of **Moderate** significance for all options.

#### ***Burdiehouse Burn Valley Park LNR***

There is considered to be no credible impact pathway to Burdiehouse Burn Valley Park LNR for the following reasons: i) the static nature of the features of interest (generally woodland/grassland habitat), ii) distance from all options (minimum 1800m), iii) lack of connectivity to the Site (there is no evidence of rare lichens here therefore

no likely significant air pollution effects), and iv) the buffering effect of intervening habitat (improved grassland, arable fields and residential housing). Therefore no significant impacts are likely on Burdiehouse Burn Valley Park LNR, and this results in **Neutral** significance for all options.

### 3.6.4.2 Non-statutory Designated Sites

Dalkeith Estate and the River North Esk LWSs could be impacted by operational surface pollution from the development passing to them via surface waters (including the Dean Burn which flows into the River North Esk) or ground waters. Impacts on Dalkeith Estate would be via the River North Esk. Pollution of these sites (which could occur if unmitigated) may result in a major adverse impact upon them, and given the county-level designation this would be of **Moderate** significance for all options. There is no likely operational surface pollution impact on Melville Castle LWS because passage of pollutants would (without mitigation) be to the Dean Burn and thence the River North Esk, and Melville Castle LWS is upstream of the confluence.

As noted above, during the consultation process SNH commented that lichen communities considered highly sensitive to airborne pollution were a component of the SSSI (and therefore also the Dalkeith Estate LWS). Records of scarce lichen species have also been returned from the Melville Castle and River North Esk area and may occur within the boundaries of the LWS. It is concluded in Chapter 7 - Air Quality that effects on air quality will be negligible or neutral (no significant effect) for all options. As such, the lichen community of the LWSs will not be impacted (positively or negatively) by changes in airborne pollution, and this results in an impact of **Neutral** significance for all options.

### 3.6.4.3 Protected Species

#### *Otter and Badger*

An otter commuting route along the burn may be adversely affected by increased culverting, particularly by Option C (see Section 3.6.3.4), which may result in more otters crossing busy roads, and potentially increased road casualties. The dissection of the local landscape may also result in increased badger road casualties. Badger and otter road casualties have already been recorded during desk and field studies, lending support to potential increased collisions if design and mitigation are not appropriate. However, there are differences in road casualty expectations between options as set out below:

- Option B is smallest and includes only one roundabout and only one new connecting road, which will dissect semi-improved grassland habitat. This is on the north of the A720 where no badger evidence has (as yet) been recorded. Additionally, due to fewer and smaller impacts upon the Dean/Park Burn (see Section 3.6.3.4), possible increases in otter road casualties are likely to be lower. As such, although there is some potential for increased road traffic collision, risk of increased otter and badger road traffic casualties is least for Option B. These effects are considered likely to represent a moderate adverse impact on county-valued resources, resulting in impacts of **Slight** significance for Option B.
- Option A consists of two new roundabouts and associated connecting infrastructure, and habitat within the footprint will become more dissected than by Option B, by several new roads and slip roads. This impact may be compounded by the changes to the Dean/Park Burn as described above (see Section 3.6.3.4). This Option therefore has intermediate potential to increase road traffic casualties for otter and badger. These effects are considered likely to represent a major adverse impact for otter and moderate adverse impact for badger, resulting in impacts of **Moderate/ Slight** significance for otter/badger respectively Option A
- Option C consists of three new roundabouts and associated connecting infrastructure, and the habitat within the footprint will become dissected by more new roads and slip roads than the other Options. Some potential foraging habitat for badger (grassland) is expected to remain between at least some of the new roads, with consequent possible increased road crossings by badger. Additionally, this Option requires by far the most culverting of the Dean Burn with consequent greater likelihood of increased otter road casualties. Therefore Option C has the highest potential to increase otter and badger road traffic casualties. These effects are considered likely to represent a major adverse impact on county-valued resources, resulting in impacts of **Moderate** significance for Option C.

#### *Bats*

Bat foraging and commuting features will be more or less equally adversely affected by all options. Option C has a slightly higher impact on potential commuting activity through permanent greater severance of potential



commuting corridors and associated possible increased bat vehicle collisions, owing to the greater degree of landscape dissection caused by the multiple roads required for Option C. This could potentially result in major adverse impacts on a possible county-level resource, resulting in an impact of **Moderate** significance for Option C, but **Neutral** for other options.

### ***Notable Lichens and Invertebrates***

As noted above, the scheme is thought likely to reduce air pollution and may in that respect provide a benefit to lichens. Any benefit, should it occur, would likely represent a minor beneficial impact, but given the national sensitivity of the lichen species it would be of **Moderate Beneficial** significance for all options.

### 3.6.5 Ecologically Preferred Option

The key ecological differences between the three options concern woodland losses (and associated potential impacts on protected species), lengths of required culverting (and associated potential impacts on protected species), and variability in likely increases in protected species road traffic casualties. In all these cases, Option C is ecologically inferior, since it results in significantly greater impact on ancient woodland, significantly more culverting and greatest likelihood of increased protected species road traffic casualties. Additionally, if the pond closest to and immediately south of the existing bypass is retained, Option C will remove a larger part of it, and Option C has the greatest landtake. Thus Option C is the least preferred ecologically.

Options A and B have similar ecological effects, but owing to the significantly smaller landtake and reduced culverting required for Option B, **Option B** is the most preferred ecologically.

## 3.7 Potential Mitigation

Mitigation that is likely to be required is set out below:

### ***Compensatory Planting of Trees and Scrub***

This is intended to compensate for woodland loss. However, it cannot fully mitigate loss of mature woodland except in the long term, because of the extended time period required for trees to reach maturity and for the associated ecosystem to develop (especially in the case of ancient woodland). Thus residual impacts for any loss of mature woodland will remain. Planted trees should be native species of local provenance. If the area of planted trees can be larger than that lost, there could be a long-term biodiversity enhancement. Scrub planting should also be undertaken to replace lost scrub on existing verges.

### ***Appropriate Design of Culverts***

Ideally, and to retain the most ecological value and connectivity, culverts should be very much over-sized and retain a natural substrate. Regardless, all culverts (particularly those longer than 100m) must be designed to allow the free movement of otters and other riparian species. If they cannot be much over-sized, they should be as large as possible (60cm wide and 60cm headroom minimum), and should ideally be square or rectangular rather than round in cross section and have appropriate access ramps following SNH and DMRB mitigation guidance. Smaller culverts under existing road crossings should also be designed to be as large as possible to facilitate otter movement. Fencing may also be required to guide animals to safe crossing points and discourage them from gaining access to the road.

### ***Badger Underpasses***

During detailed protected species surveys for Stage 3, note should be made of trails and road crossing points. If badger or other protected species refuges, well-worn paths to/ from these, or regular crossing points are recorded in the vicinity of the design, then this may require the use of mammal underpasses and mammal fencing, and/or landscaping considerations. In some cases, it may be possible to combine the function of underpasses for both badger and otter.

### ***Measures for Bat Road Crossing Points***

If further survey finds that new roads (largely a concern for Option C, which involves significantly greater landscape dissection) will fragment bat commuting corridors, then measures may be required to encourage bats to cross new roads at sufficient height.

### ***Compensatory Pond Creation***

If the pond closest to and immediately south of the existing bypass will be significantly reduced or destroyed, the loss should be replaced, for example within a SUDS detention area. This is because of the significant ecological value of ponds, in this case including use by otter and at least common amphibians. However, to be of benefit to amphibians (and otters which frequently forage on amphibians), any replacement pond would need to be designed to retain water until at least the end of July, in order to allow amphibians to metamorphose.

### ***Invasive Species Management***

An invasive species Risk Assessment and Management Plan should be prepared for all options to exercise due diligence regarding invasive species (in this case including giant hogweed) and their treatment prior to any works commencing.

### ***Pollution Controls***

To avoid pollution events contaminating surface or ground waters, including the Dean Burn and (indirectly) the River North Esk and downstream designated sites, SEPA-approved management measures for working near watercourses should be implemented and set out in a Construction Environmental Management Document (CEMD) and Method Statements. This should include controls and contingency measures for management of run-off from construction areas, silt management, and management of fuel, oil, chemicals and materials. Design of SUDS should be appropriate to contain pollutant run-off from the scheme and be approved by SEPA.

### ***Avoidance of Breeding Bird Offences***

Vegetation clearance should take place outside the bird breeding season (March to August inclusive). If the bird surveys discover notable species (such as barn owl) and adverse impacts are possible on these, then licensing and/or other measures may be required.

### ***Further Survey***

Further ecological surveys are crucial to properly inform Stage 3 assessment and design of mitigation. These survey requirements are set out below under the section 'Scope of DMRB Stage 3 Assessment'.

### 3.8 Summary of Effects

Table 3.11 below gives likely significance of impacts prior to mitigation, and likely significance with mitigation. Unless otherwise stated, impacts are adverse.

**Table 3.11 – Potential Construction and Operational Effects**

	Option	Predicted Effects	Magnitude of Predicted Impact	Sensitivity of Receptor	Significance of Effect	Potential Mitigation Measures	Residual Effects
<b>Dalkeith Oakwood SSSI</b>							
Construction	Common to all Options	Pollution via surface or ground-waters.	Major Adverse	National	Very Large	Standard SEPA-approved pollution control measures.	Neutral
Operation	Common to all Options	Pollution via surface or ground-waters.	Major Adverse		Very Large	Implementation of SUDS.	Neutral
<b>Dalkeith Oakwood SSSI – Rare Lichens</b>							
Operation	Common to all Options	Air pollution effects. However, no significant change in air quality likely (see Chapter 7 - Air Quality).	Negligible	National	Neutral	None required.	Neutral
<b>Dalkeith Estate LWS, Melville Castle LWS and River North Esk LWS</b>							
Construction	Common to all Options	Pollution via surface or ground-waters.	Major Adverse	County	Moderate	Standard SEPA-approved pollution control measures.	Neutral
Operation	Common to all Options	Pollution via surface or ground-waters.	Major Adverse		Moderate	Implementation of SUDS.	Neutral
<b>Firth of Forth SPA/ Ramsar/ SSSI</b>							
Construction	Common to all Options	Pollution via surface- or ground-waters, but likely to be minor as a result of very large dilution effect of Firth of Forth.	Minor Adverse	International	Moderate	Standard SEPA-approved pollution control measures.	Neutral
Operation	Common to all Options	Pollution via surface- or ground-waters, but likely to be minor as a result of very large dilution effect of Firth of Forth.	Minor Adverse		Moderate	Implementation of SUDS.	Neutral
<b>Ancient Woodland</b>							
Construction	C	Loss of c.0.59ha ancient woodland	Minor Adverse	National	Moderate (but greater extent than Options A and B)	Compensatory tree-planting. This will not constitute ancient woodland, but given that this ancient woodland is species-poor plantation, the residual impact is considered slight.	Slight

	Option	Predicted Effects	Magnitude of Predicted Impact	Sensitivity of Receptor	Significance of Effect	Potential Mitigation Measures	Residual Effects
	A & B	Loss of c.0.17ha ancient woodland	Minor Adverse		Moderate (but less extent than Option C)		Slight
<b>Terrestrial Habitat Loss</b>							
Construction	Common to all Options	Loss through land-take of habitats of negligible ecological value, and slight loss of habitats of low ecological value.	Minor Adverse	Local or less	Neutral	None required	Neutral
<b>River North Esk</b>							
Construction	Common to all Options	Pollution during construction.	Major Adverse	County	Moderate	Implementation of SUDS.	Neutral
Operation	Common to all Options	Pollution during operation.	Major Adverse		Moderate		Neutral
<b>Dean Burn</b>							
Construction	A & C	Culverting of long lengths of watercourse.	Major Adverse	County	Moderate	Culvert design, in decreasing order of preference: i) Over-sized with natural substrate; ii) As large as possible, preferably rectangular rather than round, minimum DMRB standards for otter passage.	Moderate to Slight (depending on culvert design)
	B	Culverting of moderate lengths.	Moderate Adverse		Slight		Slight to Neutral (depending on culvert design)
<b>Ponds</b>							
Construction	Common to all Options	Partial or total loss of pond closest to existing bypass, with impact on protected species (at least otter) and general biodiversity.	Major Adverse	County	Moderate	Compensate partial or total loss through creation of pond nearby, connected to the Dean Burn.	Neutral
<b>Invasive Non-Native Species of Plant</b>							
Construction	Common to all Options	Spread of non-native species including giant hogweed (a species of UK concern).	Major Adverse	Regional	Large	Produce and adhere to an Invasive Species Risk Assessment & Management Plan.	Neutral
<b>Otter</b>							
Construction	A & C	Reduction in otter numbers/distribution through loss of pond and culverting of long lengths of Dean Burn, and loss of lie-up.	Major Adverse	County	Moderate (most severe for Option C)	Suitable culvert design (see above) and minimised lengths of culvert.	Moderate to Slight (depending on culvert design)

	Option	Predicted Effects	Magnitude of Predicted Impact	Sensitivity of Receptor	Significance of Effect	Potential Mitigation Measures	Residual Effects
	B	Reduction in otter numbers/distribution through loss of pond and culverting of moderate lengths of Dean Burn.	Moderate Adverse		Slight	Compensatory pond creation.	Slight to Neutral (depending on culvert design)
Operation	A & C	Increased otter vehicle collisions (known already to occur) through significant culverting of Dean Burn.	Major Adverse		Moderate		Moderate to Slight (depending on culvert design)
	B	Minor increased in otter vehicle collisions (known already to occur) through moderate culverting of Dean Burn.	Moderate Adverse		Slight		Slight to Neutral (depending on culvert design)
<b>Badger</b>							
Construction	C	Destruction of known small badger sett.	Major Adverse	County	Moderate	Further survey to determine sett significance/locate other setts; licensed closure; replacement sett if necessary.	Neutral
	A & B	Disturbance of known small badger sett.	Minor Adverse		Slight	Further survey to determine sett significance/locate other setts; licensed disturbance.	Neutral
Operation	C	Increased badger vehicle collisions (known already to occur) through significant further dissection of landscape by roads.	Major Adverse		Moderate	Further survey to locate any badger crossing points; use of mammal underpass(es).	Neutral
	A & B	Unlikely that significant increase in badger vehicle collisions would occur as degree of further landscape dissection minimal.	Negligible		Neutral		Neutral
<b>Bats</b>							
Construction	Common to all options	Possible loss of roosts.	Major Adverse	County	Moderate	Further survey to locate bat roost potential; if required, licensed roost destruction and compensatory roost provision.	Neutral
Operation	C	Potential increased bat vehicle collisions through significant further dissection of landscape by roads.	Major Adverse		Moderate	Further survey to locate bat commuting routes; use of measures to encourage bats to cross new roads at high level (e.g. tree planting, wires, fencing).	Slight to Neutral (depending on mitigation success)
	A & B	Unlikely that significant increase in bat vehicle collisions would occur as degree of further landscape dissection minimal.	Negligible		Neutral		Neutral
<b>Water Vole</b>							

	Option	Predicted Effects	Magnitude of Predicted Impact	Sensitivity of Receptor	Significance of Effect	Potential Mitigation Measures	Residual Effects
Construction	A & C	If water vole is present along the suitable parts of the Dean Burn, significant water vole habitat could be lost.	Major Adverse	Regional	Large	Further survey to determine water vole presence/absence; if required, compensatory nearby habitat creation and licensed translocation of water voles.	Neutral
	B	If water vole is present along the suitable parts of the Dean Burn, parts of water vole habitat could be lost.	Moderate Adverse		Moderate		Neutral
<b>Red Squirrel</b>							
Construction	Common to all Options	If red squirrel is present, loss of one or a small number of dreys may occur if dreys are located in the small amount of woodland affected.	Moderate Adverse	County	Slight	Further survey to determine location of dreys; if required, licensed destruction of dreys.	Neutral
<b>Amphibians</b>							
Construction	Common to all Options	Partial or total loss of pond closest to existing bypass, with effect on great crested newt if present.	Major Adverse	County	Moderate	Further survey to determine great crested newt presence/absence; compensatory pond creation; if required, licensed translocation.	Neutral
<b>Breeding Birds</b>							
Construction	Common to all Options	Destruction of nests of common wild birds.	Minor Adverse	Local	Slight	Clear vegetation outwith breeding bird season.	Neutral
	Common to all Options	Destruction of nests of specially-protected wild birds, such as barn owl.	Major Adverse	County	Moderate	Further survey to determine presence/absence of specially-protected birds. If birds such as barn owl present, licensed nest destruction and compensation.	Neutral
<b>Plant Species</b>							
Construction	Common to all Options	Impacts on plant species are expected to be negligible as the habitats in the footprint of all options are not likely to support any of the scarce species identified in the desk study.	Negligible	Local	Neutral	None required. However, potential enhancement easily achieved by sowing species-rich grassland mix on verges.	Neutral
<b>Lichens in Wider Area (See above for Oakwood SSSI lichens)</b>							
Operation	Common to all Options	Air pollution effects. However, no significant change in air quality likely (see Chapter 7 – Air Quality).	Negligible	National	Neutral	None required.	Neutral

## 3.9 Compliance with Policy and Plans

In this section, the City of Edinburgh Local Development Plan, Midlothian Council Local Development Plan and Midlothian Proposed Local Development Plan (to be adopted in 2017) are abbreviated to 'CEC LDP', 'MLC LCP' and 'MLC pLDP' respectively. Scottish Planning Policy is abbreviated to 'SPP'.

### ***Policies regarding Designated Nature Conservation Sites***

There will be no contravention of such policies from direct impacts because the footprint of all options does not impinge upon designated nature conservation sites. Potential impacts concern possible passage of pollution via surface and ground waters to downstream designations, and air pollution effects on scarce/rare lichens in Dalkeith Oakwood SSSI and along the River North Esk. Compliance with the former will be achieved through implementation of standard SEPA-approved pollution control measures. The effect on air quality is expected to be insignificant (see Chapter 7 – Air Quality) and all options will therefore comply with respect to air pollution.

### ***Policies regarding Protected Species***

All protected species policies will be complied with as long as i) the further survey recommendations set out below under Scope of DMRB Stage 3 Assessment are undertaken, and ii) appropriate mitigation is undertaken in accordance with the mitigation section below, adapted according to further survey information and licensed where necessary by SNH.

### ***Policies regarding Woodland***

SPP, CEC LDP and MLC LDP/pLDP all expect development to avoid losses of ancient or semi-natural woodland and veteran trees, or other woodland of landscape importance, and to provide compensation where loss cannot be avoided. To fully comply with these policies, compensatory tree planting should be carried out for the small losses of woodland (see mitigation section 3.7).

### ***Policies regarding General Biodiversity Protection/ Enhancement***

SPP, CEC LDP and MLC LDP/pLDP all expect development to provide biodiversity enhancements where feasible, and to compensate for loss of significant ecological features whether designated or not. For full compliance with these policies, the following is recommended:

- In addition to compensatory tree planting for the small losses of woodland (see above and mitigation section 3.7), potential biodiversity enhancement could be provided in the long term by planting trees in a greater area than that lost.
- Compensate for damage or loss of pond closest to bypass (see mitigation section 3.7);
- If culverting will destroy lengths of watercourse used by water voles (pending Stage 3 survey), enhance other areas of adjacent watercourse for water vole or provide compensatory habitat (e.g. diverted water channel with appropriate bank structure/habitat).
- A general enhancement to biodiversity could be easily and cheaply achieved by sowing a species-rich meadow mix on new grassland verges.

### ***Policies regarding Green Networks***

The MLC pLDP includes proposed 'Sheriffhall Link' and 'Melville Link' green network components. However, these are located beyond the footprint of all three options to the north-west/north/north-east and south-west respectively, thus none of the options will impinge upon land for green network proposals, and compliance will be automatic. There are no such green network components in the City of Edinburgh LDP in the scheme footprint or close by.

### ***Policies regarding Peatlands***

No areas of peatland will be impacted therefore all options will automatically comply with all national and local policies concerned with protection of peat and associated carbon storage.

### ***Policies regarding National and Local Biodiversity Action Plans***

National and local policies expect priorities in the Scottish Biodiversity List (SBL) and Local Biodiversity Action Plans (LBAPs) to be acknowledged. This has been addressed as far as currently possible, and will be further addressed at Stage 3, through desk study and fieldwork which note records of such species and habitats in the scheme vicinity, and then by the further surveys and mitigation measures in respect of these. Such policies will be complied with if the recommended surveys and mitigation (adapted as required following further Stage 3 surveys) are implemented.

### ***Policies regarding the Water Environment***

SPP, CEC LDP and MLC LDP/pLDP all contain presumptions against culverting. Since culverting cannot be avoided by any of the options, such policies can be complied with as far as possible by employing as many of the following measures as possible:

- Implement the design which requires the least length of culverting;
- Design culverts to be over-sized with natural substrate;
- Design culverts to be rectangular rather than circular, and follow guidance for maximising suitability for protected species (see further details in Section 3.7).

SPP, CEC LDP and MLC LDP/ pLDP also all contain requirements for SUDS. SUDS should therefore be incorporated into the scheme design to ensure compliance with such policies. Additionally, SUDS design should take into account likely damage to or loss of the pond closest to the existing bypass, and include a compensatory pond (see further details in mitigation below).

## **3.10 Conclusions**

During the construction phase it is anticipated that nature conservation effects are slightly greater for Options A and C, particularly relating to impacts on the Dean Burn and therefore on Otter Habitat.

The key ecological differences between the three options concern woodland losses (and associated potential impacts on protected species), lengths of required culverting (and associated potential impacts on protected species), and variability in likely increases in protected species road traffic casualties. In all these cases, it is anticipated that Option C will result in the greatest effect, since it results in significantly greater impact on ancient woodland, significantly more culverting (of up to 400m, a length for which there is uncertainty as to whether otters will use it even if designed according to DMRB standards, unless much over-sized with natural substrate) and the greatest likelihood of increased protected species road traffic casualties (through significantly greater landscape dissection). Additionally, if the pond closest to and immediately south of the existing bypass is retained, Option C will remove a larger part of it, and Option C also has the greatest land take. Thus Option C is the least preferred ecologically.

Options A and B have similar ecological effects, but owing to the significantly smaller land take and reduced culverting required for Option B; Option B is the most preferred ecologically. It is anticipated that the greatest effects are likely from Option C, with Option B resulting in the least effects, followed by Option A.

## **3.11 Scope of DMRB Stage 3 Assessment**

The Stage 3 assessment should include the following elements. Note that this list does not include further vegetation surveys apart from invasive species survey, because the habitats likely to be directly affected are considered to be of insufficient quality or interest to warrant such survey.

- A full otter survey, encompassing the full length of the Dean Burn within the survey area and ponds likely to be affected by the chosen Option, ideally not in summer when vegetation is most dense and hardest to



search. The findings of this survey will inform potential licensing of the works, inform possible employment of artificial refuges and inform designed of culverts (particularly important for Option C).

- Full badger survey both within the scheme footprint and throughout the wider survey area, ideally not in summer when vegetation is most dense and hardest to search. The locations of badger setts beyond the immediate scheme footprint is often important in determining the significance of setts close to or within it. The findings of this survey will inform potential licensing of the works, provision of artificial setts, and inform design and employment of any mammal fencing and mammal underpasses that might be required.
- Full bat surveys. Bat surveys should locate any trees or structures likely to be affected by the works that have bat roost potential, and this should inform subsequent bat activity and emergence/re-entry survey design, which would ideally need to be undertaken through the period May to September. The findings of these surveys will inform whether licensing is required and (if so) proportionate mitigation, which may include appropriate seasonal timing of the works and provision of replacement roost features (if features will be lost).
- Full water vole survey, ideally in the period April to June when vegetation is lower but latrine activity is high. This should be targeted at the Dean Burn within a minimum of 200m of the works, and also at ponds likely to be affected. The findings will inform whether licensing is required and (if so) proportionate mitigation, which could include habitat enhancement/creation.
- Search for squirrel dreys within the small areas of woodland potentially impacted by the scheme, ideally in spring or autumn. If found in this search area, it may be necessary to conduct further surveys to determine occupying species.
- Great crested newt survey. This should be targeted at the pond closest to and immediately south of the existing bypass (and at other ponds in the wider area if the scheme changes such that effects on these are possible). If great crested newt is found, this will have important implications for additional mitigation, which could include use of fencing, trapping and habitat enhancement/creation.
- Breeding bird survey. This should utilise an adapted Common Bird Census method comprising at least three visits spread through April, May and June, covering the scheme footprint and a minimum buffer of 100m. Further investigation should also be undertaken regarding the potential presence of barn owl. The findings of these surveys will inform whether mitigation is required beyond standard measures (including vegetation clearance outside the bird breeding season).
- Survey for invasive plant species. This should encompass the scheme footprint and a minimum buffer of 100m to account for possible deviations and construction of temporary compounds, etc. It must be undertaken in spring/summer to properly determine abundance and types of invasive species.
- Air quality data should be evaluated to determine potential consequences on lichen and invertebrate receptors. It is not considered necessary to conduct specific lichen or invertebrate surveys, given the location of the scarce and rare species in higher quality habitat in designated sites beyond the scheme footprint.

## 4. Cultural Heritage

### 4.1 Introduction

This section identifies and assesses the potential effects upon cultural heritage assets from the remaining options being considered for the Sheriffhall Roundabout, centred on Grid Reference NT318679.

The cultural heritage resource consists of archaeology, historic buildings and historic landscape and covers both designated and non-designated heritage assets.

### 4.2 Approach and Methodology

This assessment has been undertaken in accordance with Design Manual for Roads and Bridge (DMRB) Volume 11, Section. 3, Part 2 '*Cultural Heritage*' (HA 208/07). Work was undertaken in accordance with the Chartered Institute for Archaeologists Code of Conduct (CIfA, 2014) and the Standard and Guidance for Historic Environment Desk-based Assessment (CIfA, 2014), and Historic Environment Scotland's Managing Change in the Historic Environment: Setting document (HES, 2016).

#### 4.2.1 Purpose and Scope of the Assessment

The purpose of the Stage 2 Options Appraisal Simple Assessment (DMRB Vol. 11, S. 3, P. 2 – '*Cultural Heritage*') is to:

- Identify the known and potential cultural heritage resource, including both designated and non-designated assets;
- Establish the value of the affected heritage assets and make a comparative assessment of the potential effects of the proposed options upon the cultural heritage resource of the area; and,
- To reach an understanding of the likely environmental effects to inform the final design and assessment;
- To determine the need for mitigation measures or enable the need for mitigation to be discounted.

#### 4.2.2 Information Sources

The assessments of potential impacts made in this chapter are based on information from desk-based assessment and walkover study. Baseline data has been obtained from a range of sources, including the following:

- Historic Environment Scotland (HES) for information on designated sites comprising World Heritage Sites, Scheduled Monuments, Listed Buildings, Conservation Areas, sites included on the Inventory of Gardens and Designed Landscapes in Scotland, and the Inventory of Historic Battlefields;
- Historic Landuse Assessment project data undertaken by the Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS);
- East Lothian and Midlothian Historic Environment Record (HER);
- Historic maps and plans held by the National Library of Scotland;
- Published archaeological books and journals;
- Unpublished reports held in the HER and elsewhere;
- Discovery and Excavation in Scotland data available online through the archaeology data service at: <http://archaeologydataservice.ac.uk/archives/view/des/>;
- An inspection of the study area and route options from publicly-accessible points on roads and rights of way.

Designated heritage assets are mapped on Figures 4.1 to 4.6 – Location of Cultural Heritage Assets. Heritage assets are referenced in the text in bold (e.g. LB1234), using their unique identifier assigned by HES or the HER.

Appendix 4.1 – Gazetteer of Cultural Heritage Assets contains coordinate information, detailed descriptions and Statements of National Importance/ Special Interest. The appendix is split in to a number of tables as below:

- Appendix 4.1.1 - Scheduled Monuments within 2km of the Options
- Appendix 4.1.2 - Listed Buildings (Category A) within 2km of the Options
- Appendix 4.1.3 - Listed Buildings (Category B & C) within 1km of the Options
- Appendix 4.1.4 - Entries in the Inventory of Gardens and Designed Landscapes within 2km of the Options
- Appendix 4.1.5 - Conservation Areas within 2km of the Options

Appendix 4.2 - Cultural Heritage Glossary of Terms is provided for ease of reading alongside this chapter.

### 4.2.3 Study Areas

The Study Areas were used to identify both assets which may experience a physical impact from the proposals, and those which may experience an impact upon their setting. Buffers were measured from the farthest extent of each of the proposed options. This allows for minor shifts in route alignment.

- 2km buffer area: For designated assets such as scheduled monuments, listed buildings (Category A), entries on the Inventory of Gardens and Designed Landscapes and Inventory of Historic Battlefields, and conservation area boundaries.
- 1km buffer area: A 1km buffer was used to identify Category B and C listed buildings and Historic Landuse Assessment (HLA) Data.
- 500m buffer area: For non-designated assets including archaeological sites and findspots, locally significant buildings and locally significant historic landscapes.

In order to help place any affected remains in their local context, and to help predict the potential for unknown archaeological remains on each route option, archaeological information from a wider surrounding area was also taken into account.

### 4.2.4 Impact Assessment Methodology

The assessment methodology follows guidance set out in DMRB, Vol. 11, S. 3, P. 2 – ‘*Cultural Heritage*’. Application of appropriate mitigation measures follows guidance set out in DMRB Vol. 10, S. 6, P. 1 (HA 75/01) – ‘*Trunk Roads and Archaeological Mitigation*’. The magnitude of impact is first assessed without reference to the value of the feature. The findings of this assessment are then cross-referenced with the value rating of the feature to establish the significance of effect that is likely to result from the options firstly prior to mitigation measures being imposed, then again taking into account the mitigation proposals to establish the residual effect. Both stages are calculated by the use of a matrix (Table 4.1) that balances the value/sensitivity of a feature against the magnitude of impact.

**Table 4.1 – Significance of Effect**

Magnitude of Impact	Value/ Sensitivity of Receptor				
	Very High	High	Medium	Low	Negligible
<b>Major</b>	Very Large	Large or Very Large	Moderate or Large	Slight or Moderate	Slight
<b>Moderate</b>	Large or Very Large	Moderate or Large	Moderate	Slight	Neutral or Slight
<b>Minor</b>	Moderate or Large	Slight or Moderate	Slight	Neutral or Slight	Neutral or Slight
<b>Negligible</b>	Slight	Slight	Neutral or Slight	Neutral or Slight	Neutral
<b>No change</b>	Neutral	Neutral	Neutral	Neutral	Neutral

### 4.2.5 Assessing Value

The value of a structure, area, site or landscape reflects its significance or importance as a historic asset and, therefore, its sensitivity to change. For the purposes of this report, value has been assessed in accordance with DMRB Vol. 11, S. 3, P. 2 – ‘*Cultural Heritage*’. The value of archaeological remains, historic buildings and historic landscapes is assessed by reference to the criteria outlined in Table 4.2.

Historic Environment Scotland has outlined a number of principles which contribute to an asset's value, including evidential, historical, aesthetic and communal value. Non-designated assets may exhibit equivalent values to those which have been granted statutory protection and have been assessed accordingly.

The significance of any remains that are compromised by poor preservation or truncation is assessed as very low. The significance of any previously unknown remains that may survive within the scheme area would derive from their evidential value and their potential to contribute to our understanding of past human activity guided by local, regional and national research priorities.

**Table 4.2 – Guide for Assessing the Value of Heritage Assets**

Importance	Description
Very High	<ul style="list-style-type: none"> <li>World Heritage Sites</li> <li>Assets of acknowledged international importance</li> <li>Assets that can contribute significantly to acknowledged international research objectives</li> <li>Buildings of recognised international importance</li> <li>Historic landscapes of international value, whether designated or not</li> <li>Extremely well preserved historic landscapes with exceptional coherence, time-depth or other critical factor(s)</li> </ul>
High	<ul style="list-style-type: none"> <li>Scheduled Monuments</li> <li>Non designated assets of schedulable quality and importance</li> <li>Assets that can contribute significantly to acknowledged national research objectives</li> <li>Category A Listed Buildings</li> <li>Other listed buildings that can be shown to have exceptional qualities in their fabric or historical association not adequately reflected in their listing grade</li> <li>Conservation Areas containing very important buildings</li> <li>Non designated structures of clear national importance</li> <li>Designated historic landscapes of outstanding interest</li> <li>Battlefields listed on the Inventory</li> <li>Well preserved historic landscapes, exhibiting considerable coherence, time-depth or other critical factor(s)</li> </ul>
Medium	<ul style="list-style-type: none"> <li>Designated or non-designated assets that contribute to regional research objectives</li> <li>Category B Listed Buildings</li> <li>Historic (unlisted) buildings that can be shown to have exceptional qualities in their fabric or historic association</li> <li>Conservation Areas containing important buildings</li> <li>Historic Townscape or built-up areas with historic integrity in their buildings, or built settings (e.g. including street furniture and other structures)</li> <li>Designated special historic landscapes</li> <li>Non-designated that would justify special historic landscape designation, landscapes of regional value</li> <li>Averagely well-preserved historic landscapes with reasonable coherence, time-depth or other critical factor(s).</li> </ul>
Low	<ul style="list-style-type: none"> <li>Non designated assets of local importance</li> <li>Assets compromised by poor preservation and/or poor survival of contextual associations</li> <li>Assets of limited value, but with potential to contribute to local research objectives</li> <li>Category C Listed buildings</li> <li>Historic (unlisted) buildings of modest quality in their fabric or historical association</li> <li>Historic Townscape or built-up areas of limited historic integrity in their buildings, or built settings (e.g. including street furniture and other structures)</li> <li>Robust non-designated historic landscapes</li> <li>Historic landscapes with importance to local interest groups</li> <li>Historic landscapes whose value is limited by poor preservation and/or poor survival of contextual associations</li> </ul>
Negligible	<ul style="list-style-type: none"> <li>Assets with very little or no surviving archaeological interest</li> <li>Buildings of no architectural or historical note; buildings of an intrusive character</li> <li>Landscapes with little or no significant historical interest</li> </ul>
Unknown	<ul style="list-style-type: none"> <li>The importance of this resource cannot be ascertained</li> <li>Buildings with some hidden (i.e. inaccessible) potential for historic significance</li> </ul>

## 4.2.6 Levels of Impacts

Impacts of the options upon cultural heritage assets can be positive or negative; direct or indirect; long term or temporary and/or cumulative.

Direct impacts are those that arise as straightforward consequences of the options. For archaeological remains and historic structures, this can mean physical damage to, or physical improvement of, the fabric or the setting of cultural heritage assets. An indirect impact is an impact arising from the options where the connection between the options and the impact is complicated, unpredictable or remote.

Long-term impacts can be related to either the construction or the operation of the options. Long-term construction impacts include damage caused by topsoil stripping, geotechnical investigations, hedgerow removal, excavations for borrow pits, drainage and communications, the movement and installation of heavy machinery and plant, and mitigation works in connection with other environmental topics. Long-term operational impacts are those that would arise from the use of the road once built, for example new lighting, noise, dust, vibration, and visual intrusion by traffic or planting.

Temporary impacts are mainly related to the construction of the options. These include noise, dust, visual intrusion and disruption of access during construction. Temporary impacts arising from the operation of the Scheme may be the result of noise caused by traffic diverted during predictable maintenance or other traffic management operations.

The setting of a heritage resource is a material consideration in Scottish planning and guidance relating to archaeological remains, historic buildings and designed landscapes and should be assessed as part of the Options Assessment process. HES have published specific guidance relating to the setting of heritage assets (HES, 2016). It states that “*Setting is the way the surroundings of a historic asset or place contribute to how it is understood, appreciated and experienced*”. In managing change within the historic environment, HES Policy Statement June 2016 emphasises the need to maintain an appropriate setting for a heritage asset.

The magnitude of a potential impact on the cultural heritage features has been evaluated using the criteria provided in Table 5.3 “Factors in the Assessment of the Magnitude of an Impact” (DMRB, Vol11,S3.P2), with some additional criteria based on professional experience. (see Table 4.3 below).

**Table 4.3 – Guidance Factors in Assessing the Magnitude of Impacts on Heritage Assets**

Impact	Magnitude
Change to most or all key heritage elements, such that the resource is totally altered Comprehensive changes to setting	Major
Change to most or all key historic landscape elements, parcels or components; extreme visual effects; gross change of noise or change to sound quality; fundamental changes to use or access; resulting in total change to historic landscape character unit.	
Changes to many key heritage elements, such that the resource is clearly modified Considerable changes to setting that affect the character of the asset	Moderate
Changes to many key historic landscape elements, parcels or components, visual change to many key aspects of the historic landscape, noticeable differences in noise or sound quality, considerable changes to use or access; resulting in moderate changes to historic landscape character.	
Changes to key heritage elements, such that the asset is slightly altered Slight changes to setting	Minor
Changes to few key historic landscape elements, parcels or components, slight visual changes to few aspects of historic landscape, limited changes to noise levels or sound quality; slight changes to use or access: resulting in limited changes to historic landscape character.	
Very minor changes to elements or setting. Very minor changes to key historic landscape elements, parcels or components, virtually unchanged visual effects, very slight changes in noise levels or sound quality; very slight changes to use or access; resulting in a very small change to historic landscape character.	Negligible
No change No change to elements, parcels or components, no visual or audible changes; no changes arising from in amenity or community factors	No change

## 4.3 Planning Policy Context

### 4.3.1 Legislation, National Policy and Guidance

There are a number of statutory instruments and policies governing the approach to cultural heritage.

The main pieces of legislation are:

- Historic Environment Scotland Act 2014;
- The Historic Environment (Amendment) (Scotland) Act 2011;
- Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997;
- The Town and Country Planning (Scotland) Act 1997 as amended by the Planning etc. (Scotland) Act 2006; and,
- Ancient Monuments and Archaeological Areas Act 1979.

The principal elements of policy and guidance comprise:

- Historic Environment Scotland Policy Statement, June 2016, which replaces the Scottish Historic Environment Policy (SHEP) for operational matters;
- Historic Environment Circular 1. Historic Environment Scotland (2016);
- Scottish Planning Policy (SPP) Paragraphs 135-151: Valuing the Historic Environment (2014);
- Our Place in Time - The Historic Environment Strategy for Scotland (2014) ;
- Planning Advice Note 2/2011 – Planning and Archaeology (2011);
- Planning Advice Note 71 – Conservation Area Management (2004); and,
- The 'Managing Change in the Historic Environment' series of guidance notes issued by Historic Environment Scotland (HES 2016).

Historic Environment Scotland compiles the Battlefield Inventory which is the first dedicated designation for nationally important battlefields in Scotland. Additional protection of battlefield features is provided through existing legislation for scheduled monuments, listed buildings, gardens and designed landscapes, and conservation areas through the Historic Environment Scotland Act 2014. Historic Environment Scotland works closely with planning authorities and relevant public bodies to ensure that Inventory sites are taken into account in their plans, policies and decision-making processes.

The Historic Environment (Amendment) Scotland Act (2011) made it a statutory duty for Historic Environment Scotland to compile and maintain an Inventory of Gardens and Designed Landscapes in Scotland. Sites on the inventory of Historic Gardens and Designed landscapes are of national importance and should be taken into account during the planning process

Conservation areas are described by the Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997 "as areas of special architectural or historic interest, the character of which it is desirable to preserve or enhance". Local planning authorities are required to determine which parts of their area should be safeguarded due to their architectural or historic interest, to ensure that any new development pays respect to or enhances their character.

Listing of a building or structure with special architectural or historic interest is provided through legislation and the Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997. Historic Environment Scotland is responsible for listing buildings of particular historical or architectural merit. Buildings are assigned to one of three categories according to their relative importance. All listed buildings receive equal legal protection, which applies to the interior and exterior of the building, regardless of its category.

- Category A: buildings of national or international importance, either architectural, historical, or fine, little altered examples of a particular period, style or building type.
- Category B: buildings of regional (or more than local) importance, or major examples of a particular period, style or building type, which may have been altered.

- Category C: buildings of local importance, lesser examples of any period, style or building type, as originally constructed or moderately altered, and simple traditional buildings that group well with others in categories A and B.

Scheduled Monuments are of national or international importance and are protected under the Ancient Monuments and Archaeological Areas Act 1979 and the Historic Environment (Amendment) (Scotland) Act 2011.

Historic Environment Scotland's Policy Statement (June 2016), Scottish Planning Policy, Historic Environment Circular 1 and Historic Environment Scotland's Managing Change in the Historic Environment guidance note series are the documents to which planning authorities are directed in their consideration of applications for conservation area consent, listed building consent and their consideration of planning applications affecting the historic environment and the setting of individual elements of the historic environment.

Most of the historic environment is not covered by statutory designation and therefore is not afforded national protection from development. Protection of these assets of local interest is covered by individual local authorities and recorded in the Historic Environment Record (HER).

The importance placed on cultural heritage is set out in 'Our Place in Time – The Historic Environment Strategy for Scotland, 2014' which sets out a 10-year strategy for protecting and managing heritage assets.

### 4.3.2 Regional Policy

### 4.3.3 SESplan

#### **Strategic Development Plan (Adopted 2013)**

SESplan (2013) notes that Local Development Plans will "Ensure that there are no significant adverse impacts on the integrity of international and national built or cultural heritage sites in particular World Heritage Sites, Scheduled Ancient Monuments, Listed Buildings, Royal Parks and Sites listed in the Inventory of Gardens and Designed Landscapes". The Strategic Development Plan is currently under review.

### 4.3.4 Local Policy

The options cover two council areas: the City of Edinburgh to the northwest and Midlothian to the southeast.

Local policy is provided in two plans: the Midlothian Local Plan (2008) and the City of Edinburgh Local Development Plan (2016).

#### **4.3.4.1 City of Edinburgh Council**

##### **Edinburgh Local Development Plan (Adopted November 2016)**

The Local Development Plan (LDP) sets out cultural heritage policies in Section 3; Caring for the Environment.

This notes that "Protection of the historic and natural environment for the benefit of future generations is an important role of the planning system".

- Policy Env 2 – Listed Buildings – Demolition

*"Proposals for the total or substantial demolition of a listed building will only be supported in exceptional circumstances, taking into account: a) the condition of the building and the cost of repairing and maintaining it in relation to its importance and to the value to be derived from its continued use b) the adequacy of efforts to retain the building in, or adapt it to, a use that will safeguard its future, including its marketing at a price reflecting its location and condition to potential restoring purchasers for a reasonable period. c) the merits of alternative proposals for the site and whether the public benefits to be derived from allowing demolition outweigh the loss."*

- Policy Env 3 – Listed Buildings – Setting

*"Development within the curtilage or affecting the setting of a listed building will be permitted only if not detrimental to the architectural character, appearance or historic interest of the building, or to its setting."*

- Policy Env 6 – Conservation Areas – Development
 

*“Development within a conservation area or affecting its setting will be permitted which:*

  - a) preserves or enhances the special character or appearance of the conservation area and is consistent with the relevant conservation area character appraisal*
  - b) preserves trees, hedges, boundary walls, railings, paving and other features which contribute positively to the character of the area and*
  - c) demonstrates high standards of design and utilises materials appropriate to the historic environment.*

*Planning applications should be submitted in a sufficiently detailed form for the effect of the development proposal on the character and appearance of the area to be assessed.”*
- Policy Env 7 – Historic Gardens and Designed Landscapes
 

*“Development will only be permitted where there is no detrimental impact on the character of a site recorded in the Inventory of Gardens and Designed Landscapes, adverse effects on its setting or upon component features which contribute to its value. Elsewhere, adverse effects on historic landscape features should be minimised. Restoration of Inventory sites and other historic landscape features is encouraged.”*
- Policy Env 8 – Protection of Important Remains
 

*“Development will not be permitted which would:*

  - a) adversely affect a scheduled monument or other nationally important archaeological remains, or the integrity of their setting*
  - b) damage or destroy non-designated archaeological remains which the Council considers should be preserved in situ.”*
- Policy Env 9 – Development of Sites of Archaeological Significance
 

*“Planning permission will be granted for development on sites of known or suspected archaeological significance if it can be concluded from information derived from a desk-based assessment and, if requested by the Council, a field evaluation, that either:*

  - a) no significant archaeological features are likely to be affected by the development or*
  - b) any significant archaeological features will be preserved in situ and, if necessary, in an appropriate setting with provision for public access and interpretation or*
  - c) the benefits of allowing the proposed development outweigh the importance of preserving the remains in situ. The applicant will then be required to make provision for archaeological excavation, recording, and analysis, and publication of the results before development starts, all to be in accordance with a programme of works agreed with the Council”.*

*“The objective of the above policies is to protect and enhance archaeological remains, where possible by preservation in situ in an appropriate setting. In some cases, depending on the nature of the remains and character of the site, the Council may require provision for public access and interpretation as part of the proposed development. When preservation in situ is not possible, recording and/or excavation followed by analysis and publication of the results will be required. 179 Developers should seek early advice from the Council’s Archaeologist for sites where historic remains are known or thought likely to exist. Where a development may affect a scheduled monument or its setting, early contact should be made with Historic Environment Scotland”.*

#### **4.3.4.2 Midlothian Council**

##### ***Midlothian Local Plan (Adopted December 2008)***



There are a number of policies in the adopted 2008 Midlothian Local Plan that outline protection for cultural heritage within the local plan area. The policies on the Built Heritage seek to conserve and enhance the quality of the built and historic environment. Relevant policies comprise:

- RP22 Conservation Areas  
*“Within or adjacent to a Conservation Area, development will not be permitted which would have any adverse effect on its character and appearance.”*
- RP24 Listed Buildings  
*“Development will not be permitted which would adversely affect the character of appearance of a listed building, its setting or any feature of special or architectural or historic interest that it possesses.”*
- RP25 Nationally Important Gardens and Designed Landscapes  
*“Development will not be permitted which would harm the character, appearance or setting of a garden or designed landscape which is included in the Inventory of Historic Gardens and Designed Landscapes.”*
- RP26 Scheduled Ancient Monuments  
*“Development which could have an adverse effect on a scheduled Ancient Monument, or the integrity of its setting, will not be permitted.”*
- RP27 Other Important Archaeological or Historic Sites  
*“Development will not be permitted where it could adversely affect an identified regionally or locally important archaeological or historic site or its setting unless the applicant can show that:*  
  
*A. there is a public interest to be gained from the proposed development which outweighs the archaeological importance of the site*  
  
*B. There is no alternative location for the proposal; and*  
  
*C. The proposal has been sited and designed to minimise damage to the archaeological interest.”*
- RP28 Site Assessment, Evaluation and Recording  
*“Where any development proposal could affect an identified site of archaeological importance, the applicant will be required to provide an assessment of the archaeological value of the site and of the impact of the proposal on the archaeological resource. Unless the Council is satisfied to the contrary, such an assessment will require a field evaluation of the site to determine:*  
  
*A. The character and extent of the archaeological remains;*  
  
*B. The likely impact of the proposed development upon the features of archaeological interest; and*  
  
*C. Ways in which the proposed development can be designed to preserve the archaeological interest.”*  
  
*“Where the development is considered to be acceptable and it is not possible to preserve the archaeological resource in situ, the developer will be required to make arrangements for an archaeological investigation. The scope of this will be appropriate to the physical character of the site and proportionate to the importance of the information expected to be recoverable. Except for sites of minor local interest, this investigation will normally include excavation and recording prior to the start of development, followed by analysis and publication of the field data.”*

#### **Midlothian Proposed Local Development Plan (2014)**

The Midlothian LDP will replace the current Midlothian adopted Local Plan and is scheduled to be adopted in spring 2017. The proposed Midlothian Local Development Plan (Midlothian Council 2014) sets out plans for protecting heritage in Section 5.2 ‘Preserving our Historic Environment’, including:

- Policy ENV 19 – Conservation Areas  
*“Within or adjacent to a Conservation Area, development will not be permitted which would have any adverse effect on its character and appearance.”*

- Policy ENV 20 – Nationally Important Gardens and Designed Landscapes
 

*“Development will not be permitted which would harm the character, appearance and/ or setting of a garden or designed landscape as identified in the Inventory of Historic Gardens and Designed Landscapes.”*
- Policy ENV 21 – Nationally Important Historic Battlefields
 

*“Development within a site listed in the Inventory of Historic Battlefields will not be permitted where it would have an adverse effect on the character, appearance, setting or the key features of the battlefield.*

*The siting, scale and design of any new development, or extensions to existing buildings, must preserve, conserve or enhance the key characteristics of the battlefield. These may include landscape characteristics, key viewpoints that assist in the understanding of the battle and historic assets (particularly archaeological deposits found in situ).”*
- Policy ENV 22 – Listed Buildings
 

*“Development will not be permitted which would adversely affect the character or appearance of a listed building, its setting or any feature of special architectural or historic interest.*

*New development within the curtilage of a listed building or its setting will only be permitted where it complements its special architectural or historical character.”*
- Policy ENV 23 – Scheduled Monuments
 

*“Development which could have an adverse effect on a scheduled monument, or the integrity of its setting, will not be permitted.”*
- Policy ENV 24 – Other Important Archaeological or Historic Sites
 

*“Development will not be permitted where it could adversely affect an identified regionally or locally important archaeological or historic site, or its setting, unless the applicant can show that:*

*A. there is a public interest to be gained from the proposed development which outweighs the archaeological and historic importance of the site; and*

*B. there is no alternative location for the proposal; and*

*C. the proposal has been sited and designed to minimise damage to archaeological and historic interest.”*
- Policy ENV 25 – Site Assessment, Evaluation and Recording
 

*“Where development could affect an identified site of archaeological importance, the applicant will be required to provide an assessment of the archaeological value of the site and of the likely impact of the proposal on the archaeological resource.*

*Unless the Council is satisfied to the contrary, such an assessment will require a field evaluation of the site to determine:*

*A. the character and extent of the archaeological remains;*

*B. the likely impact of the proposed development on the features of archaeological interest; and*

*C. ways in which the proposed development can be designed to preserve the archaeological interest.*

*Where the development is considered to be acceptable and it is not possible to preserve the archaeological resource in situ, the developer will be required to make arrangements for an archaeological investigation. The scope of this will be appropriate to the physical character of the site and proportionate to the importance of the information expected to be recoverable. Except for sites of minor local interest, this investigation will normally include excavation and recording prior to the start of development, followed by analysis and publication of field data.”*

## 4.4 Consultation

Consultations regarding the scheme (DMRB Stage 2) were carried out in February 2015 and again in November 2016. Consultee responses relevant to cultural heritage are summarised in Table 4.4 below. Copies of all consultation responses are contained in Appendix 1.1 – Copy of Consultation Responses.

**Table 4.4 – Summary of Consultation Responses**

Consultee	Response
Historic Environment Scotland (previously Historic Scotland)	<p><b>Dated 12/03/2015</b></p> <p>Historic Scotland advised that although none of the suggested layouts appeared to involve direct impacts on designated assets, “<i>the locations of the following assets should be identified in constraint mapping:</i></p> <ul style="list-style-type: none"> <li>• Elginhaugh, Roman camp, native fort and palisaded enclosure 600m NE of (Scheduled Monument, Index No. 6202)</li> <li>• Elginhaugh, Roman fort, annexe and bathhouse 200m NE of (Scheduled Monument, Index No. 5684)</li> <li>• Melville Grange, homestead and pit alignments 600m ESE of (Scheduled Monument, Index No. 4592)</li> <li>• Dalkeith Park, King's Gate, Walls And Lodge (Category A listed building, HB Num 1437)</li> <li>• Dalkeith House (Palace) GDL”</li> </ul> <p>The response noted that “It appears unlikely at this stage that any of the proposed schemes would have a significant impact on the settings of these heritage assets. It is possible, however, that minor changes to some of the proposed options could result in direct impacts, in particular to Elginhaugh Roman Camp, and care should be taken to ensure that all elements of the scheme avoid this. There is also the possibility for direct impacts on Dalkeith House GDL, and if alterations to the scheme suggest this would be the case (for example, impacting boundary walls or planting within the designated area), we would welcome the opportunity to comment further.”</p> <p>The response also noted that “It may also be necessary to consider mitigation to ensure that there is no accidental damage to these heritage assets, or any others in the immediate vicinity of any construction works”.</p> <p>Historic Scotland recommended that the local authority archaeology and conservation services were also consulted, to comment on potential impacts on the historic environment including non-designated archaeology and category B and C listed buildings.</p> <p><b>Dated 06/12/2016</b></p> <p>Historic Environment Scotland recommended that both City of Edinburgh and Midlothian Councils’ archaeological and conservation advisors be consulted regarding potential impacts on the historic environment, including undesignated assets. The previous comments made at DMRB Stage 1 remain valid.</p>
VisitScotland	<p><b>Dated 18/02/2015</b></p> <p>VisitScotland’s response noted that the scheme would seek to minimise “the intrusion of the new works on the natural environment, cultural heritage and people whilst enhancing the local environment where opportunities arise”, and encouraged consideration of tourism signage.</p>
Planning – Midlothian Council	<p><b>Dated 13/03/2015</b></p> <p>Midlothian Council’s response noted that “While there are no designations such as AGLV or Designed Landscape directly impacted on although there will be some impact on the neighbouring designed landscape of Dalkeith Palace by the proposals especially any associated light pollution”. In terms of significant landscape and visual impacts, they noted the potential for impacts upon views in and out towards the Pentland Hills as well as towards the Dalkeith Palace ground due to the construction of the raised roadway and removal of woodland.</p>

### 4.4.1 DMRB Stage 3 Consultation

Consultation with Historic Environment Scotland and the Local Authority Archaeological Officer (City of Edinburgh Council and Midlothian Council Areas) was carried out at Stage 2 and will continue to be included in the consultation process. This report will form the basis of consultation with these bodies during the Stage 3 Assessment.

## 4.5 Baseline Conditions

### 4.5.1 Designated Assets

A 2km search area from the furthest extents of each option was used to identify the designated assets. This identified:

- 16 scheduled monuments;
- 21 Category A listed buildings;
- Four gardens and parks on the Inventory of Gardens and Designed Landscapes; and,
- Six conservation areas.

There are no entries on the Inventory of Historic Battlefields within the Study Area.

There are no World Heritage Sites (WHS) or WHS Buffer Zones within the Study Area.

Within the 1km Study Area, 32 Category B and 20 Category C listed buildings were identified.

### 4.5.2 Scheduled Monuments

A total of 16 scheduled monuments have been identified within the 2km search area. Detailed descriptions and statements of national significance are contained in Appendix 4.1 – Gazetteer of Cultural Heritage Assets (section 4.1.1) and they are mapped on Figures 4.1 to 4.6 – Location of Cultural Heritage Assets.

- Within 1km of the Options is the site of Elginhaugh Roman camp, native fort and palisaded enclosure (SM6202) and its annexe and bathhouse (SM5684) and the site of a prehistoric homestead and pit alignments at Melville Grange (SM4592).
- Over 1.5km northeast of Options is a series of prehistoric pit alignments (SM5704, SM5705, SM5706, SM5729) at Newton and Castle Steads. At Castlesteads Park there is the scheduled site of prehistoric ring ditches, probably indicating a settlement (SM5707).
- Further scheduled prehistoric domestic or defensive enclosures are located over 1.5km beyond the Options, at Home Farm, to the north (SM6038), at Thornybank House, to the east (SM6203), and at Hardengreen to the south (SM6335).
- Over 1.5km beyond the Options are a series of scheduled medieval sites: Newbattle Abbey to the south (SM1190), a Cistercian Abbey founded in 1140 by David I as the daughter house of Melrose Abbey; the ruined choir of Collegiate Kirk of St. Nicholas, Dalkeith to the southeast (SM1188); Newton Church, with its enclosures and field system to the east (SM5441) and Lasswade old parish church (SM5673) to the west. These sites are all located in the valleys of the South Esk and North Esk rivers.

### 4.5.3 Listed Buildings

A total of 21 Category A listed buildings have been identified within the 2km search area.

Within the 1km study area, 32 Category B and 20 Category C listed buildings were identified.

Detailed descriptions and statements of national significance are contained in Appendix 4.1 – Gazetteer of Cultural heritage (sections 4.1.2 and 4.1.3) assets and listed buildings are mapped on Figures 4.1 to 4.6 – Location of Cultural Heritage Assets.

### 4.5.4 Listed buildings within 1km of the Options (Categories A, B & C)

#### **Sheriffhall**

Summerside Farmhouse, Stables and Cottage Range (LB14186, Category B) lies on Old Dalkeith Road c. 140m northwest of the existing Sheriffhall Junction. Summerside Farmhouse dates from around 1780, with additions in the early 19th century and later.

Further north on Old Dalkeith Road are Campend House, Boundary Walls, Gatepiers and Gates (LB47735) and Campend Steading (LB47736). These are both Category C buildings, but their close proximity to each another means that the buildings as a group are a Category B Group. Campend House is earlier 19th century with later additions. Campend Steading is located adjacent to the Old Dalkeith Road. It was named Campend as it was once thought that this was the northwesternmost extent of a Roman camp – this is illustrated on Taylor and Skinner's 1776 map (Figure 4.7 - 1752 – 1755 General Roy's Military Survey of Scotland, 1747-1755 AND 1776 G Taylor and A Skinner's Survey and maps of the roads of North Britain or Scotland – The Road from Edinburgh to Cornhill by Greenlaw).

Sheriffhall Farmhouse including Steading and Walled Garden (LB14183; Category B) is located c. 160m southeast of the existing roundabout. It is a late 18th century farmhouse adjoining a walled garden and a range of traditional farm buildings. The principal elevation of the farmhouse is to the southeast. The walled garden lies to the southwest of the farmhouse and southeast of the steading. The steading is a complex of three buildings with a later single storey. The farm is built near the site of Sheriffhall House, on part of the estate that formed the pleasure grounds for Dalkeith Palace and was later occupied by Sheriffhall Colliery. The farm is a good example of a traditional steading; most farms in the area are improvement steadings.

Sheriffhall Dovecot (LB19674, Category B) is located c. 200m southeast of the existing roundabout. It is an early 17th century dovecot with a tall, pyramidal roof. Like the nearby Old Newton Kirk Tower (SM5441), the converted dovecot was used as an eye-catcher for the pleasure grounds of Dalkeith Palace. It has undergone major repairs and is in good condition.

### ***Dalkeith House (Palace)***

Dalkeith House (Palace) designed landscape (GDL00128; see Section 4.5.6, inventory of Gardens and Designed Landscapes) includes several listed buildings and Dalkeith House & Park Conservation Area (CA347; see Section 4.5.7, Conservation Areas). The A6094 runs along the south and east boundaries of the estate, lined by high walls. Sheriffhall Junction lies c. 400m northwest of the boundary of the garden and designed landscape. Listed buildings within the park within 1km of the Options comprise:

- The Kings Gate, Walls and Lodge (LB1437, Category A), designed by William Burn and David Bryce in 1852. It is a gateway to Dalkeith Estate from Old Dalkeith Road (A68), with screen walls, and lodge to northeast. The Kings Gate is located c. 435m to the south of the present Sheriffhall Junction. The Kings Gates are an impressive tripartite gateway, and the Lodge is a single storey with attic; with the high screen walls, they form an imposing entrance to Dalkeith House. There are views to the north and northwest towards the roundabout options from the gateway.
- The Montagu Bridge including Cauld (LB1440, Category A), built by neoclassical architect Robert Adam (1728 – 1792) in 1792, it represented a feat of engineering when it was built across the River North Esk. It is striking classical vehicle bridge, a single span with semi-circular arch constructed of droved ashlar. It is designed to be seen in the context of the water and the surrounding parkland, and there are no views outwards towards Sheriffhall to the north.
- The Hermitage (LB1414, Category B) is an 18th century folly with a small, rubble barrel-vaulted chamber. Dalkeith Park includes remnants of architectural features, including ashlar bridge piers and rubble wall to the north of the Hermitage. The Hermitage by its very nature is an isolated building that was designed to be discovered within the park and is experienced within its dense woodland setting.

### ***Dalkeith House & Park Conservation Area***

Category B and C listed buildings in Dalkeith House and Park Conservation Area are listed below. It should be noted the setting of the buildings on Lugton Brae are defined by their location within the village; they contribute positively to the street scene and add to the character and interest of Lugton, which adjoins the Dalkeith Estate.

- The Head Gardener's House (LB1433, Category B) is a mid- to late 19th century building of 2 storeys asymmetrical gabled house with Tudor details with hood mould openings. It is located to the east of Dalkeith House with Dalkeith Park, and is part of a Category A Group with Lugton Walled Gardens (formerly to Dalkeith House), Dalkeith Park, Dalkeith House and other estate ancillary buildings (see separate listings).
- Lugton Walled Garden (LB49624, Category C) which is formerly the garden to Dalkeith House and includes the upper walled garden, lower walled garden and boundary wall. They are now surrounded by multiple

modern houses which limit the visual association with the estate. The new development has created an almost suburban setting for these isolated and outnumbered historic structures.

- 1 Lugton Brae, Greenacres (LB1446, Category B) is a Lorimerian Arts and Crafts house, built between 1932 and 1949.
- 6 Lugton Brae, Lugton House with boundary walls and railings (LB1432, Category C) is an early 19th century house that sits back from the pavement behind a low boundary stone wall topped with railings.
- 17 Lugton Brae (LB1447, Category C) was designed by G L Cadell in 1951-2. It is usual due to its late construction date yet, mimics a vernacular style.
- 19 Lugton Brae, old Parsonage including boundary wall with gate piers (LB1431, Category B) is an early 19th century house, extended in the mid-19th to serve as the parsonage for St Mary's Episcopal Chapel, which was constructed from 1843-54.
- Edinburgh Road, Lugton Bridge (LB24349, Category B) is a road bridge carrying Edinburgh Road (A68) over River North Esk.
- 2 Bridgend, the Neuk with outbuildings (LB24330), 4 Bridgend, Craigievar (LB24331), 6 Bridgend, Tower House (LB24332) and 8 Bridgend, Rosecot and railings (LB24333) are all Category C listed buildings. They are an irregular terrace of later 18th century cottages. The terrace has been categorised as a B Group due to the informal and picturesque grouping of buildings in a conspicuous position within the village. Its setting is defined by its location within the village. Wider views to the north towards Sheriffhall are not appreciable.

### **Melville Castle**

Melville Castle lies on the north bank of the valley of the river North Esk, c. 775m southwest of the Options. The main A7 (T) runs along the northern and eastern boundaries. The A768 runs along the southern boundary, linking Eskbank with Loanhead. To the northeast, parallel to the A7, runs the A68 (T), which is joined by a short road linking the carriageways of Melville and its neighbour, Dalkeith House, reputed to have been constructed for George IV's visit in 1828. To the north and east, separating the castle grounds from the encroaching urban fringe of Edinburgh, is a strip of agricultural land which has been impacted by historical mining operations. The field to the north of the East Lodge, once part of the estate, is now run as a nursery garden centre. The southern-most corner of their land, seen from the main drive to the Castle, is now a rubbish tip. Melville Castle has limited significance in the surrounding landscape due to its valley setting and, for the same reason, has no significant outward views.

The castle and its ancillary buildings sit within a designed landscape (GDL00282). Melville Castle (LB7394, Category A) is a castellated mansion by James Playfair, built in 1786-91 with later alterations and additions.

A complex of buildings within the grounds of the castle forms an important aspect of the asset and adds to the group value. It has been identified as being a category A Group with:

- Chestnut House, a late 18th to early 19th century stable and coach house block (LB7397, Category B).
- East Lodge (LB12934, Category B), an earlier 19th century lodge.
- Esk Cottage (LB12937, Category B), a late 18th to early 19th century sawmill and cottage, established at a paper mill in 1770. Paper had been manufactured in Lasswade since 1750 and that Melville Mill had long been famed for the production of its hand-made paper.
- Garden Cottage (LB12935, Category C), c. 1800, a cottage west of Garden Farmhouse.
- Garden Farmhouse (LB12936, Category C), a late 18th century farmhouse.
- Walled Garden (LB13509, Category B), a late 18th to early 19th century walled garden.
- Walled Garden Lodge (LB13019, Category B), 1831 to 1841, originally on the north drive through the park to the castle.
- South Driveway Bridge (LB97396, Category B), an early 19th century cast-iron bridge carrying the South Drive to Melville Castle over the River North Esk.
- South Lodge (LB12933, Category C), late 18th century with later alterations and additions.

- Walled Garden Steading (LB12938, category C), 18th and early 19th century.
- Willie's Temple (LB12940, Category A), 1760, a hilltop summerhouse which is an important focus within the designed landscape at Melville, on a hilltop reputed to be a medieval lookout point.
- Elginhaugh Farmhouse and Cottages (LB12941, Category B) dating from the late 18th century with later additions and alterations, formerly the site of a corn mill, now ruinous. The ruined mill acts as a picturesque curiosity in the garden.

Melville Mains, South Range of Steading (LB12939, Category B) is a late 18th century dovecot, possibly formerly a kiln, and a probable former flour mill. The large kiln suggests that this was an important grain mill for the Melville Estate, located within the King's Acre Golf course to the west of Melville Castle on an elevated northern slope rising from the River North Esk with views to the south.

### **Newton**

The mining village of Newton lies to the north of the Sheriffhall Junction. Newton Parish Church (LB14201, Category C) was built in 1742 a replacement for the older Kirk in the southeast of the parish (SM5441). The Watch Tower (LB47734, Category C), c. 1828, is a single-storey rectangular watch house adjacent to the kirkyard, built to prevent grave robbing. There are no views of the A720 as it is situated within a valley and the general expanse of appreciable landscape.

East of Newton is Chalfont, formerly Newton Manse (LB14178, Category B) dated 1804. It is essentially experienced in a rural setting with arable fields surrounding it. However, it is clear that it is situated in a former mining area with scars evident within the landscape. It is on the periphery of Millerhill Park which lies to the southeast. It is visible from Old Craighall Road within Millerhill Park over farmland and through the ruinous remains of the former farmstead. The land is relatively flat with strategic belt of tree planting which limits opportunities to see the present Sheriffhall Junction.

### **Dalkeith**

Other listed buildings in Dalkeith include:

- Cemetery Road, Water Tower (LB24338, Category B) The Water Tower was constructed for the Town Council by James Leslie, Engineer of Edinburgh Water Company in 1879. The red brick water tower is thought to be the oldest of its kind in Scotland. From the gateway to the cemetery it is possible to see clear views of the spire of west Church, but there is no relationship with Sheriffhall.
- The mid-19th century Cemetery Road Bridge (LB24336, Category B), which crosses the dismantled North British Railway.
- Elginhaugh Bridge (LB7393, Category B) carries the B6392 over the River North Esk. The arched bridge dates to 1794.

### **Eskbank**

Eskbank is located c. 1km southeast of the Options, south of Dalkeith. The area developed in the late 18th and early 19th century, expanding in the 1840s after Eskbank railway station opened and substantial villas were constructed. These tended to be occupied by Dalkeith and Edinburgh merchants and professionals, the air at Eskbank being regarded as beneficial and healthier than the smoky atmosphere of the city. Listed buildings include:

- 14 Glenesk Crescent, Eskbank House (LB24375, Category A), a Georgian villa built in 1794, originally built as a manse by the Rev James Brown, Minister of Newbattle.
- Category B and C listed 19th century villas – 38 Eskbank Road (LB24366, Category C), 44 Eskbank Road, Woodville (LB24369, Category B) which was used as a commercial premises by the Bank of Scotland from circa 1897-1927; 46 Eskbank Road, Beechmohr and 1 Avenue Road, Dunhohr (LB24370, Category C) although this building dates from late 19th to early 20th century; 47 Eskbank Road, Belmont (LB24361, Category B) including Coach House; 49 Eskbank Road, The Birks (LB24362, Category B); and, 2 Avenue Road, Strathesk (LB24325, Category B). Historic Environment Scotland has recognised the group of Nos 40, 42, 44, 46 and 48 Eskbank Road, and No 1 and 2 Avenue Road as of Group B Value.

- 13 and 15 Lasswade Road (LB24433, Category C) dates to c. 1909. It is a pair of semi-detached English vernacular style houses, with Tudor details.

Religious buildings in Eskbank include:

- The early English Gothic style St David's Church (Roman Catholic) with boundary Walls and Gatepiers (LB24355, Category A) was designed by Joseph Aloysious Hansom, 1853-54. It is listed category A for the quality of the interior.
- The early English Gothic style Old Edinburgh Road, West Church (Church of Scotland), with Boundary Walls (LB24457, Category B), also known as Buccleuch Church, designed by William Burn in 1840. Disused, now a woodworker's workshop.
- Associated with the church is 12 Old Edinburgh Road, West Church Manse (LB24458, Category B).
- West Church and its former Manse sit opposite the crenellated octagonal New Burial Ground, Watch Tower (LB24456, Category B) which dates to 1827. It was built to stop 'resurrectionists' exhuming bodies. This collection of buildings sits on a prominent part of Dalkeith with views over towards the southern edge of Dalkeith Park. West Church is a significant landmark.

The former Eskbank and Dalkeith Station (LB24473, Category B) including footbridge, road bridge and platforms was designed by Thomas Grainger and John Miller. Also associated with the railway is the Glenesk Railway Viaduct (LB1445, Category A). Glenesk Viaduct (also known as Glen Arch) spans the River North Esk. It was built for the Edinburgh and Dalkeith Railway.

Gilmerton Road, Glenarch, Summerhouse (LB1443, Category C) and Gilmerton Road, Glenarch, Lodge and Gatepiers (LB1444, Category C) are located just without the Eskbank Conservation Area, west of the railway line. The Summerhouse dates to c. 1890 and is a rustic Arts and Crafts style building. Historic Environment Scotland notes that this is a good example of a transient type of structure. The lodge and gatepiers date from the mid-late 19th century and form the gateway to Glenarch House from Gilmerton Road with Gothic detailing.

### ***Dalkeith: Industrial Heritage***

Industrial buildings within Dalkeith include:

- 22 Ironmills Road, Lade Cottage (LB49659, Category C), an early 19th century or earlier traditional house associated with the remains of a 17th century waulk mill.
- Ironmills Park which contains the remains of the Ironmills Complex including Iron Mill (LB24427, Category B), Cartshed Range (LB24426, Category B) and Miller's House (LB24428, Category B). The site had been used for iron founding since 1648. The iron mill was converted into a corn mill in the early 19th century.
- The Ironmills Park Sports Pavillion (LB24430, Category B), was built between 1932 and 1949. The location is secluded and enclosed by mature trees growing along the banks of the river to the south and High Wood to the north. Views into and out of the site are limited.

## **4.5.5 Listed buildings between 1km and 2km of the Options (Category A)**

### ***Dalkeith House (Palace) and Dalkeith House & Park Conservation Area***

There are a number of listed buildings within Dalkeith House (Palace) designed landscape (GDL00128) and Dalkeith House & Park Conservation Area (CA347). Category A listed buildings within the park (over 1km from the Options) comprise:

- Dalkeith House, with Retaining Wall and Lamp Standards (LB1411, Category A). Dalkeith House was designed c.1701 by James Smith (1645 – 1731), who pioneered the Palladian style in Scotland. It incorporates the early parts of 15th century and 16th century Dalkeith Castle. It was repaired in 1762 by John Adam (1721 – 1792) and was added to by James Playfair (1755 – 1794) in 1786 and by William Burn (1789 – 1870) in 1831. Views into the designed landscape are limited by the surrounding walls in the south but the enclosed deciduous woodlands are visible from the surrounding area and particularly from the main roads to the north, including the A720, east of the present Sheriffhall Roundabout.
- The Stables and Coach-house (LB1442, Category A) were designed in 1740 by William Adam (1689 – 1748) with additions in 1840 by William Burn.



- The Conservatory (LB1410, Category A) is a twelve-sided building with rich Jacobean detailing designed by William Burn in 1832-34. Views into and out of this area are limited by the mature parkland.
- The Dark Walk, Gateway and Walls (LB1412, Category A) gates are 18th century. It is a depressed-arched gateway and gates with low walls adjoining to the north and south of the gateway. There is no relationship with the Sheriffhall area.
- St Mary's Episcopal Chapel, with Lamp Standard (LB1441, is a Category A) was designed by William Burn and David Bryce in 1843. The early English gothic Chapel was commissioned by Walter Francis, 5th Duke of Buccleuch as a private chapel. It features the last remaining water driven combined organ and bells system in Scotland. The church is enclosed to the north by woodland and intervening landscape, which limits views towards Sheriffhall.

### ***Dalkeith Mills***

Dalkeith Mills lies c. 1.2km southeast of the existing Sheriffhall Junction. Its setting is influenced by the proximity of the urban fringe of Dalkeith. Intervening buildings limit views to and from this area. Listed buildings include:

- Grannies Park, Dalkeith Mills (LB24347, Category B). A former flour mill complex of three late 18th and early and mid-19th century buildings. It has been classified as a B Group with the Former Skinnery, Grannies Park.
- The Former Skinnery (LB24348, Category C) is a late 18th century building, although it was heightened in 19th century.
- 13 and 15 Glebe Street, Glebe Bank House with garden and boundary walls (LB24373, Category B) is an earlier-mid 19th century villa, built between 1835 and 1853.

### ***Dalkeith Conservation Area***

Category A buildings within Dalkeith Conservation Area (over 1km from the Options) include:

- Old Kirk (Church of Scotland, Formerly East Church (St Nicholas)) including graveyard walls and watch house (LB24377, Category A), a 15th century late Gothic church which was partly remodelled in the 19th century. There is a roofless choir to the east (SM1188) and sacristy to the northeast which was abandoned 1592 (see Section 4.5.2, Scheduled Monuments). Its setting in the heart of Dalkeith makes it a prominent building.
- 176-180 (Even Nos) High Street, Dalkeith Tolbooth (LB24417, Category A) is mid-17th century with later alterations. The Tolbooth ceased to be used as a jail in 1841, and is now used as a church hall. The setting is closely associated with the Dalkeith High Street and its former civic functions. Views out are enclosed by dense woodland to the east and north.
- 200 High Street and 61 St Andrew Street, Corn Exchange (LB24422, Category A). Jacobean-style corn exchange designed by David Cousin, opened in 1854. It was the biggest indoor grain market in Scotland at that date. The setting of this building is enclosed and related to the urban built form.
- Croft Street, Fairfield House, Hot House (LB24339, Category A) is an early-mid 19th century. lean-to curved glass house which adjoins the north retaining wall of Fairfield House (separately listed Category B). Its setting is now within a built up urban area that is characterised by schools and civic buildings.
- Newmills Road, Dalkeith Lodge (Newbattle Abbey West Lodge), with Gateway and adjoining Wall (LB24452, Category A) is part of the Newbattle Abbey complex. It is a mid-19th century gothic gateway and adjoining lodge and tower, built after 1853. The lodge gateway and wall are continuous with the park wall of Newbattle Estate to the west. Its setting is still visibly related to Newbattle Abbey while also being on the southern edge of Dalkeith.

Other Category A listed buildings in Dalkeith include:

- 12 Melville Road, Linsandel House, with Outbuildings, Boundary Walls, Gates and Gatepiers, Dalkeith (LB24443, Category A), an Italianate villa designed by Knox and Hutton, dated 1884.

### ***Newbattle Abbey***

Newbattle Abbey is located over 2km from Options A and B, and just under 2km from Option C. Newbattle Abbey (LB14561, Category A; SM1190, scheduled) incorporates the remains of the medieval monastic buildings. It was extended in the 17th century and remodelled in a castellated style in the late 18th century with further 19th century additions. There is no relationship with Sheriffhall.

### ***The Drum***

The Drum estate is located northwest of the present Sheriffhall Roundabout. It is bounded to the northeast by the A68 (T), to the north by the A720, and to the southwest by the A7(T). Despite its urban fringe setting, the house and park are well-screened from the surrounding roads by park woodlands. Further details on the designed landscape (GDL00356) are provided in Section 4.5.6, Inventory of Gardens and Designed Landscapes.

Drum House (LB28052, Category A) is located over 1km northwest of the Options. It is a Palladian-style mansion built between 1726 and 1734. Within the estate, Drum House occupies a position on a ridge, with extensive views southeast, towards the Options. It is possible these views to the south to the existing A720 ring road. Most of the estate buildings are listed separately and formed part of Category A Group, including the Stables (LB28054, Category B), the East Lodges (LB14185, Category B), Gardeners' Cottages (LB43252, Category C), Icehouses (LB28058, Category C), the facsimile Mercat Cross (LB28053, category B), Steading (including cottages, Dovecot, Screen Walls and Gamekeepers cottage) (LB28136, Category B), Walled Garden, West Lodge including gatepiers, gates and railings (LB43253, Category B), Drumbank and North Gatepiers (LB43258, Category B) and Walled Garden (LB28056, Category C).

### ***Danderhall***

Danderhall Miners' Club, Woolmet House gateway and boundary wall (LB14184, Category A) is located c.1.5km northwest of the route options. This early Renaissance entrance gateway, c. 1686, is the only surviving element of Woolmet House.

## **4.5.6 Inventory of Gardens and Designed Landscapes**

Four entries in the Inventory of Gardens and Designed Landscapes have been identified within the 2km search area. Descriptions and statements of national significance are contained in Appendix 4.1 – Gazetteer of Cultural Heritage Assets (section 4.1.4), and they are mapped on Figures 4.1 to 4.6 – Location of Cultural Heritage Assets.

- East of the Options and extending northwards along the River Esk North valley, and immediately south of the westbound carriageway of the A720, is Dalkeith House (Palace) Designed Landscape (GDL00128). The estate also contains the ruins of Dalkeith Castle which was the stronghold of the Douglasses of Dalkeith. There are some designed views within the estate, particularly from the house south, towards the Pentland Hills. The estate contains a large number of listed structures including the Category A listed Dalkeith House and Montagu Bridge, designed by Robert Adam. Rich in historical association, the design composition of architecture, gardens, parkland, river terraces and woodland is still attractive today and provides a valuable wildlife refuge, as well as the setting for a Category A listed building.
- Southwest of the Options is the estate of Melville Castle (GDL00282), located on the northern slope of the River Esk North valley. The lawns, parkland and woodland still provide the setting for a Category A listed house, but the 18th century design has been badly eroded. The setting of the estate is defined by its boundaries. The surrounding landscape has been eroded by later mining activity and encroaching commercial and residential development which do not contribute towards the understanding of the asset. The lawns, parkland and woodland still provide the setting for a Category A listed house, but the 18th century design has been badly eroded.
- The Drum (GDL00356), surrounding the Category A listed Drum House, are located 1km to the north of the Options, with the eastern boundary of the site formed by the A7.
- Newbattle Abbey (GDL00295) is situated c. 1.5km south of the Options, set in is the valley of the River South Esk at the confluence of a number of tributaries. There are no significant or key views which would be affected by the Options. This multi-period landscape was an early monastic site developed as a country house at the Reformation, set within a formal landscape from the mid-16th century. This formed the basis of an 18th century landscape park, extended further in the 19th century, and developed with formal gardens, an extensive circuit of picturesque walks and rides.

#### 4.5.7 Conservation Areas

A total of six conservation areas have been identified within the 2km search area. Detailed descriptions are contained in Appendix 4.1 – Gazetteer of cultural Heritage Assets (section 4.1.5) and they are mapped on Figures 4.1 to 4.6 – Location of Cultural Heritage Assets.

- Immediately southeast of the Options is Dalkeith House & Park Conservation Area (CA347). The Dalkeith House and Park Conservation Area comprises of two main sections. The first is Dalkeith House and its surrounding parkland. The second is the adjoining, although visually separate, urban centre of the burgh of Dalkeith.
- Southeast of the Options is Eskbank & Ironmills Conservation Area (CA348). The Eskbank and Ironmills Conservation Area lies immediately to the southwest of Dalkeith town centre. Eskbank is characterised by substantial 19th century villas while Ironmills reflects the post-medieval industrial development of the North Esk valley, with its grain and cloth mills and iron manufacturing.
- South of the Options, and separated from them by the Eskbank & Ironmills Conservation Area, is the Newbattle Conservation Area (CA350). Newbattle Conservation Area includes the former mansion house set in 125 acres of landscaped policies, which contain various other buildings and structures. The original house is of outstanding importance, and is part of an important designed landscape. The house is built on the site of a Cistercian Abbey dating from the 12th century, and some remains of the Abbey are included in the current house. The Abbey was largely demolished at the Reformation, and the house and estate were built and altered from 1580 onwards.
- To the southwest of the Options are two conservation areas, Lasswade & Kevock (CA352) and Broomieknowe (CA349). The Lasswade and Kevock Conservation Area lies on either side of the North Esk and is characterised by the village of Lasswade and its valley setting and the wooded Kevock area with its large, individual and architecturally significant houses.
- Northwest of the Options is the Gilmerton Conservation Area (CA21). The Gilmerton Conservation Area Character Appraisal emphasises the predominance of a limited number of building types within the historic core providing a unifying element within the townscape. Sheriffhall junction lies in a dip in the topography of the landscape, is not visible and does not affect the setting of Gilmerton Conservation Area.

#### 4.5.8 Non-Designated Assets

East Lothian HER data indicates that there are 44 non-designated assets and the sites of eight archaeological excavations located within the 500m search buffers of the options. A further 40 HER entries duplicate the entries for designated heritage assets; these are not described or mapped here, to avoid double-counting.

There is varied evidence for prehistoric activity within the Study Area, including a number of prehistoric scheduled monuments located in the wider 2km Study Area. The non-designated assets within the 500m Study Area provide evidence of settlement, farming and funerary activity and also show continued use of the landscape through the later prehistoric period and into the Roman period.

HER data is mapped on Figures 4.1 to 4.6 – Location of Cultural Heritage Assets.

#### 4.5.9 Late Upper Palaeolithic c. 12,700 – 8500 BC

The Upper Palaeolithic period was a time of considerable environmental change, with alternating warm and cold phases. Following the retreat of the last Devensian ice sheets c. 10,000 BC, flora and fauna began to re-colonise Scotland and nomadic hunter-fisher-gatherers returned to the area. Evidence of the seasonal camps of these small groups is rare, and has generally been recovered from the banks of watercourses.

There is no evidence of Late Upper Palaeolithic activity in the study area.

#### 4.5.10 Mesolithic c. 8500 – 4100 BC

During the Mesolithic period, hunting, fishing and gathering continued, and small groups resettled the landscape, with some long-lasting permanent and seasonal camps. Mesolithic settlement sites and stone tool scatters are typically located in river valleys and close to water sources. The nearest watercourse is the Dean Burn, which runs parallel to and south of the A720 towards the North Esk, flowing into the river at the northeastern corner of Dalkeith Park.

Mesolithic flints (MEL8404) were recovered from beneath the western rampart of Roman Elginhaugh Fort during excavations (Hanson, 1987). This site is now occupied by the Scottish Widows/Royal Bank of Scotland Data Centre, east of Melville Gate Road. In the wider area, a few scatters of worked flint and chert were recovered from Castlesteads Park, Dalkeith (Rees 1995), and a Mesolithic flint scatter was recorded during excavations at Musselburgh Primary Care Centre, Inveresk (Kirby, 2011).

#### 4.5.11 Neolithic c. 4100 BC – 2500BC

Neolithic farmers began to build permanent settlements and clear land for grazing and planting crops. The period is marked by distinctive monuments such as large communal burial monuments (barrows, cairns), stone circles and henges.

A stone ball was found near Melville Castle in the 19th century (MEL8349). Carved stone balls seem to date mainly to the Late Neolithic period (c. 3000 – 2500 BC). Beyond the Study Areas, a polished flint adze is known from Inveresk, Musselburgh and four fragments of late Neolithic pottery were recovered during the construction of the Woodburn Housing Scheme in Dalkeith (Henshall, 1967).

The lack of prehistoric evidence may simply reflect poor survival of archaeological evidence and limited systematic archaeological investigation of the area.

#### 4.5.12 Bronze Age c. 2500 BC – 800BC

During the Bronze Age, metalworking technology developed, resulting in social changes. Individual cremation or inhumation burials in stone-lined chambers or cists, often accompanied by grave goods, replaced the communal burial practices of the Neolithic. The climate became increasingly cold and wet in the Bronze Age.

The excavation of the Elginhaugh Fort recovered a number of prehistoric artefacts including an early Bronze Age beaker (MEL8405).

#### 4.5.13 Iron Age c. 800BC – AD400

In the Iron Age, populations lived in distinct tribal communities and were influenced by cultures in continental Europe.

An Iron Age settlement (MEL8403) was identified during the excavation of Elginhaugh Fort also verified through aerial photograph analysis.

Two prehistoric sites have been identified near the Gilmerton Road roundabout. Cropmarks and later excavations revealed a palisaded enclosure with central roundhouse (MEL8401) at Lugton Bogs. To the south of the roundabout is an area of cropmarks which excavation showed to be an Iron Age to Roman settlement (MEL8327). The proximity of this settlement to the Roman fort indicates the potential for further sites to be located in the vicinity, taking advantage of the protection of the fort and opportunities to trade with the Roman auxiliary unit.

There is extensive evidence for late Bronze Age or Iron Age activity along the valleys of the South Esk and North Esk rivers and their confluence. A later Bronze Age or Iron Age palisaded enclosure and an early Iron Age roundhouse were excavated in advance of the construction of the A7 Dalkeith Western Bypass at Melville Nurseries, Dalkeith (Raisen & Rees, 1995). These excavations also recorded undated prehistoric parallel ditches. A pit alignment and roundhouse were excavated at Thornybank, Dalkeith (Rees, 1997) and a further pit alignment was recorded at Eskbank Nurseries (Barber, 1985).

#### 4.5.14 Roman c. AD 77 – 211

There is extensive evidence of Roman activity within the Study Area, including the scheduled monument of Elginhaugh fort, annexe and bath house (SM5684) and the adjacent scheduled monument of Elginhaugh camp with the Iron Age fort and palisaded enclosure also included within the scheduling (SM6202). If the 77AD date given by a foundation coin hoard recovered from the fort is correct, it may be one of the earliest Roman sites in Scotland. Roman activity was occurring here at the very earliest phases of the excursion into Scotland.

The results of the excavations at Elginhaugh have provided evidence for the use of locally manufactured pottery and the continued use of the fort and annexe following the withdrawal of troops. This indicates the potential for

the presence of kilns nearby, though none have been located as yet. It has provided evidence on a wide range of aspects of the Roman occupation of the fort and annexe including knowledge of the diet of the Roman army. The excavation found evidence of consumption of grains in the form of breads and soups and locally available wild fruits. There was also evidence of imported foods and luxury items such as olive oil and figs (ScARF 2012, 45) along with evidence for food preparation in two ovens built into the back rampart of the fort.

Most of the non-designated Roman assets in the Study Area are associated with, or are the records of a particular phase of the Roman fort, bath house, annexe and camp at Elginhaugh including the records of a possible Roman road (MEL8643) found in 1980. An excavation was undertaken within the scheduled monument in 2009 (MEL9897). During this work, a series of ditches, a gateway, a well and a coin from the reign of the Emperor Trajan (AD97 – 117) were discovered, providing the first detailed evidence of the annex building.

Outside the boundary of the scheduled monuments, there is further evidence of Roman activity. Directly to the north of Sheriffhall roundabout is the location of a possible Roman temporary camp (MEL8383). The field has been ploughed and there are no visible signs of archaeology in this area, but the potential should be noted, as the location would be strategically useful for a temporary camp during the construction of the fort to the south. Around the area of Melville Nurseries, to the southwest of the roundabout, evidence for Iron Age settlement was found during an excavation undertaken in 2007 (MEL9564) identified 33 possible prehistoric pits, but also identified three Roman ovens, and two parallel linear ditches, interpreted as part of the post-military occupation of the fort and as part of a field system or stock enclosure.

Located directly to the south of the scheduled monuments, between Lasswade Road and the River North Esk is the location of two Roman temporary camps (MEL8379). They were identified in 1962 as a cropmark and subject to excavation in 1972 prior to the construction of a housing estate. The main part of the camps is now covered by modern development. The excavation also revealed medieval and post-medieval features indicating some continuity of use.

#### 4.5.15 Medieval (AD 400 – 1500)

Place names in the Study Area are derived from Gaelic (including Old Welsh, Pictish or Cumbric), Latin, French, Old English and Scots and reflect past landscapes, geography and history.

- Sheriffhall – First recorded in 1441, meaning the dwelling of the sheriff. It was the home of the Giffords, Sheriffs of Lothian, from at least the 14th century.
- Campend – first noted in 1773, named as the Roman camps at Inveresk/Elginhaugh were thought to extend to Campend.
- Elginhaugh – Unknown meaning + *haugh*, a low lying meadow on the banks of a stream, or between hills.
- Melville – of Norman origin, from any of several places called Malleville in Normandy. Derived from the Latin elements *mala* (bad) and *villie* (settlement). A Galfrida de Melville is mentioned in a charter of c.1153 and a Philippus de Malavilla c. 1230-50.
- Lugton – first recorded as Loggetone in 1166-1214, meaning the farmstead by a pool, derived from the Old English *luh* (pool) + *tūn* (farm)
- Dalkeith – first recorded as Dolchet in 1144, probably meaning the meadow or valley of the wood, derived from Old Welsh, Pictish or Cumbric *\*dol* (valley) + *\*cēd* (wood)

To the south, beyond the Study Areas, is the site of the Cistercian Newbattle Abbey (SM1190), one of the wealthiest medieval abbeys in Lothian. It was founded in 1140. There are several old estates, such as Melville, Ruchale and Dalkeith, in the locality. There was a village at Dalkeith by the end of the 14th century, it was granted a market in 1401 and became a burgh in 1540.

There was a medieval settlement at Melville Gate, to the east of Melville Gate Road and north of the B6392 (MEL5919). During a watching brief undertaken in 2001, areas of terracing and levelling were identified, along with ceramic material which could indicate the presence of a medieval settlement. 19th century formal landscaping had removed most traces of the terracing and levelling, however, remnants survive well enough to indicate this could be the site of a small settlement.

#### 4.5.16 Early Modern (1500 – 1750)

Blaeu's 1652 map of Lothian and Linlithgow (Plate 4.1) shows Dalkeith Park, to the east of Dalkeith, and the Drum policies, northwest of Dalkeith.



**Plate 4.1 – 1657 Johan & Cornelius Blaeu, Lothian and Linlithgow (National Library of Scotland)**

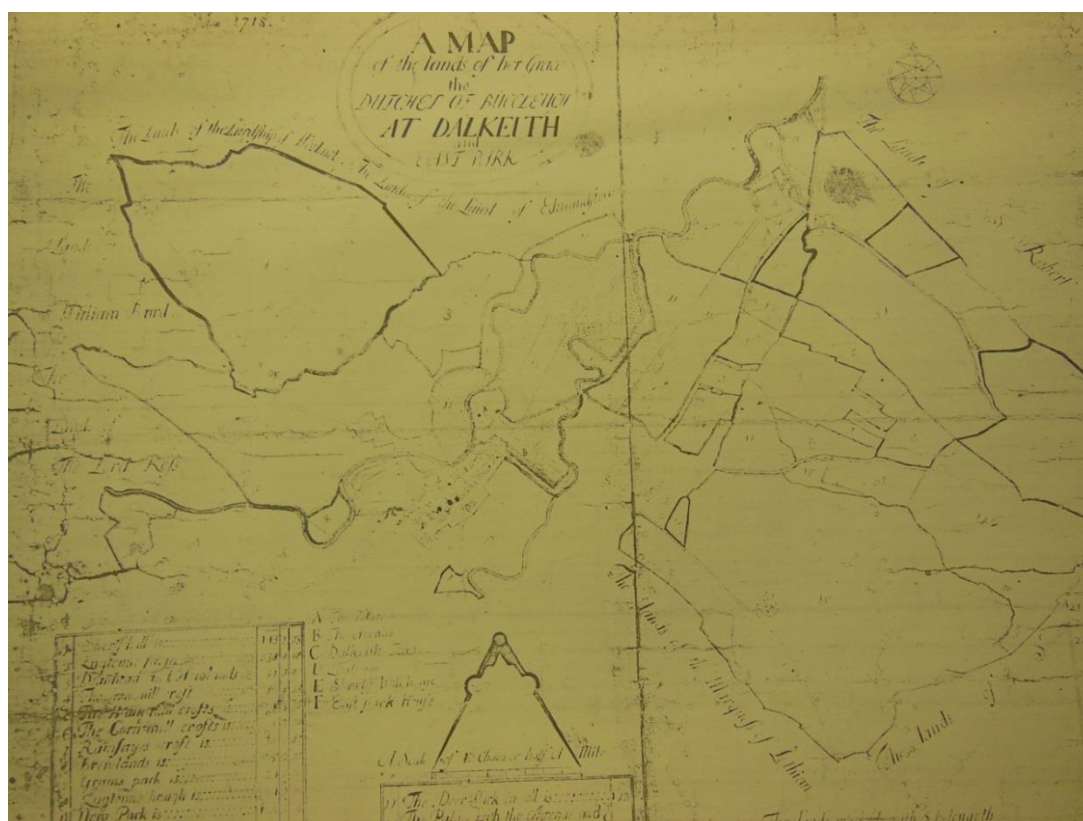
The farm buildings at Sheriffhall Farm (MEL8350) are located within the complex of Sheriffhall which was first recorded on the 1682 John Adair map of Midlothian as *Shyryfhal*, and is marked with a substantial building and small amount of parkland (Plate 4.2). Some of the farm buildings re-used 15th century ecclesiastical stones, possibly looted from Newbattle Abbey, and are broadly contemporary with the late 16th century Sheriffhall mansion.

Also marked on the 1682 map are *Lugtoun* and *Bridgend*, located on the bridge carrying the Dalkeith to Edinburgh road across the North Esk.



**Plate 4.2 – 1682 John Adair Map of Midlothian (National Library of Scotland)**

The Buccleuch estate at Dalkeith is shown in detail in a map of 1718 (Plate 4.3)



**Plate 4.3 – 1718 Map of the lands of Her Grace the Duchess of Buccleuch at Dalkeith and East Park. National Records of Scotland, Papers of the Montague-Douglas-Scott Family, Dukes of Buccleuch (National Records of Scotland)**

There are a small number of assets dating to the early modern period within the Study Area, all of which relate to agricultural activity. There are two records of rig and furrow recorded from aerial photographs (MEL5080, MEL5081) located within the Dalkeith policies. These are shown in detail on General Roy's Military Survey of Scotland, 1752 – 1755 (Figure 4.7).

The locations of former coal mining areas on Sheriffhall Mains are shown on the 1779 Plan of the Barony of Sheriffhall and lands of Lugton (Figure 4.8).

#### 4.5.17 Modern (1750 – present)

James Knox's 1816 Map of the Shire of Edinburgh (Figure 4.9) illustrates the Melville and Dalkeith parkland southwest and southeast of the present roundabout, as well as roads and tree-lined field boundaries.

The 1832 Thomson Map of Scotland shows Sheriffhall and also notes the names of the principal landowners and gentry occupying the country estates in the area. The Drum was occupied by Mr. Innes, the Melville Estate by Lord Melville and Dalkeith House by the Duke of Buccleuch.

The 1st edition 1854 Ordnance Survey map (not illustrated) shows the line of the North British Railway, Edinburgh and Dalkeith branch running to the east of the Options (MEL5225, MEL9472). The line opened in 1849, with the associated structures such as the surviving lineman's hut (MEL9473), with the line passing through the Study Area mostly in a cutting. This allowed the line to pass beneath the existing junction of Melville Gate Road, Kings Lodge and the Edinburgh to Dalkeith Road (A6106) via a road bridge (MEL5216). The railway remained in use until 1969 when it was closed to passengers and the line was eventually dismantled. However, this line is in the process of being reinstated and reopened. Work is underway to re-lay the tracks and return this line to use.

The 1894 Ordnance Survey map (Figure 4.10) shows that a new road has been constructed leading northwards from the old Edinburgh to Dalkeith Road (A7), providing the first junction in the area which would later be covered by the Sheriffhall Roundabout.

There are a number of buildings dating from the early modern period within the Study Area including a row or terraced cottages at Sheriffhall Mains (MEL5775) to the north of the Options and a 19th century house (MEL5739) in Dalkeith. There is also evidence of continuing cultivation, in the cropmarks of rig and furrow near Lugton (MEL10014). A trackway (MEL6535) is identified by the HER on the 3rd edition Ordnance Survey map; however its location is difficult to pinpoint. This record may have been confused with the Kaim Plantation trackway which is marked as 'ancient' on the Ordnance Survey maps.

There is also evidence of early industry in the Study Area. To the north of Sheriffhall Roundabout at Todhills is the remains of a colliery (MEL9063): a field boundary and number of pits have been identified on aerial photographs. An archaeological evaluation carried out in 2006 identified three large coal-filled pits, and air shafts. This is likely to be the remains of a post-medieval or early modern colliery, one of several in the area. There is the site of a mill lade (MEL9705) almost parallel to the River North Esk. The mill lade supported a number of industrial buildings including oat and flour processing, a barley mill, waulk mill and saw mill.

The parklands of the great houses and mansions in this area occupy much of the land in the Study Area. Although there is evidence for agriculture in land which would have been leased or used by the lord or owner of these estates, there is also evidence for buildings and structures from the early modern period. Within the Study Area, these include a well-head (MEL5636) and an ice house (MEL5637) within the Melville Castle estate. The former Melville estate also contains the only identified modern non-designated asset within the Study Area, a golf course (MEL10123).

#### 4.5.18 Unknown Date

There are a number of assets that cannot be ascribed to a period as they do not have enough distinguishing characteristics to enable a secure identification and date to be assigned. The majority of these unknown assets are cropmarks identified on aerial photographs. These include a cropmark of an oval enclosure measuring 30m by 25m (MEL8396) located in the vicinity of, if not now beneath the Sheriffhall Roundabout. The other cropmarks include a circular enclosure (MEL7046) 600m northwest of Dalkeith House, a possible ring ditch at Todhills (MEL9377), cropmarks of possible industrial pit alignments at Eskbank (MEL8333) and Lugton Bogs (MEL10015), further pit alignment cropmarks at Melville Nurseries (MEL8421) and Melville Grange (MEL8339), cropmarks of an enclosure at Sheriffhall (MEL8634), a trackway within the Dalkeith policies (MEL5082) which may be associated another pathway (MEL8431) also within the policies. Cropmarks have also been identified at Elginhaugh (MEL8406) and are thought to be field drains, not associated with the Roman fort.

The Kaim Trackway is shown on a number of Ordnance Survey maps (MEL8436) and is marked on them as an ancient trackway, first identified as such by an anonymous source in 1792. The path is a glacial ridge with lynchets on each side. It is classed as unknown as its origins and its first use as a trackway cannot be stated with certainty.

England's Hill, near Parkburn, is the purported location of the Battle of Roslin (MEL8077), one of the most important battles of the First War of Scottish Independence, fought between the Scots and the English on 24th February 1303. This is noted in the Midlothian Ordnance Survey Name Books (1852-3). The true site of the battle is identified by HES in the Inventory of Historic Battlefields and is located to the west, between Bilston and Roslin (NGR centred on NT 275 641).

#### 4.5.19 Archaeological Potential

This section assesses the potential for further unrecorded buried archaeological remains to be present within the proposed development areas as shown in Table 4.5 below. The assessment of archaeological potential is based on the data available at the time of writing, and takes into consideration the known archaeological assets within the options and study areas, historical and cartographic evidence presented in the baseline and known previous ground disturbance.

**Table 4.5 – Assessment of Potential for Archaeological Remains within the Study Area**

Period	Evidence within the Study Area	Potential for Remains
Palaeolithic	Evidence of the seasonal camps of these small groups is rare, and has generally been recovered from the banks of watercourses. There are no known Palaeolithic remains within the Study Areas.	Low
Mesolithic	Similar to the Palaeolithic, the discovery of evidence associated with the Mesolithic is rare	Low



Period	Evidence within the Study Area	Potential for Remains
	nationally and predominately made up of stone tool finds within alluvial deposits. Mesolithic flints were recovered during the excavation of Roman Elginhaugh Fort within the Study Areas, and a few scatters of worked stone tools are known from the wider area	
Neolithic	There is little evidence of Neolithic activity from the Study Areas, although a carved stone ball of possible late Neolithic date was found near Melville Castle. An adze and pottery are known from the wider area.	Low
Bronze Age	The excavation of the Elginhaugh Fort recovered a number of prehistoric artefacts including an early Bronze Age beaker.	Low to Moderate
Iron Age	There is extensive evidence of Iron Age farming and burial activity in the Study Areas and along the valleys of the South Esk and North Esk rivers and their confluence. These include an Iron Age fort and palisaded enclosure at Elginhaugh Fort, a cist cemetery on England's Hill near Parkburn, a palisaded enclosure with central roundhouse at Lugton Bogs, and an Iron Age to Roman settlement south of the Gilmerton Road roundabout.	Moderate to High
Roman	There is extensive evidence of Roman activity in the Study Areas, focussed on the scheduled Elginhaugh fort, annexe and bath house, and the adjacent scheduled monument of Elginhaugh Camp. There is further evidence of Roman activity beyond the fort and camp, including the location of a possible Roman temporary camp immediately north of Sheriffhall Roundabout, and ovens and field systems or stock enclosures to the southwest, at Melville Nurseries.	High
Medieval	There is extensive evidence for medieval activity in the Study Areas, in the form of settlements and field systems.	Moderate to High
Early Modern	There is extensive evidence for early modern activity in the Study Areas, including settlements, farms, rig and furrow cultivation, and areas of early coal mining.	High
Modern	There is extensive evidence for modern activity in the Study Areas, including farming and early industry, particularly 18th, 19th and early 20th century coal workings.	High

It is anticipated that there will have been severe truncation of any archaeological remains within the footprints of the present Sheriffhall Roundabout, roads and associated services such as deep cable ducts and roadside drainage, as well as 'cut' areas of the road sunk into the landscape.

#### 4.5.20 Historic Landscape

The Historic Land-use Assessment project (HLA) data shows that that landscape is dominated by post-medieval rectilinear fields and farms, with areas of managed woodland to the south of the Options and the plantation woodland of Dalkeith Park to the east. Landscape types identified in the vicinity of Sheriffhall Roundabout are described in Table 4.6 below and mapped on Figures 4.1-4.6 - .

**Table 4.6 – Historic Landscape Types**

Period	HLA Type	HLA Map Key	Description	Location
Roman	Military Site - Cropmark	Agriculture and Settlement	Most Roman military sites have been ploughed flat but can be identified from cropmarks using aerial photography as they are bounded by ditches and ramparts in a distinctive playing card shape.	South of Old Dalkeith Road, west of High Wood, south of Lugton; south of Gilmerton Road on the south bank of the River North Esk
Prehistoric and Undated	Settlement and Agriculture - Cropmark	Agriculture and Settlement	Remains of past features that have been ploughed flat leave traces below ground that can be recorded from the air as cropmarks. Although many are undated, they include numerous prehistoric settlements, field systems, ritual and funerary sites.	South of Gilmerton Road, in area of Melville Castle policies; in vicinity of Gilmerton Road roundabout;
Medieval/Post-medieval	Medieval/Post-medieval Settlement and Agriculture	Agriculture and Settlement	The remains of settlements and field systems that pre-date the agricultural improvements of the 18th or 19th century survive in marginal areas, with ruinous buildings, small kilns, curvilinear boundaries, and rig cultivation.	At Westgate Park, Deanhead Park and Howlands Park, Lugton Haugh.
17th – 18th century	Rectilinear Fields and Farms	Agriculture and Settlement	Rectilinear field boundaries and associated farm steadings and other buildings are typical of agricultural improvements since the 1700s. Recent amalgamation of these fields is	Farmland in vicinity of Sheriffhall Roundabout, Old Sheriffhall Farmhouse, Summerside, Campend

Period	HLA Type	HLA Map Key	Description	Location
19th century - present			common.	and Drum Farm.
	Industrial-scale Farming Unit	Agriculture and Settlement	Large-scale buildings such as poultry sheds, poly tunnels for market gardens or fish hatcheries indicate production at an industrial scale.	Northwest of Millerhill Road, at Campend and at Melville Nurseries
	Designed Landscape	Designed Landscape	Redevelopment of parts of designed landscapes around old mansion houses is common, with some areas reverting to agricultural use while others are now built-up areas, Country Parks or golf courses.	Lugton Haugh and Meville Castle, adjacent to River North Esk.
	Managed Woodland	Woodland and Forestry	Much managed woodland is 'ancient', generally consisting of broad-leaved species or native pine woods, characterised by space between the trees. The wood used to be taken by coppicing or other traditional means.	North of Gilmerton Road
	Industrial-scale Farming Unit	Agriculture and Settlement	Large-scale buildings such as poultry sheds, poly tunnels for market gardens or fish hatcheries indicate production at an industrial scale.	Northwest of Millerhill Road, at Campend and at Melville Nurseries
	Country Park	Leisure and Recreation	Designated Country Parks with their parklands, woods and visitor facilities are managed primarily for recreation, giving opportunities for days out to families and walkers.	Dalkeith Park
	Industrial or Commercial Area	Built-up Area	Industrial estates, large office developments and shopping centres, car parks or storage facilities, as well as factories and mills, are located in and around urban areas.	Melville Nurseries; offices south of Melville Gate Road;
	Railway Features	Transport	Railway stations, marshalling yards and their associated buildings can be quite extensive, although the railway lines themselves are usually on land too narrow to be included as HLA data.	Millerhill Junction

## 4.6 Assessment of Potential Effects

### 4.6.1 Limitations to the Assessment

No particular limitations or difficulties have affected the preparation of this chapter.

### 4.6.2 Potential Effects on the Cultural Heritage Resource

The potential impacts detailed in Sections 4.6.3 to 4.6.5 are reported in line with the following:

- Potential impacts represent those which could result from the construction or operation of the route options.
- Potential impacts are described without mitigation, and therefore represent a worst-case scenario. Mitigation to reduce these impacts will be developed for the preferred option during the DMRB Stage 3 Assessment.
- To provide context to the impact assessment, an overview of the potential impacts during the construction and operation of road schemes in relation to cultural heritage assets are discussed.
- Cultural heritage assets potentially affected by each of the current options are listed in the tables below.

Highway construction can have a harmful effect upon archaeological remains, built heritage and historic landscapes due to:

- Direct physical impacts, such as full or partial removal of a cultural heritage asset, damage or disturbance;
- Severance/fragmentation of related features or historic landscapes;
- Changes to groundwater levels, flows or chemistry;
- Visual intrusion by traffic and an increase in noise and pollution;

- Changes to lighting;
- Changes to traffic flow and volume; and,
- Impacts on the setting of heritage assets.

Potential impacts on archaeological remains are likely to occur primarily during the road construction phase, particularly within the immediate footprint of new route elements and adjacent working areas, haul roads, compounds, borrow pits, etc. Impacts may result from, but are not limited to, activities such as topsoil stripping, geotechnical investigations, compound construction and the excavation of borrow pits.

Potential impacts on the setting of cultural heritage assets, including archaeological remains, would commence during construction of the selected Option and continue during operation; however, the degree of impact may vary between phases. Such impacts can include:

- Changes to the surroundings of heritage assets or the general character of their setting;
- Changes to access or the viability of heritage assets; and,
- Cumulative impacts on historic landscape elements as a result of operational maintenance through alteration of historic landscape elements.

Given the potential for waterlogged deposits at Lugton Bogs, in the southwestern part of the scheme area, residual impacts could occur following construction. These could include dewatering and desiccation of any surviving waterlogged deposits within or immediately adjacent to the footprint of the selected Option. Construction may also result in alterations to the water table up and downstream of the new roundabout, which may adversely affect waterlogged deposits elsewhere in the area, particularly to the west of the Options.

Due to the inherent limited design information available for each option at this stage, it is not possible to accurately determine the impacts that the preferred Option would have on archaeological remains. In addition, specific route options may impact on buried and presently unknown archaeological remains, or other heritage assets that have not yet been identified or recorded in HES or HER datasets.

Depending on the option selected and the detailed design, there is the potential for adverse effects on the setting of historic buildings, archaeological sites and historic landscapes located within and in the vicinity of the Options during construction, due to activities such as topsoil stripping, bulk earthworks operations, erection of new highways structures, piling, or excavation.

For these reasons, in the following sections, a broad assessment of likely impacts and magnitude of effect prior to mitigation is provided, assuming a worst-case scenario. The assets that are likely to be adversely impacted are detailed by route option. Although the lists below are extensive, they are intended to be indicative. For a complete list of designated heritage assets within the Study Areas, see Appendix 4.1 - Gazetteer of Cultural heritage Assets and Figures 4.1 to 4.6 – Location of Cultural Assets.

Predicted impacts, significance of effect, potential mitigation measures and residual effects are summarised in Table 4.9.

### 4.6.3 Option A

The setting of the northwestern edge of Dalkeith House (Palace) garden and designed landscape (**GDL00128**) would be impacted by the construction and operation of the embanked westbound off slip, and may be impacted by increased noise and visual intrusion from lighting.

Option A would have limited setting impacts on the category A listed King's Gate, Walls and Lodge at Dalkeith Park (LB1437), due to the gates and lodge being set back from the Old Dalkeith Road (A6106) and screened by existing trees at the southwestern end of Dalkeith Park and along the A6106. It may experience increased noise and visual intrusion from lighting from the new southern roundabout and link roads.

Raising the A720 over the new junction would result in setting impacts on Elginhaugh Roman camp (SM6202) and Elginhaugh Roman Fort (SM5684), although these are screened by topography and dense vegetation along Melville Gate Road and the railway line.

Option A would have a direct impact upon the Category C listed (B-Group) Campend House Boundary Walls (LB47735) resulting from verge works.

Option A would have setting impacts upon Category B listed Summerside Farmhouse, Stables and Cottage Range (LB14186) resulting from the proximity of the proposed east bound slip road from the A720 to the A7.

Option A would have setting impacts upon the Category B listed Sheriffhall Farmhouse including Steading and Walled Garden (LB14183) and Sheriffhall Dovecot (LB19674) resulting from the westbound off slip for the A720 and the new raised roundabout on the A6106.

Option A would result in direct, physical impacts on a number of non-designated assets, in particular the cropmarks of enclosure visible on aerial photographs (MEL8634) and the possible location of a Roman temporary camp at Campend noted in antiquarian accounts (MEL8383).

There may be direct, physical impacts on an as yet unidentified archaeological resource in areas of low previous ground disturbance – particularly the southern new roundabout, the A7 and the A6106. Previous excavations south of the roundabout have identified significant pre-Roman Iron Age settlement and farming, and Roman military and civilian settlement and industry. There is high potential for the presence of further archaeological remains in undisturbed areas.

In addition, construction would have a temporary adverse impact on the setting of cultural heritage assets in the Study Area or immediate surrounding area. Impacts relating to the construction phase may include increased traffic, noise/ vibration, lighting and the presence of temporary structures, borrow pits, haul roads, stockpiling areas and site compounds.

All presently known heritage assets that are potentially affected by Option A are listed in Table 4.7 below, with a preliminary indication of their sensitivity and the potential significance of the impact upon them.

**Table 4.7 – Cultural Heritage Sites Potentially Affected by Option A**

Reference number	Asset Name, brief description and designation	Sensitivity	Magnitude of Impact	Significance of Effect Without Mitigation
<b>Listed Buildings</b>				
LB14186	Summerside Farmhouse, Stables and Cottage Range. Category B listed building.	Medium	Major	Large Adverse
LB14183	Sheriffhall Farmhouse including Steading and Walled Garden. Category B listed building.	Medium	Major	Large Adverse
LB19674	Sheriffhall Dovecot. Former staircase to Sheriffhall. Category B listed building.	Medium	Major	Large Adverse
LB47736	Old Dalkeith Road, Campend Steading. Category C listed building. Part of a B-Group with Campend House (listed separately).	Medium	Minor	Slight Adverse
LB47735	Old Dalkeith Road, Campend House, Boundary Walls, Gatepiers and Gates. Category C listed building. B-Group with Campend Steading (listed separately).	Medium	Moderate	Moderate Adverse
LB1437	Dalkeith Park, King's Gate, Walls and Lodge. Category A listed building.	High	Minor	Moderate Adverse
<b>Gardens and Designed Landscapes</b>				
GDL00128	Dalkeith House (Palace), Inventory of Gardens and Designed Landscapes.	High	Moderate	Moderate Adverse
<b>Scheduled Monuments</b>				
SM6202	Elginhaugh Roman camp, fort and palisaded enclosure.	High	Negligible	Slight Adverse
<b>Canmore Records (Undesignated)</b>				
MEL8634	Sheriffhall, cropmarks of enclosure.	Low	Major	Moderate Adverse
MEL8383	Sheriffhall, possible Roman temporary camp.	High	Minor	Slight Adverse
MEL6535	Campend, site of trackway.	Negligible	Major	Slight Adverse
MEL10014	Lugton Bogs, cropmarks of ridge and furrow. Early Modern.	Low	Minor	Slight Adverse
MEL10015	Lugton Bogs, cropmarks of possibly industrial pit	Low	Moderate	Slight Adverse

Reference number	Asset Name, brief description and designation	Sensitivity	Magnitude of Impact	Significance of Effect Without Mitigation
	alignment and quarrying, unknown date.			
MEL8396	Somerside, cropmarks of an oval enclosure. Beneath current roundabout.	Negligible (destroyed)	No change	Neutral
MEL8401	Lugton Bogs, cropmark of palisade enclosure and round house. Excavated.	Negligible (excavated)	No change	Neutral
MEL9564	Melville Nurseries, excavation revealed pits, a Flavian field system, and three Roman ovens.	Negligible (excavated)	No change	Neutral
MEL9472	Edinburgh to Hawick Branch Railway, Millerhill Station to Dalhousie Station Section.	Low	Negligible	Neutral
MEL9473	Edinburgh to Hawick Branch Railway, Sheriffhall, railway linesman's hut.	Low	Negligible	Neutral
MEL5225	Edinburgh and Dalkeith Railway.	Low	Negligible	Neutral
MEL5216	Edinburgh and Dalkeith Railway, Sheriffhall Bridge, road bridge.	Low	Negligible	Neutral

#### 4.6.4 Option B

The setting of the northwestern edge of Dalkeith House (Palace) garden and designed landscape (**GDL00128**) would be altered by the construction and operation of the embanked westbound off slip, and may be impacted by increased noise and visual intrusion from lighting.

Option B would erode the setting of Category B listed Summerside Farmhouse, Stables and Cottage Range (LB14186) resulting from the proximity of the proposed east bound slip road from the A720 to the A7, and the new raised roundabout.

Option B would have setting impacts upon the Category B listed Sheriffhall Farmhouse including Steading and Walled Garden (LB14183) and Sheriffhall Dovecot (LB19674), resulting from the construction of the embanked westbound off slip for the A720 and the new raised roundabout.

Option B would result in direct, physical impacts on a number of non-designated assets, in particular the cropmarks of enclosures visible on aerial photographs (MEL8634) and the possible location of a Roman temporary camp at Campend noted in antiquarian accounts (MEL8383).

All presently known heritage assets potentially affected by Option B are listed in Table 4.8 below, with a preliminary indication of their sensitivity and the potential significance of the impact on them.

**Table 4.8 – Cultural Heritage Sites Potentially Affected by Option B**

Reference number	Asset name, brief description and designation	Sensitivity	Magnitude of Impact	Significance of Effect Without Mitigation
<b>Listed Buildings</b>				
LB14183	Sheriffhall Farmhouse including Steading and Walled Garden. Category B listed building.	Medium	Moderate	Moderate Adverse
LB19674	Sheriffhall Dovecot. Former staircase to Sheriffhall. Category B listed building.	Medium	Moderate	Moderate Adverse
LB47736	Old Dalkeith Road, Campend Steading. Category C listed building. Part of a B-Group with Campend House (listed separately).	Medium	Negligible	Slight Adverse
LB47735	Old Dalkeith Road, Campend House, Boundary Walls, Gatepiers and Gates. Category C listed building. B-Group with Campend Steading (listed separately).	Medium	Negligible	Slight Adverse
LB14186	Summerside Farmhouse, Stables and Cottage Range. Category B listed building.	Medium	Minor	Slight Adverse
LB1437	Dalkeith Park, King's Gate, Walls and Lodge. Category A listed building.	High	Minor	Slight Adverse

Reference number	Asset name, brief description and designation	Sensitivity	Magnitude of Impact	Significance of Effect Without Mitigation
<b>Gardens and Designed Landscapes</b>				
GDL00128	Dalkeith House (Palace), Inventory of Gardens and Designed Landscapes.	High	Moderate	Moderate Adverse
<b>Scheduled Monuments</b>				
<b>SM6202</b>	Elginhaugh Roman camp, fort and palisaded enclosure	High	No change	Neutral
<b>Canmore Records (undesigned)</b>				
MEL8383	Sheriffhall, possible Roman temporary camp.	High	Minor	Slight Adverse
MEL8634	Sheriffhall, cropmarks of enclosure.	Low	Minor	Slight Adverse
MEL6535	Campend, site of trackway.	Negligible	Minor	Slight Adverse
MEL10014	Lugton Bogs, cropmarks of ridge and furrow. Early Modern.	Low	Moderate	Slight Adverse
MEL10015	Lugton Bogs, cropmarks of possibly industrial pit alignment and quarrying, unknown date.	Low	Minor	Slight Adverse
MEL8396	Somerside, cropmarks of an oval enclosure. Beneath current roundabout.	Negligible (destroyed)	No change	Neutral
MEL8401	Lugton Bogs, cropmark of palisade enclosure and round house. Excavated.	Negligible (excavated)	No change	Neutral
MEL9564	Melville Nurseries, excavation revealed pits, a Flavian field system, and three Roman ovens.	Negligible (excavated)	No change	Neutral
MEL9472	Edinburgh to Hawick Branch Railway, Millerhill Station to Dalhousie Station Section.	Low	Negligible	Neutral
MEL9473	Edinburgh to Hawick Branch Railway, Sheriffhall, railway linesman's hut.	Low	No change	Neutral
MEL5225	Edinburgh and Dalkeith Railway.	Low	Negligible	Neutral
MEL5216	Edinburgh and Dalkeith Railway, Sheriffhall Bridge, road bridge.	Low	No change	Neutral

#### 4.6.5 Option C

Option C would have a setting impact upon the Category A listed King's Gate, Walls and Lodge at Dalkeith Park (LB1437). Although the gates and lodge being set back from the Old Dalkeith Road (A6106) and screened by existing trees at the southwestern end of Dalkeith Park and along the A6106, the option would introduce a new slip road from the A6106 at the junction with Melville Gate Road to the proposed southern roundabout.

The setting of the northern and western edges of Dalkeith House (Palace) garden and designed landscape (GDL00128) would be altered by the construction and operation of the embanked A720 and the new southeastern slip road to the A6106 at the junction with Melville Gate Road, and would be impacted by increased noise and visual intrusion from lighting.

Construction works, the new slip road from the A6106 at the junction with Melville Gate Road and the embankment of the A6106 Old Dalkeith Road would impact upon the setting of Elginhaugh Roman camp (SM6202), although it is partly screened by topography and dense vegetation along Melville Gate Road and the railway line.

Option C has the potential to have a beneficial impact upon the Category C listed (B-Group) Campend House (LB47735) and Campend Steading (LB47736), resulting from the reduction of traffic along the northbound A7. However, its rural setting would be impacted by the new link road to Millerhill Road (A6106) to the southeast, and a new roundabout to the south.

Option C would have an adverse impact by eroding the setting to rear of Category B listed Summerside Farmhouse, Stables and Cottage Range (LB14186), resulting from the proximity of the proposed new embanked eastbound slip road to the A720, and link road to the A7 to the west.

Option C would have setting impacts upon the Category B listed Sheriffhall Farmhouse (LB14183) and Sheriffhall Dovecot (LB19674) resulting from raising the eastbound A720 onto an embankment. There would, however, a beneficial impact to setting in taking traffic away from the A6106 near the Sheriffhall Farm buildings.

Option C would result in physical impacts on a number of non-designated assets, in particular the cropmarks of enclosures visible on aerial photographs (MEL8634), the possible location of a Roman temporary camp at Campend noted in antiquarian accounts (MEL8383), and an area of cropmarks of ridge and furrow at Lugton Bogs (MEL10014). Land south of the (poorly located) possible Roman temporary camp is (MEL8383) is traversed by the new link road to Millerhill Road. At Lugton Bogs, the place name indicates this area may be waterlogged and have the potential to preserve organic remains and therefore could be of high archaeological potential.

There may be direct, physical impacts on an as yet unidentified archaeological resource in areas of low previous ground disturbance – particularly the southern new roundabout, and new link roads. Previous excavations south of the roundabout have identified significant pre-Roman Iron Age settlement and farming, and Roman military and civilian settlement and industry. There is high potential for the presence of further archaeological remains in undisturbed areas.

In addition, construction would have a temporary adverse impact on the setting of cultural heritage assets in the Study Area or immediate surrounding area. Impacts relating to the construction phase may include increased traffic, noise/vibration, lighting and the presence of temporary structures, borrow pits, haul roads, stockpiling areas and site compounds.

All presently known heritage assets potentially affected by Option C are listed in Table 4.9 below, with a preliminary indication of their sensitivity and the potential significance of the impact on them.

**Table 4.9 – Cultural Heritage Sites Potentially Affected by Option C**

Reference No.	Asset Name, Brief Description and Designation	Sensitivity	Magnitude of Impact	Significance of Effect Without Mitigation
<b>Listed Buildings</b>				
LB14186	Summerside Farmhouse, Stables and Cottage Range. Category B listed building.	Medium	Major	Large Adverse
LB1437	Dalkeith Park, King's Gate, Walls and Lodge. Category A listed building.	High	Major	Large Adverse
LB14183	Sheriffhall Farmhouse including Steading and Walled Garden. Category B listed building.	Medium	Moderate	Moderate Adverse
LB19674	Sheriffhall Dovecot. Former staircase to Sheriffhall. Category B listed building.	Medium	Moderate	Moderate Adverse
LB47736	Old Dalkeith Road, Campend Steading. Category C listed building. Part of a B-Group with Campend House (listed separately).	Medium	Minor	Slight Beneficial
LB47735	Old Dalkeith Road, Campend House, Boundary Walls, Gatepiers and Gates. Category C listed building. B-Group with Campend Steading (listed separately).	Medium	Minor	Slight Beneficial
<b>Gardens and Designed Landscapes</b>				
GDL00128	Dalkeith House (Palace), Inventory of Gardens and Designed Landscapes.	High	Moderate	Moderate Adverse
<b>Scheduled Monuments</b>				
SM6202	Elginhaugh Roman camp, fort and palisaded enclosure.	High	Moderate	Moderate Adverse
<b>Canmore Records (undesigned)</b>				
MEL8634	Sheriffhall, cropmarks of enclosure.	Low	Major	Moderate Adverse
MEL8383	Sheriffhall, possible Roman temporary camp.	High	Minor	Slight Adverse
MEL6535	Campend, site of trackway.	Negligible	Moderate	Slight Adverse
MEL10014	Lugton Bogs, cropmarks of ridge and furrow. Early Modern.	Low	Major	Slight Adverse

Reference No.	Asset Name, Brief Description and Designation	Sensitivity	Magnitude of Impact	Significance of Effect Without Mitigation
MEL8401	Lugton Bogs, cropmark of palisade enclosure and round house. Excavated.	Negligible (excavated)	Major	Slight Adverse
MEL10015	Lugton Bogs, cropmarks of possibly industrial pit alignment and quarrying, unknown date.	Low	Moderate	Slight Adverse
MEL5216	Edinburgh and Dalkeith Railway, Sheriffhall Bridge, road bridge.	Low	Moderate	Slight Adverse
MEL9473	Edinburgh to Hawick Branch Railway, Sheriffhall, railway linesman's hut.	Low	Minor	Slight Adverse
MEL5225	Edinburgh and Dalkeith Railway.	Low	Negligible	Neutral
MEL8396	Somerside, cropmarks of an oval enclosure. Beneath current roundabout.	Negligible (destroyed)	No change	Neutral
MEL9472	Edinburgh to Hawick Branch Railway, Millerhill Station to Dalhousie Station Section.	Low	Negligible	Neutral
MEL9564	Melville Nurseries, excavation revealed pits, a Flavian field system, and three Roman ovens.	Negligible (excavated)	No change	Neutral

#### 4.6.6 Potential Impacts on all Options

Regarding Options A, B and C, there may be direct, physical impacts on an as yet unidentified archaeological resource in areas of low previous ground disturbance – particularly in the offline section of the A7 to the south. Previous excavations south of the roundabout have identified significant pre-Roman Iron Age settlement and farming, and Roman military and civilian settlement and industry. There is high potential for the presence of further archaeological remains in undisturbed areas.

In addition, construction would have a temporary adverse impact on the setting of cultural heritage assets in the Study Area or immediate surrounding area. Impacts relating to the construction phase may include increased traffic, noise/vibration, lighting and the presence of temporary structures, borrow pits, haul roads, stockpiling areas and site compounds.

A number of archaeological sites close to the options may be indicators of the type of archaeological remains likely to be encountered along the route. These are mostly cropmarks of circular enclosures, pit alignments and agricultural drainage and earthworks. The presence of these remains, and the nature of the archaeological remains in the Study Area as a whole, suggests a significant risk that any route option will have additional archaeological impacts over and above those listed in Tables 4.6 to 4.8.

#### 4.6.7 Potential Construction Effects

Disruption due to construction affecting cultural heritage includes:

- Advance works by utilities, which may extend beyond the construction site, and impact upon buried archaeological remains;
- Temporary construction impacts, including a localised increase in noise, vibration, dust and dirt, and a loss of amenity due to the presence of heavy construction traffic. This may impact upon the setting of built heritage and Dalkeith Park.

The construction of any of the three options under consideration has the potential to affect heritage assets in the following ways:

- Partial or total removal of heritage assets during ground investigations, site clearance and road construction;
- Impact of landscaping, spoil disposal and planting on the setting of heritage assets, and damage caused to archaeological deposits caused by planting or earthwork bunds;
- Compaction of archaeological deposits due to construction traffic movement or materials storage; damage through rutting of superficial deposits from construction traffic;
- Vibration and changes in air quality, causing damage to historic monuments during construction;



- Changes in groundwater levels leading to the desiccation of previously waterlogged archaeological deposits, damage caused by changes to hydrology and chemical alteration, or changes in silt deposition regimes;
- Effects on the setting of heritage assets, including visual and noise intrusion and changes in traffic levels; and,
- Severance causing dereliction or neglect of historic monuments or reduction of group value and adverse impacts on amenity as a result of construction works.

#### 4.6.8 Potential Operational Effects

The impacts on archaeological assets arising from the Proposed Development would occur during construction. Consequently the operation of the Proposed Development would not have any effect on archaeological assets and no further assessment is required or discussed further in this chapter.

Built heritage and historic landscape assets would experience setting impacts assets arising from the Proposed Development during operation. In the majority of cases, these would be long-term in nature. These impacts would commence during construction of the selected Option and continue during operation; however, the degree of impact may vary between phases. Such impacts can include:

- Changes to the surroundings of heritage assets or the general character of their setting;
- Changes to access or the viability of heritage assets; and,
- Cumulative impacts on historic landscape elements as a result of operational maintenance through alteration of historic landscape elements.

Operation of the scheme would result in impacts on the setting of heritage assets located along the route due to the presence of the new road configuration, noise and visual intrusion, resulting from the movement of vehicles, lighting, noise barriers and signage.

There would be potential for beneficial impacts on the setting of historic buildings due to reductions in traffic levels on the road network in the surrounding area, which would result in beneficial impacts on heritage assets at some distance from the selected Option.

#### 4.7 Potential Mitigation

The design has not been sufficiently developed to allow mitigation measures to be defined in detail at this stage. However, this section identifies potential mitigation taking into account DMRB guidance, HES guidance and legislation, and will be refined following Option selection and the DMRB Stage 3 Assessment. As part of DMRB Stage 3, the design of the preferred Option would be reviewed and where possible, the preferred option would be further developed (pre-DMRB Stage 3 Assessment mitigation) to minimise impacts on cultural heritage assets.

It is anticipated that it would be possible to mitigate the development's impacts upon the buried archaeological resource through an appropriate staged programme of archaeological investigation and recording. Further investigation could take the form of archaeological evaluation (monitoring of any geotechnical investigation, geoarchaeological investigation, geophysical survey and trial trench evaluation), followed by detailed excavation and targeted watching briefs if required.

Any requirement for archaeological site investigation and mitigation would be determined by Midlothian or City of Edinburgh Council, and would be the subject of an appropriately worded planning condition. Any mitigation strategy required would be developed further (in consultation with HES and Midlothian Council or City of Edinburgh Council) once the detailed design of the selected Option has been finalised.

Mitigation works will be considered in more detail in the Environmental Statement following the DMRB Stage 3 investigations. It is often possible to minimise or reduce the scope of archaeological mitigation works through sensitive design, including localised reroutes and changes to the alignment and/or informed drainage, structures and embankment design. In particular, it may be possible to substantially reduce the impact of the preferred Option through detailed design of the junction layout. Mitigation options that may be considered include:

- Detailed design of development proposals to avoid or reduce impacts on heritage assets;

- Installation of physical protection or screening measures, or temporary removal of assets for reinstatement following the completion of construction works;
- Archaeological investigations in advance of, and/or during, construction;
- Historic building recording and historic landscape recording in advance of construction to provide a permanent documentary record of assets in their current form and condition; and
- Dissemination of the results of all surveys in an appropriate format and supporting archive.

It is anticipated that adverse impacts on the setting of heritage assets resulting from the operation of the scheme can be mitigated through detailed design. This may include measures such as consideration of the horizontal or vertical alignment of the selected Option to reduce its visual prominence, careful siting of lighting or signage, the possible use of acoustic noise fencing or maintenance of access routes to historic buildings to maintain their viability. Further mitigation can be provided through the use of landscape mitigation measures such as bunds, planting or materials to soften the impact of highways structures. These measures can help to reduce the visual prominence of the selected Option and aid its integration with the surrounding landscape.

Residual effects are presented as a sliding scale, as detailed mitigation methods have not yet been developed in detail and the final residual effect is liable to fall within this scale.

## 4.8 Summary of Effects

Table 4.9 overleaf summarises both the potential construction and operational effects for all three options. Potential mitigation measures are identified for the scheme options construction and operational phases.

Table 4.10 - Potential Construction and Operational Effects

	Option	Predicted Impacts	Magnitude of Predicted Impact	Sensitivity of Receptor	Significance of Effect Without Mitigation	Potential Mitigation Measures	Residual Effects
Construction	A	<p>During construction there will be impacts to archaeological remains, built heritage and historic landscapes due to direct physical impacts and impacts on the setting of heritage assets.</p> <p>Option A will result in Major impacts upon historic buildings at Summerside Farmhouse, Sheriffhall Farmhouse and Sheriffhall Dovecot, and undesignated archaeological cropmarks and trackway.</p> <p>Option A would have a Moderate impact upon historic boundary walls at Campend House, the setting of Dalkeith House (Palace) designed landscape, and undesignated cropmarks at Lugton Bog.</p> <p>There would be a minor impact on the King's Gate at Dalkeith Park and upon undesignated archaeological sites – a possible Roman temporary camp and cultivation cropmarks.</p>	Major	High	Large Adverse	<p>Detailed design to avoid or reduce impacts on heritage assets, physical protection or screening measures, including planting.</p> <p>Historic building recording and historic landscape recording in advance of construction to provide a permanent documentary record of assets in their current form and condition.</p> <p>Archaeological evaluation (monitoring of any geotechnical investigation, geoarchaeological investigation, geophysical survey and trial trench evaluation), followed by detailed excavation and targeted watching briefs if required.</p>	Moderate to Large Adverse
	B	<p>During construction there will be impacts to archaeological remains, built heritage and historic landscapes due to direct physical impacts and impacts on the setting of heritage assets.</p> <p>Option B will result in Moderate impacts upon historic buildings at Sheriffhall Farmhouse and Sheriffhall Dovecot, and the Dalkeith House (Palace) designed landscape.</p> <p>It would have minor impacts upon Summerside Farmhouse, the King's Gate at Dalkeith Park, and upon undesignated archaeological sites – the site of a possible Roman temporary camp, cropmarks of an enclosure, a pit alignment/quarry and cultivation cropmarks.</p> <p>Option B has the smallest footprint and the least potential to impact upon cultural heritage assets.</p>	Moderate	High	Moderate Adverse	<p>Detailed design to avoid or reduce impacts on heritage assets, physical protection or screening measures, including planting.</p> <p>Historic building recording and historic landscape recording in advance of construction to provide a permanent documentary record of assets in their current form and condition.</p> <p>Archaeological evaluation (monitoring of any geotechnical investigation, geoarchaeological investigation, geophysical survey and trial trench evaluation), followed by detailed excavation and targeted watching briefs if required.</p>	Slight to Moderate Adverse
	C	<p>During construction there will be impacts to archaeological remains, built heritage and historic landscapes due to direct physical impacts and impacts on the setting of heritage assets.</p> <p>Option C would have a Major impact upon built heritage at the King's Gate, Dalkeith Park and Summerside Farmhouse. It would have a Major impact on undesignated archaeological remains comprising enclosure and cultivation cropmarks.</p> <p>It would have a Moderate impact upon historic buildings at Sheriffhall Farmhouse and Sheriffhall Dovecot, and the designed landscape at Dalkeith House (Palace). Option C would have a Moderate impact on archaeology remains comprising a trackway</p>	Major	High	Large Adverse	<p>Detailed design to avoid or reduce impacts on heritage assets, physical protection or screening measures, including planting.</p> <p>Historic building recording and historic landscape recording in advance of construction to provide a permanent documentary record of assets in their current form and condition.</p> <p>Archaeological evaluation (monitoring of any geotechnical investigation, geoarchaeological investigation, geophysical survey and trial trench evaluation), followed by detailed</p>	Moderate to Large Adverse

Option	Predicted Impacts	Magnitude of Predicted Impact	Sensitivity of Receptor	Significance of Effect Without Mitigation	Potential Mitigation Measures	Residual Effects
	<p>site, cropmarks of a pit alignment/quarry, and a railway bridge.</p> <p>The Option would have minor impacts on undesignated archaeological sites comprising the possible Roman temporary camp at Sheriffhall, and a railway linesman's hut.</p> <p>Option C would have minor impacts upon Campend Steading and House, resulting in a Slight Beneficial effect.</p>				excavation and targeted watching briefs if required.	
Operation	<p>All Options Built heritage and historic landscape assets would experience setting impacts arising from the Proposed Development during operation. This is due to the presence of the new road configuration, noise and visual intrusion, resulting from the movement of vehicles, lighting, noise barriers and signage.</p> <p>The setting of the northwestern edge of Dalkeith House (Palace) designed landscape would be impacted by the construction and operation of the embanked A720 and increased noise and visual intrusion from lighting.</p>	Major	High	Moderate Adverse	Detailed design to avoid or reduce impacts on heritage assets, physical protection or screening measures, including planting.	Slight to Moderate Adverse
	<p>A Option A would have operational setting impacts upon Category B listed Summerside Farmhouse resulting from the proximity of the proposed east bound slip road from the A720 to the A7.</p> <p>Option A would have operational setting impacts Sheriffhall Farmhouse and Sheriffhall Dovecot due to the westbound off slip for the A720 and the new raised roundabout on the A6106.</p> <p>The setting of the northwestern edge of Dalkeith House (Palace) designed landscape would be impacted by the operation of the embanked westbound off slip, and may be impacted by increased noise and visual intrusion from lighting.</p>	Major	High	Large Adverse	Detailed design to avoid or reduce impacts on heritage assets, physical protection or screening measures, including planting.	Moderate to Large Adverse
	<p>B The setting of the northwestern edge of Dalkeith House (Palace) designed landscape would be altered by the construction and operation of the embanked westbound off slip, and may be impacted by increased noise and visual intrusion from lighting.</p> <p>Option B would erode the setting of Summerside Farmhouse due to the proximity of the proposed east bound slip road from the A720 to the A7, and the new raised roundabout.</p> <p>Option B would have operational setting impacts on Sheriffhall Farmhouse and Dovecot resulting from the construction of the embanked westbound off slip for the A720 and the new raised roundabout.</p>	Moderate	High	Moderate Adverse	Detailed design to avoid or reduce impacts on heritage assets, physical protection or screening measures, including planting.	Slight to Moderate Adverse
	<p>C Option C would have an operational setting impact on the King's Gate at Dalkeith Park, due to the new slip road from the A6106 at the junction with Melville Gate Road to the proposed southern</p>	Major	High	Large Adverse	Detailed design to avoid or reduce impacts on heritage assets, physical protection or	Moderate to Large Adverse

Option	Predicted Impacts	Magnitude of Predicted Impact	Sensitivity of Receptor	Significance of Effect Without Mitigation	Potential Mitigation Measures	Residual Effects
	<p>roundabout.</p> <p>The setting of the northern and western edges of Dalkeith House (Palace) designed landscape would be altered by the operation of the embanked A720 and the new southeastern slip road to the A6106 at the junction with Melville Gate Road, and increased noise and visual intrusion from lighting.</p> <p>Option C has the potential to have a beneficial impact on Campend House and Campend Steading resulting from the reduction of traffic along the northbound A7. However, its rural setting would be impacted by the new link road to Millerhill Road (A6106) to the southeast, and a new roundabout to the south.</p> <p>It would have an adverse impact by eroding the setting to rear of Summerside Farmhouse, resulting from the proximity of the proposed new embanked eastbound slip road to the A720, and link road to the A7 to the west. It would have setting impacts on Sheriffhall Farmhouse and Dovecot resulting from raising the eastbound A720 onto an embankment. There would, however, a beneficial impact to setting in taking traffic away from the A6106 near the Sheriffhall Farm buildings.</p>				screening measures, including planting.	

## 4.9 Compliance with Policy and Plans

This assessment of the compliance of the route options in relation to the policies and plans mentioned in Section 4.3 takes into account potential impacts on Scheduled Monuments, Listed Buildings, sites listed in the Inventory of Gardens and Designed Landscapes and undesignated assets.

### 4.9.1 National Importance and Strategic Benefits

The proposed junction improvements at A720 Sheriffhall Roundabout scheme is included in the Strategic Transport Projects Review (STPR) (Transport Scotland, 2008) which identifies a programme of strategic transport interventions necessary to support the future effective operation of Scotland's transport network. Intervention 22 recommends targeted road congestion/environmental relief schemes, including junction improvements at the Sheriffhall roundabout.

The Infrastructure Investment Plan (Scottish Government, 2015) also identifies investment in Scotland's transport as a key enabler for enhancing productivity and delivering sustainable growth.

The SESplan Strategic Development Plan Action Programme (September 2013) lists the delivery of "*grade separation of Sheriffhall Roundabout on A720 Edinburgh City Bypass*" (Action 34), developed in conjunction with SESplan Member Authorities and Key Agencies.

The South East Scotland Transport Partnership (SEStran) 2015 Regional Transport Strategy highlights delays in the Edinburgh Outer Orbital Corridor, noting major junction delays at Sheriffhall. The Regional Transport Strategy supports an integrated approach to managing congestion on the A720 Edinburgh City Bypass, including "*the removal of obvious bottlenecks such as Sheriffhall through measures which are compatible with the capacity of the surrounding network and which also prioritise public transport*".

### 4.9.2 Scheduled Monuments

The Options have the potential to conflict with SPP and Policy 1B of SESplan (2013) in relation to their impacts on Scheduled Monuments, in particular upon the setting of the scheduled Elginhaugh Roman Camp (SM6202) and Elginhaugh Roman Fort (SM5684).

SPP considers that "Where there is potential for a proposed development to have an adverse effect on a scheduled monument or on the integrity of its setting, permission should only be granted where there are exceptional circumstances" (SPP, Paragraph 145). SESplan Policy 1B (The Spatial Strategy: Development Principles) supports this, noting that LDPs will "*Ensure that there are no significant adverse impacts on the integrity of international and national built or cultural heritage sites in particular ... Scheduled Ancient Monuments ...*". This is supported by the Adopted Edinburgh Local Development Plan (November 2016; Policy Env 8 – Protection of Important Remains) and the Adopted Midlothian Local Plan (2008; Policy RP26 Scheduled Ancient Monuments), which note that development which would have an adverse effect on a scheduled monument, other nationally important archaeological remains or the integrity of their setting, or non-designated archaeological remains which the Council considers should be preserved *in situ* or the integrity of their setting, will not be permitted.

There is scope to consider that as the options are likely to deliver strategic and public benefits of national importance, they would comply with these policies. However, further assessment on the full extent of the impacts would be required to conclude whether or not the benefits of strategic and national importance outweigh these adverse impacts.

### 4.9.3 Listed Buildings

The Options have the potential to conflict with SPP, SESplan Policy 1B (The Spatial Strategy: Development Principles), the Adopted Edinburgh Local Development Plan Policies Env 2 (Listed Buildings – Demolition) and Env 3 (Listed Buildings – Setting) and the Adopted Midlothian Local Plan (Policy RP24 – Listed Buildings), in relation to their potential impact on the setting of the King's Gate, Walls and Lodge at Dalkeith Park (LB1437; category A listed), buildings at Summerside (LB14186; category B listed), Old Sheriffhall Farmhouse (LB14183; category B listed), Old Sheriffhall Dovecot (LB19674; category B listed), and the B-Group of Campend House (LB47735; category C listed) and Campend Steading (LB47736; category C listed).

The Adopted Edinburgh Local Development Plan (2016) notes that demolition of listed buildings will only be supported in exceptional circumstances, taking into account the merits of alternative proposals for the site and whether the public benefits to be derived from allowing demolition outweigh the loss (Policy Env 2 – Listed Buildings – Demolition).

Within the abovementioned policies there is a presumption against works that will adversely affect a Listed Building or its setting and development would only be allowed if it can be satisfactorily demonstrated that it will not have an unacceptable impact on the Listed Building, or the merits of alternative proposals for the site and whether the public benefits to be derived from allowing demolition outweigh the loss.

#### 4.9.4 Inventory of Gardens and Designed Landscapes

The Options have the potential to conflict with SPP and Policy 1B of SESplan (2013) in relation to their impacts on sites listed in the Inventory of Gardens and Designed Landscapes, in particular upon the setting of Dalkeith House (Palace) (GDL00128).

The Adopted Edinburgh Local Development Plan Policy Env 7 (Historic Gardens and Designed Landscapes) the Adopted Midlothian Local Plan (Policy RP25 – Nationally Important Gardens and Designed Landscapes), have a presumption against any development which would harm the character, appearance or setting of a garden or designed landscape included in the Inventory of Historic Gardens and Designed Landscapes.

#### 4.9.5 Undesignated Assets

All route options also have the potential to conflict with SPP, SESplan Policy 1B, the Adopted Edinburgh Local Development Plan (Policies Policy Env 8 – Protection of Important Remains and Env 9 – Development of Sites of Archaeological Significance) and the Adopted Midlothian Local Plan (Policy RP27 Other Important Archaeological or Historic Sites) in relation to potential impacts on undesignated cultural heritage assets.

SPP seeks to protect and preserve as far as possible undesignated historic assets and should it not be possible to preserve archaeological assets present on site in-situ, appropriate excavation, recording, analysis, publication and archiving will be required before or during development.

SPP is supported by the Adopted Edinburgh Local Development Plan (Policy Env 9 – Development of Sites of Archaeological Significance and Policy Env 8 – Protection of Important Remains), and the Adopted Midlothian Local Plan (Policy RP27 – Other Important Archaeological or Historic Sites and Policy RP28 – Site Assessment, Evaluation and Recording). These policies note that archaeological sites and their settings should be understood and protected from harmful development, unless the benefits of allowing the proposed development outweigh the importance of preserving the remains in situ. However, where there is potential for an asset or its setting to be lost, consideration should be given to its significance and to the means available to preserve, record and interpret it in line with national policy, as well as to minimising damage to archaeological remains by sensitive scheme design.

With appropriate mitigation, such as preservation in-situ or appropriate archaeological investigation, excavation, recording, analysis, publication, interpretation and archiving, it is expected that all Options could comply with these policies.

### 4.10 Conclusions

The proposed Scheme consists of three options to upgrade the existing roundabout at Sheriffhall. This report represents a summary of the key heritage issues for each option and concludes with a preliminary identification of the preferred option. Each option presents a constraint to elements of the cultural heritage resource.

All three options have the potential to impact upon Dalkeith House (Palace) garden and designed landscape (GDL00128). Raising the A720 over the new junction, or building embanked roundabouts, may result in setting impacts on Elginhaugh Roman camp (SM6202) and Elginhaugh Roman Fort (SM5684).

Options A and C would impact upon the setting of the category A listed King's Gate, Walls and Lodge at Dalkeith Park (LB1437). All options would impact on the setting of Category B listed Summerside Farmhouse (LB14186), Category B listed Sheriffhall Farmhouse Garden (LB14183) and Sheriffhall Dovecot (LB19674), and Category C listed (B-Group) Campend House (LB47735) and Campend Steading (LB47736).

Options A and C involve significant land-take in the vicinity of the present roundabout, and the construction of new link roads and slip roads. Given their relatively large land-take, these options are likely to result in impact upon areas with archaeological potential. The effects of Option C are expected to be greater than Option A.

On the basis of current information, **Option B** would be the preferred option as it has the smallest footprint and the least potential to impact upon cultural heritage assets.

It is anticipated that, while it may be possible to reduce or avoid some impacts through design solutions, archaeological mitigation works are likely to be required. These are likely to include set-piece excavations in advance of construction, and will lead to a need for post-excavation assessment, analysis and reporting works.

#### 4.11 Scope of DMRB Stage 3 Assessment

This assessment carries some uncertainties at present, due to the nature and quality of available information. The information available suggests the potential for the occurrence of significant archaeological impacts, particularly upon areas of known potential for later prehistoric and Roman remains in the areas north, south and southwest of the present roundabout.

It would therefore be advisable to undertake additional archaeological investigations to clarify these issues during the detailed Environmental Impact Assessment at DMRB Stage 3. Such investigations would ensure that all archaeological impacts have been properly identified and assessed; maximise the potential for achieving design solutions to minimise impact; and reduce the risk of previously unknown archaeological remains having a negative impact on the construction programme and costs. The results of the investigations would contribute to the selection of the preferred option and would inform the Options Appraisal and mitigation measures at detailed design.

The investigations would take the form of a staged programme of archaeological evaluation works. Following the selection of a preferred Option, evaluation works would be undertaken to allow a proper identification and assessment of the impacts of the scheme, and the identification of the most appropriate mitigation works. The nature and scope of evaluation works cannot be defined at this stage, but available techniques that are likely to be applicable would include:

- Fieldwalking and metal detector survey;
- Field recording/ survey of upstanding earthworks and other features;
- Archaeological monitoring of geotechnical investigations;
- Geoarchaeological investigation, augering/ boreholes;
- Geophysical survey; and
- Trial trench excavation.

Estimated costs for cultural heritage investigation and recording cannot be provided at this stage, as the scheme is not sufficiently defined to enable outline costing.



## 5. Road Drainage and the Water Environment

### 5.1 Introduction

This chapter assesses the potential environmental impacts on the water environment and takes into account surface water, drainage network assets, and groundwater. A desktop study of the hydrological and hydrogeological features associated with the Scheme has been undertaken and a site inspection was carried out by an AECOM hydrologist.

The receptors to be included in the assessment have been identified by review of mapping and site visits to establish the potential construction access routes and working areas and the potential for hydrological connection to the options during construction and operation. The significant water features included in this assessment are therefore assessed to be:

- River North Esk;
- Dean Burn;
- Esk Valley Sand and Gravel Aquifer;
- Dalkeith Bedrock and Localised Sand and Gravel Aquifers; and,
- Scottish Water drainage network.

A full description of the proposed options is included in Chapter 1- Overview of Environmental Assessment, but the details that have an effect on this assessment are summarised briefly here.

The route of the Dean Burn may be affected by construction of new slip roads and roundabouts. Each of the options could result in the introduction of additional or extended culverts or bridges and loss of floodplain. The pond located between the Dean Burn and the existing A720 may be impacted by some of the proposed route options, potentially reducing its size and/ or resulting in complete removal. The construction of foundations for new road sections has the potential to disturb groundwater resources within the study area.

This Stage 2 assessment includes three proposed options for the road layout, namely:

- Option A – Grade separated dumbbell roundabouts at Sheriffhall;
- Option B – Grade separation at Sheriffhall; and
- Option C - Dumbbell grade separation (to the west of the existing Sheriffhall Roundabout).

### 5.2 Approach and Methodology

The assessment of potential effects on the water environment has been carried out in accordance with the guidance and techniques presented within the Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3, Part 10 '*Road Drainage and the Water Environment*'. The assessment is in line with the 'Simple' level as defined in DMRB, as a mainly desktop study to determine if there is likely to be an impact. Further guidance was obtained from Chapter 3 – '*Fluvial Geomorphology*' of the Environment Agency's Fluvial Design Guide (2009).

The following sources were used to gather baseline information on the identified water resource features:

- Ordnance Survey (OS) Maps (1:25,000 and 1:10,000)
- Scottish Environment Protection Agency (SEPA) Water Environment Hub ;
- SEPA Flood Risk Management Maps 2014 ;
- SEPA Superficial and Bedrock Aquifer and Groundwater Vulnerability Maps ;
- Scottish Natural Heritage (SNH) Sitelink website ;
- Scottish Water Edinburgh ICM Model;
- Flooding information provided by Edinburgh and Midlothian Councils, see Appendix 1.1 – Copy of Consultation Responses; and

- Private water supply data provided by Midlothian Council Appendix 1.1 – Copy of Consultation Responses.

## 5.2.1 Receptor Importance

The Importance of a water environment feature is a synthesis of its environmental importance, socio-economic value, recreational value, and also its resilience to cope with change. The Importance of water environment features has been evaluated using the guidance provided in DMRB Vol. 11, S. 3, P. 10 *Road Drainage and the Water Environment*’- Table A4.1 “Water Features: Attributes and Indicators of Quality” and Table A4.3 ‘Estimating the Importance of Water Environment Attributes’, as well as, additional criteria based on the professional experience of the assessment team. From this guidance, Table 5.1 has been compiled to show the objective tests, which have been used in this chapter to assess resource/ receptor importance.

**Table 5.1 - Characteristics Defining Receptor Importance (based on DMRB Guidance)**

Importance or Value of Resource/ Receptor	Criteria	Characteristics
<b>High</b>	Very high importance and rarity, international scale and very limited potential for substitution.	<p>Surface Water:</p> <p>EU Designated Salmonid/Cyprinid Fishery;</p> <p>WFD Class ‘High’;</p> <p>Site protected/designated under EU or UK habitat legislation (Special Area of Conservation (SAC), Special Protection Area (SPA), Sits of Special Scientific Interest (SSSI), Ramsar wetland site, salmonid water)/ Species protected by EU legislation.</p> <p>Hydromorphology:</p> <p>Waterbody at ‘High’ status or at borderline between WFD categories, with the opportunity for works to improve or degrade the classification.</p> <p>Groundwater:</p> <p>Principal aquifer providing a regionally important resource or supporting site protected under EU and UK habitat legislation.</p> <p>Flood Risk:</p> <p>Floodplain or defence protecting more than 100 residential properties from flooding.</p> <p>Drainage Infrastructure:</p> <p>Essential infrastructure.</p>
<b>Medium</b>	High importance and rarity, national scale, and limited potential for substitution.	<p>Surface Water:</p> <p>WFD Class ‘Good’;</p> <p>Major Cyprinid Fishery. Species protected under EU or UK habitat legislation.</p> <p>Hydromorphology:</p> <p>Waterbody at ‘Moderate’ status and sensitive to changes.</p> <p>Groundwater:</p> <p>Principal aquifer providing locally important resource or supporting river ecosystem.</p> <p>Flood Risk:</p> <p>Floodplain or defence protecting between 1 and 100 residential properties or industrial premises from flooding.</p>
<b>Low</b>	High or medium importance and rarity, regional scale, limited potential for substitution.	<p>Surface Water:</p> <p>WFD Class ‘Moderate’.</p> <p>Hydromorphology:</p> <p>Heavily Modified Waterbody or feature at ‘Poor’ or ‘Bad’ status with little likelihood of improvement.</p> <p>Groundwater:</p> <p>Aquifer providing water for agricultural or industrial use with limited connection to surface water.</p> <p>Flood Risk:</p> <p>Floodplain or defence protecting 10 or fewer industrial properties from flooding.</p>
<b>Very Low</b>	Low or medium importance and rarity, local scale.	<p>Surface Water:</p> <p>WFD Class ‘Poor’.</p> <p>Hydromorphology:</p> <p>Heavily Modified Waterbody or feature at ‘Poor’ or ‘Bad’ status with little likelihood of improvement or waterbody not classified under WFD</p> <p>Groundwater:</p> <p>Unproductive strata.</p> <p>Flood Risk:</p>

Importance or Value of Resource/ Receptor	Criteria	Characteristics
		Floodplain with limited constraints and a low probability of flooding of residential and industrial properties.

It should be noted that professional judgement is applied when assigning an importance category to all water features. The WFD status of a watercourse is not an overriding factor and in many instances it may be appropriate to upgrade a watercourse which is currently at poor or moderate status to a category of higher importance to reflect its overall value in terms of other attributes and WFD targets for the watercourse. Likewise, just because a watercourse may currently be below Good Ecological Status (GES), this does not mean that a poorer quality discharge can be emitted. All controlled waters are protected from pollution under the Water Resources Act 1991 (as amended) and future Water Framework Directive (WFD) targets also need to be considered.

The Importance of receptors has been scaled from very low, to low, medium and high. To ensure the transparency of this assessment, the key environmental, socio-economic, recreational, and resilience indicators used to derive the Importance of each water body are identified in Section 5.5 - Baseline Conditions.

### 5.2.2 Magnitude of Impact

The magnitude of a potential effect on the water resource features has been evaluated using the criteria provided in Table A4.4 "Estimating the Magnitude of an Impact on an Attribute" (DMRB), with some additional criteria (see Table 5.2 below).

**Table 5.2 - Characteristics Defining Magnitude of Impacts (based on DMRB Guidance)**

Magnitude of Impact	Criteria	Characteristics
<b>Major Adverse</b>	Results in loss of attribute and/ or quality and integrity of the attribute.	<p>Surface Water:</p> <p>Loss or extensive change to a fishery, loss or extensive change to a designated Nature Conservation Site;</p> <p>Deterioration of a waterbody leading to a failure to meet Good Ecological Status / Potential (GES / GEP) and reduction in Class.</p> <p>Hydromorphology:</p> <p>Significant change to sediment regime, channel morphology or natural fluvial processes.</p> <p>Groundwater:</p> <p>Loss of, or extensive change to, an aquifer;</p> <p>Potential high risk of pollution to groundwater from routine runoff;</p> <p>Loss of, or extensive change to, groundwater supported designated wetlands.</p> <p>Flood Risk:</p> <p>Increase in peak flood level (1% annual probability) &gt;100 mm.</p>
<b>Moderate Adverse</b>	Results in effect on integrity of attribute, or loss of part of attribute.	<p>Surface Water:</p> <p>Partial loss in productivity of a fishery;</p> <p>Deterioration of a waterbody leading to failure to meet GES / GEP.</p> <p>Hydromorphology:</p> <p>Moderate change to sediment regime, channel morphology or natural fluvial processes.</p> <p>Groundwater:</p> <p>Partial loss or change to an aquifer;</p> <p>Potential medium risk of pollution to groundwater from routine runoff;</p> <p>Partial loss of the integrity of groundwater supported designated wetlands;</p> <p>Flood Risk:</p> <p>Increase in peak flood level (1% annual probability) &gt;50 mm.</p>
<b>Minor Adverse</b>	Results in some measurable change in attributes quality or vulnerability.	<p>Surface Water:</p> <p>No impact on structures;</p> <p>Effect on waterbody which may prevent achievement of GES / GEP or other WFD target.</p> <p>Hydromorphology:</p>

Magnitude of Impact Criteria		Characteristics
		<p>Minor change to sediment regime, channel morphology or natural fluvial processes.</p> <p>Groundwater: Potential low risk of pollution to groundwater from routine runoff; Minor effects on groundwater supported wetlands.</p> <p>Flood Risk: Increase in peak flood level (1% annual probability) &gt;10mm.</p>
<b>Negligible</b>	Results in effect on attribute, but of insufficient magnitude to effect the use or integrity	Impacts which are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error, these effects are unlikely to influence decision making, irrespective of other impacts.
<b>Minor Beneficial</b>	Results in some beneficial effect on attribute or a reduced risk of negative effect occurring	<p>Surface Water: Minor reduction in existing polluting discharge. Effect on waterbody which may facilitate achievement of GES / GEP or other WFD target.</p> <p>Hydromorphology: Minor improvement to sediment regime, channel morphology or natural fluvial processes.</p> <p>Groundwater: Minor reduction in existing polluting discharge. Minor benefit to groundwater supported wetlands.</p> <p>Flood Risk: Reduction in peak flood level (1% annual probability) &gt;10 mm</p>
<b>Moderate Beneficial</b>	Results in moderate improvement of attribute quality	<p>Surface Water: Partial reduction of existing polluting discharge. Enhancement of a waterbody leading to achievement of Good Ecological Status / Potential (GES / GEP)</p> <p>Hydromorphology: Moderate improvement to sediment regime, channel morphology or natural fluvial processes.</p> <p>Groundwater: Partial reduction of existing polluting discharge. Moderate benefit to groundwater supported wetlands.</p> <p>Flood Risk: Reduction in peak flood level (1% annual probability) &gt;50 mm</p>
<b>Major Beneficial</b>	Results in major improvement of attribute quality	<p>Surface Water: Removal of existing polluting discharge, or removing the likelihood of polluting discharges occurring to a watercourse Enhancement of a waterbody leading to achievement of Good Ecological Status / Potential (GES / GEP) and upgrade of Class.</p> <p>Hydromorphology: Major improvement to sediment regime, channel morphology or natural fluvial processes.</p> <p>Groundwater: Removal of existing polluting discharge to an aquifer or removing the likelihood of polluting discharges occurring. Major benefit to groundwater supported wetlands.</p> <p>Flood Risk: Reduction in peak flood level (1% annual probability) &gt;100 mm</p>

### 5.2.3 Significance of Effects

Table 5.3 below shows how the determination of the significance of effect is reached, by considering both the magnitude of impact and sensitivity of the receptor. Effects that are Large or Very Large are considered to represent key factors in the decision making process. Those that are moderate are considered to be important but not likely to be key decision making factors. Effects which are slight are unlikely to be critical in the decision making process but are important in enhancing the subsequent design of the project. Neutral refers to those effects which are beneath levels of perception. Effects are assumed to be adverse unless stated otherwise.

**Table 5.3 - Classification of Effects**

Magnitude of	Importance/Value of Receptor
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Impact	Very High	High	Medium	Low
Major	Very large	Large/Very Large	Large	Slight/Moderate
Moderate	Large/Very Large	Moderate/Large	Moderate	Slight
Minor	Moderate/Large	Slight/Moderate	Slight	Neutral
Negligible	Neutral	Neutral	Neutral	Neutral

## 5.3 Planning Policy Context

### 5.3.1 Overarching Legislation

A summary of the relevant legislation and planning policies for the water environment assessment is included in the sections below.

Two key pieces of legislation, namely; the EU Directive 2000/60/EC Water Framework Directive (WFD) transposed into the Water Environment and Water Services Act (Scotland) 2003 and The Water Environment (Controlled Activities) (Scotland) Regulations 2011 regulate the water environment aspects for development of this nature. This legislation aims to protect and enhance the status of aquatic ecosystems, prevent further deterioration to such ecosystems, promote sustainable use of available water resources, and contribute to the mitigation of floods and droughts.

A review of the Scottish Natural Heritage (SNH) Sitelink website identified a number of designations for surface and groundwater features, including several for the Firth of Forth (SSSI, SPA, Ramsar) and these have been noted in the establishment of the baseline conditions and taken into account in the assessment of Importance. Listed below is all relevant legislation for the assessment of the water environment in relation to the Scheme:

- EU Directive 2000/60/EC (Water Framework Directive (WFD)), transposed into the Water Environment and Water Services Act (Scotland) 2003 ('the WEWS Act');
- Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR) in respect of discharges to surface or groundwater ('the CAR Regulations'); and,
- Flood Risk Management (Scotland) Act 2009 and the Flood Risk Management (Flood Protection Schemes, Potentially Vulnerable Areas and Local Plan Districts) (Scotland) Regulations 2010 ('the Flood Risk Management Act').

### 5.3.2 National Policy and Guidance

#### **National Planning Framework 3**

The National Planning Framework 3 (NPF 3) was published in 2014 by the Scottish Government and outlines the key principles that guide the wider planning system in Scotland. NPF 3 guides Scotland's spatial development for the next 20 to 30 years, setting out strategic development priorities to support the Scottish Governments central purpose of promoting sustainable economic growth. Plans that are beneath the NPF 3 in the planning policy hierarchy are directly influenced by the goals and themes in the document.

Adaptation to climate change is an important theme, understanding that flood risk will be an increasingly important consideration in future planning decisions.

#### **Scottish Planning Policy (2014)**

Scottish Planning Policy (SPP) provides the current context for planning controls and includes the specific controls in relation to flood risk. Paragraphs 254 to 268 of the SPP address flood risk issues, which start by stating, "*National Planning Framework 3 supports a catchment-scale approach to sustainable flood risk management. The spatial strategy aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Flooding can impact on people and businesses. Climate change will increase the risk of flooding in some parts of the country. Planning can play an important part in reducing the vulnerability of existing and future development to flooding.*" (Clause 254)

In terms of planning policy principles, paragraph 255 stipulates that the planning system should promote:

- *“A precautionary approach to flood risk from all sources, including coastal, watercourse (fluvial), surface water (pluvial), groundwater, reservoirs and drainage systems (sewers and culverts), taking account of the predicted effects of climate change;*
- *Flood avoidance: by safeguarding flood storage and conveying capacity, and locating development away from functional floodplains and medium to high risk areas;*
- *Flood reduction: assessing flood risk and, where appropriate, undertaking natural and structural flood management measures, including flood protection, restoring natural features and characteristics, enhancing flood storage capacity, avoiding the construction of new culverts and opening existing culverts where possible; and*
- *Avoidance of increased surface water flooding through requirements for Sustainable Drainage Systems (SuDS) and minimising the area of impermeable surface.”*

Paragraph 262 states that *“Local development plans should protect land with the potential to contribute to managing flood risk, for instance through natural flood management, managed coastal realignment, washland or green infrastructure creation, or as part of a scheme to manage flood risk.”*

Development within the 0.5% Annual Exceedance Probability (AEP) or 1 in 200 year flood boundary may be suitable for *“essential infrastructure within built-up areas, designed and constructed to remain operational during floods and not impede water flow”* (Paragraph 263).

#### **Planning Advice Notes (PANs) and Other Guidance**

PANS provide national guidance on various topics and SEPA has produced a number of guidance documents covering a range of environmental issues. Those documents and others relevant to the water environment are listed below:

- PAN 51 - Planning, Environmental Protection and Regulation;
- PAN 61 - Planning and Sustainable Urban Drainage Systems;
- PAN 79 - Water and Drainage ;
- SEPA Policy No. 19 - Groundwater Protection Policy for Scotland;
- SEPA Interim Position Statement on Planning and Flooding ;
- SEPA Engineering Activities in the Water Environment: Good Practice Guide – River Crossings ;
- SEPA Land Use Planning System SEPA Guidance Note 31, ‘Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems;
- SEPA Technical Flood Risk Guidance for Stakeholders ;
- SEPA Pollution Prevention Guidelines are currently out of date and are undergoing revision. However, in Scotland they are to be used as a source of information on good practice and are therefore listed below:
  - PPG 1 General Guide to the Prevention of Pollution, 2013;
  - PPG 2 Above Ground Oil Storage Tanks, 2011;
  - PPG 3 Use and design of oil separators in surface water drainage systems, 2006;
  - PPG 4 Treatment and disposal of sewage where no foul sewer is available, 2006;
  - PPG 5 Works and maintenance in or near water, 2007;
  - PPG 6 Working at Construction and Demolition Sites, 2012;
  - PPG 7 Safe storage - The safe operation of refuelling facilities, 2011;
  - PPG 8 Safe Storage and Disposal of Used Oil, 2004;
  - PPG 21 Polluting Incident Response Planning, 2009; and,
  - PPG 22 Dealing with spills, 2011.
- Scottish Natural Heritage (SNH), A Handbook on Environmental Impact Assessment ;

- CIRIA, C532 Control of Water Pollution from Construction Sites ;
- CIRIA, C648 Guidance on Controlling Water Pollution from Linear Construction Projects ; and
- CIRIA, C741 Environmental Good Practice on Site Guide.

### 5.3.3 Regional Policy

#### 5.3.3.1 SESplan

##### **Strategic Development Plan: SESplan (Adopted June 2013)**

The Edinburgh and South East Scotland Strategic Development Plan (SESplan), which was approved by Scottish Ministers (with modifications) on 27 June 2013 comprises the City of Edinburgh, East Lothian, Midlothian, Fife, Scottish Borders and West Lothian Councils. Policy 15 within the plan states that Local Development plans “*will consider flood risk at the catchment-scale, identify areas where there is a degree of flood risk, and include policies to reduce that overall risk by avoiding new allocations which are at risk of flooding. Strain on existing water management infrastructure may be exacerbated by new development. The SDP seeks to ensure a high quality water environment where water quality, quantity and ecology are protected.*”

##### **Proposed Strategic Development Plan: SESplan (October 2016)**

The Proposed SESplan sets out the vision for the city region over 20 years from 2018. When approved in 2018 it will replace the current SESplan and will inform the next set of Local Development Plans. One of the Placemaking Principles is to be ‘Resource Efficient’, indicating that “*Development should be located away from functional flood plains and areas of medium to high flood risk*” and “*Areas important for flood storage and conveying capacity should be safeguarded for a range of compatible uses such as recreation, water quality management, flood attenuation and habitat creation.*”

### 5.3.4 Local Policy

#### 5.3.4.1 City of Edinburgh Council

##### **Edinburgh Local Development Plan (Adopted November 2016)**

The Edinburgh City Adopted Local Plan adopted 2016 Policy Env 21 states that “*Planning permission will not be granted for development that would:*

*Increase a flood risk or be at risk of flooding itself;*

*Impede the flow of flood water or deprive a river system of flood water storage within the areas shown on the Proposals Map as areas of importance for flood management; and*

*Be prejudicial to existing or planned flood defence systems.”*

Policy Env 22 states that “*Planning permission will only be granted for development where:*

*There will be no significant adverse effects for health, the environment and amenity and either*

*There will be no significant adverse effects on: air, and soil quality; the quality of the water environment; or on ground stability; or*

*Appropriate mitigation to minimise any adverse effects can be provided.”*

#### 5.3.4.2 Midlothian Council

##### **Midlothian Local Plan (Adopted 2008)**

The Midlothian Adopted Local Plan, adopted 2008 Policy RP8 states that “*Development will not be permitted which could adversely affect the water environment by:*

- a. *Having a damaging impact on fisheries, nature conservation, landscape, recreation or public access in a river corridor or other waterside area;*
- b. *Polluting surface or underground water (including water supply catchment areas) as a result of the nature of the surface, wastewater discharge or leachate;*
- c. *Giving rise to pollution problems resulting from the disturbance of contaminated land;*
- d. *Being subject to unacceptable flooding risk, or by causing or exacerbating flooding problems either within the site, or upstream or downstream of the site;*
- e. *Not meeting standards set in the SuDS manual (published by CIRIA 2007), or successor document, or failing to take into account best practice on suds design and management; or*
- f. *Not meeting the requirements of policy DP3 relating to the protection of the water environment in relation to all new development proposals.”*

This policy is further supplemented by Policy DP3; Protection of the Water Environment which provides additional guidance regarding assessing and managing flood risk, drainage and WFD status.

Policy RP9 states *“Development within the river valley protection areas of the Rivers North Esk, South Esk and Tyne will not be permitted unless there is a specific locational need for the development. Where the locational requirement has been established, development must demonstrate that:*

*It will not have an adverse impact either on the landscape and conservation value of the valleys or impede potential public access opportunities; and*

*It is not in conflict with other relevant local plan policies (in particular the water environment policies).”*

#### **Midlothian Proposed Local Development Plan (2014)**

The proposed Midlothian Local Plan will replace the current Midlothian adopted Local Plan and is scheduled to be adopted in Spring/Summer 2017.

Policy ENV8, ‘Protection of River Valleys’ states that: *“Development within the river valley protection areas of the Rivers North and South Esk and River Tyne will not be permitted unless there is a specific locational need for the development. This requirement is not applicable within the urban envelopes (see policy DEV2).*

*Where the locational requirement has been established (or within the urban envelopes), development must demonstrate that it will not have an adverse impact either on the landscape and conservation value of the valleys or impede potential public access opportunities; and it is not in conflict with other relevant policies of this Plan (in particular the Water Environment policies).”*

*“Infrastructure and buildings may be located in areas subject to surface water flooding but should be designed to remain free from flooding where the annual probability of occurrence is greater than 0.5%. New development should not increase surface water flooding elsewhere, or lead to a worsening of surface water quality. There is a requirement for new development to pass surface water through SUDS systems to help achieve this objective. Advice on the design, installation and maintenance of SUDS may be found in Sewers for Scotland (Scottish Water), and SUDS for Roads (SUDS working party).”*

Policy ENV9, ‘Flooding’ states that *“Proposals for development will be assessed in relation to the flood risk framework for watercourse flooding and guidance set out in Scottish Planning Policy, using the SEPA flood maps to delineate the zones of little or no risk, low to medium risk, and medium to high risk. Development will not be permitted which would be at unacceptable risk of flooding or would increase the risk of flooding elsewhere\*. Flood Risk Assessments will be required for most forms of development in areas of medium to high risk, but may also be required at other locations depending on the circumstances of the proposed development.”*

*“Sustainable urban drainage systems will be required for most forms of development, so that surface water run-off rates are not greater than in the site’s pre-developed condition, and to avoid any deterioration of water quality. The Council may seek long-term management agreements with developers to maintain such features in perpetuity.”*

Policy ENV 10, ‘Water Environment’ states that *“New development should pass surface water through a sustainable urban drainage system (SUDS) which ameliorates the water to an acceptable quality prior to release to the wider water environment. The design of the system should meet best current practice. To ensure that the*



*biodiversity and amenity benefits of SUDS are realised, the Council does not favour the use of underground tanks as a SUDS measure, other than in exceptional circumstances. There is a presumption against development which changes the natural morphology of a river or other water body. The formation of new culverts is not supported.”*

*“Proposals that support measures identified in the River Basin Management Plan will be supported in principle, including the retrofitting of SUDS features to the existing surface drainage system, the restoration of watercourses through the opening out of existing culverts, and the removal of redundant structures. There is a presumption against development which may cause deterioration in water quality. Where development generating a foul drainage requirement takes place in an area benefiting from a public sewerage system, it should connect to that system. Where development adjoins a watercourse, buffer strips of a minimum of 6 metres in width from the top of the bank should be provided, to enable access for maintenance, promote biodiversity and improve public amenity.”*

## 5.4 Consultations

Consultation with key stakeholders was undertaken for the Stage 2 Assessment in February 2015 and again in November 2016. SEPA are the key consultee for this assessment chapter and in response to the initial Stage 2 Assessment (Dated 05/03/2015); they stated that they had nothing further to add to their DMRB Stage 1 Assessment Response (Dated 28/11/2013). Additional consultations were then carried out in 2016 (Dated 06/12/2016) given delays to the project. Both the 2013 and 2016 responses are summarised Table 5.4 below. For full responses see Appendix 1.1 – Copy of Consultation Responses.

**Table 5.4 - SEPA Consultation Responses**

Date	Details	AECOM Comment
2013 & 2016	A detailed Flood Risk Assessment (FRA) should be undertaken	A FRA would be prepared as part of the Stage 3 assessment, once a final design has been agreed.
2013 & 2016	Assessment of culvert and bridge capacity to be undertaken for replacement or extended structures.	Consideration will be given to the number and type of structures required during the Stage 3 assessment.
2013 & 2016	New culverts or bridges to be designed to convey the 1:200 year design flow.	This will be addressed at Stage 3.
2013 & 2016	Compensatory storage would be required for any land raising undertaken.	This will be addressed at Stage 3.
2013 & 2016	Any temporary or permanent diversions/ realignments of the Dean Burn (or any small watercourses) should be suitably sized to convey design flows as any change to a channel can have a range of consequences.	This will be addressed at Stage 3.
2013 & 2016	We would recommend that contact is made with your Flood Prevention Authority to glean any information/ local knowledge that they may possess.	This has been undertaken and the information provided in Appendix 1.1 – Copy of Consultation Responses
2013 & 2016	In terms of “enhancing the local environment”, any future investigations should determine whether there is scope for installing SUDS for any new hard-standing areas or indeed retro-fitting SUDS for larger areas of existing roadway (ref “SUDS for Roads” document, published by the SUDS Working Party).	This will be addressed at Stage 3.
2013 & 2016	We would ask that SEPA are consulted on any proposed method of work far enough in advance of works commencing (e.g. 21 days) to influence how any engineering in / in the vicinity of inland waters (if proposed) is to be carried out.	This will be undertaken at Stage 3.
2013 & 2016	We advise that the applicant should, through the EIA process or planning submission, systematically identify all aspects of site work that might impact upon the environment, potential pollution risks associated with the proposals and identify the principles of preventative measures and mitigation. This will establish a robust environmental management process for the development. A draft Schedule of Mitigation should be produced as part of this process.	This will be undertaken at Stage 3.
2013 & 2016	A Construction Environmental Management Document is a key management tool to implement the Schedule of Mitigation.	This will be undertaken at Stage 3.

Date	Details	AECOM Comment
2013 & 2016	In order to meet the objectives of the Water Framework Directive of preventing any deterioration and improving the water environment, developments should be designed to avoid engineering activities in the water environment wherever possible.	This will be addressed at Stage 3.
2016	Updated flood maps show surface water flooding of A720 during 0.5%AEP event	An assessment of flood risk will be undertaken at Stage 3.
	Flood risk principles in SPP 2014 should guide the Scheme design	This will be addressed at Stage 3.
	Flooding records for adjacent properties and the A720 exist but not for the Dean Burn.	Incorporated in this chapter
	Works should be kept out of the 0.5%AEP flood envelope but should this not possible, they should be designed to prevent an increase in flood risk elsewhere.	This will be addressed at Stage 3.
	We note that the Borders railway is located in close proximity to the roundabout and any works to the roundabout should be done in consultation with Network Rail to ensure there is continuity between the different infrastructures and no increase in flood risk as a result.	This will be addressed at Stage 3.

## 5.5 Baseline Conditions

Waterbodies and watercourses within the study area are shown on Figure 5.1 - Road Drainage and Water Environment - Receptors. Details for each waterbody were gained from desktop studies and site visits undertaken on 18<sup>th</sup> November 2014 and 19<sup>th</sup> February 2015. The responses received as part of the Stage 2 consultations which are relevant to the water environment are provided in Section 5.4 below. The baseline conditions of the water environment receptors relevant to the assessment are outlined in the following sections and Table 5.9 provides a summary of this baseline information and the Importance of each receptor.

### 5.5.1 Surface Water

#### 5.5.1.1 River North Esk

The River North Esk is the largest watercourse in the vicinity of the proposed works. From the Sheriffhall roundabout, the A7 passes southwards and crosses the River North Esk at Melville Nurseries, see Figure 5.1 – Road Drainage and the Water Environment – Receptors and Plate 5.1. From the A7 Bridge, the river flows through Dalkeith Country Park to where it meets the River South Esk.



**Plate 5.1 - Downstream view of the River North Esk from the A7 Bridge**

The 17km reach of the River North Esk from the Glencorse Burn confluence to the South Esk was classified as having an overall WFD status of 'Poor' in 2014 (two separate waterbodies; IDs 3807 and 3806). It did not achieve 'Good' or 'High' status due to water quality issues and obstacles to fish passage. The objective is to improve this status to 'Good' by 2027 (Table 5.5 and

Table 5.6).

**Table 5.5 - WFD Status of the River North Esk from Glencorse Burn confluence to Elginhaugh (ID3807)**

	Current	2021	2027	Long Term
Overall	Poor	Poor	Good	Good
Access for Fish Migration	Poor	Good	Good	Good
Water Flows and Levels	High	High	High	High
Physical Condition	High	High	High	High
Freedom from Invasive Species	High	High	High	High
Water Quality	Moderate	Moderate	Good	Good

**Table 5.6 - WFD Status of the River North Esk from Elginhaugh to confluence with South Esk (ID3806)**

	Current	2021	2027	Long Term
Overall	Poor	Poor	Good	Good
Access for Fish Migration	Poor	Good	Good	Good
Water Flows and Levels	High	High	High	High
Physical Condition	Good	Good	Good	Good
Freedom from Invasive Species	High	High	High	High
Water Quality	Moderate	Moderate	Good	Good

The River Esk (the combined north and south rivers) discharges to the Firth of Forth at Musselburgh, approximately 7km to the north east of Sheriffhall. The Firth of Forth has a number of environmental designations, which include a Site of Special Scientific Interest (SSSI), a Special Protection Area (SPA) and is designated as a Ramsar site (a wetland designation of international importance under the Ramsar Convention). The designations cover a range of aspects, including unique habitats and geology, bird species and invertebrates, along with archaeological and other landscape assets.

All three options for Sheriffhall Junction are at least 400m to the north of the River and therefore will not directly impact upon it. It may however, be an indirect receptor via the Dean Burn but the size of the waterbody will allow for sufficient dilution. Baseline information is provided due to the importance of the waterbody; related to its size and degraded status and planned improvements, and also as a background to the Dean Burn, which is a minor tributary and is likely to be directly affected by the proposals.

#### **5.5.1.2 Dean Burn**

The Dean Burn is a minor tributary of the River North Esk and rises as the May Burn at the Pentland Industrial Estate, flowing from west to east, to the south of the A720. The Burn passes the Scottish Water pumping station (see Plate 5.2 - Dean Burn adjacent to the Scottish Water Pumping Station)

Water quality appears to be poor, with iron rich deposits on the bed of the Burn and cloudy water (Plate 5.3 and Plate 5.4) noted at the time of the site visits.



**Plate 5.2 - Dean Burn adjacent to the Scottish Water Pumping Station**



**Plate 5.3 - Dean Burn at the Surface Water outflow Downstream of the Pumping Station**



**Plate 5.4 - Iron Rich Deposits on the Bed of the Dean Burn**

A further outflow enters the Dean Burn from a constructed wetland used to treat contaminated mine drainage from Gilmerton Coal Bing to the north of the A720. The inflow and outflow to the treatment system are monitored by SEPA, as well as baseline water quality from an upstream location. Chemistry data was requested from SEPA and is provided in Appendix 1.1 – Copy of Consultation Responses. Water quality is variable and data indicate that at times the system appears to provide an improvement for some elements (such as Ammonia, Aluminium, Biological Oxygen Demand, Chemical Oxygen Demand, Electrical Conductivity, Iron and Suspended Solids), however pH remains very acidic compared to the baseline samples. Therefore, water quality in the Dean Burn is shown to be impacted to some degree by the outflow from the Gilmerton Coal Bing treatment system.

Downstream of the Scottish Water pumping station, there is a small standing waterbody adjacent to the A720 at Lugton Bogs (Plate 5.3). The inlet and outlet are piped, and appear to take some flow from the Burn and at high water levels, outfalls to the Burn downstream. There appears to be no outfall from road drainage directly to the pond but water quality appears to be poor, particularly in the vicinity of the inlet. Historic maps indicate that the pond may have been created around the time of construction of the A720 (between 1981 and 1989). It is likely that the pond was created for the primary purpose of amenity and may be utilised for shooting activities (suggested by the presence of small hides).



**Plate 5.5 - Pond Alongside the A720 (view towards east)**

The Dean Burn flows through an area of woodland at Lugton Bogs, before entering farmland. The banks of the Burn comprise very soft, erodible sandy material, as the superficial geology in this area is dominated by glacial sand and gravel deposits. The woodland is poorly managed, with large volumes of woody debris in the channel; see Plate 5.6. The presence of this material in the channel has helped to create a somewhat morphologically diverse channel, with some steps and pools, and erosion and deposition processes. However, it is likely that woody debris could be transported downstream during high flows as the majority has been stripped of branches and is unanchored. The woodland is used by Edinburgh Combat Challenge for paintballing and much of the woody material located around the Burn may be related to this. Such woody material can cause downstream blockage and damage to structures.



**Plate 5.6 - Dean Burn in the Woodland Area**

Historic maps show that the Dean Burn has changed little since the OS maps of the 1800s were created. Where the reach flows through farmland, downstream of the woodland, the watercourse is deeper, wider and straighter than it would be naturally, see Plate 5.7. Modifications are likely related to agriculture and road construction.



**Plate 5.7- Modification of the Dean Burn**

Along its course, the Burn flows through a number of road culverts including beneath the A772, the A7 and A6106, following which it flows through Dalkeith Country Park, subsequently joining the River North Esk to the north of Dalkeith. The Burn is not classified under the WFD, therefore the status is taken to be similar to that of the River North Esk, into which it flows ('Poor' status).

Some of the proposed Scheme options are likely to be located within an area identified to have a 0.5% or greater AEP of flooding from the Dean Burn (See SEPA Flood Map Extract in Appendix 5.1 – Surface Water, Drainage and Flood Risk). Current climate change predictions published by the Department for Environment, Food and Rural Affairs (DEFRA) assume an increase in river flows of 20% up to the 2080s. This may result in greater flooding of land in the vicinity of the Burn in future events. There are no formal flood defences on the Dean Burn. Midlothian and Edinburgh councils were contacted regarding reporting of flood incidents in the area and they have indicated that no flooding from the Burn has been recorded (see Appendix 5.1 – Surface Water, Drainage and Flood Risk).

Receptors of fluvial flooding are assessed to be the road network, vacant land and properties. Their sensitivities are Medium, Low and High respectively, which is based on the consequences and cost of repair following flood events.

## 5.5.2 Groundwater

In the vicinity of the existing Sheriffhall Junction, the underlying bedrock is composed of the moderately productive Scottish Coal Measures Group. The unit is composed of sedimentary cycles including sandstone and coal layers. Fractures and abandoned mine shafts provide a secondary permeability as there are historic coal mine workings abundant throughout the area. Water quality from these sources tends to be poor with elevated iron and fluoride concentrations.

The 'Dalkeith' groundwater body has an overall WFD status of 'Poor', due to the extensive coal mining works, and resultant degraded water quality, see Table 5.7. The waterbody is approximately 75km<sup>2</sup> in size, and the quantity and flow of groundwater have 'Good' status. Remediation of the water quality is not possible due to the long term effects of leaching of metals from strata exposed during mining. It is therefore expected that improvement will not be detected for decades to come.

**Table 5.7 - WFD Status of Dalkeith Groundwater Body (ID 150552) 75km<sup>2</sup>**

	Current	2021	2027	Long Term
Overall	Poor	Poor	Poor	Good
Water Flows and Levels	Good	Good	Good	Good



	Current	2021	2027	Long Term
Water Quality	Poor	Poor	Poor	Good

Overlying the bedrock is the moderately to highly productive 'Esk Valley Sand and Gravel Aquifer', which has an overall WFD status of 'Good' (Table 5.8). Both the quality and quantity of groundwater are assessed to have 'Good' status. The aim is to maintain this status throughout the upcoming cycles. The waterbody is approximately 22km<sup>2</sup> in size.

**Table 5.8 - WFD Status of Esk Valley Sand and Gravel Groundwater Body (ID 150723) 22km<sup>2</sup>**

	Current	2021	2027	Long Term
Overall	Good	Good	Good	Good
Water Flows and Levels	Good	Good	Good	Good
Water Quality	Good	Good	Good	Good

British Geological Survey (BGS) maps indicate that the uppermost aquifer generally has a moderate to low vulnerability to pollutants due to the thickness of superficial deposits, which restrict and slow their downward movement.

No detailed Ground Investigation (GI) data is currently available so depths of superficial deposits and depth to groundwater are not currently known. However, historic borehole records available from the BGS indicate that in the vicinity of the proposed Scheme, groundwater may be encountered between approximately 10m to 4m below ground level (bgl).

### 5.5.3 Drainage Networks

There are a number of Scottish Water assets in the vicinity of the Scheme, which could be affected by the proposals (see Figure 5.1 – Road Drainage and the Water Environment - Receptors). The Gilmerton Sewage Treatment Works (STW) is no longer in operation but is utilised as a wastewater pumping station. Surface water from nearby roads drain to the Dean Burn and foul flow is conveyed to the pumping station and pumped to a location near Dobbies Garden Centre, where it joins the gravity system, see Plate 5.8. There are two surface water outfalls discharging to the Burn in the vicinity of the pumping station. The first is located immediately downstream of the access road to the pumping station and conveys surface water drainage from a short section of the A720. The second is located approx. 70m downstream of the pumping station and conveys road drainage from the A772 Gilmerton Road.



**Plate 5.8 - Foul Drainage Pipe Crossing the Dean Burn at the Pumping Station and Behind, Surface Water Drainage Outfall from a Section of the A720**

Management of the drainage of the A720 is the responsibility of Amey, as the network is not adopted by Scottish Water. It is unknown what drainage exists and where it is discharged, but it is likely to be a traditional form, with outfalls to the Dean Burn.

#### 5.5.4 Surface Water Flooding

SEPA Flood Risk Management (FRM) maps indicate that surface water flooding is predicted to occur along the A720, at the junction itself, upstream of the culvert conveying the Dean Burn below the A7 and upstream of the A6106 culvert in a Medium likelihood event (0.5% AEP, see Appendix 5.1 – Surface Water, Drainage and Flood Risk). Flooding has been reported between Campend and Summerside due to local blockage of the drainage system; however, upsizing of part of the pipe network has resolved this issue (See correspondence from Midlothian Council in Appendix 1.1 – Copy of Consultation Responses)

Receptors of surface water flooding are assessed to be the road network and vacant land. Their sensitivities are Medium, and Low respectively, which is based on the consequences and cost of repair following flood events.

#### 5.5.5 Private Water Supplies

Information provided by Midlothian Council Environmental Health Officer indicated that there are no private water supplies in the vicinity of the proposed works and therefore this has been scoped out of the assessment (see Appendix 1.1 – Copy of Consultation Responses).

#### 5.5.6 Receptor Importance

The assessed Importance of each identified receptor is provided in Table 5.9 below:

**Table 5.9 - Sensitivities of Receptors**

Waterbody	WFD Status	Vulnerability to pollution	Recreation	Value to Economy	Flooding	Biodiversity	Overall Importance
River North Esk	Overall WFD Status assessed as 'Moderate' Medium	Large catchment size and ability to buffer flows Low	Some fishing interest Medium	Used for recreational fishing. Medium	Medium size watercourse, moderate area of floodplain Medium	WFD ecological Status assessed as "Moderate". High	Medium
Dean Burn	WFD	Small catchment	None known	None known	Small size of	WFD	Medium

Waterbody	WFD Status	Vulnerability to pollution	Recreation	Value to Economy	Flooding	Biodiversity	Overall Importance
	unclassified but taken to be similar to the River North Esk ('Moderate') Medium	size and ability to buffer flows. Known discharge of contaminated mine drainage Low	Low	Low	watercourse, moderate area of floodplain Medium	unclassified High	
Esk Valley Sand and Gravel Aquifer	Overall WFD Status assessed as 'Good' High	Moderate size of waterbody Medium	N/A	None known Low	Contribution to base flow of Dean Burn Medium	None known Low	Medium
Dalkeith Aquifer	Overall WFD Status assessed as 'Poor' Low	Moderate size of waterbody Medium	N/A	None known Low	Contribution to base flow of River North Esk Medium	None known Low	Medium
Scottish Water assets	NA	NA	NA	Essential infrastructure High	NA	NA	High

## 5.6 Assessment of Potential Effects

The following sections set out the range of potential impacts, their magnitude, and the overall significance of effect based on the Importance of the receptor. The effects are split into construction effects (Section 5.6.1) and operation effects (Section 5.6.3) phase and are assessed prior to the implementation of mitigation measures. Effects are assumed to be adverse unless stated otherwise.

### 5.6.1 Limitations to the Assessment

Sufficient information has been gathered to inform the Stage 2 assessment. However, Ground Investigation (GI) data was not available but will be provided at Stage 3.

### 5.6.2 Potential Construction Effects

Impacts upon the water environment are likely to be most pronounced during the construction phase due to the high levels of activity and opportunity for release of contaminants. Disruption due to Construction impacts on the water environment, relevant to all options, may include:

- An increase in suspended sediment in the Dean Burn due to runoff from site working areas;
- Loss of floodplain of the Dean Burn due to construction of new structures and associated land raising;
- Changes to flow dynamics of the Dean Burn as a result of increased fine sediment input, changes to the bed and banks and construction of or alterations to culverts;
- Impacts on the quality of groundwater due to runoff from site working areas and the use of plant within excavations; and
- Changes to groundwater flow as a result of dewatering of excavations and placement of new structures which could have a secondary impact of transfer of contaminants from nearby areas associated with historical mining.

#### **Surface Water Quality**

The Scheme options involve significant earthworks in the vicinity of the Dean Burn. There is potential for large quantities of silt laden or polluted runoff to reach the watercourse in the vicinity of the works. This could potentially impact the Burn itself, and if severe enough, the River North Esk, the River Esk and the Firth of Forth.

#### **Flooding and Hydrology**

During construction there is potential for flooding of site working areas given all of the options encroach into the flood envelope of the Dean Burn. Surface water flooding could lead to inundation of site working areas, with the associated potential for release of contaminants. It is not anticipated that the works would increase the risk of surface water flooding as there will be a requirement for Sustainable Drainage Systems (SuDS) to be included in site management plans. The hydrology of the Dean Burn could be impacted by construction works, with the creation of temporary hardstanding, artificial site drainage and dewatering of excavations potentially increasing flow in the Burn.

### ***Hydromorphology***

Diversion of the Dean Burn and alterations to its bed and banks, along with the potential increase in sediment input could lead to changes in the hydromorphology of the Dean Burn. This in turn could impact the River North Esk and its current and future WFD classification.

### ***Drainage Infrastructure***

Scottish Water assets could be at risk of damage during construction due to the high levels of activity and access requirements for the works. This could include underground or exposed pipework and outfalls. Breakage of pipework could lead to leakage of foul or surface flow across the land and would be costly to repair. This could occur at the western extent of the works (for all options), in the vicinity of the Scottish Water pumping station. Excess sediment entering the system as a result of the works could also lead to blockage of the system or decrease capacity, with the potential to increase flood risk.

### ***Groundwater***

There may be some impact on the flow and quality of groundwater due to the construction of new roads, and excavations for bridging structures. Minewater treatment may be required beneath the Scheme, which may have an impact on groundwater flows. Groundwater quality could also be impacted by the works, with the potential for relatively deep excavations, exposing groundwater to runoff and associated pollution. Dewatering of such excavations could lead to a reduction in groundwater flow in the local area, with the potential for contaminants to be drawn in. However, there are no Groundwater Dependant Terrestrial Ecosystems (GWDTEs) identified in the study area (see Chapter 3 - Nature Conservation), therefore local changes to groundwater flow is likely to have a negligible impact.

#### **5.6.2.1 Potential Construction Effects of Option A**

This option involves the creation of an overbridge to convey the A720, with the associated lowering of the ground level to create the dumb-bell roundabouts below it to convey the A7 and other roads. New slip roads will be created from the A720, and the new roundabouts will lead to an increase in the footprint of the junction.

The creation of an overbridge to convey the A720 involves significant earthworks in the vicinity of the Dean Burn. Works would be undertaken within the floodplain and Burn channel, with the potential for flooding of site areas, and resultant downstream contamination. This could have an impact on the River North Esk (although this is unlikely to be significant due to its large volume of flow and distance to the confluence of approximately 1.5km downstream of the option). The hydrology of the Dean Burn could be impacted, with the creation of temporary hardstanding, artificial site drainage and dewatering of excavations potentially increasing flow in the Burn. Much of the area is also subject to surface water flooding, and this could further impact working areas. The introduction of silt could impact on the functioning of the watercourse, and may result in a requirement for clearing of the channel.

Alteration of the pond at Lugton Bogs would be required, which could potentially reduce its storage capacity and lead to an increase in flow in the Burn during flood events (although the function of the pond during flooding is not known, except that it is within the floodplain).

Approximately 700m of channel length (from upstream of the pond at Lugton Bogs to downstream of the A6106) may require to be moved to accommodate the new road footprint.

Movement of vehicles at the western extent of the works on the A720 have the potential to impact upon the Scottish Water assets in the vicinity.

There is likely to be some impact on the flow of groundwater due to the construction of new roads, and excavation for the A720 overbridge.

**Table 5.10 - Significance of Effect – Option A**

Issue	Importance or Value of Resource/Receptor	Magnitude of Impact	Significance of Effect	Nature of Effect
Surface Water Quality	Medium - Dean Burn Medium - River North Esk	Moderate	Moderate - Dean Burn Moderate – River North Esk	Short term, temporary, direct Short term, temporary, indirect
Flooding and Hydrology	Medium - Dean Burn Medium - River North Esk	Moderate	Moderate - Dean Burn Moderate – River North Esk	Short term, temporary, direct Short term, temporary, indirect
Geomorphology	Medium - Dean Burn Medium - River North Esk	Moderate	Moderate - Dean Burn Moderate – River North Esk	Short term, temporary, direct Short term, temporary, indirect
Drainage Infrastructure	High - Drainage Infrastructure	Major	Large – Drainage Infrastructure	Short term, temporary and permanent effects, direct
Groundwater Quality	Medium - Groundwater	Moderate	Moderate - Groundwater	Short term, temporary, direct and indirect effects
Groundwater Flow	Medium - Groundwater	Moderate	Moderate - Groundwater	Short term, temporary, direct and indirect effects

The overall magnitude of effect is Moderate, resulting in a significance of effect of Moderate for the Dean Burn, River North Esk and groundwater bodies, and Large/Very Large for the drainage infrastructure, all of which are significant effects. Option A is assessed to be the second best option in relation to the water environment during construction.

### 5.6.2.2 Potential Construction Effects of Option B

For Option B, the A720 would be conveyed by an overbridge, with a single roundabout formed below for the A7 and other roads. Slip roads would be created to connect the A720 and this roundabout, increasing the footprint of the junction.

The creation of an overbridge to convey the A720 involves significant earthworks in the vicinity of the Dean Burn. Works would be undertaken within the floodplain and Burn channel, with the potential for flooding of site areas, and the resultant downstream contamination. This could have an impact on the River North Esk (although this is unlikely to be significant due to its large volume of flow and distance to the confluence of approximately 1.5km downstream of the Option). The hydrology of the Dean Burn could be impacted, with the creation of temporary hardstanding, artificial site drainage and dewatering of excavations potentially increasing flow in the Burn. Much of the area is also subject to surface water flooding, and this could further impact working areas. The introduction of silt could impact on the functioning of the watercourse, and may result in a requirement for clearing of the channel.

Alteration of the pond at Lugton Bogs would be required, which could potentially reduce its storage capacity and lead to an increase in flow in the Burn during flood events (although the function of the pond during flooding is not known, except that it is within the floodplain).

Approximately 200m of channel length (from upstream of the pond at Lugton Bogs to upstream of the A7) may require to be moved to accommodate the new road footprint.

Movement of vehicles at the western extent of the works on the A720 have the potential to impact upon the Scottish Water assets in the vicinity.

There is likely to be some impact on the flow of groundwater due to the construction of new roads, and excavation for the A720 overbridge.

**Table 5.11 - Significance of Effect – Option B**

Issue	Importance or Value of Resource/Receptor	Magnitude of Impact	Significance of Effect	Nature of Effect
Surface Water Quality	Medium - Dean Burn Medium - River North Esk	Moderate	Moderate - Dean Burn Moderate – River North Esk	Short term, temporary, direct Short term, temporary, indirect
Flooding and Hydrology	Medium - Dean Burn Medium - River North Esk	Moderate	Moderate - Dean Burn Moderate – River North Esk	Short term, temporary, direct Short term, temporary, indirect
Geomorphology	Medium - Dean Burn Medium - River North Esk	Minor	Slight - Dean Burn Slight - River North Esk	Short term, temporary, direct Short term, temporary, indirect
Drainage Infrastructure	High - Drainage Infrastructure	Major	Large – Drainage Infrastructure	Short term, temporary and permanent effects, direct
Groundwater Quality	Medium - Groundwater	Moderate	Moderate - Groundwater	Short term, temporary, direct and indirect effects
Groundwater Flow	Medium - Groundwater	Moderate	Moderate - Groundwater	Short term, temporary, direct and indirect effects

The overall magnitude of effect is Moderate, resulting in a significance of effect of Moderate for the Dean Burn, River North Esk and groundwater bodies, and Large/Very Large for the drainage infrastructure, which are significant effects. Option B is assessed to be the best option in relation to the water environment during construction.

### 5.6.2.3 Potential Construction Effects of Option C

Option C involves the lowering of the existing A720 and the creation of three new roundabouts and associated access roads conveying the A7 to an overbridge. The creation of new slip roads and roundabouts results in an increase in the footprint of the junction and approach roads.

The creation of a new junction between Gilmerton and Sheriffhall presents the risk of large quantities of silt laden or polluted runoff reaching the watercourse in the vicinity of the works.

Extensive excavation would be required and the Dean Burn may require to be diverted over a length of approximately 720m (from upstream of pond at Lugton Bogs to downstream of A6106) to accommodate the new road footprint.

There is the potential for a significant impact on groundwater flow, quality and quantity due to the extent of excavation for new roads, roundabouts and the A720 overbridge. Works would be undertaken within the floodplain and Burn channel, with the potential for flooding of site areas, and resultant downstream contamination. This could have an impact on the River North Esk (although this is unlikely to be significant due to its large volume of flow and distance to the confluence of approximately 1.5km downstream of the Option). The hydrology of the Dean Burn could be impacted, with the creation of temporary hardstanding, artificial site drainage and dewatering of excavations potentially increasing flow in the Burn.

Much of the area is also subject to surface water flooding, and this could further impact working areas. The introduction of silt could impact on the functioning of the watercourse, and may result in a requirement for clearing of the channel.

Significant alteration of the pond at Lugton Bogs would be required, which could potentially reduce its storage capacity and lead to an increase in flow in the Burn during flood events (although the function of the pond during flooding is not known, except that it is within the floodplain).

Movement of vehicles and road works at the western extent of the Scheme on the A720 have the potential to impact upon the Scottish Water assets in the vicinity. In particular, the conduit crossing the A720 in this location may be affected.

**Table 5.12 - Significance of Effect – Option C**

Issue	Importance or Value of Resource/Receptor	Magnitude of Impact	Significance of Effect	Nature of Effect
Surface Water Quality	Medium - Dean Burn Medium - River North Esk	Moderate	Moderate - Dean Burn Moderate – River North Esk	Short term, temporary, direct Short term, temporary, indirect
Flooding and Hydrology	Medium - Dean Burn Medium - River North Esk	Major	Large – Dean Burn Large– River North Esk	Short term, temporary, direct Short term, temporary, indirect
Geomorphology	Medium - Dean Burn Medium - River North Esk	Major	Large – Dean Burn Large – River North Esk	Short term, temporary, direct Short term, temporary, indirect
Drainage Infrastructure	High - Drainage Infrastructure	Major	Large – Drainage Infrastructure	Short term, temporary and permanent effects, direct
Groundwater Quality	Medium - Groundwater	Moderate	Moderate - Groundwater	Short term, temporary, direct and indirect effects
Groundwater Flow	Medium - Groundwater	Major	Large - Groundwater	Short term, temporary, direct and indirect effects

The overall magnitude of effect is Major, resulting in a significance of effect of Large for the Dean Burn, River North Esk, groundwater bodies, and Large/ Very Large for drainage infrastructure, all of which are significant effects. Option C is assessed to be the least preferred option in relation to the water environment during construction.

### 5.6.3 Operational Effects of All Options

Impacts upon the water environment during the operation phase of the Scheme are likely to be related to the alteration of catchment hydrology, the introduction of structures over the Burn, and movement of groundwater. Positive impacts resulting from this work could be improved water quality in the Burn and a potential betterment in surface water runoff due to the introduction of SuDS in order to manage surface water runoff from the road.

#### **Surface Water Quality**

Implementation of SuDS would be required to treat and manage the road drainage from the new road layout. This could present an improvement to the existing situation where surface water runoff may be discharged directly into the Dean Burn. Removal of this input to the Burn could lead to an improvement in the surface water quality which currently appears to be degraded, with the downstream benefit to the River North Esk.

#### **Geomorphology**

Introduction of new structures (culverts or bridges) to the bed and banks of the Burn would result in degradation of the physical quality of the watercourse. This would have an adverse effect on the geomorphology of the Dean Burn channel, changing flow dynamics and modifying the bed and banks.

#### **Flooding and Hydrology**

Modifications to the channel of the Dean Burn and its catchment in the vicinity of the road junction have the potential to impact flooding in the area. However, structures will require to be designed to convey 0.5% Annual Exceedance Probability (AEP) flows and compensation storage will be required should the Preferred Option be shown to increase flood risk by decreasing the area of floodplain. Therefore it is unlikely that residential or commercial properties would be at risk from increased flooding as a result of the Scheme and this is assumed within the assessment. The use of SuDS to manage surface water runoff provides potential for the Scheme to improve the risk from surface water flooding in the area.

## Groundwater

Some minor, local diversion of groundwater flow may result from the introduction of foundations for the new structures. Road drainage will be managed via SuDS and therefore, groundwater quality should not be impacted.

### 5.6.3.1 Potential Operational Effects of Option A

The use of SuDS as part of the proposed Scheme could provide an improvement in the water quality of the Dean Burn and the potential to reduce surface water flooding both to the junction and the surrounding area. This may of slight benefit to the River North Esk (confluence approximately 1.5km downstream).

Introduction of new structures (culverts or bridges) to the bed and banks of the burn would result in degradation of its physical quality. This would have an adverse effect on the geomorphology of the Dean Burn channel, changing flow dynamics and modifying the bed and banks. This may affect up to approximately 700m of channel length (from upstream of pond at the Lugton Bogs to downstream of the A6106).

There is likely to be a replacement of the existing A7 culvert with a longer culvert across the new roundabout.

**Table 5.13 - Significance of Effect – Option A**

Issue	Importance or Value of Resource/Receptor	Magnitude of Impact	Significance of Effect	Nature of Effect
Surface Water Quality	Medium - Dean Burn	Moderate Beneficial	Moderate Beneficial - Dean Burn	Long term, permanent, direct
	Medium - River North Esk		Moderate Beneficial - River North Esk	Long term, permanent, indirect
Flooding and Hydrology	Medium - Dean Burn	Negligible	Neutral - Dean Burn	Long term, permanent, direct
	Medium - River North Esk		Neutral – River North Esk	Long term, permanent, indirect
Surface Water Flooding	Medium – Road Network	Moderate Beneficial	Moderate Beneficial – Road Network	Long term, permanent, direct
	Low – Vacant Land		Slight Beneficial – Vacant Land	
Geomorphology	Medium - Dean Burn	Minor	Slight - Dean Burn	Long term, permanent, direct
Groundwater Quality	Medium - Groundwater	Negligible	Neutral - Groundwater	Long term, permanent, direct
Groundwater Flow	Medium - Groundwater	Negligible	Neutral - Groundwater	

The overall magnitude of effect is Minor, resulting in a significance of effect of Slight for the Dean Burn and groundwater bodies, which are not significant effects. There are also Moderate Beneficial effects on surface water quality and flooding. Option A is assessed to be the second best option in relation to the water environment during operation.

### 5.6.3.2 Potential Operational Effects of Option B

The use of SuDS as part of the proposed Scheme could provide an improvement in the water quality of the Dean Burn and the potential to reduce surface water flooding both to the junction and the surrounding area. This may of slight benefit to the River North Esk (confluence approximately 1.5km downstream).

Introduction of new structures (culverts or bridges) to the bed and banks of the burn would result in degradation of its physical quality. This would have an adverse effect on the geomorphology of the Dean Burn channel, changing flow dynamics and modifying the bed and banks. This may affect up to approximately 200m of channel length (from upstream of the pond at Lugton Bogs to upstream of the A7).

Slight modification of the A7 culvert may be required for this option.



**Table 5.14 - Significance of Effect – Option B**

Issue	Importance or Value of Resource/Receptor	Magnitude of Impact	Significance of Effect	Nature of Effect
Surface Water Quality	Medium - Dean Burn	Moderate Beneficial	Moderate Beneficial - Dean Burn	Long term, permanent, direct
	Medium - River North Esk		Moderate Beneficial - River North Esk	Long term, permanent, indirect
Flooding and Hydrology	Medium - Dean Burn	Negligible	Neutral - Dean Burn	Long term, permanent, direct
	Medium - River North Esk		Neutral – River North Esk	Long term, permanent, indirect
Surface Water Flooding	Medium – Road Network	Moderate Beneficial	Moderate Beneficial – Road Network	Long term, permanent, direct
	Low – Vacant Land		Slight Beneficial – Vacant Land	
Geomorphology	Medium - Dean Burn	Minor	Slight - Dean Burn	Long term, permanent, direct
Groundwater Quality	Medium - Groundwater	Negligible	Neutral - Groundwater	Long term, permanent, direct
Groundwater Flow	Medium - Groundwater	Negligible	Neutral - Groundwater	

The overall magnitude of effect is Minor, resulting in a significance of effect of Slight for the Dean Burn and groundwater bodies, which are not significant effects. There are also Moderate Beneficial effects on surface water quality and flooding. Option B is assessed to be the best option in relation to the water environment during operation.

### 5.6.3.3 Potential Operational Effects of Option C

The use of SuDS as part of the proposed Scheme could provide an improvement of the water quality of the Dean Burn and the potential to reduce surface water flooding to both the junction and the surrounding area. This may of slight benefit to the River North Esk (confluence approximately 1.5km downstream).

Introduction of new structures (culverts or bridges) to the bed and banks of the burn would result in degradation of its physical quality. This would have an adverse effect on the geomorphology of the Dean Burn channel, changing flow dynamics and modifying the bed and banks. This may affect up to approximately 720m of channel length (from upstream of the pond at Lugton Bogs to downstream of the A6106).

There may be a requirement for four new culverts as part of this option, with substantial diversion of the channel being likely.

**Table 5.15 - Significance of Effect – Option C**

Issue	Importance or Value of Resource/Receptor	Magnitude of Impact	Significance of Effect	Nature of Effect
Surface Water Quality	Medium - Dean Burn	Moderate Beneficial	Moderate Beneficial - Dean Burn	Long term, permanent, direct
	Medium - River North Esk		Moderate Beneficial – River North Esk	Long term, permanent, indirect
Flooding and Hydrology	Medium - Dean Burn	Negligible	Neutral - Dean Burn	Long term, permanent, direct
	Medium - River North Esk		Neutral – River North Esk	Long term, permanent, indirect
Surface Water Flooding	Medium – Road Network	Moderate Beneficial	Moderate Beneficial – Road Network	Long term, permanent, direct
	Low – Vacant Land		Slight Beneficial – Vacant Land	
Geomorphology	Medium - Dean Burn	Moderate	Moderate - Dean Burn	Long term, permanent, direct
Groundwater Quality	Medium - Groundwater	Negligible	Neutral - Groundwater	Long term, permanent,

direct

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Groundwater Flow	Medium - Groundwater	Negligible	Neutral - Groundwater
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The overall magnitude of effect is Moderate, resulting in a significance of effect of Moderate for the Dean Burn and groundwater bodies, which are significant effects. There are also Moderate Beneficial effects on surface water quality and flooding. Option C is assessed to be the least preferred option in relation to the water environment during operation.

## 5.7 Potential Mitigation

### 5.7.1 Flood Risk

A flood risk assessment (FRA) should be undertaken to assess the potential impact of the preferred option on the flood risk both locally and up and downstream of the development at Stage 3. Any loss of floodplain will be mitigated by the design and inclusion of compensatory storage, if required.

### 5.7.2 Sediment Mobilisation and Spillage or Discharge of other Pollutants into Surface and Groundwater

The Contractor will be required to produce a Construction Environmental Management Plan (CEMP) which will describe the specific procedures to be put in place to control sediment mobilisation, surface water discharges, and spillages. The CEMP shall be discussed and agreed with SEPA prior to commencement of site works and all staff on site shall be briefed on and trained in the procedures contained within the CEMP. The CEMP shall incorporate best practice guidance as detailed in PPG's published by SEPA and CIRIA Reports C532 & C648. Further details on this shall be provided at Stage 3.

### 5.7.3 Damage to Drainage Outfalls

All drainage outfalls should be clearly marked on site and a plan showing each should be displayed in the contractor's compound area. Barriers could be placed around Scottish Water structures to minimise the risk of damage.

## 5.8 Summary of Effects

Table 5.16 below gives likely significance of impacts prior to mitigation, and likely significance with mitigation.

**Table 5.16 – Potential Construction and Operational Effects**

Option	Predicted Impacts	Magnitude of Predicted Impact	Importance of Receptor	Significance of Effect	Potential Mitigation Measures	Residual Effects	
<b>Dean Burn</b>							
Construction	A	Flooding - Flooding of working areas, , and increase in flood levels due to increased hardstanding	Moderate Adverse	Medium	Moderate Adverse		Slight Adverse
		Water Quality - Potential for release of sediment and pollutants to the watercourse,	Moderate Adverse	Medium	Moderate Adverse		Slight Adverse
		Geomorphology - Damage to channel bed and banks	Moderate Adverse	Medium	Moderate Adverse		Slight Adverse
	B	Flooding - Flooding of working areas, , and increase in flood levels due to increased hardstanding	Moderate Adverse	Medium	Moderate Adverse	Development and implementation of the CEMP will reduce the impact on surface water quality, geomorphology and flooding.	Slight Adverse
		Water Quality - Potential for release of sediment and pollutants to the watercourse,	Moderate Adverse	Medium	Moderate Adverse		Slight Adverse
		Geomorphology - Damage to channel bed and banks	Minor Adverse	Medium	Slight Adverse		Neutral
	C	Flooding - Flooding of working areas, , and increase in flood levels due to increased hardstanding	Major Adverse	Medium	Large Adverse		Moderate Adverse
		Water Quality - Potential for release of sediment and pollutants to the watercourse,	Moderate Adverse	Medium	Moderate Adverse		Slight Adverse
		Geomorphology - Damage to channel bed and banks	Major Adverse	Medium	Large Adverse		Moderate Adverse
Operation	A and B	Flooding.	Negligible Adverse	Medium	Neutral	None proposed	Neutral
		Water Quality & Surface Water Flooding - Possible improvement of water quality related to increased use of SuDS	Moderate Beneficial	Medium	Moderate Beneficial	None proposed	Moderate Beneficial
		Geomorphology - Increased length of channel modifications and culverts.	Minor Adverse	Medium	Slight Adverse	None proposed	Slight
	C	Flooding -.	Negligible	Medium	Neutral	None proposed	Neutral

Option	Predicted Impacts	Magnitude of Predicted Impact	Importance of Receptor	Significance of Effect	Potential Mitigation Measures	Residual Effects	
		Adverse					
	Water Quality & Surface Water Flooding - Possible improvement of water quality related to increased use of SuDS	Moderate Beneficial	Medium	Moderate Beneficial	None proposed	Moderate Beneficial	
	Geomorphology - Increased length of channel modifications and culverts.	Moderate Adverse	Medium	Moderate Adverse	None proposed	Moderate	
<b>River North Esk</b>							
Construction	A	Water Quality- Increased downstream flooding, potential for release of sediment and pollutants to the watercourse	Moderate Adverse	Medium	Moderate Adverse	Development and implementation of the CEMP will reduce the impact on surface water quality, geomorphology and flooding.	Slight Adverse
		Flooding - Increased downstream flooding, potential for release of sediment and pollutants to the watercourse	Moderate Adverse	Medium	Moderate Adverse		Slight Adverse
		Geomorphology - Increased downstream flooding, potential for release of sediment and pollutants to the watercourse	Moderate Adverse	Medium	Moderate Adverse		Slight Adverse
	B	Water Quality- Increased downstream flooding, potential for release of sediment and pollutants to the watercourse	Moderate Adverse	Medium	Moderate Adverse		Slight Adverse
		Flooding - Increased downstream flooding, potential for release of sediment and pollutants to the watercourse	Moderate Adverse	Medium	Moderate Adverse		Slight Adverse
		Geomorphology - Increased downstream flooding, potential for release of sediment and pollutants to the watercourse	Minor Adverse	Medium	Slight Adverse		Neutral
	C	Water Quality - Increased downstream flooding, potential for release of sediment and pollutants to the watercourse	Moderate Adverse	Medium	Moderate Adverse		Slight Adverse
		Flooding - Increased downstream flooding, potential for release of sediment and pollutants to the watercourse	Major Adverse	Medium	Large Adverse		Moderate Adverse
		Geomorphology - Increased downstream flooding, potential for release of sediment and pollutants to the watercourse	Major Adverse	Medium	Large Adverse		Moderate Adverse
Operation	Common to All Options	Possible improvement of water quality related to increased use of SuDS	Moderate Beneficial	Medium	Moderate Beneficial	None proposed	Moderate Beneficial
<b>Flooding – Road Network</b>							
Operation	Common to all Options	Possible improvement of surface water flooding related to increased use of SuDS.	Moderate Beneficial	Medium	Moderate Beneficial	None proposed	Moderate Beneficial
<b>Flooding – Vacant Land</b>							

	Option	Predicted Impacts	Magnitude of Predicted Impact	Importance of Receptor	Significance of Effect	Potential Mitigation Measures	Residual Effects
Operation	Common to all Options	Possible improvement of flooding related to increased use of SuDS.	Minor Beneficial	Low	Neutral	None proposed	Neutral
<b>Groundwater</b>							
Construction	A and B	Potential for release of sediment and pollutants to the groundwater.	Moderate Adverse	Medium	Moderate Adverse	Development and implementation of the CEMP will reduce the impact on groundwater quality and flow.	Slight Adverse
		Dewatering of excavations could impact local groundwater flow.	Moderate Adverse	Medium	Moderate Adverse		Slight Adverse
	C	Potential for release of sediment and pollutants to the groundwater.	Moderate Adverse	Medium	Moderate Adverse		Slight Adverse
		Dewatering of excavations could impact local groundwater flow.	Major Adverse	Medium	Large Adverse		Moderate Adverse

## 5.9 Compliance with Policies and Plans

The proposed scheme options generally comply with the international, national and local policies and plans outlined in Section 5.3 of this chapter. The key aspects covered by these plans are outlined in Table 5.17 below.

**Table 5.17 - Compliance of Scheme Options with Policies and Plans Key Issues**

Key Issues	Source	Scheme Options Compliance / Non-Compliance
Flooding should not be increased as a result of the works and the Scheme should be located out with the functional floodplain, if possible.	Edinburgh and Midlothian Councils Local Plans, SESPlan and Scottish Planning Policy,	The Scheme cannot be located out with the floodplain but there will be a requirement to compensate for any loss of floodplain so flood risk will not be increased. Guidelines will be followed for the assessment of flood risk and SEPA will be consulted on all relevant aspects of the scheme and the associated assessment
Development will not be permitted within the river valley of the North Esk unless there is a specific location need	Midlothian Council	There is a specific need for improvements to Sheriffhall Roundabout recognised by Policy TRAN3
SuDS will be required and must comply with agreed design standards	Midlothian Council Local Plan, SESPlan and Scottish Planning Policy	SuDS will be included as part of the Scheme design
Construction of new culverts will not be supported	Midlothian Council Local Plan	Scheme Option C proposes four new culverts as part of the works and therefore does not comply with this requirement. Options A and B include the extension of existing culverts.

## 5.10 Conclusions

Effects on the water environment during the construction phase include sediment mobilisation and spillage of pollutants to the Dean Burn and preferential pathways to groundwater. Regardless of which option is progressed, there will be a requirement for varying degrees of diversion of the Dean Burn channel and alteration of the floodplain in the vicinity of the proposed Scheme. The effects for Option C are anticipated to be greater than Options A and B.

Flooding of the working areas could occur from the Dean Burn and surface water flooding which are predicted to occur in this location. Sediment input to the Burn could lead to short term hydromorphological changes to the watercourse channel and banks. Alterations to existing culverts and (for some options) new culverts may be required. Groundwater flow may be impacted through dewatering of excavations.

Effects during the operation phase include a potential improvement in water quality in the Dean Burn through the use of Sustainable Urban Drainage Systems (SuDS) for road drainage for all options. There may also be an opportunity to improve current surface water flooding issues through the use of SuDS.

The hydromorphology of the Dean Burn may be degraded to some degree through channel modification and culverting. Overall Option C is anticipated to result in the greatest effects. Long term impacts are not anticipated as the modified channel and culvert structures will be required to convey the 0.5% AEP flow. However, this will be fully assessed at Stage 3.

The assessment of options has indicated that in relation to the water environment is Option B is anticipated to result in the least effects, as it results in the least intrusion into the floodplain of the Dean Burn and leads to the shortest length of channel diversion and culverting.

A flood risk assessment (FRA) should be undertaken to assess the potential impact of the preferred option on flood risk both locally and up and downstream of the development at Stage 3. Any loss of floodplain will be mitigated by the design and inclusion of compensatory storage, if required. The Contractor will be required to produce a Construction Environmental Management Plan (CEMP) which will describe the specific procedures to be put in place to control sediment mobilisation, surface water discharges, and spillages.

## 5.11 Scope of DMRB Stage 3 Assessment

Following agreement of a final design for the Scheme, a Stage 3 DMRB will be required to assess the impacts of the Scheme on Road drainage and the Water Environment. This assessment should include a number of aspects, listed below.

- The Dean Burn (and downstream impacts on the River North Esk), groundwater bodies and drainage infrastructure should be included as receptors;
- Ground investigation data will be required with regards groundwater levels at the Site to fully assess the impacts of the Scheme on this receptor;
- Flood risk and potential compensatory floodplain storage will require to be fully assessed at Stage 3. This will include the design of structures and channel modifications;
- Assessment of road drainage arrangements is required to ensure there is no detriment to local water quality as a result of the Scheme; and
- Proposals for mitigation measures and identifying where opportunities may exist to offset impacts.

## 6. Noise and Vibration

### 6.1 Introduction

The current Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 7: HA213/11 – Revision 1 ‘*Noise and Vibration*’, no longer includes Stage 1, 2 and 3 assessments. Instead, it focuses on a risk based approach using three assessment levels:

- Scoping;
- Simple; and,
- Detailed.

For the purposes of this report a simple level assessment has been carried out. This is most comparable to the previous ‘Stage 2’ approach and is appropriate to assessing a number of different options, when sufficient information is available to complete a quantitative assessment. Once a preferred option has been determined a detailed level assessment of that option will be completed.

This chapter details the assessment of predicted noise and vibration impacts associated with the construction and operation of the three proposed options for the A720 Sheriffhall Roundabout Improvement, the ‘Scheme’.

Temporary noise and vibration impacts arising from the construction works associated with the proposed Scheme are discussed herein. However, at present a construction contractor has not been appointed, and as such the construction methods and plant to be used are not known. As there are insufficient details available to undertake a quantitative assessment, a qualitative construction noise and vibration assessment has been carried out for each option based on the currently available information on the nature and duration of the construction works.

The proposed Scheme operation will potentially affect traffic noise and vibration levels as experienced by sensitive receptors, such as occupiers of residential properties, in the vicinity of the proposed scheme, and along any other existing affected roads on the local road network.

The assessment considers absolute traffic noise levels, changes in traffic noise levels and the effects on residential properties and other sensitive receptors. The assessment considers the following scenarios for which traffic data were generated:

- Do-Minimum 2024 (DM 2024): the year of full opening 2024 without the proposed scheme;
- Do-Minimum 2039 (DM 2039): future assessment year 15 years after full opening, without the proposed scheme;
- Do-Something 2024 (DS 2024): year of full opening, with each of the three proposed scheme options; and,
- Do-Something 2039 (DS 2039): future assessment year 15 years after full opening, with each of the three proposed scheme options.

Appendix 6.1 provides details of relevant noise and vibration terminology as used herein.

### 6.2 Approach and Methodology

#### 6.2.1 Study Area

The study area for the qualitative assessment of construction phase noise impacts comprises the closest identified potentially sensitive receptors to the Scheme.

The study area for the assessment of operational phase noise impacts comprises an area extending to 1 km from the proposed scheme and the existing junction which would be replaced by the proposed scheme. Within this 1 km area, a 600 m zone has been subject to detailed traffic noise modelling. This is explained further below:

- The study area consists of the proposed scheme, the existing junction and all surrounding existing roads that are predicted to be subject to a change in traffic noise level as a result of the proposed scheme of:
  - 1 dB(A) or more in the short term (DM 2024 vs DS 2024); or,



- 3 dB or more in the long term (DM 2024 vs DS 2039), subject to a minimum change of 1 dB between DM 2039 and DS 2039.

These roads are defined as 'affected routes'. Analysis of the provided traffic data indicates that some sections of the A720 (west of the scheme), A7 and A6016 meet the criteria to be defined as an affected route with all options. Other affected routes include small sections of the B6362 and Melville Gate Road with all, options. In Option B only, a section of the A720 east of the scheme is also considered an affected route; while in Option C only, the entire length of Melville Gate Road is an affected route;

- The study area for the detailed quantitative assessment of noise impacts comprises a corridor 600 m either side of the proposed scheme, 600 m either side of the extent of the existing junction replaced by the proposed scheme, and a 600 m corridor either side of the identified affected routes within the wider 1 km study area;
- For dwellings and other sensitive receptors that are within the 1 km wider study area, but more than 600 m from an affected route, the proposed scheme or existing junction replaced by the proposed scheme, a qualitative assessment of the traffic noise impacts has been carried out; and
- The DMRB methodology also includes consideration of affected routes which are outside the 1 km wider study. The A720 to the west of the Scheme is an affected route beyond the 1km boundary, however there are no sensitive receptors within 50m of this affected route.

The proposed scheme, the 1 km wider study area around the three proposed scheme options and extent of the existing junction replaced by the proposed scheme, and sensitive receptors within the 1 km wider study area are shown in Figure 6.1 – Noise Location Plan. The smaller 600 m study area for the detailed quantitative assessment of noise impacts is also shown on Figure 6.1. To ensure the results for each option can be compared on a 'like for like' basis the same 1 km and 600 m study areas have been used for all three options.

## 6.2.2 Baseline Noise Measurements

A baseline noise survey was undertaken by Atkins on Wednesday, 6th December 2006 and is summarised as follows. Three 15 minute measurements were taken at a total of five positions (A-E see Figure 6.1 – Noise Location Plan) considered to be representative of the nearest residential receptors, in consecutive hours between 10:00 and 17:00 hours. The measurement parameters included the  $L_{A10}$ , used to represent traffic noise levels, the  $L_{Aeq}$ , used to represent the overall ambient noise level, and the  $L_{A90}$  used to represent typical background levels. For the purposes of this simple level options assessment the 2006 baseline survey is considered to be sufficient, an updated baseline noise survey is propose at the next stage once a preferred option has been established.

## 6.2.3 Construction Noise

The noise levels generated by construction activities and experienced by nearby sensitive receptors, such as the occupants of residential properties, depend upon a number of variables, the most significant of which are:

- The noise generated by plant or equipment used on site, generally expressed as a sound power level;
- The periods of operation of the plant on the site, known as its 'on-time';
- The distance between the noise source and the receptor; and,
- The attenuation due to ground absorption and barrier effects.

Part 1 of BS 5228: 2009+A1: 2014 'Code of Practice for Noise and Vibration Control on Construction and Open Sites' provides a methodology for the estimation of likely construction noise levels as an equivalent continuous noise level averaged over a suitable assessment period, for example a one-hour period ( $L_{Aeq,1h}$ ).

BS 5228 contains a database of the noise emission from individual items of equipment and routines which can be used to predict noise from construction activities at identified receptors. The prediction method gives guidance on the effects of different types of ground, barrier attenuation and how to assess the impact of fixed and mobile plant.

Thresholds for the onset of potentially significant effects for construction noise have been defined by reference to the ABC Method described in Annex E of BS 5228-1. The ABC Method provides thresholds at residential building façades based on prevailing ambient noise levels as shown in Table 6.1.

**Table 6.1 – Construction Noise Thresholds at Residential Dwellings**

Assessment Category	Threshold Value ( $L_{Aeq,T}$ dB facade)		
	Category A	Category B	Category C
Night-time (23:00 – 07:00)	45	50	55
Evenings and weekends (19:00 – 23:00 weekdays; 13:00 – 23:00 Saturdays; 07:00 – 23:00 Sundays)	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75

NOTE 1: A potential significant effect is indicated if the  $L_{Aeq}$  noise level arising from the site exceeds the threshold value for the category appropriate to the ambient noise level.

NOTE 2: If the ambient noise level exceeds the Category C threshold values given in the table, then a potential significant effect is indicated if the total noise level for the period increases by more than 3dB due to site noise.

NOTE 3: Applied to residential receptors only.

Category A: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these threshold values.

Category B: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as Category A threshold values.

Category C: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than Category A threshold values.

The magnitude of the impact of construction noise has been classified in accordance with the descriptors in Table 6.2.

**Table 6.2 – Magnitude of Impact for Construction Noise (Residential Dwellings)**

Magnitude of Impact	Construction Noise Level minus Threshold Value or Increase in Total Noise Level ( $L_{Aeq,T}$ dB façade)
Major	$\geq 5$
Moderate	$3 < 5$
Minor	$1 < 3$
Negligible	$< 1$

In order to quantify the likely noise from construction works in accordance with the methods and guidance in BS 5228, it is necessary to define the various activities to be undertaken and the equipment to be used, based upon the anticipated construction works programme. At this stage details regarding construction activities and plant requirements for each of the three options are not available, therefore, a qualitative discussion of potential construction noise impacts is provided herein. This is based on the identification of residential properties and any other potentially sensitive receptors in the vicinity of the three options, the identification of anticipated construction activities which could have a significant noise effect, and taking account of best practice noise control measures.

#### 6.2.4 Construction Vibration

Piling, ground improvement works and compaction of earthworks using vibratory rollers can be potentially significant sources of construction vibration. Construction vibration can result in annoyance to sensitive receptors, such as occupants of a residential property, or in extreme cases building damage.

At this stage it is not known if piling works will be required with each option, such as for the foundations of the new bridge, or if ground improvement or compaction using vibratory rollers will be required. Therefore, as a conservative approach, construction vibration impacts have been scoped into the assessment.

The passage of vibration through the ground is highly dependent on site-specific ground conditions. However, Part 2 of BS 5228 provides a range of measured historical data for a variety of different ground improvement works.

Guidance on the effects of construction vibration in terms of building damage is provided in BS 7385: 1993 'Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from ground borne vibration'. It provides guidance on transient vibration levels likely to result in cosmetic damage, and is referenced in BS 5228. Limits for transient vibration, above which cosmetic building damage could occur, are given in Table 6.3.

**Table 6.3 – Transient Vibration Guide Values for Cosmetic Damage**

Building Type	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	50 mms <sup>-1</sup> at 4 Hz and above	50 mms <sup>-1</sup> at 4 Hz and above
Unreinforced or light framed structure Residential or light commercial buildings	15 mms <sup>-1</sup> at 4 Hz increasing to 20 mms <sup>-1</sup> at 15 Hz	20 mms <sup>-1</sup> at 15 Hz increasing to 50 mms <sup>-1</sup> at 40 Hz and above

Note 1: Values referred to are at the base of the building.  
Note 2: For unreinforced or light framed structures and residential or light commercial buildings, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.

BS 7385 states that the probability of building damage tends to be zero for transient vibration levels less than 12.5 mms<sup>-1</sup> ppv. For continuous vibration the threshold is around half this value.

It is also noted that these values refer to the likelihood of cosmetic damage. ISO 4866:2010 defines three different categories of building damage:

- Cosmetic: formation of hairline cracks in plaster or drywall surfaces and in mortar joints of brick/ concrete block constructions;
- Minor: formation of large cracks or loosening and falling of plaster or drywall surfaces or cracks through brick/ block; and
- Major: damage to structural elements, cracks in support columns, loosening of joints, splaying of masonry cracks.

BS 7385 indicates that minor damage occurs at a vibration level twice that of cosmetic damage, and that major damage occurs at a vibration level twice that of minor damage. This guidance can be used to define the magnitude of vibration damage impact as shown in Table 6.4.

**Table 6.4 – Magnitude of Impact for Vibration Damage**

Magnitude of Impact	Damage Risk	Continuous Vibration Level ppv mms <sup>-1</sup>	Transient Vibration Level ppv mms <sup>-1</sup>
Major	Major	30	60
Moderate	Minor	15	30
Minor	Cosmetic	7.5	15
Negligible	Negligible	6	12

BS 5228 provides guidance on the impact of construction vibration in terms of annoyance, focussing on occupants of residential properties. The vibration levels and associated effects stated in BS 5228, combined with the assigned magnitude of impact, are provided in Table 6.5.

**Table 6.5 – Magnitude of Impact for Vibration Annoyance**

Magnitude of Impact	Annoyance	Continuous Vibration Level $\text{ppv mms}^{-1}$
Major	Vibration is likely to be intolerable for any more than a very brief exposure to this level.	10
Moderate	It is likely that vibration of this level in residential environments will cause complaints, but can be tolerated if prior warning and explanation has been given to residents.	1.0
Minor	Vibration might be just perceptible in residential environments.	0.3
Negligible	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.	0.14

In order to quantify the likely vibration impact from construction works in accordance with the methods and guidance outlined above, it is necessary to define the various construction activities to be undertaken and the equipment to be used, based upon the anticipated construction works programme. At this stage details regarding construction activities and plant requirements for each of the three options are not available, therefore a qualitative discussion of potential construction vibration impacts is provided herein. This is based on the identification of residential properties and other potentially sensitive receptors in the vicinity of the proposed scheme, the identification of construction activities which could have a significant vibration effect, and taking account of best practice vibration control measures.

### 6.2.5 Operational Traffic Noise

Noise from a flow of road traffic is generated by both the vehicle engines and the interaction of tyres with the road surface. The traffic noise level at a receptor, such as an observer at the roadside or residents within a property, is influenced by a number of factors including traffic flow, speed, composition (percentage of HGVs), road gradient, type of road surface, distance from the road and the presence of any obstructions between the road and the receptor.

Noise from a stream of traffic is not constant, but to assess the noise impact a single figure estimate of the overall noise level is necessary. The index adopted by the Government in 'The Calculation of Road Traffic Noise' (CRTN) to assess traffic noise is  $L_{A10,18h}$ . This value is determined by taking the highest 10% of noise readings in each of the 18 one-hour periods between 06:00 and 00:00, and then calculating the arithmetic mean. As recorded in DMRB, a reasonably good correlation has been shown to exist between this index and the perception of traffic noise by residents over a wide range of noise exposures.

CRTN provides the standard methodology for predicting the  $L_{A10,18h}$  road traffic noise level. Noise levels are predicted at a point measured 1 m horizontally from the external façade of buildings.

DMRB also requires an assessment of night-time (i.e. between 23:00 and 07:00) traffic noise levels ( $L_{\text{night, outside}}$ ). However, this parameter is not predicted by the standard CRTN methodology. DMRB refers to three methods for calculating night-time traffic noise levels developed by the Transport Research Laboratory (TRL 2002 and 2006). The most widely used is 'Method 3' which factors the  $L_{\text{night}}$  from the  $L_{A10,18h}$ , based on the typical diurnal pattern of traffic flows in the UK. Method 3 has been adopted for the purposes of this assessment. A -2.5 dB correction has been applied to the night-time predicted traffic noise levels, to convert from façade to free-field levels i.e. noise levels which are unaffected by reflecting surfaces other than the ground (as advised in CRTN).

The objective of the assessment, as set out in DMRB, is to gain an overall appreciation of the noise and vibration climate, both with (Do-Something) and without (Do-Minimum) the proposed scheme, to identify where noise impacts occur and to determine where mitigation to reduce these impacts is required. These conditions are assessed for the baseline year (the year of proposed scheme opening) and the future assessment year (15 years after proposed scheme opening). DMRB outlines the steps to be carried out at the simple assessment stage:

- a. Identify the study area (refer to section 6.2.1) and predict 18-hour (06:00 - 00:00) and night-time (23:00 - 07:00) traffic noise levels at all residential properties within 600 m of the proposed scheme, existing routes being improved or bypassed, and affected routes within the 1 km study area (affected routes are defined as existing roads which would experience a potentially significant change in traffic noise level as a result of the proposed scheme). Predictions are required for the Do-Minimum and Do-

Something scenarios in the year of proposed scheme opening and 15 years after proposed scheme opening. The computer noise modelling software SoundPLAN version 7.4, which implements the CRTN methodology to predict  $L_{A10,18h}$  noise levels and the TRL 'Method 3' to predict  $L_{night,outside}$  levels, has been used to complete the traffic noise predictions. Further details of the noise model are provided in Appendix 6.2;

- b. Carry out the following comparisons for each property in order to identify the number of properties where residents may experience an increase or decrease in traffic noise levels:
  - The Do-Minimum scenario in the baseline year against the Do-Something scenario in the baseline year (short-term) (DM 2024 to DS 2024); and
  - The Do-Minimum scenario in the baseline year against the Do-Something scenario in the future assessment year (long-term) (DM 2024 to DS 2039).

For night-time traffic noise levels, comparisons are only required for the long-term scenario and for properties where the  $L_{night,outside}$  level is 55 dB(A) or more in the relevant scenarios;

- c. Assess the impact on sensitive receptors, other than residential properties, within the 600 m study area. This is based on 18 hour (06:00 - 00:00) traffic noise levels and considers the same two comparisons as outlined in (b) above for residential properties. Other sensitive receptors include hospitals, educational buildings, community facilities (such as places of worship), designated ecological areas such as Areas of Outstanding Natural Beauty (AONB), National Parks, Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Sites of Special Scientific Interest (SSSI), designated scheduled monuments and public rights of way (PRoW);
- d. Complete a qualitative assessment of sensitive receptors which are within the 1 km study area, but more than 600 m from the proposed scheme, existing routes which are bypassed or improved, and affected routes; and
- e. For affected routes which are outside the 1 km study area, complete an assessment by estimating the CRTN Basic Noise Level on these roads (the traffic noise level at 10 m) with and without the proposed scheme. Count the number of dwellings and other sensitive receptors within 50 m of these routes.

Different façades of the same property can experience different changes in traffic noise level depending on their orientation to the noise source. DMRB requires that each of the above comparisons of traffic noise levels is based on the façade which experiences the worst-case change i.e. the largest increase, or, if all façades undergo a decrease, the smallest decrease.

DMRB provides two classifications for the magnitude of the noise impact of a proposed road scheme, as shown in Tables Table 6.6 and Table 6.7 (taken from DMRB). These relate to short-term changes in noise levels and long-term changes in noise levels. Paragraph 3.36 of DMRB HD 213/11 states that HA 205/08 'provides a method for the classification of the magnitude of impact and the significance of an effect, in order to arrive at an overall level of significance. In terms of road traffic noise, a methodology has not yet been developed to assign significance according to both the value of the resource and the magnitude of an impact. However, the magnitude of traffic noise impact from a road project should be classified into levels of impact in order to assist with the interpretation of the road project. Therefore for the assessment of traffic noise that is covered by [DMRB] a classification is provided for the magnitude of impact'.

In light of the advice in DMRB set out above, Tables Table 6.6 and Table 6.7 have been used to assess changes in operational traffic noise. The short term classification in Table 6.6 also corresponds to the example classification provided in the Technical Advice Note Assessment of Noise (Scottish Government 2011) for impacts for a new road affecting residential receptors.

**Table 6.6 – Classification of Magnitude of Traffic Noise Impacts – Short-term**

Traffic Noise Change $L_{A10,18h}$ dB	Magnitude of Impact
0	No change
0.1 - 0.9	Negligible
1.0 - 2.9	Minor
3.0 - 4.9	Moderate
≥5.0	Major

**Table 6.7 – Classification of Magnitude of Traffic Noise Impacts – Long-term**

Traffic Noise Change $L_{A10,18h}$ dB	Magnitude of Impact
0	No change
0.1 - 2.9	Negligible
3.0 - 4.9	Minor
5.0 - 9.9	Moderate
$\geq 10.0$	Major

## 6.2.6 Operational Traffic Vibration

Vibration from traffic can be transmitted through the air or through the ground. Airborne vibration is produced by the engines and exhausts of road vehicles, with dominant frequencies typically in the range of 50 - 100 Hz. Ground borne vibration is produced by the interaction of the vehicle tyres and the road surface with dominant frequencies typically in the range of 8 - 20 Hz. The passage of vehicles over irregularities in the road surface can also be a source of ground borne vibration.

Traffic vibration can potentially affect buildings and disturb occupiers. DMRB reports that extensive research on a wide range of buildings has found no evidence of traffic induced ground borne vibration being a source of significant damage to buildings and no evidence that exposure to airborne vibration has caused even minor damage (Watts, G. R., 1990).

DMRB states that perceptible vibration only occurs in rare cases and identifies that the normal use of a building, such as closing doors and operating domestic appliances, can generate similar levels of vibration to that from traffic in most circumstances.

It is a requirement of new highway constructions that the highway surface be smooth and free from any discontinuities. Paragraph A5.26 of DMRB HD213/11 states, in relation to ground borne vibration: '*Such vibrations are unlikely to be important when considering disturbance from new roads and an assessment will only be necessary in exceptional circumstances*'. Hence, no impacts or effects from traffic induced ground borne vibration due to the passage of vehicles over irregularities in the surface of the proposed scheme are anticipated.

At the 'simple' assessment level DMRB only requires an assessment of operational traffic vibration if ground-borne vibration is identified as a potential problem on existing routes. As this is not the case at Sheriffhall Junction operational vibration impacts are not assessed further in this chapter.

## 6.2.7 Significance of Effect

The significance of effect is a function of the value or sensitivity of the receptor and the magnitude of the impact. Table 6.8 details the sensitivity of receptors, whilst

Table 6.9 presents the significance of effect, based on the magnitude of impact (as detailed in the previous sections) and the sensitivity of receptors (as per Table 6.8).

As a general rule, major and moderate effects are considered to be significant, whilst minor and negligible effects are considered to be not significant. Other project-specific factors such as the number of receptors affected and the timing, duration and character of the impact should also be considered when determining if there is a potentially significant effect.

**Table 6.8 – Sensitivity of Receptors**

Sensitivity/ Value of Receptor	Description
Very High	Concert halls/ theatres, specialist vibration sensitive equipment
High	Residential properties, educational buildings, medical facilities
Medium	Designated Ecological receptors (Sites of Special Scientific Interest (SSSI), Special Protection Area (SPA) & Special Area of Conservation (SAC)). Designated Heritage receptors (Scheduled Monuments) Community facilities (including Places of worship, sports facilities etc.)
Low	Commercial and industrial premises, public rights of way

**Table 6.9 – Significance of Effect**

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

## 6.3 Planning Policy Context

### 6.3.1 National Policy and Guidance

#### **National Planning Framework 3 (2014)**

The third National Planning Framework (NPF 3) (Scottish Government, 2014) outlines the long-term strategy for Scotland. It is the spatial expression of the Governments Economic Strategy, and of their plans for development and investment in infrastructure. NPF 3 identifies national developments and other strategically important development opportunities in Scotland. The NPF does not contain any specific policies or guidance on noise and vibration.

#### **Scottish Planning Policy (2014)**

Scottish Planning Policy (SPP) is a statement of Scottish Government policy on how nationally important land use planning matters should be addressed across the country.

The SPP does not contain any specific policies or guidance on noise or vibration. The need to consider noise impacts is acknowledged in several sections relating to specific types of development such as new commercial developments, new energy infrastructure and new mineral sites. With regard to new transport infrastructure, noise impacts are not explicitly identified, though DMRB is highlighted as a key document and the need to consider environmental constraints highlighted.

#### **PAN 1/2011 'Planning and Noise'**

PAN 1/2011 'Planning and Noise' (Scottish Government, 2011) provides advice on the role of the planning system in helping to prevent and limit the adverse effects of noise. The accompanying Technical Advice Note (Scottish Government, 2011) provides advice on noise impact assessment methods. With regard to road traffic noise the accompanying Technical Advice Note refers to the DMRB assessment methodology when assessing new road schemes.

### ***Environmental Noise (Scotland) Regulations 2006***

The Environmental Noise (Scotland) Regulations 2006 implement Directive 2002/49/EC of the European Parliament. Under the regulations the Scottish Government had an obligation to make strategic noise maps for:

- agglomerations (large urban areas with populations of more than 100,000);
- major roads (those with more than three million vehicle passages per year); and
- major railways (those with more than 30,000 train passages per year).

The A720 Sheriffhall roundabout and surrounding major roads were included in the second round of strategic noise mapping for 2012.

The Scottish Government also has an obligation to draw up action plans for locations near major roads and major railways, and for agglomerations. The Transportation Noise Action Plan was issued in 2014 (Scottish Government, 2014) and identifies a number of Candidate Noise Management Areas (CNMA). The identification of CNMAs takes into account a range of factors including the absolute noise levels, the population exposed and the likely annoyance due to transport noise. The CNMAs may subsequently progress into a Noise Management Area (NMA) between 2013 and 2018. The NMAs will be the primary consideration when formulating environmental noise management actions/policy. No CNMAs are located in the vicinity of the Sheriffhall junction.

The Transportation Noise Action Plan includes a number of actions which have been implemented up to 2012, including use of low noise surfacing, noise barrier installation and promoting the use of electric cars. In addition, potential future actions to be implemented between 2013 and 2018 are also identified, including engineering solutions and network operational management of roads.

### ***Control of Pollution Act 1974***

Sections 60 and 61 of Control of Pollution Act 1974 (CoPA) provide the main legislation regarding demolition and construction site noise and vibration. If noise complaints are received, a Section 60 notice may be issued by the local planning authority with instructions to cease work until specific controls to reduce noise have been adopted.

Section 61 of CoPA provides a means to apply for prior consent to carry out noise generating activities during construction. Once prior consent has been agreed under Section 61, a Section 60 notice cannot be served provided the agreed conditions are maintained on-site.

The CoPA requires that 'Best Practicable Means' (as defined in Section 72 of CoPA) be adopted for construction noise on any given site. CoPA makes reference to BS 5228 as Best Practicable Means.

### ***Environmental Protection Act 1990***

Noise and vibration from construction works also fall under the remit of the Environmental Protection Act 1990 (EPA) Part 3. Road traffic noise is not covered by the EPA.

The EPA prescribes noise (and vibration) emitted from premises (including land) so as to be prejudicial to health or a nuisance as a statutory nuisance.

Local Authorities are required to investigate any public complaints of noise and vibration if they are satisfied that a statutory nuisance exists, or is likely to occur or recur; they must serve a noise abatement notice. A notice is served on the person responsible for the nuisance. It requires either simply the abatement of the nuisance or works to abate the nuisance to be carried out, or it prohibits or restricts the activity. Contravention of a notice without reasonable excuse is an offence. Right of appeal to the Magistrates Court exists within 21 days of the service of a noise abatement notice.

In determining if a noise complaint amounts to a statutory nuisance the Local Authority can take account of various guidance documents and existing case law, no statutory noise limits exist. Demonstrating the use of best practicable means to minimise noise levels is an accepted defence against a noise abatement notice.

### ***Land Compensation (Scotland) Act 1973***

In general noise and vibration are recognised as both a common law nuisance (either private or public) and a statutory nuisance. However, this does not apply to noise and vibration from road traffic. As a result, the Land



Compensation (Scotland) Act 1973 and the Noise Insulation (Scotland) Regulations 1975 are used in respect of road traffic noise.

The Land Compensation (Scotland) Act 1973 Part I provides a means by which compensation can be paid to owners of land or property which has experienced a loss in value caused by the use of public works, such as new or altered roads. Noise and vibration are two of the factors which would be considered in any claims for compensation; however the claim should consider all changes and effects, including betterment.

### **Noise Insulation (Scotland) Regulations 1975**

The Noise Insulation (Scotland) Regulations 1975 were made under Part II of the Land Compensation (Scotland) Act 1973. Section 3 imposes a duty, and Section 4 a power, on the relevant Highway Authority to undertake or make a grant in respect of the cost of undertaking noise insulation work in eligible buildings affected by a new or altered highway. This is subject to meeting a range of criteria on road traffic noise levels as specified in the regulations. Section 5 also provides discretionary powers to undertake or make a grant in respect of the cost of undertaking noise insulation work in eligible buildings with respect to construction noise.

## 6.3.2 Regional Policy

### 6.3.2.1 SESplan

#### **Strategic Development Plan (Adopted June 2013)**

Six authorities (City of Edinburgh, East Lothian, Fife, Midlothian, Scottish Borders and West Lothian) prepared a Strategic Development Plan (SDP) for South East Scotland in 2013 (SESplan, 2013). The SDP is intended to set out a vision statement of their broad view on the future development of the area, along with a Spatial Strategy on the future development and land use within the area. The SDP does not contain any specific policies or guidance on noise or vibration. However one of the aims of the SDP is to '*conserve and enhance the natural and built environment*'.

#### **Proposed Strategic Development Plan (October 2016)**

A proposed update of the SDP was issued in 2016 (SESplan, 2016). Again the proposed update of the SDP does not contain any specific policies or guidance on noise or vibration.

## 6.3.3 Local Policy

### 6.3.3.1 City of Edinburgh Council

#### **Edinburgh Local Development Plan (Adopted November 2016)**

Policy Env 22 Pollution and Air, Water and Soil Quality of the City of Edinburgh Council Local Development Plan (November 2016) states that '*Planning permission will only be granted for development where:*

- a. there will be no significant adverse effects for health, the environment and amenity and either
- b. there will be no significant adverse effects on: air, and soil quality; the quality of the water environment; or on ground stability
- c. appropriate mitigation to minimise any adverse effects can be provided.

Pollution can arise from many sources and activities including traffic and transport, domestic heating, industrial processes, agriculture, waste disposal and landfill. Air, soil and water quality can all be affected and harmed by some forms of development and land can present a potential pollution or safety threat if it has been contaminated or destabilised by previous activities. Air, noise and light pollution can also be a source of harm to health and amenity.

The potential risk and significance of pollution will be considered when assessing planning applications, in consultation where necessary with relevant agencies, such as Scottish Environment Protection Agency and the Health and Safety Executive'.

### 6.3.3.2 Midlothian Council

#### **Midlothian Local Plan (Adopted December 2008)**

The Midlothian Local Plan adopted in 2008 does not contain any policies of direct relevance to noise impacts from transport schemes. The 2008 Local Plan is proposed to be replaced in spring 2017.

#### **Midlothian Proposed Local Development Plan (2014)**

The Proposed Local Plan was issued in 2014. Policy ENV 18 Noise covers noise impacts in general and is not specific to transport schemes it states *'The Council will seek to prevent noisy development from damaging residential amenity or disturbing noise sensitive uses. Where new developments with the potential to create significant noise are proposed, these may be refused or require to be modified so that no unacceptable impact at sensitive receptors is generated. Applicants may be required to carry out a noise impact assessment either as part of an Environmental Impact Assessment or separately. Where new noise sensitive uses are proposed in the locality of existing noisy uses, the Council will seek to ensure that the function of established operations is not adversely affected.'*

## 6.4 Consultations

A number of consultations were carried out in 2015 and again in 2016 during the DMRB Stage 2 options Assessment. This section includes details of consultations of the relevant consultee responses in Table 6.10 below. A full summary of all Stage 2 consultation responses is provided in Chapter 1 - Overview of Environmental Assessment and consultations are provided in full in Appendix 1.1 – Copy of Consultation Responses.

**Table 6.10 – Summary of Consultation Responses**

Consultee	Response
Environmental Health Officer – Midlothian Council	<b>Dated 28/11/2016</b> Asked AECOM to advise whether the remaining three options have been modelled in relation to predicted noise emissions and air quality impacts for each of the three schemes in relation to neighbouring sensitive receptors.
Scottish Environmental Protection Agency (SEPA)	<b>Dated 06/12/2016</b> Identify all aspects of works that may impact upon the environment and potential pollution risks, then identify principals of preventative measures and mitigation. Recommend Environmental Health officers in the relevant local authorities be consulted.

AECOM responded to Midlothian Council on the 1<sup>st</sup> February 2017, stating: *'To date no traffic noise or air quality predictions relating to the junction upgrade have been completed. A Stage 1 qualitative assessment of various options was completed in 2014 and we are just starting work on the stage 2 assessment. This work will include quantitative predictions of traffic noise and air quality, in accordance with the current DMRB assessment methodology for road schemes. This work is due to be completed and published late March. We would be more than happy to provide you with a copy of the completed assessment once it is published and we will of course continue to liaise with you as we progress to Stage 3 which is likely to include an Environmental Impact Assessment and the preferred option will be modelled again for noise and air.'*

## 6.5 Baseline Conditions

### 6.5.1 Baseline Noise Survey

Baseline noise monitoring was undertaken by Atkins in 2006 at a selection of the closest residential receptors to the scheme to determine the baseline noise conditions:

- Position A, Gilmerton Road – Road traffic noise from the A720, which is in cutting at this point, was considered the dominant noise source.
- Position B, Summerside Cottages – Road traffic noise from the A720 was considered the dominant noise source, with a noticeable contribution from the A7.
- Position C, Sheriffhall House – Road traffic noise from the A720 was considered the dominant noise source.

- Position D, Newton Farm – Road traffic noise from the A720 was considered the dominant noise source.
- Position E, 10 Orchard View - Surrounded by housing, road traffic noise from the A7 was considered the dominant noise source.

Weather conditions on the day of the survey were suitable for noise monitoring, dry with clear skies throughout. The ambient temperature was approximately 9°C. In the morning there was a light southerly breeze not exceeding 2 ms<sup>-1</sup>, whilst in the afternoon wind speeds picked up a little and were typically between 1 - 3 ms<sup>-1</sup> with some intermittent gusts of up to 4 ms<sup>-1</sup>. All instrumentation had a calibration certificate approved by UKAS. The meter was calibrated before and after the measurements with no significant drift in calibration levels.

The results from the noise surveys taken at the above locations are presented in Table 6.11 the positions are shown on Figure 6.1 - Noise Location Plan.

**Table 6.11 – Summary of Baseline Noise Levels (free-field)**

Location	Estimated L <sub>A10,18h</sub> (dB)*	Average daytime L <sub>Aeq,15min</sub> (dB)	Average daytime L <sub>A90,15min</sub> (dB)
A - Gilmerton Road	66	65	63
B – Summerside Cottages	64	63	61
C - Sheriffhall House	61	61	59
D - Newton Farm	55	55	53
E - 10 Orchard View	52	51	48

\* L<sub>A10,18h</sub> estimated by Atkins as arithmetic average of three L<sub>A10,15mins</sub> measurements in three consecutive hours between 10:00 and 17:00 minus 1 dB

## 6.6 Assessment of Potential Effects

### 6.6.1 Limitations to the Assessment

The following limitations to the current assessment have been identified:

- No specific information is available at this stage with regard to the construction of the Scheme, including likely volumes and routes of construction traffic;
- The traffic data provided is limited in its extents, for the majority of roads it does not extend as far as the 600m quantitative noise study area, see Figure 6.1. To accurately predict traffic noise levels at the edge of the 600m study area the traffic data must extend significantly beyond 600m. In addition, the affected routes extend to the edge of the available traffic data for a number of roads. This limitation applies equally to the three options;
- The Sheriffhall Park & Ride has not been included in the provided traffic data;
- Data on the composition of traffic (percentage of heavy duty vehicles) has not been available for individual roads, the traffic data assumes 7% for all roads in all scenarios and years.
- The traffic data assumes there is no growth in traffic in the Do-Minimum scenario from 2024 to 2039. This assumption is applied to all roads and all time periods, including the 18 hour traffic data used for the operational traffic noise assessment;
- The traffic data assumes there is no growth in traffic in the Do-Something scenario for each option beyond 2030. Therefore, the 2030 data is applied to the 2039 future assessment year. This assumption is applied to all roads and all time periods, including the 18 hour traffic data used for the operational traffic noise assessment;
- There is no topographical survey for the Scheme area available at this stage. Close to the Scheme LIDAR spot height data converted to 0.5m contours has been provided. Such data does not provide the same level of detail as the 3d Scheme designs provided for each option. Further from the Scheme area commercially available 5m digital terrain model (DTM) data, converted to 2m contours, has been purchased. The area where the two datasets meet does not match closely in all areas, as more detailed features present in the 0.5m LIDAR contours are not always included in the less detailed wider area 2m contours;

- A recently opened (2015) railway line runs close to the Scheme to the south-east between the A720 and the A6106 in a cutting, however this feature is not included in the provided LIDAR 0.5m contour data or the wider area 2m contour data;
- The identification of residential properties and potentially sensitive non-residential buildings has been based on the OS Addressbase Plus dataset. This dataset is not 100% complete or accurate. Some manual checking has been completed based on publically available data sources such as Bing aerial photography and Google Streetview; and
- Building height data as provided as part of the OS mastermap dataset has been used to estimate building heights. This dataset is not 100% complete or accurate. Therefore a range of standard building heights has been applied to residential properties. For non-residential buildings the provided dataset has, in general, been applied. Some manual checking to assess if the building heights were reasonable has been completed, based on publically available data sources such as Bing aerial photography and Google Streetview.

### 6.6.2 Potential Construction Effects

No detailed information is currently available on the nature of the works required to construct the three options, although works such as site clearance, earthworks, bridge construction, carriageway surfacing and landscaping are likely to be required. It is anticipated that each of the options would entail approximately an eighteen month construction period. With regard to construction vibration the need for piling is likely to be limited to the new bridge required with each option. No information is currently available on the need for piled foundations at the new bridge, or the type of any such piling. No information on the need for ground improvement works, or if vibratory methods would be proposed is known. The use of vibratory rollers to compact earthworks is a possibility. With regard to construction traffic, no information is currently available on the likely volume or routes.

The risk of vibration induced building damage from piling, ground improvement works or earthwork compaction is considered to be very low. The magnitude of impact in terms of vibration induced building damage is classed as negligible, therefore the significance of the effect is classed as neutral. The risk of annoyance due to construction vibration from standard construction works would be limited to the very closest receptors such as those at Sheriffhall Farm and House and Summerside. There is the potential for temporary vibration annoyance impacts of minor magnitude at the closest residential properties. Residential properties are classed as high sensitivity therefore the potential significance of effect is classed as slight adverse.

Construction noise impacts are likely to extend over a larger area. Approximately 17 residential properties are located within 100 m of Option A, 14 within 100 m of Option B, and 17 within 100 m of Option C. Given the close proximity of receptors to the proposed scheme construction works, there would be the potential for major adverse impacts at some receptors due to construction noise. At residential properties, there is the potential for large adverse significant effects.

The magnitude of the impact and the significance of the effect at individual receptors will vary depending on their proximity to the works. Based simply on the physical extent of the works, Option B is likely to result in the lowest construction noise and vibration impacts and Option C the highest.

### 6.6.3 Operational Impacts

A total of 611 residential buildings are considered in the Do-Minimum to Do-Something comparisons for all options. However, only 20 properties meet the DMRB criterion of 55 dB  $L_{\text{night, outside}}$  at one or more façades in one or more scenarios for inclusion in the night-time traffic noise assessment for Option A and B. For Option C, 21 properties meet this criterion.

A total of 9 non-residential sensitive receptors are located within the 600 m study area of the detailed quantitative predictions, consisting of 1 educational building (nursery), 2 medical buildings (hospital and health centre), 2 community buildings (library and leisure centre), and 4 scheduled monuments.

The sections below provide further comment on proposed scheme operational phase noise impacts for each option in turn.

All the comparisons in the short and long term are based on the façade which would experience the worst case change in traffic noise levels for that comparison. The results are provided for the top floor of each building, for example, 1.5 m for a 1 storey house, 4 m for a 2 storey house etc.

### 6.6.4 Option A

Table 6.12 summarises the short-term change in predicted traffic noise levels in 2024 between the Do-Minimum (DM) and the Option A Do-Something (DS) scenarios at both residential buildings and other sensitive receptors within the 600 m study area. Table 6.13 summarises the long-term change between the 2024 Do-Minimum and 2039 Option A Do-Something scenarios.

**Table 6.12 – Option A Short-term Change in Traffic Noise Levels (DM 2024 to DS 2024)**

Change in Noise Level		Daytime	
		Number of Residential Buildings	Number of Other Sensitive Receptors
Increase in noise level Daytime $L_{A10,18h}$ dB	0.1 – 0.9	34	2
	1.0 - 2.9	575	7
	3.0 - 4.9	0	0
	$\geq 5$	0	0
No Change	0	1	0
Decrease in noise level Daytime $L_{A10,18h}$ dB	0.1 - 0.9	1	0
	1.0 - 2.9	0	0
	3.0 - 4.9	0	0
	$\geq 5$	0	0

**Table 6.13 – Option A Long-term Change in Traffic Noise Levels (DM 2024 to DS 2039)**

Change in Noise Level		Daytime		Night-time
		Number of Residential Buildings	Number of Other Sensitive Receptors	Number of Residential Buildings
Increase in noise level Daytime $L_{A10,18h}$ dB Night –time $L_{night,outside}$ dB	0.1 –2.9	608	9	20
	3.0 - 4.9	2	0	0
	5.0 - 9.9	0	0	0
	$\geq 10$	0	0	0
No Change	0	0	0	0
Decrease in noise level Daytime $L_{A10,18h}$ dB	0.1 - 2.9	1	0	0
	3.0 - 4.9	0	0	0
Night –time $L_{night,outside}$ dB	5.0 - 9.9	0	0	0
	$\geq 10$	0	0	0

The noise changes from Do-Minimum (DM) 2024 to Do-Something (DS) 2024 and DM 2024 to DS 2039 for Option A are presented as noise difference contour plots in Figure 6.2 – Option A Short Term Traffic Noise Change and Figure 6.3 – Option A Long Term Traffic Noise Change respectively. These maps are based on free-field traffic noise levels at first floor level (calculated at 4 m above ground). It should be noted that the noise difference contour plots are based on a 10 m x 10 m grid and are provided for illustration purposes.

As detailed in Table 6.11, in the short-term in 2024 for Option A, the majority of residential buildings (around 94%) would experience a minor (1.0 - 2.9 dB) increase in daytime traffic noise levels due to the proposed scheme. Around 6% would experience a negligible increase (0.1 - 0.9 dB), and a small number (<1%) would experience no change or a negligible decrease (0.1 - 0.9 dB). No residential buildings experience a moderate (3.0 – 4.9 dB) or major ( $\geq 5$  dB) increase in noise levels, and likewise no residential buildings experience a minor, moderate or major decrease in traffic noise levels. Two of the scheduled monument sites experience a negligible increase in traffic noise in the short term (0.1 – 0.9 dB), the remainder of the non-residential receptors experience a minor increase (1.0 – 2.9 dB).

As detailed in Table 6.13, in the long-term in 2039 for Option A, the vast majority of residential buildings (>99%) would experience a negligible increase (0.1 – 2.9 dB). A small number (<1%) experience a minor (3.0 – 4.9 dB) increase in traffic noise levels. All the non-residential receptors experience a negligible increase in traffic noise in the long term (0.1 – 2.9 dB). At night all the selected residential properties experience a negligible increase in the long term (0.1 – 2.9 dB).

The source of the widespread negligible/minor increase in traffic noise levels across the study area is the increase in traffic flows and speeds due to the Scheme, which is the consequence of improving the junction and relieving congestion both on the A720 and surrounding connecting roads. As illustrated on the noise difference contour plots the realignment of the A7 and A6106 results in corresponding increases and decreases in traffic noise levels, which benefits the front façade of receptors facing directly onto the A7 at Summerside and Campend. The construction of the A720 and the slip roads on embankment also provides some localised benefits in the immediate shadow of the embankment.

Table 6.14 details the change in the CRTN Basic Noise Level (BNL) for Option A at the identified affected routes beyond the 1 km study area. The location of these roads is provided on Figures 6.2 and 6.3. All of these roads have been identified as affected routes because of a change in the Basic Noise Level in the short term DM 2024 to DS 2024 of 1.0 dB or more. All the identified affected routes are predicted to experience a minor (1.0 - 2.9 dB) short-term increase in traffic noise levels at the roadside due to the general increase in traffic flows and speeds with the proposed Scheme in operation. No residential or non-residential sensitive receptors have been identified within 50 m of these affected routes.

For all options, no routes beyond 1 km have been identified as affected routes due to an exceedance of the 3 dB change threshold in the long term DM 2024 to DS 2039, though the results are provided for completeness.

**Table 6.14 – Option A Affected Routes Beyond 1 km - Change in Traffic Noise Levels (DM 2024 to DS 2024 and DM 2024 to DS 2039)**

Link Ref.	Description	No. Receptors within 50 m		Basic Noise Level $L_{A10,18h}$ dB at 10 m from the Road			
		Residential	Non-Residential	2024 DS	2039 DS	ST Change	LT Change
1:2 & 32:33	A720 Between Gilmerton Rd and Lasswade Rd	0	0	81.1	81.4	+1.0	+1.3
2:3 & 31:32	Junctions	0	0	81.2	81.5	+1.1	+1.4
3:294 & 30:31		0	0	81.4	81.7	+1.1	+1.4

## 6.6.5 Option B

Table 6.15 summarises the short-term change in predicted traffic noise levels in 2024 between the Do-Minimum (DM) and the Option B Do-Something (DS) scenarios at both residential buildings and other sensitive receptors within the 600 m study area. Table 6.16 summarises the long-term change between the 2024 Do-Minimum and 2039 Option B Do-Something scenarios.

**Table 6.15 – Option B Short-term Change in Traffic Noise Levels (DM 2024 to DS 2024)**

Change in Noise Level	Daytime		
		Number of Residential Buildings	Number of Other Sensitive Receptors
Increase in noise level Daytime $L_{A10,18h}$ dB	0.1 – 0.9	27	2
	1.0 - 2.9	584	7
	3.0 - 4.9	0	0
	≥5	0	0
No Change	0	0	0
Decrease in noise level Daytime $L_{A10,18h}$ dB	0.1 - 0.9	0	0
	1.0 - 2.9	0	0
	3.0 - 4.9	0	0

## Change in Noise Level

Change in Noise Level	Daytime	
	Number of Residential Buildings	Number of Other Sensitive Receptors
≥5	0	0

Table 6.16 – Option B Long-term Change in Traffic Noise Levels (DM 2024 to DS 2039)

Change in Noise Level		Daytime		Night-time
		Number of Residential Buildings	Number of Other Sensitive Receptors	Number of Residential Buildings
Increase in noise level Daytime $L_{A10,18h}$ dB Night –time $L_{night,outside}$ dB	0.1 – 2.9	609	9	20
	3.0 - 4.9	2	0	0
	5.0 - 9.9	0	0	0
	≥10	0	0	0
No Change	0	0	0	0
Decrease in noise level Daytime $L_{A10,18h}$ dB Night –time $L_{night,outside}$ dB	0.1 - 2.9	0	0	0
	3.0 - 4.9	0	0	0
	5.0 - 9.9	0	0	0
	≥10	0	0	0

The noise changes from Do-Minimum (DM) 2024 to Do-Something (DS) 2024 and DM 2024 to DS 2039 for Option B are presented as noise difference contour plots in Figure 6.4 – Option B Short Term Traffic Noise Change and Figure 6.5 – Option B Long Term Traffic Noise Change respectively. These maps are based on free-field traffic noise levels at first floor level (calculated at 4 m above ground). It should be noted that the noise difference contour plots are based on a 10 m x 10 m grid and are provided for illustration purposes.

As detailed in Table 6.15, in the short-term in 2024 for Option B, the majority of residential buildings (around 96%) would experience a minor (1.0 - 2.9 dB) increase in daytime traffic noise levels due to the proposed scheme. Around 4% would experience a negligible increase (0.1 - 0.9 dB). No residential buildings experience a moderate (3.0 – 4.9 dB) or major (≥5 dB) increase in noise levels, and likewise no residential buildings experience no change or a decrease in traffic noise levels. Two of the scheduled monument sites experience a negligible increase in traffic noise in the short term (0.1 – 0.9 dB), the remainder of the non-residential receptors experience a minor increase (1.0 – 2.9 dB).

As detailed in Table 6.16, in the long-term in 2039 for Option B, the vast majority of residential buildings (>99%) would experience a negligible increase (0.1 – 2.9 dB) in traffic noise. Two (<1%) experience a minor (3.0 – 4.9 dB) increase. All the non-residential receptors experience a negligible increase in traffic noise in the long term (0.1 – 2.9 dB). At night all the selected residential properties experience a negligible increase in the long term (0.1 – 2.9 dB).

The source of the widespread negligible/minor increase in traffic noise levels across the study area is the increase in traffic flows and speeds due to the Scheme, which is the consequence of improving the junction and relieving congestion both on the A720 and surrounding connecting roads. As illustrated on the noise difference contour plots the realignment of the A7 and A6106 results in corresponding increases and decreases in traffic noise levels, which benefits the front façade of receptors facing directly onto the A7 at Summerside. The construction of the A720 and the slip roads on embankment also provides some localised benefits in the immediate shadow of the embankment.

Table 6.17 details the change in the CRTN Basic Noise Level for Option B at the identified affected routes beyond the 1 km study area. The location of these roads is provided on Figures 6.4 and 6.5. All of these roads have been identified as affected routes because of a change in the Basic Noise Level in the short term DM 2024 to DS 2024 of 1.0 dB or more. All the identified affected routes are predicted to experience a minor (1.0 - 2.9 dB) short-term increase in traffic noise levels at the roadside due to the general increase in traffic flows and speeds with the proposed Scheme in operation. No residential or non-residential sensitive receptors have been identified within 50 m of these affected routes.

For all options, no routes beyond 1 km have been identified as affected routes due to an exceedance of the 3 dB change threshold in the long term DM 2024 to DS 2039, though the results are provided for completeness.

**Table 6.17 – Option B Affected Routes Beyond 1 km - Change in Traffic Noise Levels (DM 2024 to DS 2024 and DM 2024 to DS 2039)**

Link Ref.	Description	No. Receptors within 50 m		Basic Noise Level $L_{A10,18h}$ dB at 10 m from the Road			
		Residential	Non-Residential	2024 DS	2039 DS	ST Change	LT Change
1:2 & 32:33	A720 Between Gilmerton Rd and Lasswade Rd	0	0	81.1	81.4	+1.0	+1.3
2:3 & 31:32	Junctions	0	0	81.2	81.5	+1.1	+1.4
3:294 & 30:31		0	0	81.4	81.7	+1.1	+1.4

### 6.6.6 Option C

Table 6.18 summarises the short-term change in predicted traffic noise levels in 2024 between the Do-Minimum (DM) and the Option C Do-Something (DS) scenarios at both residential buildings and other sensitive receptors within the 600 m study area. Table 6.19 summarises the long-term change between the 2024 Do-Minimum and 2039 Option C Do-Something scenarios.

**Table 6.18 – Option C Short-term Change in Traffic Noise Levels (DM 2024 to DS 2024)**

Change in Noise Level		Daytime	
		Number of Residential Buildings	Number of Other Sensitive Receptors
Increase in noise level Daytime $L_{A10,18h}$ dB	0.1 – 0.9	56	3
	1.0 - 2.9	549	6
	3.0 - 4.9	1	0
	$\geq 5$	0	0
No Change	0	0	0
Decrease in noise level Daytime $L_{A10,18h}$ dB	0.1 - 0.9	3	0
	1.0 - 2.9	2	0
	3.0 - 4.9	0	0
	$\geq 5$	0	0

**Table 6.19 – Option C Long-term Change in Traffic Noise Levels (DM 2024 to DS 2039)**

Change in Noise Level		Daytime		Night-time
		Number of Residential Buildings	Number of Other Sensitive Receptors	Number of Residential Buildings
Increase in noise level Daytime $L_{A10,18h}$ dB Night –time $L_{night, outside}$ dB	0.1 – 2.9	605	9	16
	3.0 - 4.9	1	0	0
	5.0 - 9.9	0	0	0
	$\geq 10$	0	0	0
No Change	0	0	0	0
Decrease in noise level Daytime $L_{A10,18h}$ dB Night –time $L_{night, outside}$ dB	0.1 - 2.9	5	0	5
	3.0 - 4.9	0	0	0
	5.0 - 9.9	0	0	0
	$\geq 10$	0	0	0



The noise changes from Do-Minimum (DM) 2024 to Do-Something (DS) 2024 and DM 2024 to DS 2039 for Option C are presented as noise difference contour plots in Figure 6.6 – Option C Short Term Traffic Noise Change and Figure 6.7 – Option C Long Term Traffic Noise Change respectively. These maps are based on free-field traffic noise levels at first floor level (calculated at 4 m above ground). It should be noted that the noise difference contour plots are based on a 10 m x 10 m grid and are provided for illustration purposes.

As detailed in Table 6.18, in the short-term in 2024 for Option C, the majority of residential buildings (around 90%) would experience a minor (1.0 - 2.9 dB) increase in daytime traffic noise levels due to the proposed scheme. Around 9% would experience a negligible increase (0.1 - 0.9 dB) and one property at Summerside a moderate increase (3.0 to 4.9 dB). A small number of properties at Campend (<1%) would experience a negligible (0.1 - 0.9 dB) or minor (1.0 – 2.9 dB) decrease. No residential buildings experience a major ( $\geq 5$  dB) increase in noise levels, and likewise no residential buildings experience no change or a moderate or major decrease in noise levels. Three of the scheduled monument sites experience a negligible increase in traffic noise in the short term (0.1 – 0.9 dB), the remainder of the non-residential receptors experience a minor increase (1.0 – 2.9 dB).

As detailed in Table 6.19, in the long-term in 2039 for Option C, the vast majority of residential buildings (99%) would experience a negligible increase (0.1 – 2.9 dB). Five properties at Campend would experience a negligible decrease (0.1 – 2.9 dB), whilst one property at Summerside experiences a minor (3.0 – 4.9 dB) increase. All the non-residential receptors experience a negligible increase in traffic noise in the long term (0.1 – 2.9 dB). At night 16 of the selected residential properties experience a negligible (0.1 - 2.9 dB) increase and the five properties at Campend a negligible decrease.

The source of the widespread negligible/minor increase in traffic noise levels across the study area is the increase in traffic flows and speeds due to the Scheme, which is the consequence of improving the junction and relieving congestion both on the A720 and surrounding connecting roads. As illustrated on the noise difference contour plots, the realignment of the A7 and A6106, and the construction of the new junction to the west, results in corresponding increases and decreases in traffic noise levels. This benefits the front façade of receptors facing directly onto the A7 at Summerside and Campend, though at Summerside this is potentially offset by the new A7 constructed to the rear of the receptors. At the rear of one property at Summerside a short term increase of just over 3 dB is predicted as the rear façade is shielded from the A7 in the Do-Minimum scenario by adjacent properties, but faces towards the relocated A7 in the Do-Something scenario.

Table 6.20 details the change in the CRTN Basic Noise Level for Option C at the identified affected routes beyond the 1 km study area. The location of these roads is provided on Figures 6.6 and 6.7 – Option C Traffic Noise Change. All of these roads have been identified as affected routes because of a change in the Basic Noise Level in the short term DM 2024 to DS 2024 of 1.0 dB or more. All the identified affected routes are predicted to experience a minor (1.0 - 2.9 dB) short-term increase in traffic noise levels at the roadside due to the general increase in traffic flows and speeds with the proposed scheme in operation. No residential or non-residential sensitive receptors have been identified within 50 m of these affected routes.

For all options, no routes beyond 1 km have been identified as affected routes due to an exceedance of the 3 dB change threshold in the long term DM 2024 to DS 2039, though the results are provided for completeness.

**Table 6.20 – Option C Affected Routes beyond 1 km - Change in Traffic Noise Levels (DM 2024 to DS 2024 and DM 2024 to DS 2039)**

Link Ref.	Description	No. Receptors within 50 m		Basic Noise Level $L_{A10,18h}$ dB at 10 m from the Road			
		Residential	Non-Residential	2024 DS	2039 DS	ST Change	LT Change
1:2 & 32:33	A720 Between Gilmerton Rd and Lasswade Rd	0	0	81.1	81.4	+1.0	+1.3
2:3 & 31:32	Junctions	0	0	81.2	81.3	+1.1	+1.2
3:294 & 30:31		0	0	81.4	81.4	+1.1	+1.1

## 6.7 Potential Mitigation

### 6.7.1 Construction

A Construction Environmental Management Plan (CEMP) would be prepared and implemented by the selected construction contractor. The CEMP would include a range of best practice measures associated with mitigating potential noise and vibration impacts - such measures are described below:

- Selection of quiet and low vibration equipment;
- Review of construction programme and methodology to consider low noise/ low vibration methods (including non-vibratory compaction plant and low vibration piling methods, where required);
- Optimal location of equipment on site to minimise noise disturbance;
- The provision of acoustic enclosures to static plant, where necessary;
- Use of less intrusive reversing alarms, such as broadband vehicle reversing warnings; and
- Local screening of equipment and employment of perimeter hoarding.

It is not currently known if any night time, evening or weekend works will be required for any of the options. The need for any such works would be reviewed within the CEMP with a view to reducing their occurrence and duration to a minimum.

During the proposed scheme construction phase appropriate mechanisms to communicate with local residents would be set up to highlight potential periods of disruption (e.g. web-based, newsletters, newspapers, radio announcements etc. and provision of site contact details).

### 6.7.2 Operation

The assessment methodology in DMRB recommends that mitigation should be considered where there is an increase in traffic noise levels of 1 dB or greater in the short-term or 3 dB or greater in the long-term.

For all options the majority of the study area experiences a minor increase in traffic noise levels in the short term (i.e. greater than the 1 dB short term threshold), and a negligible increase in the long term (i.e. below the 3 dB long term threshold). The purpose of the Scheme is to reduce congestion at the Sheriffhall junction, therefore an increase in traffic flows and speeds on the A720, and the main roads connecting to the junction (A7 and A6106), is an inevitable consequence of the scheme.

The potential for mitigation measures such as noise barriers is likely to be limited to within the Scheme extents, therefore, the benefit of any such measures would be limited to the small number of receptors close to the junction. The need for any such noise barriers/bunds will be considered at Stage 3. Noise barriers along the wider road network are unlikely to be possible or practical therefore the wider impact of the Scheme would remain unchanged.

Based on information from Transport Scotland low noise surfacing has been assumed on the whole length of the A720 mainline and slip roads within the noise model extents, in both the Do-Minimum and Do-Something scenarios, and in both 2024 and 2039.

## 6.8 Summary of Effects

Table 6.21 below gives likely significance of impacts prior to mitigation, and likely significance with mitigation. Unless otherwise stated, impacts are adverse. Conclusions with regard to the construction and operational impacts of the three options are provided in section 6.10.

**Table 6.21 – Potential Construction and Operational Effects**

	Option	Predicted Impacts	Magnitude of Predicted Impact	Sensitivity of Receptor	Significance of Effect	Potential Mitigation Measures	Residual Effects
<b>Sensitive Receptors within 600m Study Area, Predominantly Residential Properties</b>							
Construction Vibration – Building Damage	Common to All Options	Potential for building damage	Negligible	Medium/ High	Neutral	Choice of construction methods, standard best practicable means, site specific mitigation if required to be determined once contractor involved and specific information available	Neutral
Construction Vibration – Annoyance	Common to All Options	Potential for annoyance	Minor	Medium/ High	Slight	Choice of construction methods, standard best practicable means, site specific mitigation if required to be determined once contractor involved and specific information available	Slight
Construction Noise	Common to All Options	Potential for disturbance	Major	Medium/ High	Large	Choice of construction methods, standard best practicable means, site specific mitigation if required to be determined once contractor involved and specific information available	Large
Operational Traffic Noise	Common to All Options	Potential for annoyance	Minor	Medium/ High	Slight	Low noise surface included in design. Additional mitigation measures to be considered at Stage 3 if required and feasible	Slight

## 6.9 Compliance with Policies and Plans

City of Edinburgh Council Policy Env 22 and Mid Lothian Council Policy Env 18 require a noise impact assessment to be completed for new developments. The assessment reported herein meets this requirement.

The City of Edinburgh policy states planning permission will not be granted if significant adverse effects are likely from a development. The Midlothian policy aims to avoid unacceptable impacts. This assessment indicates that all impacts will be negligible or minor in magnitude for all three options.

## 6.10 Conclusions

### 6.10.1 Construction

No detailed information is currently available on the nature of the works required to construct the three options, therefore a qualitative assessment of the likely impacts has been completed. It is anticipated that each of the options would entail approximately an eighteen month construction period.

The risk of vibration induced building damage is considered to be very low and the significance of the effect is classed as neutral. The risk of annoyance due to construction vibration from standard construction works would be limited to the very closest receptors. There is the potential for slight adverse effects due to temporary vibration annoyance impacts at the closest residential properties.

Construction noise impacts are likely to extend over a larger area. Given the close proximity of receptors there is the potential for large adverse significant effects at nearby receptors.

The magnitude of the impact and the significance of the effect at individual receptors will vary depending on their proximity to the works. Based simply on the physical extent of the works, Option B is likely to result in the lowest construction noise and vibration impacts and Option C the highest. However, at this stage before any specific construction information is available construction noise and vibration impacts should not be considered as a major factor in determining which option to take forward.

### 6.10.2 Operation

Due to the purpose of the Scheme being to reduce congestion at the Sheriffhall junction, an increase in traffic flows and speeds is anticipated on the A720, and the majority of the surrounding connecting roads, with all the options. This results in a predominantly minor increase in traffic noise levels in the short term across the majority of the study area for all options. In the long term the magnitude of the increase is negligible across the majority of the study area for all options. The significance of the effect of all the options on traffic noise levels is classed as slight adverse.

In comparing the three options for the Scheme, the traffic noise impact of each is very similar in its extent and magnitude.

Overall the differences in operational traffic noise impacts between the options are minimal and limited to the very closest receptors to the junction, and as such operational noise should not be considered as a major factor in determining which option to take forward.

## 6.11 Scope of DMRB Stage 3 Assessment

A 'detailed' level DMRB assessment of the preferred scheme is proposed at stage 3. In addition, the baseline noise survey previously completed in 2006 will be updated. As part of the detailed level assessment an initial indication of the likelihood of any residential properties qualifying under the Noise Insulation (Scotland) Regulations will be made.

## 7. Air Quality

### 7.1 Introduction

The current Air Quality section of the Design Manual for Roads and Bridges (DMRB), i.e. Volume 11, Section 3, Part 1 '*Air Quality*': HA207/07, no longer includes Stage 1, 2 and 3 assessments. Instead, it focuses on a 'fit-for-purpose' approach based on four assessment levels:

- Scoping;
- Simple;
- Detailed; and,
- Mitigation / enhancement and monitoring.

For the purposes of this report a detailed level assessment involving dispersion modelling has been carried out. This is appropriate to assess a number of different options, when sufficient information is available to complete a quantitative assessment.

This chapter details the assessment of predicted air quality impacts associated with the construction and operation of the three proposed options for the A720 Sheriffhall Roundabout Improvement, the 'Scheme'.

Temporary dust impacts arising from the construction works associated with the proposed Scheme are discussed in Section 7.6.3. At present a construction contractor has not been appointed, and as such the construction methods and plant to be used are not known. A qualitative construction dust assessment has been carried based on the currently available information on the nature and duration of the construction works.

The proposed Scheme operation will potentially affect traffic emissions and therefore exposure to air pollutant concentrations as experienced by sensitive receptors, such as occupiers of residential properties in the vicinity of the proposed scheme, and along any other existing affected roads on the local road network.

The assessment considers absolute traffic related emission levels, changes in traffic emissions and the effects of air quality concentrations of the pollutants nitrogen dioxide (NO<sub>2</sub>) and particulates (PM<sub>10</sub>) on residential properties and other sensitive receptors. The assessment considers the following scenarios for which traffic data were generated:

- Base 2014: the base year of data used for model verification purposes;
- Do-Minimum 2024 (DM 2024): the year of full opening 2024 without the proposed scheme;
- Do-Something 2024 (DS 2024): year of full opening, with each of the three proposed scheme options;
- Do-Minimum 2039 (DM 2039): future assessment year 15 years after full opening, without the proposed scheme; and
- Do-Something 2039 (DS 2039): future assessment year 15 years after full opening, with each of the three proposed scheme options.

### 7.2 Approach and Methodology

#### 7.2.1 Baseline Monitoring

There is no existing air quality monitoring conducted in the study area by surrounding local authorities. AECOM was therefore commissioned to undertake a six month baseline survey to monitor NO<sub>2</sub> concentrations from April 2015 to September 2015. To do this, passive diffusion tubes were located at nine sites close to the study area (see Table 7.1 and Figure 7.2 – Air Quality Study Area). These site locations were chosen as they represented worst case sites of relevant exposure to the annual mean objective value. Site I (Kingsacre Golf Course) was also included to provide an indication of the background concentration away from road sources. The results for these tubes were annualised to represent an annual mean for the base year of 2014 to be used as part of the model verification process (see Section 7.5.1).

**Table 7.1 - Air Quality Monitoring Locations**

ID	Site description	Number of tubes	X coordinate	Y coordinate
A	Gilmerton Road	3	330542	667933
B	Melville Grange	3	331202	667630
C	Burnside	3	330820	667778
D	Melville Inn	3	331571	667436
E	Campend	3	331565	668265
F	Summerside	3	331659	668100
G	Sheriffhall Farm	3	331979	667936
H	West End of Dalkeith	3	332507	667630
I	Kingsacre Golf Course	1	330487	667063

### 7.2.2 Construction Dust

The DMRB construction phase assessment for air quality requires the air quality assessor to identify key sensitive receptor locations that may require mitigation to reduce the effects of dust emissions and to propose methods of mitigation. This assessment considers the potential for adverse effects from construction along the Scheme route.

The consideration of construction dust is based on the approach set out in DMRB. Sensitive receptors located along the Scheme that may be adversely affected during the construction phase have been identified. Dust sensitive receptors are defined as residential and industrial properties within 400 metres of construction boundaries and construction compounds. Where required to mitigate potential adverse impacts on sensitive receptors, mitigation measures have been recommended.

There are no nationally designated ecosystems (e.g. SSSIs, SACs and SPAs) within 200 m of any construction works which includes Dalkeith Oakwood Site of SSSI (which is located over 250m from the A720, to the east of the proposed Scheme). Therefore impacts upon designated ecosystems have been scoped out of the construction phase dust impact assessment.

Sensitive receptors that may be affected by construction HGV movements and traffic management are those located within 200 m the proposed scheme (and potential construction compounds) and the roads used to access the works. Whilst receptors in proximity to the proposed scheme are understood, given that HGV movement routes are not fully known, some receptors cannot be identified until further information is available from an appropriate construction.

The overall aim is for the scheme (including mitigation measures if necessary) to not introduce the potential for additional complaints to be generated due to construction related dust emissions.

### 7.2.3 Operational Air Quality Effects

Based on the methodology in HA 207/07, the assessment of operational impacts considers air quality impacts due to changes in road traffic related emissions at both a local and regional scale for the following three options:

- Option A
  - Visibility review undertaken and verges widened as required for stopping sight distance
  - Slip roads lengthened to aid constructability
  - Shared cycleway/footway incorporated with at-grade crossings
- Option B
  - Visibility review undertaken and verges widened as required for stopping sight distance
  - Slip roads lengthened to aid constructability

- Shared cycleway/footway incorporated with at-grade crossings – revised since the exhibition to bring in line with Option A and ensure fair comparative assessment
- Option C
  - Visibility review undertaken and verges widened as required for stopping sight distance
  - Shared cycleway/footway incorporated. Footbridge shown indicatively for A720 crossing and A6106 Old Dalkeith Road crossing via subway.
  - A6106 Millerhill Road Entry flare length increased to improve operational capacity

### 7.2.3.1 Local Assessment

At the local scale the assessment focuses on impacts on sensitive residential properties located within 200 metres of the existing A720, A6106, A7 and A6106 roads near the A720 roundabout. Within this distance of a road, emissions from vehicles will affect air quality and, therefore, the levels of pollutants. Beyond 200 metres, emissions will have dispersed sufficiently for concentrations to remain at background levels.

For Stage 2, the local air quality study area is conducted for the opening year (2024) and includes roads and receptors within a zone that is within 500 metres of the maximum extent of the existing A720 Sheriffhall Roundabout that is to be upgraded by the options. The ADMS-Roads modelling software is used to predict pollution levels at selected receptors in order to give an indication of the magnitude and significance of the change due to each of the three options compared to the baseline in the same year. To enable a 'like for like' comparison between the baseline and each option, the study area for the baseline and each option is identical.

As part of the Stage 1 scoping assessment, a number of residential properties within 200 metres were identified but no designated nature consideration sites (SACs, SPAs, pSPAs, SSSIs and Ramsar sites) were identified within the 200m local air quality study area. The nearest designated site is Dalkeith Oakwood SSSI. This site is located more than 250m from the A720, to the east of the proposed Scheme and therefore no adverse effect on air quality is anticipated due to the Scheme at this site. No assessment of the effect of air quality on ecological sites is therefore required as part of the Stage 2 assessment.

The local assessment focuses on the following regulated air quality pollutants: NO<sub>2</sub> and PM<sub>10</sub> in the opening year of 2024.

### 7.2.3.2 Regional Assessment

At the regional scale the assessment focuses on total annual pollution emissions of NO<sub>x</sub>, PM<sub>10</sub>, and carbon dioxide (CO<sub>2</sub>). The DMRB sets the following criteria regarding changes in traffic flows, composition and speed, which if met, requires an assessment of regional impacts:

- a change of more than 10% in AADT; or
- a change of more than 10% to the number of heavy duty vehicles; or,
- a change in daily average speed of more than 20 km/hr.

The verification process is not applied to the regional calculations. Total annual pollution emissions for the air quality study area for the baseline and each option is calculated using the Emissions Factor Toolkit, EFT (v7) based on the supplied traffic data between the same start and end point on the A720 Sheriffhall Roundabout. With regard to road traffic emissions, the change with respect to the baseline is determined for the opening year (2024) and future design year (2039).

#### Significance of Impacts

To convey the level of impact of the proposed options, it is necessary to determine the significance of the predicted air quality impact. This is a function of the sensitivity of the receptor and the scale or magnitude of the impact. In this study, all assessed receptors are considered of equal sensitivity as the annual mean objectives apply to 'all locations where members of the public might be regularly exposed including: building facades of residential properties, schools, hospitals, care homes etc. (Defra, 2016). Therefore, if the receptor is at the façade of a residential building, it is assumed that any member of the public could be present within the building, including the elderly, infants, or other vulnerable groups.

The significance of the predicted changes in local air quality due to the proposed options (DS scenario) at 9 selected representative sensitive receptors compared to the DM base has been determined following the interim advice note; IAN174/13 (Highways Agency 2013). This note has not been officially adopted by Transport Scotland but it provides guidelines to determine significant local air quality effects. This methodology takes into account the magnitude of change from DM to DS, concentration of pollutant above the objective and the number of relevant receptors affected.

As taken from this note, the magnitude of change criteria for the assessment of air quality relevant to an objective is provided in Table 7.2. For the short term PM<sub>10</sub> objective, the number of permissible days of exceeding the objective is based on the relationship with the annual mean as given in LAQM.TG16 (Defra 2016).

**Table 7.2 – Magnitude of Changes in Ambient Pollutant Concentrations Relative to Air Quality Objectives**

Magnitude of Change	Change in NO <sub>2</sub> (AQO: 40 µg/m <sup>3</sup> )	Change in PM <sub>10</sub> (AQO: 18 µg/m <sup>3</sup> )
Imperceptible (<1% +/- of AQO)	<0.4 µg/m <sup>3</sup>	<0.18µg/m <sup>3</sup>
Small(1-5% +/- of AQO)	0.4– 2 µg/m <sup>3</sup>	0.18 – 0.85 µg/m <sup>3</sup>
Medium (5-10% +/- of AQO)	2-4 µg/m <sup>3</sup>	0.85 - 1.8 µg/m <sup>3</sup>
Large (>10% +/- of AQO)	>4 µg/m <sup>3</sup>	>1.8 µg/m <sup>3</sup>

An imperceptible change is considered to be non-significant.

Highways England has developed a framework to provide guidance on the number of receptors for each of the magnitude of change categories that might result in a significant effect (see Table 7.3). These are guideline values only, and therefore are to be used to inform professional judgement on significant effects of each option.

**Table 7.3 - Guideline to Number of Receptors that Constitute a Significant Effect in Terms of Magnitude of Change in Pollutant Concentration**

Magnitude of change	Number of receptors	
	Worsening of AQO already above objective or creation of a new exceedance	Improvement of an AQO already above objective or removal of an exceedance
Large	1 to 10	1 to 10
Medium	10 to 30	10 to 30
Small	30 to 60	30 to 60

The significance of the change is likely to be greater, the higher above the air quality objectives that the changes are predicted to occur, where it is predicted that the short term NO<sub>2</sub> and/or PM<sub>10</sub> thresholds are exceeded and where there are few or no receptors with any improvements. The potential for the scheme to contribute to/or interfere with the successful implementation of policies and strategies for the management of local air quality is also relevant but the focus is on change to the likelihood of future achievement of the air quality objective values.

In addition to considering the magnitude of change, a number of other criteria given in IAN 174/13 (Highways Agency, 2013) are used to inform professional judgement on the significance of the impact. These include (but are not limited to) the following criteria:

- Is there a risk the air quality objectives will be breached?
- Is the magnitude of change predicted to be large?
- Will the effect continue for a long time (e.g. six years or more)?
- How many people will be affected?
- Taking into account the uncertainty and limitations given in the model, is there a high probability of the effect occurring?
- Will the effect extend over a large area?



## 7.3 Planning Policy Context

### 7.3.1 Legislation

#### **Air Quality Legislation**

The Clean Air for Europe (CAFE) programme revisited the management of Air Quality within the EU and replaced the EU Framework Directive 96/62/EC (Council of European Communities, 1996), its associated Daughter Directives 1999/30/EC (Council of European Communities, 1999), 2000/69/EC (Council of European Communities, 2000), 2002/3/EC (Council of European Communities, 2002), and the Council Decision 97/101/EC (Council of European Communities, 1997) with a single legal act, the Ambient Air Quality and Cleaner Air for Europe Directive 2008/50/EC (Council of European Communities, 2008). Directive 2008/50/EC (Council of European Communities, 2008) is currently transcribed into UK legislation by the Air Quality Standards Regulations 2010 (H.M. Government, 2010), which came into force on 11th June 2010. These limit values are binding on the UK and have been set with the aim of avoiding, preventing or reducing harmful effects on human health and on the environment as a whole.

### 7.3.2 National Policy and Guidance

#### **National Planning Framework (2014)**

The National Planning framework (NPF 3) identifies the need for effective national transport infrastructure that can accommodate sustainable economic growth, along with the need to reduce carbon emissions and improve air quality (Scottish Government, 2014). Through the use of this framework, the Scottish Government sets out its commitment to improving air pollution particularly within densely populated areas.

#### **Planning Advice Note 51 – Environmental Protection**

The central purpose of this Planning Advice Note (PAN) is to support the existing policy on the role of the planning system in relation to the environmental protection regimes, including air quality (Scottish Executive, 2006). PAN51 refers to the need for air quality to be a material consideration in or adjacent to AQMAs for large scale proposals, those that are to be occupied by sensitive groups or likely to have cumulative effects. If needed, conditions may need to be applied to mitigate adverse effects. PAN51 goes on to state that planning authorities may consult with environmental health officers to determine whether a study of air quality issues may be warranted, particularly for proposals which are likely to have a significant impact on air quality.

#### **Scottish Air Quality Objectives**

The air quality objectives and target dates for the main road traffic pollutants are listed in the National Air Quality Strategy (Department for Environment, Food and Rural Affairs; Defra, 2007). Some of these objectives are prescribed in the Air Quality (Scotland) Regulations 2000 (H.M. Government, 2000), and the Air Quality (Scotland) (Amendment) Regulations 2002 (H.M. Government, 2002) (see Table 7.4 below). The EU Limit Values are now prescribed under the Air Quality Standards Regulations 2010 (H.M. Government, 2010), which replaced the Air Quality Limit Values Regulations (H.M. Government, 2007). The Air Quality Standards Regulations transfer EU Directives on ambient air quality into UK law. These objectives are not legally binding unlike Air Quality Limit Values.

**Table 7.4 - Scottish Air Quality Objectives**

Pollutant	Objective value	Averaging Period	Objective Target Date
Nitrogen Dioxide (NO <sub>2</sub> )	40 µg/m <sup>3</sup>	Annual Mean	31/12/2005
	200 µg/m <sup>3</sup> not to be exceeded more than 18 times per year	1hr mean	31/12/2005
Fine Particulate Matter (PM <sub>10</sub> )	18 µg/m <sup>3</sup>	Annual Mean	31/12/2010
	50 µg/m <sup>3</sup> not to be exceeded more than 7 times per year	24 hour mean	31/12/2010

Scottish Planning Policy (SPP) is a statement on how nationally important land use planning matters should be addressed in Scotland. The SPP facilitates development while at the same time “protecting and enhancing the natural and built environment” and is considered to be central to the Scottish Government’s “central purpose of achieving sustainable economic growth”.

### 7.3.3 Local Policy

The A720 is located within both Midlothian Council and Edinburgh City Council’s administrative areas. Relevant air quality planning policies in these Councils include:

#### 7.3.3.1 City of Edinburgh Council

##### ***Edinburgh Local Development Plan (Adopted November 2016)***

The LDP was approved in November 2016 and replaces the Local Plan - Policy Env 22 Pollution and Air, Water and Soil Quality (City of Edinburgh, 2016a). The LDP refers to the need for mitigation to ensure development does not adversely affect air quality in AQMAs or, by cumulative impacts, lead to the creation of further AQMAs in the city and the policy states that “*planning permission will only be granted for development where:*

- a. *there will be no significant adverse effects for health, the environment and amenity and either*
- b. *there will be no significant adverse effects on: air, and soil quality; the quality of the water environment; or on ground stability*
- c. *appropriate mitigation to minimise any adverse effects can be provided”*

##### ***Edinburgh Air Quality Management Areas***

The City of Edinburgh currently has five Air Quality Management Areas (AQMAs) on the basis that objective values for NO<sub>2</sub> would not be met. The Central AQMA is located 7.7 kilometres north west of the A720 Sheriffhall Roundabout and although the Air Quality Action Plan (Edinburgh City Council, 2008) has targets aimed towards Edinburgh City centre itself, there are no specific targets for the A720 Sheriffhall Roundabout or the roads that lead into the roundabout. The Council’s 2016 Annual Progress Report reported that NO<sub>2</sub> concentrations had declined compared to previous years but continued to exceed the annual mean objective within the AQMAs (Edinburgh City Council, 2016b). The Council is also proposing to declare a new AQMA for PM<sub>10</sub> in Salamander Street during 2017.

#### 7.3.3.2 Midlothian Council

##### ***Midlothian Proposed Local Development Plan (2014)***

Policy Env 17 on Air Quality sets out how the Council may require further assessment (either as part of Environmental Impact Assessment or separately) to identify air quality impacts. The Council will refuse planning permission, or seek mitigation, where development proposals cause unacceptable air quality or dust impacts or where sensitive users are located close to those with the potential to generate such pollution (Midlothian Council, 2014).

##### ***Midlothian Air Quality Management Areas***

An AQMA was declared in Pathhead in 2008 for annual mean PM<sub>10</sub> objective exceedance (Midlothian Council, 2008). This AQMA was located 7.4 kilometres south east of the A720 Sheriffhall Roundabout. However, Midlothian Council has subsequently revoked the AQMA as annual mean concentrations of PM<sub>10</sub> have reduced below the objective. The Council ceased automatic monitoring in Dalkeith town centre in 2011 and in Pathhead in 2013 following a reduction in concentrations due to the opening of the Dalkeith Bypass and a reduction in fossil fuel use. The Council now undertake diffusion tube monitoring of NO<sub>2</sub> at 20 sites and the 2016 Annual Progress Report (Midlothian Council, 2016) shows that concentrations are well below the annual mean objective value at all sites.

## 7.4 Consultations

A number of consultations were carried out in 2015 and again in 2016 during the DMRB Stage 2 Options Assessment. This section includes details of consultations of the relevant consultee responses in Table 7.5 below. A full summary of all Stage 2 consultation responses is provided in Chapter 1 - Overview of Environmental Assessment and consultations are provided in full in Appendix 1.1 – Copy of Consultation Responses.

**Table 7.5 – Summary of Consultation Responses**

Consultee	Response
Environmental Health Officer – Midlothian Council	<b>Dated 28/11/2016</b> Asked AECOM to advise whether the remaining three options have been modelled in relation to predicted noise emissions and air quality impacts for each of the three schemes in relation to neighbouring sensitive receptors.
Scottish Environmental Protection Agency (SEPA)	<b>Dated 06/12/2016</b> Identify all aspects of works that may impact upon the environment and potential pollution risks, then identify principals of preventative measures and mitigation. Recommend Environmental Health officers in the relevant local authorities be consulted.
Scottish Natural Heritage (SNH)	<b>Dated 13/11/2013</b> Dalkeith Oakwood SSSI is located within 150 metres of the eastern section of the study area and includes many rare species including lichens which are particularly sensitive to air pollution. Emissions from vehicles travelling on the A720 have been identified as a source of pollution affecting the SSSI. As such we welcome any measures which will improve air quality in this area.

AECOM responded to Midlothian Council on the 1<sup>st</sup> February 2017, stating: *‘To date no traffic noise or air quality predictions relating to the junction upgrade have been completed. A Stage 1 qualitative assessment of various options was completed in 2014 and we are just starting work on the stage 2 assessment. This work will include quantitative predictions of traffic noise and air quality, in accordance with the current DMRB assessment methodology for road schemes. This work is due to be completed and published late March. We would be more than happy to provide you with a copy of the completed assessment once it is published and we will of course continue to liaise with you as we progress to Stage 3 which is likely to include an Environmental Impact Assessment and the preferred option will be modelled again for noise and air.’*

## 7.5 Baseline Conditions

2014 annual mean background pollution concentrations for the study area as taken from the local air quality management section of Defra’s website (Defra, 2017) are all below the relevant air quality strategy objectives (see Table 7.6).

**Table 7.6 - Background Pollutant Concentrations, 2014**

#	Grid square X coordinate	Grid square Y coordinate	Annual mean background concentration ( $\mu\text{g}/\text{m}^3$ )		
			NO <sub>x</sub>	NO <sub>2</sub>	PM <sub>10</sub>
1	331500	667500	18.1	13.3	13.3
2	331500	668500	15.4	11.4	14.0
3	332500	667500	15.6	11.6	11.9
4	332500	668500	16.5	12.2	13.3
Air quality strategy objective			-	40	18

Although the three nearest Councils undertake continuous and/or passive NO<sub>2</sub> and PM<sub>10</sub> air quality monitoring, none of the sites are in the vicinity of the A720 Sheriffhall Roundabout. Therefore, local Council monitoring data were not used for this assessment.

As part of the Stage 1 scheme assessment, baseline monitoring of NO<sub>2</sub> using passive diffusion tubes was conducted for six months. The data for each site were bias adjusted and then annualised to represent a bias

adjusted annual mean concentration for the base year of 2014 following the methodology described in LAQM TG(16) (Defra, 2016). A summary of the baseline monitoring results is set out in Table 7.7. Appendix 7.1 – Air Quality Monitoring includes full details of the monitoring locations.

**Table 7.7 – Measured Annual mean Nitrogen Dioxide Concentrations, 2014**

ID	Site name	NO <sub>2</sub> annual mean (µg/m <sup>3</sup> )
A	Gilmerton Road	41.1
B	Melville Grange	32.1
C	Burnside	21.6
D	Melville Inn	31.9
E	Campend	36.4
F	Summerside	39.5
G	Sheriffhall Farm	21.9
H	West End of Dalkeith	28.4
I	Background Kingsacre Golf Course	14.5

The annualised monitored NO<sub>2</sub> concentrations are below the air quality strategy annual mean objective of 40 µg/m<sup>3</sup> at all sites except Gilmerton Road, and are close to the objective at Summerside.

The monitored concentration at the background site at Kingsacre Golf Course is slightly higher than the Defra background concentrations in the area for 2014. The approach taken for the modelling was to use the measured background concentration from this site rather than the background from the modelled grid square as this better represented the local area. In the opening year of 2024, this concentration was used to estimate a future background concentration of 10.8 µg/m<sup>3</sup> based on the likely change in concentration from the base year in line with Defra projections. For PM<sub>10</sub>, the background concentrations were taken from Defra's background maps in the absence of any monitoring data. Background concentrations have been used from 2020 rather than 2024 to represent a conservative view of future air quality, whereby only some of the improvements assumed by Defra over time are realised.

Further details of the modelling approach and background used are given in Appendix 7.2 – Model Set Up.

### 7.5.1 Verification

This section reports the findings of the model verification procedure conducted for the base year of 2014 using the data collected in the baseline study. Only the following three locations were within the air quality study area for this stage of assessment; Tube ID's G, E and F. Tube I was used as to represent the background concentration in the modelling. A summary of the verification results is given in Table 7.8 and a comparison between the final modelled and measured NO<sub>2</sub> concentrations is shown in Figure 7.1 - - Modelled versus Monitored NO<sub>2</sub> concentrations (unadjusted and adjusted). Full details of model verification are given in Appendix 7.3 – Model Verification.

**Table 7.8 - Summary of the Verification Process**

ID	Monitored Road NO <sub>x</sub> (µg/m <sup>3</sup> )	Modelled Road NO <sub>x</sub> (µg/m <sup>3</sup> )	Adjusted Modelled Road NO <sub>x</sub> (µg/m <sup>3</sup> )	Adjusted Modelled NO <sub>2</sub> (µg/m <sup>3</sup> )
G	14.4	5.6	25.9	27.4
E	45.8	9.5	43.8	35.8
F	53.0	10.5	48.7	37.7

Model bias was quantified by comparing the modelled total NO<sub>2</sub> and road NO<sub>x</sub> values with the measured NO<sub>2</sub> and road NO<sub>x</sub> values for the diffusion tubes. This was accounted for by applying an adjustment factor of 4.63 to the modelled road NO<sub>x</sub> concentrations at the three sites. The data in Figure 7.1 - Modelled versus Monitored NO<sub>2</sub> concentrations (unadjusted and adjusted) shows the resulting adjusted modelled concentrations of NO<sub>2</sub>

compared to the measured concentration at the three monitoring sites. Two sites were within 10% of the measured value and the third site (Sheriffhall Farm) was overestimated by 25%.

The uncertainty in the model has been assessed by comparing these adjusted modelled NO<sub>2</sub> predictions to the measured concentrations and calculating the Root Mean Square Error (RMSE). LAQM TG (016 (Defra, 2016) identifies a standard of model uncertainty, expressed as a RMSE value that is within 10% of the objective value as the ideal. For annual mean NO<sub>2</sub>, 10% of the objective value is 4 µg/m<sup>3</sup>. An RMSE value of 3.4 µg/m<sup>3</sup> was obtained for this model, which can be considered robust.

In the absence of PM<sub>10</sub> monitoring data within the air quality study area, the factor applied to the primary pollutant NO<sub>2</sub> has been applied to this primary pollutant also.

## 7.6 Assessment of Potential Effects

### 7.6.1 Limitations to the assessment

The assessment of effects for Stage 2 has been limited to the immediate area around the junction (up to 500 metres) to allow comparison of the three options. It is also noted that the air quality modelling is limited by the available modelled traffic data which has been provided for this stage. The limitations to these data are outlined below:

- No specific information is available with regard to the construction of the scheme, including likely volumes and routes of construction traffic;
- Traffic associated with the Park and Ride site and Shawfair Park is not included in the traffic model;
- No traffic growth is assumed in the base situation from the 2024 opening year to 2030 and beyond 2030. This assumption is applied to all roads;
- The data assumes a proportion of heavy goods vehicles (lorries and buses) of 7% on all roads, in all scenarios and years.
- Future committed developments are considered within the traffic model. At this stage only existing receptors have been modelled for air quality as these are outside the stage 2 study area.

The air quality assessment will be updated at Stage 3 for the preferred option using updated traffic data and across a wider assessment area.

### 7.6.2 Potential Operational Effects

#### 7.6.2.1 Local Air Quality

Following the process of model verification, detailed dispersion modelling has predicted estimates of pollutant concentrations with options (DS) and without options (DM) for the opening year of 2024. The study area has included all roads within 500 metres of the junction as a means to compare the impacts of the three options.

To calculate the emission rates for the opening year, it was assumed that the vehicle fleet on the road does not evolve in line with forecasted predictions, so an interim year of 2020 was used in the EFT spreadsheet to reflect this. In line with this, background concentrations for this year were also used based on Defra's modelled background maps (Defra, 2017).

The model was run at selected residential receptors within the defined study area, details of which are given in Table 7.9 and Figure 7.1 - Modelled versus Monitored NO<sub>2</sub> concentrations (unadjusted and adjusted). The model outputs at each receptor are presented for the DM base situation in Table 7.10 in comparison to the relevant objectives.

**Table 7.9 - Location of Selected Residential Receptors**

Receptor ID	Receptor Description	X Co-ordinate	Y Co-ordinate	Distance from kerb (m)	Height (m)
R1	Façade of house in Campend	331556	668284	11.0	1.5
R2	Façade of house in	331540	668309	11.1	1.5

Receptor ID	Receptor Description	X Co-ordinate	Y Co-ordinate	Distance from kerb (m)	Height (m)
	Campend				
R3	Façade of house in Campend	331518	668345	9.9	1.5
R4	Façade of house in Summerside	331592	668055	81.7	1.5
R5	Façade of house in Summerside	331612	668028	88.6	1.5
R6	Façade of house in Summerside	331636	668100	20.2	1.5
R7	Façade of house in Summerside	331628	668110	19.8	1.5
R8	Façade of house in Sheriffhall Farm	332004	667987	75.7	1.5
R9	Façade of house in Sheriffhall Farm	332030	667904	104.6	1.5

**Table 7.10 – Do-Minimum Modelled Concentrations, 2024**

Receptor ID	Annual mean NO <sub>2</sub> (µg/m <sup>3</sup> )	Annual mean PM <sub>10</sub> (µg/m <sup>3</sup> )	No. days/ year exceedance of 24h mean PM <sub>10</sub>
R1	20.9	15.4	0
R2	20.9	15.4	0
R3	20.4	15.3	0
R4	17.7	14.5	0
R5	20.0	14.9	0
R6	19.7	15.0	0
R7	19.4	14.9	0
R8	21.1	13.0	1
R9	16.0	12.2	1
AQS objective	40	18	7

The modelled results for the opening year of 2024 for the DM base situation show that the NO<sub>2</sub> and PM<sub>10</sub> objectives are met at all relevant receptors, with the highest NO<sub>2</sub> concentration of 21 µg/m<sup>3</sup> at a house in Sheriffhall Farm (receptor R8).

Tables 7.11 to 7.13 provide the model outputs showing the concentrations for the DS situation for the three options, with the differences in outputs compared to DM for each of the pollutants.

**Table 7.11 – With Scheme Annual Mean NO<sub>2</sub> Results, 2024**

Receptor ID	NO <sub>2</sub> concentration (µg/m <sup>3</sup> )						
	2024 DM concentration	Option A DS concentration	Option A change from DM	Option B DS concentration	Option B change from DM	Option C DS concentration	Option C change from DM
R1	20.9	19.7	-1.3	20.9	<0.1	17.8	-3.2
R2	20.9	19.0	-1.9	20.8	-0.1	16.5	-4.4
R3	20.4	18.5	-1.9	20.3	-0.1	15.9	-4.5
R4	17.7	18.8	+1.2	18.5	+0.8	24.2	+6.5
R5	20.0	21.3	+1.3	20.9	+0.9	25.6	+5.6
R6	19.7	18.9	-0.9	19.4	-0.4	19.9	+0.2
R7	19.4	18.4	-1.0	19.1	-0.3	19.8	+0.4

R8	21.1	21.4	+0.3	21.6	+0.5	20.0	-1.2
R9	16.0	16.7	+0.7	15.9	-0.1	15.0	-1.1

**Table 7.12 – With Scheme Annual Mean PM<sub>10</sub> Results, 2024**

Receptor ID	PM <sub>10</sub> concentration (µg/m <sup>3</sup> )						
	2024 DM concentration	Option A DS concentration	Option A change from DM	Option B DS concentration	Option B change from DM	Option C DS concentration	Option C change from DM
R1	15.4	15.2	-0.1	15.5	+0.2	14.6	-0.7
R2	15.4	15.1	-0.3	15.5	+0.1	14.5	-0.9
R3	15.3	15.0	-0.3	15.4	+0.1	14.4	-0.9
R4	14.5	14.9	+0.4	14.9	+0.3	15.8	+1.3
R5	14.9	15.4	+0.5	15.3	+0.4	16.1	+1.2
R6	15.0	14.9	-0.1	15.1	+0.1	15.1	+0.1
R7	14.9	14.8	-0.1	15.0	+0.1	15.0	+0.1
R8	13.0	13.3	+0.3	13.3	+0.4	12.9	<0.1
R9	12.2	12.4	+0.2	12.3	+0.1	12.1	-0.1

**Table 7.13 – With Scheme Exceedances of 24h PM<sub>10</sub> Results, 2024**

Receptor ID	Number of days/year exceeding 24h mean PM <sub>10</sub> objective						
	2024 DM days ex.	Option A days ex.	Option A change from DM	Option B days ex.	Option B change from DM	Option C days ex.	Option C change from DM
R1	0	0	<1	1	+1	-1	-1
R2	0	0	<1	1	+1	-1	-1
R3	0	0	<1	0	<1	0	<1
R4	0	0	<1	0	<1	0	<1
R5	0	0	<1	0	<1	0	<1
R6	0	0	<1	0	<1	0	<1
R7	0	1	<1	0	<1	0	<1
R8	1	1	<1	1	<1	1	<1
R9	1	0	<1	1	<1	2	+1

With Option A, there is a predicted reduction in annual mean NO<sub>2</sub> concentrations at 5 receptors and a small increase (i.e. less than 5% of the objective or 2 µg/m<sup>3</sup>) at 4 properties in Summerside and at Sheriffhall Farm. A similar result is found for annual mean PM<sub>10</sub> concentrations and there is little change in the number of days exceeding the 24 hourly objective. All modelled results are below the relevant objective at all modelled receptors.

With Option B, annual mean NO<sub>2</sub> concentrations are predicted to reduce at all but 3 properties and the magnitude of change at all receptors is below 2 µg/m<sup>3</sup> so is considered to be small. Concentrations are well below the objective at all receptors. For annual mean PM<sub>10</sub> concentrations, a small increase in concentration compared to DM is modelled at all properties. For the 24 hourly objective, a small increase is found at receptors R1 and R2 in Campend.

The greatest variation in results is seen for Option C, where there are some large reductions in annual mean NO<sub>2</sub> concentrations (>10% of the objective) at receptors R2 and R3 (Campend) and conversely large increases in predicted concentrations at receptors R4 and R5 (Summerside) which are now closer to the new road. However modelled concentrations are still well below the annual mean objective. For annual mean PM<sub>10</sub>, there are medium reductions (5-10% of the objective) in Campend and medium increases in concentrations in Summerside.

### 7.6.2.2 Regional Air Quality

This section outlines the results for the regional assessment of annual emissions for the opening year and design year for the entire modelled study area (see Tables 7.14 and 7.15). Similarly to the local assessment, a fleet for an interim year of 2020 was assumed for the 2024 year and a fleet in the year 2030 was assumed for the design year of 2039 as this is the last year of available emission factors.

**Table 7.14 - Opening Year (2024) Regional Assessment**

Pollutant	Regional emissions and change from DM (tonnes/year)						
	DM 2024	Option A DS	Option A Change from DM	Option B DS	Option B Change from DM	Option C DS	Option C Change from DM
CO <sub>2</sub>	39,574	48,742	+9,168 (23%)	45,117	+5,543 (14%)	46,997	+7,424 (19%)
NO <sub>x</sub>	58.9	76.8	+17.9 (30%)	70.9	+12.0 (20%)	75.3	+16.7 (28%)
PM <sub>10</sub>	5.2	7.6	+2.4 (46%)	7.1	+1.9 (37%)	7.3	+2.1 (40%)

**Table 7.15 – Design Year (2039) Regional Assessment**

Pollutant	Regional emissions and change from DM (tonnes/year)						
	DM 2039	Option A DS	Option A Change from DM	Option B DS	Option B Change from DM	Option C DS	Option C Change from DM
CO <sub>2</sub>	38,495	51,199	+12,704 (33%)	47,849	+9,354 (24%)	49,366	+10,871 (28%)
NO <sub>x</sub>	32.5	48.2	+15.7 (48%)	44.7	+12.2 (28%)	46.8	+14.3 (44%)
PM <sub>10</sub>	4.8	7.7	+2.9 (60%)	7.2	+2.4 (50%)	7.3	+2.5 (52%)

The results indicate that regional emissions of all modelled pollutants are predicted to increase compared to the DM situation in both years in the study area. The main reasons for this increase are due to additional roads being constructed resulting in higher traffic flows and greater vehicle kilometres that would need to be travelled for the different options compared to the base DM situation. The greatest overall increase in regional emissions for all pollutants is found with Option A in both years.

### 7.6.2.3 Significance

The annual mean concentration of NO<sub>2</sub> is predicted to be well below the air quality objective by the opening year of 2024 for the DM and DS situations at all modelled receptors. In terms of the magnitude of change as set out in Table 7.2, for Option A and B compared to DM, these are either imperceptible (change of less than 1% of the objective) or small (1-5% change) at receptors. Overall, this can be considered to be an imperceptible or negligible impact for these two options. For Option C, there are large adverse impacts (>10% of the objective) at receptors R4 and R5 in Summerside and conversely large benefits at receptors in Campend (receptors R2 and R3).

Modelled PM<sub>10</sub> is also below the relevant objectives and as changes are of a similar magnitude to NO<sub>2</sub> they are considered to be small or imperceptible at all properties for Options A and B. With Option C, due to the changes in road layout north of the roundabout, there are some receptors which are predicted to have a medium increase (5-10% of the objective) in annual mean concentrations (in Summerside) and some where there is a corresponding medium to large reduction (Campend). There are no predicted exceedances in the 24 hourly mean PM<sub>10</sub> objective and any changes to these are predicted to be small or imperceptible.

Air quality objectives are not anticipated to be breached with any of the options proposed. Changes of more than 10% of the objective (as seen in Option C) may take a long time to reduce, therefore there is a greater overall effect for Option C. However these changes are predicted to be both adverse and beneficial at different receptors. Changes of less than 5% as seen in Options A and B would not take a long time to reduce.

The methodology set out in IAN 174/13 (Highways Agency, 2013) has been applied when considering the significance of these air quality impacts by taking into account the concentrations in relation to the objectives, the



predicted magnitude of change and the number of receptors affected. Based on the guidelines in Table 7.3, there are less than 10 residential receptors that would experience a large increase in concentration with Option C, and the resulting levels would still be below the objective. There is also no risk that designated sites will be affected within this study area, as there are no such sites within 200m of an affected road.

Overall, when taking into account that the pollutant concentrations are predicted to be below or well below the relevant objectives, the impact on air quality of these pollutants in the scheme opening year of 2024 is not significant for all options.

### 7.6.3 Potential Construction Effects

Construction of the scheme is estimated to be approximately 18 months in length but there is little further information currently available on the nature and timing of the works required or specific activities. At this stage it is not possible to conduct a full assessment of the risk and magnitude of impacts. However, it is likely that impacts would be due to:

- dust emissions associated with activities along the route such as site clearance, earthworks, carriageway resurfacing and bridge construction;
- emissions from site plant equipment and construction vehicles on the route; and
- changes in traffic flows along the route with traffic management in place.

Based on the size and extent of the works required for each option, it is considered likely that Option B would result in the lowest impacts on air quality and dust emissions and Option C the highest.

Construction related air quality impacts will be limited to the small number of residential properties located in close proximity to the works (i.e. within 200 m from the scheme route). Potential impacts on these properties may include:

- effects on amenity and property including changes to the rate of deposition of dust and particulate matter onto glossy surface and other property; and
- changes in 24 hour mean concentrations that might increase the risk of exposure to PM<sub>10</sub> at levels that could exceed the 24-hr air quality objective.

The magnitude of the impact and the significance of the effect at individual receptors will vary depending on their proximity to the works. Due to the low PM<sub>10</sub> background level (<14 µg/m<sup>3</sup>) and a low number of residential properties (less than 15 properties) within 50 metres of the roads (8 of which are within 20 metres), the area has a low to medium sensitivity rating for dust impacts and human health impacts.

Based on the available information it is considered that with appropriate mitigation in place (see Section 7.7.1), construction related air quality impacts are anticipated to be low risk or negligible for all options.

## 7.7 Potential Mitigation

### 7.7.1 Construction

Any potential impacts from fugitive dust and vehicle emissions that relate to the construction activities can be controlled by the implementation of suitable mitigation measures in a Construction Environmental Management Plan (CEMP). Examples of likely control measures that are considered examples of best practice to minimise dust emissions include:

- Off-site vehicles should be sheeted;
- The wheels and bodies of site vehicles should be cleaned;
- Stockpiles should also be watered; where necessary they should be covered or enclosed to reduce effects of windblown dust;
- Haul routes should be located away from off-site sensitive properties and watered regularly (wet suppression of dust);
- Vehicles transporting earthworks materials to or from site should be sheeted;

- Vehicle speeds over unmade surfaces should be limited;
- The aggregate stocking area is to be located away from sensitive areas and residential properties;
- Drop heights should be minimised to discharge material close to where it is required;
- Bulking of wastes should be consolidated to minimise transportation and handling requirements; and
- A complaint and investigative response procedure should be operated.

Additional specific mitigation measures to minimise vehicle emissions include the following:

- Where possible, all non-road mobile machinery should use fuel equivalent to ultra-low sulphur diesel;
- Machinery with exhaust emissions should be placed as far from sensitive properties as practicable;
- Vehicles or plant should not be left idling unnecessarily;
- All vehicles and plant should be well maintained and regularly serviced according to manufacturers' recommendations; and
- Where possible haul routes should be located away from off-site sensitive properties.

### 7.7.2 Operation

In terms of the operational impacts on concentrations, it is not considered necessary for any additional mitigation measures to be put in place as the concentrations of all modelled pollutants are below the relevant objectives at relevant receptors.

## 7.8 Summary of Effects

Table 7.16 below gives likely significance of impacts prior to mitigation, and likely significance with mitigation.

**Table 7.16 - Potential Construction and Operational Effects**

	Option	Predicted Impacts	Magnitude of Predicted Impact	Sensitivity of Receptor	Significance of Effect	Potential Mitigation Measures	Residual Effects
<b>Residential Properties</b>							
Construction	Common to all options	There will be temporary adverse impacts on all users during construction due to fugitive dust and vehicle emissions.	Slight to Moderate adverse	Medium	Slight to Moderate Adverse	Best practice construction measures should minimise impacts on all users during construction.	Neutral to Slight Adverse
Operation (local)	A	Change in annual mean concentrations of NO <sub>2</sub> and PM <sub>10</sub>	Slight beneficial to small adverse	N/A <sup>4</sup>	Negligible or Neutral	None proposed	Negligible or Neutral
	B	Change in annual mean concentrations of NO <sub>2</sub> and PM <sub>10</sub>	Imperceptible to small adverse	N/A <sup>1</sup>	Negligible or Neutral	None proposed	Negligible or Neutral
	C	Change in annual mean concentrations of NO <sub>2</sub> and PM <sub>10</sub>	Moderate to large beneficial to moderate to large adverse	N/A <sup>1</sup>	Negligible or Neutral	None proposed	Negligible or Neutral

<sup>4</sup> The air quality objective values for pollutants associated with road traffic have been set by the Expert Panel of Air Quality Standards at a level below the lowest concentration at which the more sensitive members of society have been observed to be adversely affected by exposure to each pollutant. Therefore all receptors that represent exposure of the public are of equal sensitivity as any member of the public could be present at those locations.

## 7.9 Compliance with Policies and Plans

City of Edinburgh Council Policy Env 22 requires an air quality assessment to be completed for new developments that are within an AQMA or that may cause or worsen national air quality objectives. Midlothian Council Policy Env17 requires further assessment of air quality impacts where the Council or Scottish Environmental Protection Agency (SEPA) considers necessary.

The City of Edinburgh policy states planning permission will not be granted if significant adverse effects are likely from a development. The Midlothian policy aims to avoid unacceptable impacts on dust and air quality.

The assessment reported herein meets all of these above planning requirements.

## 7.10 Conclusions

During the construction phase, there may be short term impacts on air quality due to fugitive dust and vehicle emissions associated with activities on site. However, the impacts would be limited to the small number of receptors within close proximity to the roads. Based on the low background PM10 concentrations and number of receptors likely to be affected, the site sensitivity is considered to be low to medium. Due to the scale and extent of the work required, it is likely that the effects would be greatest for Option C and lowest for Option B. However, with appropriate best practice mitigation measures in place as part of a Construction Environmental Management Plan, the construction impacts are anticipated to be low risk or imperceptible for all options.

In terms of the local air quality operational impacts, changes in concentrations of three pollutants at residential properties within 200 metres of the route have been considered in the opening year of 2024 for all three options compared to the base (DM) situation. The magnitude of change in concentrations at receptors ranges from imperceptible to a small adverse (i.e. 1 to 5% of the objective value) for Options A and B. However, for Option C there are large (>10% of the objective value) adverse impacts at receptors R4 and R5 in Summerside and conversely large benefits at receptors in Campend (R2 and R3). This means there these impacts are greater and changes are likely to take a longer time to reduce than for the other two options.

The assessment of significance has been based on the guidance set out in IAN 174/13 (Highways Agency, 2013) although this guidance has not been officially adopted in Scotland. This methodology takes into account the concentrations in relation to the objectives, predicted magnitude of change and the number of receptors affected. As the health based air quality objectives are not anticipated to be breached with any of the options proposed, even with potentially large magnitude of changes due to Option C and there is no risk that designated sites will be affected within the vicinity of the Scheme, it can be concluded that the impact on air quality of these pollutants in the scheme opening year of 2024 is not significant for all options.

The regional impacts on emissions in the entire study area were determined for the opening year (2024) and future design year (2039). For all three options, regional emissions are predicted to increase compared to the DM situation in both years. The two main reasons for this increase are due to additional roads being constructed resulting in higher traffic flows in the study area and greater vehicle kilometres that would need to be travelled compared to the base DM situation. The greatest effect on regional emissions is found with Option A.

## 7.11 Scope of DMRB Stage 3 Assessment

A detailed air quality modelling assessment of the preferred scheme is proposed at stage 3 which will be completed in line with the DMRB guidance HA207/07. This assessment will consider a wider study area to determine the impact on human receptors and designated ecological sites. Where possible this assessment will be based on more detailed traffic data.

## 8. Effects on All Travellers

### 8.1 Introduction

The consideration of the effects on all travellers directly associated with the A720 Sheriffhall Roundabout Improvement options has been undertaken with reference to the DMRB Interim Advice Note 125/09 Supplementary Guidance as discussed in Chapter 1 – Overview of Environmental Assessment. The assessment therefore references:

- DMRB Volume 11 Section 3 Part 8 - '*Pedestrians, Cyclists, Equestrians and Community Effects*' (Chapter 9) - but excludes the assessment of the community aspect of Part 8 which is covered in Chapter 9 – Community & Private Assets.
- DMRB Volume 11, Section 3, Part 9 – '*Vehicle Travellers*' (Chapter 5).
- The SNH Handbook on EIA (Appendix 5 – Outdoor Access Impact Assessment).

The objective of these respective reference sources DMRB Stage 2 assessments are to:

- "Undertake sufficient assessment to identify routes used by pedestrians and others". (DMRB Vol. 11 : Section 3, Part 8 – Chapter 9)
- "Undertake sufficient assessment to identify the factors and effects concerning vehicle travellers." (DMRB Vol. 11: Section 3, Part 9 – Chapter 5)
- Consideration of Non-Motorised Users (NMUs) ability to access the outdoors (Source: SNH - EIA Handbook Appendix 5).

### 8.2 Approach and Methodology

Sections 8.2.1 and 8.2.2 set out the published guidance which have been referenced and the assessment methodology used in considering the impacts of the Scheme options on travellers.

#### 8.2.1 Guidance

The assessment approach has also been guided by reference to:

- Consultee responses to the Scheme options;
- The results from site visits which are reported in the Section 8.5;
- Reference to the URS (now AECOM) A720 Sheriffhall Roundabout DMRB Stage 1 Scheme Assessment Final Report (September 2014);
- Scheme options (DMRB Stage 2) Design drawings;
- Desk-top documentation review and web-based information sources.

#### 8.2.2 Methodology

The methodology embraces a number of key considerations for existing receptors contained within, and in proximity to, the Scheme location and these are highlighted below. The scope of effects considered for the A720 Sheriffhall Roundabout DMRB Stage 2 Options Assessment (*during both the Scheme construction and Scheme operation phases*) includes:

- Permanent or temporary severance of public recreational amenities and routes e.g. existing public Rights of Way (RoW), Edinburgh City and Midlothian Council adopted core path networks, cycle-ways, bridleways, etc.;
- Scheme effects on existing NMUs (pedestrians, cyclists, equestrians) and local NMU journey routes e.g. changes in journey lengths and times;

- Changes in amenity which DMRB Vol. 11 defines as “the relative pleasantness of a journey”<sup>5</sup>.
- Any adverse mental and physiological effects experienced by a driver<sup>6</sup> traversing the Sheriffhall section of the A720 and associated road networks e.g. A7 (north & south), A6106 (north & south), the A772 Gilmerton Road and the B6392 Eskbank Road.

The assessment of the potential effects of the Scheme options (prior to Mitigation) has been undertaken by considering the magnitude of impact (the actual change taking place to the environment) and the sensitivity of the receptor. The Significance of Effect criteria are used to report the effect of the impact.

Sensitivity of receptors has been defined by professional judgement as to the importance or value of the receptor and its resilience to cope with change. A scale of sensitivity has been defined as; Negligible, Medium, High and Very High.

The levels of magnitude are shown in Table 8.1 below:

**Table 8.1. Magnitude of Impact**

Level of Magnitude	Definition
Major	A fundamental change to the Travellers baseline conditions
Moderate	A material but non-fundamental change to the Travellers baseline conditions
Minor	A detectable but non-material change to the Travellers baseline conditions
Negligible	Very minor loss or detrimental change to the Travellers baseline conditions
No Change	No loss or alteration to the Travellers baseline conditions

Table 8.2 below shows how the determination of the Significance of Effect is reached, by considering both the magnitude of impact and sensitivity of the receptor. Effects that are Large or Very Large are considered to represent key factors in the decision making process. Those that are moderate are considered to be important but not likely to be key decision making factors. Effects which are slight are unlikely to be critical in the decision making process but are important in enhancing the subsequent design of the project. Neutral refers to those effects which are beneath levels of perception.

**Table 8.2. Determination of Significance of Effect**

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

The impact significance has been determined by considering the magnitude of a predicted effect on the Sensitivity scale of the receiving receptor. Effects can be either adverse or beneficial.

Mitigation measures have been identified to minimise the effects of the proposed Scheme options as far as possible within the technical constraints of the project. The mitigation is designed to prevent, reduce, and where

<sup>5</sup> This is concerned with changes to the degree and duration of people's exposure to traffic and the impact of the road itself – primarily any visual intrusion associated with the scheme and its structures

<sup>6</sup> Driver Stress is defined for the purposes of environmental assessment as the adverse mental and physiological effects experienced by a driver traversing a road network. Driver stress has three main components: frustration, fear of potential accidents, and uncertainty relating to the route being followed

possible offset the potential effects upon the Travellers baseline conditions. The residual effects are those remaining after mitigation measures have been considered.

## 8.3 Planning Policy Context

The national, regional and local planning policies and plans relevant to All Travellers are set out below:

### 8.3.1 National Policy and Guidance

#### ***National Planning Framework 3 (June 2014)***

The National Planning Framework (NPF 3) sets out the Scottish Government's development priorities over the next 20-30 years. "A Connected Place" is one of four themes of the NPF3. It states that "the road network (Scottish) has an essential role to play in connecting cities by car, public transport and active travel". Although the proposed upgrading of the A720 Sheriffhall Roundabout is not a specific NPF3 development project, NPF 3 acknowledges its importance to the future economic development of Edinburgh in the statement on Page 13 – "Road network capacity, including the A720 where interventions are being taken forward at Sheriffhall Roundabout, has particular implications for future development".

#### ***Scottish Planning Policy (June 2014)***

Scottish Planning Policy (SPP) states that "the case for a new junction will be considered where the planning authority considers that significant economic growth or regeneration benefits can be demonstrated. New junctions will only be considered if they are designed in accordance with DMRB and where there would be no adverse impact on road safety or operational performance". SPP (2014) also supports optimising the use of existing infrastructure and providing safe and convenient opportunities for walking and cycling for both active travel and recreation.

### 8.3.2 Regional Policy

#### **8.3.2.1 SESplan**

##### ***Strategic Development Plan (Adopted June 2013)***

The South East Scotland Strategic Development Plan (SESplan) sets out a spatial strategy which recognises existing development commitments and promotes a sustainable pattern of growth across the City of Edinburgh, East Lothian, Fife, Midlothian, Scottish Borders and West Lothian Council areas. The strategy promotes the development of strategic transport and infrastructure networks to support economic growth and to meet the needs of communities. Paragraph 45 of SESplan states that the South East Edinburgh Strategic Development Area (SDA) is served by the City Bypass and Sheriffhall Roundabout "*which are operating close to capacity and are severely congested at peak times*" and that the upgrading of Sheriffhall Roundabout has been identified as an intervention within Transport Scotland's Strategic Transport Projects Review (STPR) whilst the expansion of park and ride facilities at Sheriffhall and a potential new park and ride facility to the north of the A68 / A720 junction are important to the "Regional Core". Paragraph 74 of SESplan identifies the grade separation of the Sheriffhall Roundabout as a "*key transport infrastructure project*" within the Midlothian/Borders Sub-Regional Area.

##### ***Proposed Strategic Development Plan (October 2016)***

Work is underway on the next SESplan (SDP2) which is anticipated to be approved by the summer of 2018. An SDP 2 Proposed Strategic Development Plan published in October 2016 highlights improvements to the A720 including Sheriffhall Junction – Junction Upgrades as a potential strategic cross-boundary project supporting the vision for the Plan of a "better connected place".

### 8.3.3 Local Policy

#### **8.3.3.1 City of Edinburgh Council**

##### ***Edinburgh Local Development Plan (Adopted November 2016)***

Edinburgh City's first LDP (Adopted 2016) supersedes the Edinburgh City Council Adopted Local Plan (2010). The Proposals Map included in the 2016 Edinburgh Local Development Plan contains a number of "Transport Proposals and Safeguards" (Table 9 – Page 39) and includes a direction on the Sheriffhall Junction Upgrade (Ref: T13) which states "*Grade separation of existing roundabout junction on city bypass should incorporate bus priority and safe crossing of the bypass for pedestrians and cyclists*" (Page 39). The LDP also notes through Policy Tra 10 (New and Existing Roads) that Planning permission will not be granted for development which would prejudice the proposed new roads and road network improvements listed in Table 9 and shown indicatively on the Proposals Map (Page 131).

### 8.3.3.2 Midlothian Council

#### ***Midlothian Local Plan (Adopted 2008)***

Midlothian's Local Plan – Policy TRAN 3 (Trunk Roads Proposals) states that Midlothian Council attaches "*a high priority to the grade separation of the A720/A7 Sheriffhall roundabout*" and that the Council will continue to press the Scottish Government for the early implementation of the upgrading of this junction as "current levels of congestion at this junction have a major impact on access to and from Midlothian and repercussions for its prospects for future growth and prosperity". Policy TRAN 4 (Safeguardings for Transportation Schemes) includes the safeguarding of land required for the A720 Sheriffhall Junction Grade Separation.

#### ***Midlothian Proposed Local Development Plan (2014)***

The timescale target for the Midlothian Local Development Plan adoption is currently spring 2017 as detailed in their Development Plan Scheme No. 8 (March 2016). The Proposed Plan (2014) builds upon the Midlothian Local Development Plan (MLDP) Main Issues Report consultations and focuses on providing for, and managing, future change across the Council area in line with the SESplan requirements. It comprises a development strategy for the period to 2024 and a detailed policy framework to guide future land use in a way which best reflects SESplan's vision, strategic aims and objectives.

Upgrading Sheriffhall Roundabout (Grade Separation) is included in the proposed LDP under Policy TRAN2: Transport Network Interventions. A park and ride extension at Sheriffhall is also identified under this policy (Page 29). Policy TRAN3: Strategic Transport Network further supports the upgrading of Sheriffhall Roundabout and states that "*The Council supports the early implementation of the grade separation of the A720 Sheriffhall Junction*" (Page 30). The Settlement Statement for the SE (Shawfair) Strategic Development Area (Section 8.1) states that "*There will be a need to upgrade the A720 Sheriffhall Junction and contributions are being sought from the committed development towards this future investment*". (Page 83, paragraph 8.1.6).

## 8.4 Consultations

This section includes details of consultations that were undertaken during February 2015 and November 2016 to identify issues affecting all travellers that needed to be addressed during the DMRB Stage 2 Options Assessment. Table 8.3 below summarises consultations relevant to this assessment. A full summary of all Stage 2 consultation responses is provided in Chapter 1 - Overview of Environmental Assessment and consultations are provided in full in Appendix 1.1 – Copy of Consultation Responses.

**Table 8.3 – Summary of Consultation Responses**

Consultee	Summary of Responses
Scottish Natural Heritage (SNH)	<p><b>Dated 19/02/2015</b></p> <p>In its 2015 Stage 2 consultation response, SNH noted that NMUs will "benefit from all junction options" and welcomes the commitment to improve active travel provision across the A720. SNH recommended that the Stage 2 Report highlight whether there are any differences in active travel outcomes between the options that are being taken forward, or, whether they will all result in the same level of provision.</p> <p>SNH also noted that a Core Path crosses Sheriffhall roundabout from the A7 in the north onwards to the A6106 in the south and recommended consideration of maintaining access along this Core Path during the Scheme construction. If not, the Stage 2 report should explore the provision of an alternate, temporary, active travel route.</p> <p><b>Dated 08/12/2016</b></p> <p>In its 2016 Stage 2 consultation response, SNH repeated its desire to see how the scheme would accommodate active travel and NMUs.</p>
VisitScotland	<p><b>Dated 18/02/2015</b></p>



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**Consultee**      **Summary of Responses**


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	<p>The national tourism body is pleased that the following are being considered as part of the scheme objectives:</p> <p>Minimising intrusion of the new works on the natural environment, cultural heritage and people whilst enhancing the local environment where opportunities arise</p> <p>Facilitating integration for different modes of transport along and across the A 720 corridor between Gilmerton Junction and Dalkeith Northern Bypass.</p> <p>VisitScotland also noted AECOM's awareness of the Borders Railway project.</p> <p>In terms of access to Edinburgh from the A720 and to East and Midlothian from Edinburgh/A720, VisitScotland suggests that clear directional signage is a key component and some consideration should be given if there is opportunity for tourism signage that does not distract from the main directional signage and traffic regulation signage.</p>
SEStran	<p><b>Dated 03/03/2015</b></p> <p>SEStran highlighted several issues for consideration:</p> <p>The potential for bus priority through the upgraded Sheriffhall junction to encourage residents in Midlothian and beyond to use public transport when travelling to and from Edinburgh. There is also the need to consider the bus and car linkages to the Orbital Bus proposals.</p> <p>Improving the efficiency of bus linked to park and ride and cycle links across the bypass will help to reduce the impact of increased ease of access by car to and from Edinburgh.</p> <p>SEStran is carrying out a study looking at missing links in the strategic cycle network especially cross-boundary links. Initial findings are that there is a missing link in this area across the A720 bypass.</p> <p>SEStran state that "Option 6 or 6a seems to provide the best solution", (now Option B) but that the ability to accommodate priority bus lanes and segregated cycle links is of prime importance.</p>
Road Haulage Association	<p><b>Dated 11/03/2015</b></p> <p>The RHA have no preference at this stage (in respect of the Sheriffhall Junction Options) but would be happy to gain any improvements from which ever option is selected.</p> <p>In addition, the RHA provided the following information/advice:-</p> <p>Consider the potential changes to vehicle dimensions and other matters in relation to plans for road designs and layouts. The road freight sector is trialling longer articulated vehicles to some 18.5 metres which may well become standard 'kit' at some stage in the future.</p> <p>The future possibility of increased lorry speed limits on single and dual carriageways. In terms of lorry widths vehicles may now be up to 2.6 metres wide (excluding rear view mirrors) bringing the overall width in many case to over 3.0 metres.</p> <p>Lorries getting longer as well as higher – factors which can affect stability and road safety when entering and exiting roundabouts for example.</p>
Buccleuch Estate	<p><b>Dated 17/03/2015</b></p> <p>As a response on behalf of Dalkeith Country Park which is in Buccleuch Estates ownership, the proposed A720 Sheriffhall roundabout works are viewed as "a positive development to the roads network and in enhancing the accessibility to the Park".</p> <p>Buccleuch Estates are keen to explore the opportunity to provide directional signage to Dalkeith Park sited on the bypass as part of the Sheriffhall Junction works, and also further at the A68 access point at the mid-point of the Estate as part of, or in advance of the works.</p> <p>Buccleuch Estates preference in terms of the tabled options would be Option 6A (now Option B).</p>
Access & Cycling - East Lothian Council	<p><b>Dated 08/12/2016</b></p> <p>Concerned about perceived lack of provision for NMUs in the proposed scheme options – specifically the lack of a clear, prioritized shared use (walking/cycling) route providing safe access across the A720 into the west of East Lothian. A shared-use route would benefit active travel commuting and recreational walking/cycling.</p> <p>Requests that detailed Active Travel proposals be provided in the Sheriffhall scheme proposals e.g. provision of an underpass to take NMUs under the A720, without the need to interact with traffic "would be ideal". Connectivity with the surrounding path/active travel network should also be explored during Stage 2.</p>
Transport - East Lothian Council	<p><b>Dated 19/03/2015</b></p> <p>No particular preference to any of the Sheriffhall Junction option proposals but concerns that the improvement works at Sheriffhall will result in more free flowing traffic on the A720 potentially resulting in more traffic arriving in a constant flow at the A720/A1 Old Craighall Junction and creating more congestion at this junction – particularly during peak weekday periods.</p> <p>In particular, concerns that the Sheriffhall Junction improvements will result in increased queuing of A1 southbound traffic exiting at the Old Craighall Junction to join the A720 leading to increased queue lengths back onto the East Lothian Council section of the A1 with the potential for vehicle collisions.</p> <p>The consultation response requests that "this is modelled and potential impacts (as highlighted above) mitigated against particularly on the ELC section of the A1".</p>
Planning - Midlothian Council	<p><b>Dated 13/03/2015</b></p> <p>Welcome the improvement works and have provided detailed general and option specific comments for consideration. Key general points relating to All Travellers outlined below:</p> <p>Response mentions Tram Line 3 extension to Dalkeith from SESplan Action Programme.</p>

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**Consultee**                      **Summary of Responses**


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Visual Impact less where A720 is on embankment.  
Suggest segregated cycle lanes, over/under passes and continental style roundabouts (TRL) for NMUs.  
Bus operators overall preferred option is 6A (now Option B)

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Lothian Buses

**Dated 27/01/2017**

Lothian Buses support the proposal to create a grade separated junction at Sheriffhall as it should improve journey time for its services that use the A7(N)-A6106(S) corridor.

Lothian Buses preference is for Option B because it does not require additional roundabouts. Roundabouts cause a reduced level of comfort for bus passengers. Option A and C both replace one large diameter roundabout with two smaller roundabouts, with Option C introducing an additional even smaller roundabout between the dumbbell roundabouts and the roundabout at Sheriffhall Park and Ride. Option C is also undesirable because of the additional traffic heading to/from The Wisp/Fort Kinnaird/Shawfair added to the A7 north of Sheriffhall junction. With the level of development in that area this traffic flow will only increase creating the potential for southbound traffic on the A7 to be blocked at the new roundabout during busy times which will have a negative effect on our services.

Lothian Buses note that the proposals do not detail whether any of the options include traffic signals at Sheriffhall Junction. They state that it would assist in the southbound flow of traffic if signals were retained to control as a minimum the flow of traffic leaving the by-pass to avoid the traffic queueing situation that occurs at A720 Lothianburn junction.

The consideration of the effect of the A720 on north-south traffic flows needs to be extended to the Lasswade Junction because of the high proportion of traffic that currently uses it to avoid Sheriffhall junction and congestion on the A720.

An objective for this scheme should be to encourage modal shift from car by improving the attractiveness of public transport and other non-car modes.

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British Horse  
Society**Dated 10/02/2015**

In its 2015 consultation response, the BHS welcomed the scheme and expressed desire for segregated multi-use access tracks for NMUs.

**Dated 29/11/2016**

In its 2016 consultation response, the BHS repeated its desire for off-road, multi-use provision to be included in the Stage 2 scheme considerations.

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Scottish Rights of  
Way and Accesses  
Society (Scotways)**Dated 08/12/2016**

Scotways is concerned that access to the Right of Way (LM97) is maintained during both the construction and operation of the chosen revised option (following Stage 3 assessment). Scotways provided a "marked-up" map highlighting LM97. This RoW is also a Midlothian Council Core Path (section 4-8) and runs north-east from the A7 (north) between Campend and the Sheriffhall Park & Ride site.

Scotways also wishes to see how the Sheriffhall Roundabout Improvement Scheme will improve NMU access between the Edinburgh and its hinterland beyond the A720 City Bypass (and vice versa).

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Sustrans

**Dated 27/01/2017**

In terms of the Hierarchy of Measures, Sustrans Scotland agree that off-carriageway facilities need to be provided for walking, cycling and other non-motorised users as part of the redesign, given the speed and volume of traffic at the A720 Sheriffhall Roundabout.

Sustrans Scotland feel demand for walking and cycling is suppressed by current conditions at the Sheriffhall Roundabout and that it is important that new paths are included across and around the junction linking all the roads leading to/from it (with the exception of the A720, on which cycling and walking are prohibited). This will enable people to make local journeys across the junction on foot and by bike, reducing the severance caused by the A720. Sustrans Scotland also state that there are many potential active travel journeys which require a safe crossing of the A720 Sheriffhall Roundabout.

Sustrans Scotland have assessed the 3 options presented (A, B and C) against the five Core Design Principles in Cycling by Design (Safety, Coherence, Directness, Comfort and Attractiveness) and conclude that Option C is the best for active travel (walking, cycling and non-motorised users). This is primarily because it is the most direct in terms of both distance and time and also likely to be the safest option for users. Option C is also likely to be the most attractive for users - albeit steps must be taken to make sure that user's feelings of personal security are maximised.

Although Sustrans Scotland consider Option C to be the best outline design, a number of proposals are made which Sustrans Scotland believe should be included in the detailed design to create the best facilities for walking and cycling.

Sustrans Scotland are keen to discuss the designs of active travel infrastructure in the Sheriffhall project with AECOM and Transport Scotland, as it progresses towards construction.

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## 8.5 Baseline Conditions

### 8.5.1 Establishment of Baseline Conditions

The baseline conditions for this chapter have been considered within a 500m study area around the A720 Sheriffhall Roundabout DMRB Stage 2 Scheme Options. This is illustrated in Figure 8.1 – Baseline - All Travellers. A 1km boundary has also been shown to provide a wider context to the assessment.

In addition to a site visit, the baseline conditions were identified through a review of the following:

- Ordnance Survey (OS) Explorer Maps 345 and 350;
- The Midlothian Council Core Path Network Plans (Adopted 2009);
- Edinburgh City Council Core Path Network Plan (Adopted 2008);
- National Catalogue of Rights of Way paths record (Scotways in partnership with SNH);
- Forestry Commission's GLADE Land Information Search;
- AECOM's GIS Database;
- Desk-top documentation review and web-based information sources (relevant references/links provided).

### 8.5.2 Vehicle Travellers

The A720 Sheriffhall Roundabout is connected to a network of six roads - the A7 (north and south), the A6106 (Millerhill Road and Old Dalkeith Road), and the A720 Edinburgh City Bypass (east & west).

There is a layby situated to the north-west of the Sheriffhall Roundabout, between the A720 and the A7 (north) for traffic control/monitoring purposes.

There are also two emergency lay-bys on the A720 (1 x eastbound and 1 x westbound) located between the A720 Gilmerton Junction and the A720 Sheriffhall Roundabout.

The A7 through the Sheriffhall Roundabout forms part of the Borders Historic Route (Edinburgh to Carlisle) – one of Scotland's twelve designated National Tourist Routes.

As part of the Borders Railway project, part of the A6106 Millerhill Road was realigned, running parallel to the new railway corridor, south of Newton village, but maintaining the A6106 connection (via a new A6106 Millerhill Road roundabout) between the Sheriffhall Roundabout and the settlements of Newton Village and Millerhill.

In addition, and as a further part of the Borders Railway project, a new road has been constructed linking the A7 (north) to this new A6106 Millerhill Road Roundabout via the Shawfair Park development site providing some vehicle travellers with an opportunity to bypass the Sheriffhall Roundabout if traversing between the A6106 Millerhill Road and the A7 north of Sheriffhall Roundabout.

### 8.5.3 Path Network

In the immediate vicinity of Sheriffhall Roundabout, there are off-road sections of paths allowing for NMUs to cross each of the arms of the Sheriffhall Roundabout; however there are no pedestrian controlled crossings. So although users can traverse the roundabout they have to wait until the traffic signals for vehicles allow them to do so.

### 8.5.4 Paths identified in Core Path Plans

Each local authority area is required to prepare a Core Path Plan for their area under the Land Reform Act (Scotland) 2003. There are several designated Core Paths (Edinburgh City and Midlothian Councils) located within the 500 metres study area around the Scheme options. Figure 8.1 – Baseline - All Travellers highlights adopted Core Paths within the Edinburgh City Council and Midlothian Council Local Authority Areas. It also highlights aspirational core paths and other council paths (part of the wider network).

The Edinburgh City Council Core Path (CEC4) links with the Midlothian Council Core Path section (4-34) through the Sheriffhall Roundabout which then connects to the Midlothian Council core path section (4-35a) at the A6106 Old Dalkeith Road/Melville Gate Road junction.

Midlothian Council Core Path (6-0) provides a pedestrian link from the A772 Gilmerton Road (south of the A720) to the Gilmerton Junction. Pedestrian access continues along the A772 Gilmerton Road (north of the A720).

Table 8.4 lists paths network within the 500m study area around the A720 Sheriffhall Roundabout DMRB Stage 2 scheme options - including path linkages outside the Study Area.

**Table 8.4. Paths Network (within 500m study area and direct path linkages beyond)**

#### Route Reference

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Edinburgh City Council Core Path CEC4 (Craigmillar to Dalkeith) – along the A7 from Edinburgh in the north to Sheriffhall Roundabout.

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Midlothian Council Core Path 4-8. (Note this Core Path is also a Right of Way (LM 97) as identified by Scotways in their Consultation Response) - Begins on the A7 south of the Sheriffhall Park and Ride and continues northwards along 'The Kaimes' towards Newton Village. Connects Danderhall Path Network with on-road cycle route to Edinburgh and Dalkeith.

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Midlothian Council "Other Path" 4-5 (part of the wider network) – from Old Craighall Road northwards to Millerhill.

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Midlothian Council "Other Path" 4-6 (part of the wider network) – Danderhall path network, connects to Core Path 4-8

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Midlothian Council "Other Path" 4-10 (part of the wider network) – Crosses the Old Craighall Junction of the A720

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Midlothian Council Core Path 4-34 – along the A6106 heading southwards from Sheriffhall Roundabout (Part of the Penicuik-Dalkeith Foot/Cycle Path - a spinal route linking major settlements across Midlothian)

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Midlothian Council Core Path 4-35a – Continues core path 4-34 southwards along Old Dalkeith Road

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Midlothian Council Core Path 6-0 - Foot/Cycleway running alongside A772 connecting A772/ B6392 roundabout with Midlothian and Edinburgh boundary.

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Midlothian Council "Other Path" 6-2 (part of the wider network) – Heads southwards from Burnside to the west of the Gilmerton Junction on the A772.

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Midlothian Council Core Path 6-4 - East end connects with 400 metres of Broad footway leading to start of Penicuik-Dalkeith Foot/Cycleway. West end connects with path running along River North Esk through Melville Castle Estate.

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*Source: Midlothian Council Core Paths Plan (Map 1) (2009) and City of Edinburgh Council Core Paths Plan (2008)*

There are a number of Midlothian Council "Other Paths" (4-18; 4-20 and 4-21) which are shown on the Midlothian Council Core Paths Plan (Map No.1), and which fall within the 500m study area). However all three of these "Other Paths" are contained within the boundaries of Dalkeith Country Park.

There is also pavement provision along the A7 northbound and the A6106 Millerhill Road. In addition, a significant part of the land around the Scheme options will be affected by the Land Reform (Scotland) Act 2003 legislation. Under Part 1 of the Land Reform (Scotland) Act 2003 everyone now has statutory access rights for recreational purposes on most land and inland water in Scotland – provided these rights are exercised responsibly and regardless of whether an identified path or track exists or not. Section 13 of the 2003 Act reinforces the duty of all Scottish local authorities to assert, protect, and keep open and free from obstruction or encroachment any route – which includes Rights of Way (RoW) – by which access may reasonably be exercised.

#### 8.5.5 Cycle paths/ other shared routes

There are no National Cycle Network (NCN) routes located within the 500m study area. The closest NCN route is the Whitecraig to Bonnyrigg sections of the National Cycle Route 1 (NCR1), following a route to south of the A720 Sheriffhall Roundabout through Dalkeith. NCR1 has been included on Figure 8.1 for illustrative purposes.

There is a network of local cycle routes within the 500 m study area):

- A7 (north of Sheriffhall Roundabout) – on road (marked cycle lanes) on both carriageways with off-road crossing over the Sheriffhall Roundabout (no traffic controlled signals) ;
- A6106 (Old Dalkeith Road) - off-road (a shared pedestrian/cyclist pavement on east side of the A6106 between Sheriffhall Roundabout and Melville Gate Road) . Cyclist access to the Sheriffhall section of the off-road Dalkeith to Penicuik Walkway, north of the Melville Gate Road, has been permanently severed since February 2013 when the route was reclaimed as part of the Borders Railway line corridor alignment.
- A6106 (Old Dalkeith Road) - There is a short off-road combined shared path on the west side of the A6106 linking to the south side of the Sheriffhall Roundabout;
- A772 (Gilmerton Road – south of the A720) – off road (a shared pavement on north side of the A772 between the A7 (south) and the Gilmerton Junction with off-road access across the A720 Gilmerton Junction over-bridge);
- A772 (Gilmerton Road – north of the A720) – off road (a shared pavement on east side of the A772 with off-road access across the A720 Gilmerton Junction over-bridge).

Although there is no dedicated off-road cyclist provision, both the A7 (south from the Sheriffhall Roundabout through the A7 Gilmerton Road Roundabout), and also the A6106 (Millerhill Road), provide additional on-road cycling opportunities (no marked cycle lanes).

As reported in the A720 Sheriffhall Roundabout DMRB Stage 1 report (September 2014), a cyclists survey was carried out in October 2013, with cyclists counted crossing the A720 at Gilmerton, Sheriffhall and Millerhill during a single weekday (12-hour period, 7am to 7pm). For ease of reference the results are repeated below in Table 8.5.

**Table 8.5. 2014 Cyclist Survey Results**

Location	Number Count
Gilmerton Junction	86
Sheriffhall Roundabout	14
Millerhill Junction	0

### 8.5.6 Equestrians

There are no dedicated equestrian paths or trails within the 500m study area. The nearest riding centre is the Drum Riding for the Disabled Centre based at the Drum Estate, Gilmerton. The Centre is located less than 3.4km north-west of the Sheriffhall Roundabout but is accessed from the A772 Gilmerton Road (on the north side of the A720) .The Centre provides riding therapy for over 250 riders from schools and adult learning centres across Edinburgh and the Lothians.

In addition, the Edinburgh Equestrian Centre is based at Home Farm north-east of Dalkeith. Although the Centre is located approximately 4.9km east of the Sheriffhall Roundabout it manages horse riding activities in Dalkeith Country Park and part of its advertised 'Round Estate' riding trail fall within the 500m study area.

The statement made in the section 8.5.3.1 regarding the Land Reform (Scotland) Act 2003 is also applicable for public recreational access rights to horse riding in, and around, the study area.

For the purposes of this assessment, any impacts identified for NMUs is considered to include equestrians.

### 8.5.7 Scheduled Bus Service Travellers

The Sheriffhall Park & Ride facility is located to the north of the Sheriffhall Roundabout which provides a number of bus connections. There 14 other bus stops within the study area as shown on Figure 8.1 – Baseline – All Travellers.

A summary of the scheduled bus services within the A720 Sheriffhall Roundabout 500m study area are provided in Table 8.6 below:

**Table 8.6. Scheduled Bus Services Located within the A720 Sheriffhall Roundabout Study Area**

Operator	Service Number	Service Route	Via Sheriffhall Roundabout	Via Gilmerton Junction
Lothian Buses	3	Clovenstone to Mayfield (via Gilmerton/Eskbank/Dalkeith) and vice versa		✓
	N3 (nighttime only)	Haymarket to Birkenside (via Gilmerton/Eskbank/Dalkeith) and vice versa		✓
	29	Silverknowes to Gorebridge (via Gilmerton) and vice versa		✓
	X29	Muirhouse to Gorebridge Express (via Gilmerton Crossroads) and vice versa		✓
	33	Baberton to Dalkeith (via the Sheriffhall P & R) and vice versa	✓	
	X33	Mayfield to Edinburgh (via the Sheriffhall P & R)	✓	
	49	The Jewel to Rosewell (via the Sheriffhall P&R) and vice versa	✓	
Perrymans Buses	51/52	Edinburgh to Jedburgh/Kelso (via Danderhall) and vice versa	✓	
	527	Visit Midlothian Explorer Bus (April to October only)		✓
First Bus	95A, X95	Edinburgh to Carlisle (via Eskbank) and vice versa	✓	
Lothian Community Transport Services	R3	Dalkeith to The Jewel ASDA (via Danderhall-Newton-Millerhill) and vice versa	✓	

Source: Site Visit and reference to the Lothian Buses, Perrymans Buses, First Bus, E&M Horsburgh and the Lothian Community Transport Services websites

The bus services travelling through Gilmerton Junction have been included as these services may migrate to Sheriffhall Junction if traffic is improved.

### 8.5.8 Railway Travellers

ScotRail (operated by Abellio) currently provide passenger services on the Borders Railway line between Edinburgh (Waverley) and Tweedbank in the Scottish Borders. Monday to Saturday services are half-hourly in each direction until 20:00, with an hourly service provided after 20:00 and on Sundays. The timetable allows charter train promoters to run special excursion services within the hourly evening and Sunday services (e.g. the "Flying Scotsman" steam train excursions which took place in May 2016 and the ScotRail Sunday steam trip promotions which were held in August and September 2016).

The route alignment between Millerhill and Eskbank passes below the A720 Edinburgh City Bypass to the east of the A720 Sheriffhall Roundabout. A new station (Shawfair) with vehicle parking for c.60 cars has been constructed north of Newton Village – although this is located beyond the 500m study area.

## 8.6 Assessment of Potential Effects

The following provides a summary of the effects on All Travellers for each of the three options. Where mitigation is embedded in the Scheme design this has been taken into account during assessment, otherwise the summaries provided below are prior to any mitigation. Residual effects following potential mitigation are discussed in Section 8.7.1.

### 8.6.1 Limitations to Assessment

There have been no limitations encountered in this assessment, however, a number of assumptions have been made, these include:

- Referenced baseline information and data which has been accessed from a variety of publicly available sources is correct at the time of publication;
- At this DMRB Stage 2, no detailed calculation of any journey length changes has been made. A detailed assessment of any such impacts would be further assessed during the DMRB Stage 3 preferred option assessment;
- As reported in Section 8.4, the Land Reform (Scotland) Act 2003 grants statutory rights of responsible access on and over most land. It is therefore acknowledged that additional areas of privately owned land within the study area may be used informally by NMUs and this would be identified through further consultation during the DMRB Stage 3 assessment with proposed additional mitigation if/as necessary;
- The nature of the scope of the chapter topic requires objective and subjective (qualitative) assessments to be made of predicted impacts although quantitative assessment methods have been used where practicable.

### 8.6.2 Construction Impacts

All options will result in extended local journey times for vehicles during the construction period; the significance of the effect has been assessed as **moderate adverse**.

For NMUs there will be disruption during the construction period to Edinburgh City Council Core Path CEC-4 and Midlothian Core Path 4-34 which both finish at Sheriffhall Roundabout. There will also be impacts on off-road sections of paths which link each arm of the Sheriffhall Roundabout, off- road path sections on the A6106 and pavement provision on the A7 north and A6106 Millerhill Road. The significance of effect has been assessed as **moderate adverse** prior to any mitigation measures.

During construction there will be impacts on existing bus stop provision on the A7 north and the A6106 Old Dalkeith Road and potential disruption to the operation of the Borders Railway, the significance of both of these effects have been assessed as **moderate adverse**.

All options will impact on the current traffic control and monitoring layby at Sheriffhall roundabout, the significance of effect has assessed as **moderate adverse**.

All of the options have the potential to create driver stress due to the use of temporary traffic management measures resulting in delays and frustration. The magnitude of the impact for Option C is considered less (minor) than for Options A & B (moderate) as Option C can be built mostly offline resulting in less disruption. The overall significance of effect has been assessed as **moderate adverse**.

For all options the amenity changes (relating to the relative pleasantness of a journey for NMUs and views from the road for vehicle travellers) there will be temporary adverse effects on all users during construction, the overall significance of effect has been assessed as **moderate adverse**.

### 8.6.3 Operational Impacts

#### **Impacts Common to All Options**

Grade separation of Sheriffhall Roundabout will result in operational benefits for all options as traffic on the A720 traffic will no longer have to negotiate the roundabout and local traffic should be less congested. The significance of effect has been assessed as **moderate beneficial**.

At present, all options remove the current traffic control and monitoring layby at Sheriffhall roundabout, the significance of effect has assessed as **moderate adverse**.

In terms of driver stress, all of the options have the potential to reduce driver frustration as A720 traffic will be made free flowing by the introduction of grade separation at Sheriffhall. Local traffic should also flow more freely reducing delays and the potential for frustration. Driver stress also considers fear of potential accidents. All options will provide enhanced safety benefits for users of the A720 as access will be via slip roads and all junctions will be designed to improve alignment and visibility. All options will also improve consistency of speeds on the A720 between Gilmerton Junction and the Millerhill Junction. The significance of effect has been assessed as **moderate beneficial**.

### **Option A**

NMUs - Option A retains the current A7 north and A6106 Old Dalkeith Road as segregated shared cycleway/footpaths. The significance of effect has been assessed as **slight beneficial**.

Bus Stops - Option A will impact on two bus stops on the A7 (one in each direction). At this stage the design is not developed to include new bus stop locations and this would be investigated at Stage 3. It is considered likely that replacement bus stops could be provided at or near their current location. The significance of effect has assessed as **slight adverse**.

Driver Stress - Option A introduces additional roundabouts which may provide some uncertainty for road users navigating along the A7/A6106. The significance of effect has assessed as **moderate adverse**.

Amenity Changes (relating to the relative pleasantness of a journey for NMUs and views from the road for vehicle travellers) - Option A includes benefits for users of the A720 which will be raised on an embankment providing better views from the road, the significance of effect has been assessed as **slight beneficial**. Local road users A7/A6106 (vehicles and on-road cyclists) will remain at grade, however, new bridge structures will restrict views, the significance of effect has assessed as **slight adverse**. NMUs will have segregated footway/cycleway provision, however this is adjacent to the road side for the majority of this Option meaning NMUs will be still be exposed to impacts relating to traffic noise, dirt, air quality etc. The provision of segregated provision is an improvement on the current situation; however at grade crossings will be required. The significance of effect has been assessed as **slight beneficial**.

### **Option B**

NMUs - Option B will retain the alignment of the current Core Paths, CEC4 and 4-34 and provide shared footpath/cycle way to connect across Sheriffhall Roundabout with at grade crossings. The A6106 Millerhill Road will be realigned; however this will continue to provide provision for on-road cycling. Along the A7 north a shared cycleway/footpath will connect to the current on-road cycling provision replacing a small section of current on-road cycling provision. The significance of effect has been assessed as **slight beneficial**.

Bus Stops - Option B will impact on two bus stops on the A7 (one in each direction). At this stage the design is not developed to include new bus stop locations and this would be investigated at Stage 3. It is considered likely that replacement bus stops could be provided at or near their current location. The significance of effect has assessed as **slight adverse**.

Driver Stress - Option A introduces additional roundabouts which may provide some uncertainty for road users navigating along the A7/A6106. The significance of effect has assessed as **moderate adverse**.

Amenity Changes (relating to the relative pleasantness of a journey for NMUs and views from the road for vehicle travellers) - Option B includes benefits for users of the A720 which will be raised on an embankment providing better views from the road, the significance of effect has been assessed as **slight beneficial**. Local road users A7/A6106 (vehicles and on-road cyclists) will remain at grade, however, new bridge structures will restrict views, the significance of effect has assessed as **slight adverse**. NMUs will have segregated footway/cycleway provision, however this is adjacent to the road side for the majority of this option meaning NMUs will be still be exposed to impacts relating to traffic noise, dirt, air quality etc. The provision of segregated provision is an improvement on the current situation; however at grade crossings will be required. The significance of effect has been assessed as **slight beneficial**.

### **Option C**



NMUs - Option C will result in the realignment of Sheriffhall Roundabout to the west of its existing location and will result in the realignment of all roads currently linking to the Roundabout. This Option allows each of the existing road alignments to be utilised as segregated shared cycleway/footpaths. The A720 is crossed by a footbridge. The realigned roads will impact on the current opportunities for on-road cycling; however the new road alignments will replace this provision. The significance of effect has been assessed as **slight beneficial**.

Bus Stops - Option C requires the realignment of the A7 (north) and the A6106 Old Dalkeith Road in the south. It will not be possible to provide replacement bus stops at or near their current location. It is likely that bus stops could be provided on the A7 after the roundabout connecting the A6016 Millerhill Road and on the realigned A6106 Old Dalkeith Road in the south between the new roundabout in the south and the current roundabout at Melville Gate Road/ A6106 Millerhill Road. The significance of effect has assessed as **moderate adverse**.

Driver Stress - Option C introduces additional roundabouts which may provide some uncertainty for road users navigating along the A7/A6106. The significance of effect has assessed as **slight adverse**.

Amenity Changes (relating to the relative pleasantness of a journey for NMUs and views from the road for vehicle travellers) - Option C results in A720 vehicle travellers remaining at grade with new bridge structures restricting views, and the significance of effect has been assessed as **slight adverse**. Local road users A7/A6106 (vehicles and on-road cyclists) will be raised on embankments, thereby providing better views from the road, the significance of effect has assessed as **slight beneficial**. NMUs will have segregated footway/cycleway provision to the east of the new road alignment, further separated from traffic than in Options A & B. A dedicated footbridge across the A720 means that at-grade crossings are limited to A6106 Old Dalkeith Road /Millerhill Road. The significance of effect has been assessed as **slight beneficial**.

## 8.7 Summary of Effects

Table 8.7 overleaf summarises both the predicted construction and operational effects for all three options. This includes consideration of the potential disruption due to construction.

Potential mitigation measures are identified for the scheme option's construction and operational phases.

### 8.7.1 Residual Impacts

Residual effects have been identified in Table 8.7. There are no significant adverse residual effects identified for any of the options. All options will result in significant moderate beneficial effects for vehicle travellers due to the grade separation of Sheriffhall Roundabout, allowing for free flow of A720 traffic and less congestion for vehicles travelling along the A7 (north/south) and A6106 (Millerhill Road & Old Dalkeith Road) through Sheriffhall – including grade-separated accesses to/from the A720. This also results in significant moderate beneficial effects in terms of driver stress for all options.

Table 8.7 - Potential Construction and Operational Effects

	Option	Predicted Impacts	Magnitude of Predicted Impact	Sensitivity of Receptor	Significance of Effect	Potential Mitigation Measures	Residual Effects (Following the implementation of mitigation measures)
<b>Vehicle Travellers</b>							
Construction	Common to all Options	<p>Extended local journey times for vehicles created by change to the Sheriffhall Roundabout baseline conditions during construction e.g. use of temporary traffic management measures such as route diversions, alternating single-way traffic flows, lane narrowing, changes in road speed limits, construction vehicle and plant movements etc.</p> <p>Note - Option C is slightly better for vehicle travellers during construction as it can be built off-line, however this improvement is not enough to change the Significance of Effect from 'Moderate Adverse' to 'Minor Adverse'.</p>	Moderate	Medium	Moderate Adverse	Phasing of construction works (including temporary traffic management measures) to minimise disruption to A7/A720/A6106 vehicle travellers and maintenance of vehicle traveller access at Sheriffhall to avoid any temporary route severances.	Slight Adverse
Operation	Common to all Options	Removal of the traffic light controlled Sheriffhall Roundabout creates free-flow of A720 City Bypass traffic through Sheriffhall and less congestion for vehicles travelling along the A7 (north/south) and A6106 (Millerhill Road & Old Dalkeith Road) through Sheriffhall – including grade-separated accesses to/from the A720.	Major	Medium	Moderate Beneficial	All options provide a grade separated junction lay-out at Sheriffhall and remove the current traffic light controlled at-grade roundabout accesses/exits. Mitigation will be required in terms of provision of 'New Road Layout' advance warning signage for A7/A6106 vehicle drivers.	Moderate Beneficial
<b>Non-Motorised Users (NMUs)</b>							
Construction	Common to all Options	<p>During construction there will be disruption to a number of the baseline receptors identified for NMUs these include:</p> <p>Edinburgh City Council Core Path CEC-4</p> <p>Midlothian Council Core Path 4-34</p> <p>Off road path sections linking each arm of the Sheriffhall Roundabout</p> <p>Off Road path sections on the A6106 (off road combined shared path on the west</p>	Major	Medium	Moderate Adverse	<p>During construction access through Sheriffhall Roundabout should be maintained at all times where possible to minimise disruption to NMUs.</p> <p>Any required temporary diversion should be agreed in advance with City of Edinburgh/Midlothian council and advanced signage should be</p>	Slight Adverse

		linking to Sheriffhall Roundabout and shared pavement on the east) Pavement provision on the A7 north and the A6106 Millerhill Road. On-road cycling (for which temporary traffic management may cause delays)				provided.	
Operation	A	Option A will result in in the realignment of both the A7 (north) and the A6106 Old Dalkeith Road both of which are Core Paths (CEC4 and 4-34 respectively). The design proposes to retain the current road alignments as shared cycleway/footpaths segregated from traffic.  The realigned roads will impact on the current opportunities for on-road cycling; however the new road alignments will replace this provision.	Minor	Medium	Slight Beneficial	The scheme design for Option A incorporates segregated provision for NMUs utilising the existing alignments of the A6106 (north and south) and A7 (north and south) as embedded mitigation. This includes shared NMU routes with at-grade crossings to avoid permanent severance of NMU access across Sheriffhall Roundabout.  Consultations with City Of Edinburgh Council and Midlothian Council will be undertaken at Stage 3 to inform the design of NMU routes through Sheriffhall Roundabout, including minor re-routing of Core Paths.	Slight Beneficial
	B	Option B will retain the alignment of the current Core Paths, CEC4 and 4-34 and provide shared footpath/cycle way to connect across Sheriffhall Roundabout with at grade crossings.  The A6106 Millerhill Road will be realigned; however this will continue to provide provision for on-road cycling. Along the A7 north a shared cycleway/footpath will connect to the current on-road cycling provision replacing a small section of current on-road cycling provision.	Minor	Medium	Slight Beneficial	The scheme design for Option B incorporates segregated provision for NMUs with at grade crossings as embedded mitigation.  The current A6106 Millerhill Road will be utilised as a shared cycleway/footpath once the road is realigned.  Consultations with City Of Edinburgh Council and Midlothian Council will be undertaken at Stage 3 to inform the design of NMU routes through Sheriffhall Roundabout, including minor re-routing of Core Paths.	Slight Beneficial
	C	Option C involves the movement of Sheriffhall Roundabout 250m west of its existing location and will result in the realignment of all roads currently linking to the Roundabout. This Option allows each	Minor	Medium	Slight Beneficial	The scheme design for Option C incorporates segregated provision for NMUs with a dedicated footbridge for crossing the A720 as	Slight Beneficial

of the existing road alignments to be utilised as segregated shared cycleway/footpaths with provision of a footbridge to cross the A720.

The realigned roads will impact on the current opportunities for on-road cycling; however the new road alignments will replace this provision.

embedded mitigation.

Consultations with City Of Edinburgh Council and Midlothian Council will be undertaken at Stage 3 to inform the design of NMU routes through Sheriffhall Roundabout, including minor re-routing of Core Paths.

### Public Transport Travellers

Construction	Common to all Options	During construction, each of the options has the potential to impact on current bus stops located on the A7 north (at Campend & Summerside) and the A6106 Old Dalkeith Road (east side – between Sheriffhall Roundabout and the Melville Gate Road junction). These bus stop locations are highlighted on Figure 8.1 as number 1 and 2.	Moderate	Medium	Moderate Adverse	Consultations (at DMRB Stage 3) to be held with affected bus operators (Lothian Buses and First Bus) to agree permanent alternative bus stop locations to maintain scheduled local bus services provision.	Slight Adverse
	Common to all Options	During construction, each of the options has the potential to cause disturbance to the operation of the Borders Railway to allow construction of the extension of the existing A720 Borders Railway underbridge to accommodate new slip roads onto the A720.	Moderate	Medium	Moderate Adverse	Pre-construction consultation with Network Rail and the rail operator (Abellio) to agree working methods e.g. overnight/ weekend line possessions to minimise the temporary disruption to the scheduled Borders Railway service timetable.	Slight Adverse
Operation	A & B	Both Options A & B will impact on the current two bus stops on the A7 north (at Campend & Summerside) and which are highlighted on Figure 8.1 as number 1 and 2. At this stage the design is not developed to include new bus stop locations and this would be investigated at Stage 3. It is considered likely that replacement bus stops could be provided at or near their current location.	Minor	Medium	Slight Adverse	Consultations (at DMRB Stage 3) to be held with affected bus operators (Lothian Buses and First Bus) to agree permanent alternative bus stop locations to maintain scheduled local bus services provision.	Slight Adverse
	C	Option C requires the realignment of the A7 (north) and the A6106 Old Dalkeith Road in the south. It will not be possible to provide replacement bus stops at or near their current location. These three	Moderate	Medium	Moderate Adverse	Consultations (at DMRB Stage 3) to be held with affected bus operators (Lothian Buses and First Bus) to agree permanent alternative bus stop locations to maintain	Slight Adverse

affected bus stop locations are highlighted on Figure 8.1 as number 1 , 2 and 3.

scheduled local bus services provision.

It is likely that bus stops could be provided on the A7 and on the realigned A6106 Old Dalkeith Road at Melville Gate Road/ A6106 Millerhill Road.

#### A720 Sheriffhall Roundabout – Traffic Control & Monitoring Layby

Construction & Operation	Common to all Options	The current lay-by at Sheriffhall Roundabout (located between A720 and A7 (north) will be lost for all three options.	Moderate	Medium	Moderate Adverse	Consultations will be undertaken at Stage 3 to agree whether alternative layby provision should be incorporated into the Preferred Scheme Design.	Slight Adverse
<b>Driver Stress</b>							
Construction	A & B	During construction there is the potential for driver stress whilst traversing the A720 Sheriffhall Roundabout due to construction activities. This could include the use of temporary traffic management measures such as temporary traffic lights, speed restrictions, diversionary routes, temporary closures, lane narrowing, construction vehicle movements etc.	Moderate	Medium	Moderate Adverse	Mitigation should include provision of advanced signage information (e.g. on A720 overhead gantry displays) and on the A7 and A6106 as well as updates on Traffic Scotland and local news updates warning drivers of potential traffic control measures and potential journey delays.	Slight Adverse
	C	During construction there is the potential for driver stress whilst traversing the A720 Sheriffhall Roundabout due to construction activities. As Option C can be mostly built offline the potential for disruption is less than other options. This could include the use of temporary traffic management measures such as temporary traffic lights, speed restrictions, diversionary routes, temporary closures, lane narrowing, construction vehicle movements etc.	Minor	Medium	Slight Adverse	Mitigation should include provision of advanced signage information (e.g. on A720 overhead gantry displays) and on the A7 and A6106 as well as updates on Traffic Scotland and local news updates warning drivers of potential traffic control measures and potential journey delays.	Slight Adverse
Operation	Common to all options	All of the options have the potential to reduce driver frustration as A720 traffic will be free flowing by the introduction of grade separation at Sheriffhall. Local traffic should also flow more freely reducing delays and the potential for frustration. Driver stress also considers fear of potential accidents.	Moderate	Medium	Moderate Beneficial	None proposed	Moderate Beneficial

All options will provide enhanced safety benefits for users of the A720 as access will be via slip roads and all junctions will be designed to improve alignment and visibility.

All options will also improve consistency of speeds on the A720 between Gilmerton Junction and the Millerhill Junction.

	A & C	Both Options A & C introduce additional roundabouts which may provide some uncertainty for road users navigating along the A7/A6106.	Moderate	Medium	Moderate Adverse	Signage provision will clear directions for local road users should mitigate any uncertainty over new road layouts.	Slight Adverse
<b>Amenity Changes (relating to the relative pleasantness of a journey for NMUs and views from the road for vehicle travellers)</b>							
Construction	Common to all options	There will be temporary adverse amenity impacts on all users during construction.	Moderate	Medium	Moderate Adverse	Best practice construction measures should minimise impacts on all users during construction.	Slight Adverse
Operation	A & B	Users of the A720 The A720 will be raised on an embankment, thereby providing better views from the road.	Minor	Medium	Slight Beneficial	None proposed.	Slight Beneficial
		Local road users A7/A6106 (vehicles and on-road cyclists) Local road users will remain at grade; however, new bridge structures will restrict views.	Minor	Medium	Slight Adverse	None proposed.	Slight Adverse
		NMUs NMUs will have segregated footway/cycleway provision, however this is adjacent to the road side for the majority of this Option meaning NMUs will be still be exposed to impacts relating to traffic noise, dirt, air quality etc. The provision of segregated provision is an improvement on the current situation, however at grade crossings will be required.	Minor	Medium	Slight Beneficial	Clear directional signage should be provided for all NMUs	Slight Beneficial
	C	Users of the A720 The A720 will remain at grade; however, new bridge structures will restrict views.	Minor	Medium	Slight Adverse	None proposed.	Slight Adverse

Local road users A7/A6106 (vehicles and on-road cyclists) Local road users will be raised on embankments, thereby providing better views from the road.	Minor	Medium	Slight Beneficial	None proposed.	Slight Beneficial
NMUs NMUs will have segregated footway/cycleway provision to the east of the new road alignment, further separated from traffic than in Options A & B. A dedicated footbridge across the A720 means that at - grade crossings are limited to A6106 Old Dalkeith Road /Millerhill Road.	Moderate	Medium	Slight Beneficial	Clear directional signage should be provided for all NMUs.	Slight Beneficial

## 8.8 Compliance with Policies and Plans

An assessment of the compliance of the A720 Sheriffhall Roundabout DMRB Stage 2 scheme options in relation to the policies and plans summarised below.

In Section 8.2.3 (SESPlan – June 2013), the proposed A720 Sheriffhall Roundabout upgrade is identified as a specific intervention within Transport Scotland's Strategic Transport Projects Review. In addition, the strategic transport infrastructure improvement benefits of the proposed A720 Sheriffhall Roundabout upgrade to improving connectivity, supporting the growth of active travel and recreational access, and assisting future local community and economic growth are reflected in a number of policies and plans including NPF3 (2014); SPP (2014); SESPlan (2013), the Edinburgh Local Development Plan (2016); the current Adopted Midlothian Local Plan (2008) and the Midlothian Local Development Proposed Plan (2014).

### 8.8.1 Vehicle Travellers

The NPF 3 "Connected Places" theme recognizes that the Scottish road network has an essential role to play in connecting cities by car and public transport. It acknowledges that road network capacity, including the proposed A720 Sheriffhall Roundabout upgrade has particular implications for future development. SPP (2014) also supports the theme of "Connected Place" where significant economic growth or regeneration benefits can be facilitated by improved vehicle travellers transport infrastructure.

The Edinburgh Local Development Plan (2016) promotes the provision of bus priority provision as part of the A720 Sheriffhall Junction Upgrade whilst Midlothian Council – in both its current Adopted Local Plan (2008) and its Proposed Local Development Plan (2014) – attach a high priority to the Sheriffhall Junction Upgrade for vehicle travellers and also supports the extension of the Sheriffhall Park & Ride as a transport improvement intervention.

All three A720 Sheriffhall Roundabout DMRB Stage 2 options would therefore be compliant with these key policies and plans objectives for vehicle travellers.

### 8.8.2 Non-Motorised Vehicle Users (NMUs)

The NPF 3 "Connected Places" theme recognizes that the Scottish road network has an essential role to play in developing active travel opportunities and that road network capacity, including the A720 where interventions are being taken forward at Sheriffhall Roundabout, has particular implications for future development. SPP (2014) supports the use of existing infrastructure, and improved infrastructure in providing safe and convenient NMU opportunities for both recreation and active travel. Therefore, the proposed upgrade to the A720 Sheriffhall Junction is compliant with this SPP (2014) objective.

The Edinburgh Local Development Plan (2016) promotes the provision of safe pedestrian and cyclist crossing provision as part of the Sheriffhall Junction Upgrade whilst both the City of Edinburgh Core Paths Plan (2008) and the Midlothian Council Core Paths Plan (2009) contain core paths and other paths which pass through, or are in proximity to the baseline A720 Sheriffhall Roundabout location.

All three A720 Sheriffhall Roundabout DMRB Stage 2 options proposed design interventions which maintain, and provide improved/ safer NMU access around, and through Sheriffhall Junction. These design proposals would therefore be compliant with these key policies and plans objectives for NMUs.

## 8.9 Conclusions

During the construction phase the effects are anticipated to be similar for all options and include extended local journey times for vehicles travellers (including public transport travellers) and disruption to non-motorised users. For all options during the construction phase there is the potential to increase driver stress and for temporary adverse amenity effects on all users of the A720 Sheriffhall Roundabout.

During the operation phase all of the options will improve the current situation for users of the A720 Sheriffhall Roundabout as the creation of a grade separated junction will reduce congestion for both strategic and local road users. There are a number of receptors at in the study area which will be directly affected by the options proposed including core paths, other existing shared use paths, on-road cycling provision and bus stops. Each of the options has been designed to provide similar or enhanced provision for NMUs resulting in overall benefits.



Option C provides shared cycleway/footpaths to allow NMUs to travel through Sheriffhall Roundabout which is set apart from traffic to a greater extent than Options A and B and with a dedicated NMU structure across the A720. None of the proposed options will result in any significant adverse effects, with beneficial effects expected for vehicle travellers including reduced driver stress. Options A and C introduce additional roundabouts which may result in some uncertainty for local road users navigating along the A7/A6106.

Option B could be considered to provide the best option for vehicle travellers as it is similar to the existing situation at Sheriffhall and therefore may be easier for local road users to navigate. Option C could be considered to provide the best option for NMUs as shared footway/cycleway is further segregated from traffic than Options A and B, however this is only a short section within the overall local network and all options include segregated shared footway/cycleway provision.

## 8.10 Scope of DMRB Stage 3 Assessment

The scope of the DMRB Stage 3 assessment will build upon the DMRB Stage 2 findings to update existing information, provide additional information, or to confirm/amend assessment conclusions and potential mitigation opportunities made during Stage 2 e.g. via additional landowner consultation. The DMRB Stage 3 scope is therefore likely to include:

- Further consultations with statutory consultees and relevant organisations (e.g. Midlothian Council, City of Edinburgh Council and East Lothian Council Access Officers, Scotways, Sustrans, the British Horse Society and Lothian Buses).
- Updating of the Stage 2 assessment including any additional information provided by consultees through desk-based reviews and site visits.
- Updating the Stage 2 assessment to confirm/amend the level of effect for changes in journey length and amenity created by the preferred option and agreed mitigation measures.
- Updating the Stage 2 assessment of NMU route impacts (e.g. on amenity value) taking into account information arising from parallel technical assessments being undertaken at Stage 3 (e.g. Landscape and Visual, Noise & Vibration, Air Quality) as well as Traffic – including respective mitigation measures.
- Updating the Stage 2 assessment of Driver stress impacts with reference to the Traffic assessment information arising during Stage 3.
- Reviewing and updating (if required), the proposed “All Travellers” Stage 2 mitigation, based on relevant information emerging from the DMRB Stage 3 technical and environmental assessments.

## 9. Community and Private Assets

### 9.1 Introduction

The consideration of the effects on Community and Private Assets directly associated with the A720 Sheriffhall Roundabout improvement options has been undertaken with reference to the DMRB Interim Advice Note 125/09 Supplementary Guidance as discussed in Chapter 1 – Overview of Environmental Assessment. The assessment therefore references DMRB Volume 11 Section 3 Part 6 '*Land Use*' and incorporates the Community Effects element of DMRB Volume 11 Section 3 Part 8 '*Pedestrians, Equestrians, Cyclists and Community Effects*'.

The objective of these Stage 2 assessments are as follows:

- Demolition of Private Property and Associated Land-Take
  - Undertake sufficient assessment to identify the type and number of properties which might need to be demolished and which should be taken into account in developing and refining route.
  - Consideration of the effects of any land-take from private properties such as the loss of gardens, garages and other parking spaces in part or in whole.
  - Identification of the likely impact on business premises which may be affected.
- Loss of Land (including Facilities) Used by the Community
  - Undertake sufficient assessment to identify the location, status and importance of land (including Facilities) used by the public which could be lost and which needs to be taken into account in developing and refining route options.
- Effects on Development Land
  - Undertake sufficient assessment to identify areas of land which fall within local planning authority development designations and which need to be taken into account in developing and refining route options.
- Effects on Agricultural Land
  - Undertake sufficient assessment to identify the value of agricultural land and the effects upon it to should be taken into account in developing and refining route options; and to assess their likely impacts on individual farm units in broad terms.
- Community Facilities
  - Identification of community facilities and consideration of potential community severance e.g. access to residential properties, business operations (including farms), and community facilities.

The Stage 2 assessment of the effects on Community and Private Assets assesses the likely Scheme Options effects on these baseline receptors and aims to inform future decision making regarding the preferred A720 Sheriffhall Roundabout scheme option to be taken forward for more detailed assessment as part of DMRB Stage 3.

### 9.2 Approach and Methodology

Sections 9.2.1 and 9.2.2 set out the published guidance which have been referenced and the assessment methodology used in considering the Community and Private Assets impacts of the A720 Sheriffhall Roundabout scheme options.

#### 9.2.1 Guidance

The assessment approach has also been guided by reference to:

- Consultee responses to the options;
- The results from a site visit which is reported in the baseline, Section 9.5;
- Reference to the URS (now AECOM) A720 Sheriffhall Roundabout DMRB Stage 1 Scheme Assessment Final Report (September 2014);

- Reference to the Scheme Options (DMRB Stage 2) Design drawings;
- Desk-top documentation review and web-based information sources.

### 9.2.2 Methodology

The Effects on Community and Private Assets methodology embraces a number of key considerations for existing receptors contained within, and in proximity to, the Scheme location and these are highlighted below. The scope of effects considered in this chapter (during both the Scheme options construction and Scheme options operation phases) includes:

- Temporary and permanent loss of private property (e.g. demolition) and associated land-take to accommodate the construction of the Scheme options;
- Temporary and permanent loss of community land e.g. common land and open space e.g. any land laid out as public parks or used for the purpose of public recreation;
- Temporary and permanent loss of land which either Edinburgh City Council or Midlothian Council has already designated for future development required as land-take to accommodate the construction of the Scheme options;
- Any impacts of the Scheme options on either Council's development designations;
- A broad assessment of any loss of agricultural land required as land-take to accommodate the construction of the Scheme options and any likely effects on individual farm units;
- Assessment of any relevant planning applications or proposed developments.
- Permanent or temporary effects on community access, or severance of community access, to residential properties, business operations (including farms), and community facilities.

The assessment of the potential effects of the Scheme options (prior to Mitigation) has been undertaken by considering the magnitude of impact (the actual change taking place to the environment) and the sensitivity of the receptor. The significance of effect criteria are used to report the effect of the impact.

Sensitivity of receptors has been defined by professional judgement as to the importance or value of the receptor and its resilience to cope with change. A scale of sensitivity has been defined as; Negligible, Medium, High and Very High.

The levels of magnitude are shown in Table 9.1 below:

**Table 9.1 - Magnitude of Impact**

Level of Magnitude	Definition
Major	A fundamental change to the community and private assets baseline conditions
Moderate	A material but non-fundamental change to the community and private assets baseline conditions
Minor	A detectable but non-material change to the community and private assets baseline conditions
Negligible	Very minor loss or detrimental change to the community and private assets baseline conditions
No Change	No loss or alteration to the community and private assets baseline conditions

Table 9.2 below shows how the determination of the significance of effect is reached, by considering both the magnitude of impact and sensitivity of the receptor. Effects that are Large or Very Large are considered to represent key factors in the decision making process. Those that are moderate are considered to be important but not likely to be key decision making factors. Effects which are slight are unlikely to be critical in the decision making process but are important in enhancing the subsequent design of the project. Neutral refers to those effects which are beneath levels of perception.

**Table 9.2 - Determination of Significance of Effect**

Magnitude of Impact	Sensitivity of Receptor				
	Very High	High	Medium	Low	Negligible
<b>Major</b>	Very Large	Large or Very Large	Moderate or Large	Slight or Moderate	Slight
<b>Moderate</b>	Large or Very Large	Moderate or Large	Moderate	Slight	Neutral or Slight
<b>Minor</b>	Moderate or Large	Slight or Moderate	Slight	Neutral or Slight	Neutral or Slight
<b>Negligible</b>	Slight	Slight	Neutral or Slight	Neutral or Slight	Neutral
<b>No Change</b>	Neutral	Neutral	Neutral	Neutral	Neutral

The impact significance is determined by considering the Magnitude of a predicted effect on the Sensitivity scale of the receiving receptor. Effects can be either adverse or beneficial.

Mitigation measures are identified to minimise the effects of the proposed Scheme options as far as possible within the technical constraints of the project. The mitigation is designed to prevent, reduce, and where possible offset the potential effects upon the Travellers baseline conditions. The residual effects are those remaining after mitigation measures are also considered.

## 9.3 Planning Policy Context

The national, regional and local planning policies and plans relevant to community and private assets are set out below.

### 9.3.1 National Policy

**Scottish Planning Policy (June 2014)** – states that it is important to protect against an unsustainable growth in car-based commuting and the suburbanisation of the countryside and that Plans should make provision for most new urban development to take place within, or in planned extensions to, existing settlements. SPP (2014) Transport is addressed as a subject policy within SPP (2014) - Paragraph 269 – 291 - and it is recognised that the relationship between the strategic transport network (which includes trunk roads) and land use has a strong influence on sustainable economic growth. The strategic transport network, which includes trunk roads, is identified as being critical in supporting a level of national connectivity that facilitates sustainable economic growth. SPP (2014) also promotes business and industrial development that increases economic activity while safeguarding and enhancing the natural and built environments.

SPP 14 promotes rural development and in terms of prime agricultural land (Class 1, 2 or 3.1) states that development on such land should not be permitted except where it is essential, including, “*as a component of the settlement strategy or necessary to meet an established need, for example for essential infrastructure, where no other suitable site is available*” (Paragraph 80).

SPP (2014) also states that Local Development Plans should allocate a range of sites for business, taking account of a range of factors including their integration with, and access to, existing transport networks and their accessibility to transport networks by walking, cycling and public transport.

### 9.3.2 Regional Policy

**The South East Scotland Strategic Development Plan (SESPlan – June 2013)** - sets out a spatial strategy which recognises existing development commitments and promotes a sustainable pattern of growth across the City of Edinburgh, East Lothian, Fife, Midlothian, Scottish Borders and West Lothian Council areas. The strategy is supported by a framework for delivery which includes promoting the development of strategic transport and infrastructure networks to support economic growth and to meet the needs of communities.

A key SESPlan spatial strategy development principle is to have regard to the need to improve the quality of life in local communities by conserving and enhancing the natural and built environment to create more healthy and

attractive places to live whilst SESPlan states the “continued economic growth of the Regional Core will continue to be supported”.

### 9.3.3 City of Edinburgh Council

**Edinburgh City Council Local Development Plan (LDP – Adopted November 2016)** – states that “*there is a clear link between new development and impact on the transport network*” (Page 36, Paragraph 89) and an LDP transport proposal/safeguard (T13 – Sheriffhall Junction Upgrade) supports the grade separation of the existing A720 Sheriffhall Roundabout. The LDP also includes the housing development proposals for Gilmerton Dykes Road (HSG 23), Gilmerton Station Road HSG 24) and The Drum (HSG 25) – which were previously detailed in Chapter 1 – Overview of Environmental Assessment. There is also a new Primary School proposal (SCH 7) for Gilmerton – to be located within the Gilmerton Station Road (HSG 24) housing development site.

### 9.3.4 Midlothian Council

**Midlothian Council Local Plan (Adopted December 2008)** – “attaches a high priority to the grade separation of the A720/A7 Sheriffhall Roundabout” as the current transport congestion levels at this location “have a major impact on access to and from Midlothian and repercussions for its prospects of future growth and prosperity”. (Page 90 Section 3.4.18).

Policy RP4 (Prime Agricultural Land) precludes development which leads to the permanent loss of prime agricultural land (Classes 1, 2 and 3.1 of the Macaulay Institute Land Classification for Agriculture system) unless the site is allocated to meet Structure Plan requirements (now superseded by SESPlan); there is a locational justification for the development which outweighs the environmental or economic interests served by retaining the farmland in productive use; or the development accords with all other relevant Local Plan policies and proposals.

Policy RP32 (Public Rights of Way and Other Access Routes) Development precludes development which could lead to the loss of a right of way, cycle path, bridleway, or other access route (including those defined by the Council’s Core Paths Plan) except where the developer makes arrangements for an acceptable alternative route.

Policy ECON 1 (Strategic Economic Land Allocations – Proposal) permits Business (Class 4) and general industrial (Class 5) development to meet the Structure Plan (now superseded by SESPlan) strategic economic land requirements on a number of stated sites including Shawfair Park Extension and Sheriffhall South. The area around the Sheriffhall Roundabout within the Midlothian Council region is primarily designated as Greenbelt. The Dalkeith Conservation Area lies directly to the east and the route of the ‘Waverley Rail Line’ (Borders Rail Link) runs north to south adjacent to the roundabout. The Midlothian Council Local Plan will be replaced by the Midlothian Council Local Development Plan when it is adopted.

**Midlothian Council Local Development Plan (Proposed Plan 2014)** – focuses on providing for, and managing, future change across the Council area in line with the SESPlan requirements. It comprises a development strategy for the period to 2024 and a detailed policy framework to guide future land use in a way which best reflects SESPlan’s vision, strategic aims and objectives.

Key strategic strands include “Sustainable Place Making” (e.g. accommodating growth in communities, housing development, protecting amenity) and “Promoting Economic Growth” (e.g. supporting business growth and employment). Shawfair Park (Ec1) and Sheriffhall South (E32) are identified as key economic clusters and their location in relation to, and connection with, the strategic road network (including the A720 Sheriffhall Roundabout) and the Borders Railway makes them key sites in the development strategy and represents a major opportunity for growth and employment over the MLDP period.

The proposed LDP Policy ENV4 (Prime Agricultural Land) precludes development which leads to the permanent loss of prime agricultural land to meet an established need (such as essential infrastructure); where there is no alternative site available; and where the need for the development outweighs the environmental or economic interests in retaining the farmland for productive use.

The timescale target for the MLDP adoption is currently spring 2017.

## 9.4 Consultations

A number of consultations were carried out in February 2015 and again in November 2016 during the DMRB Stage 2 Options Assessment. This section includes details of consultations that were undertaken to identify the

receptors that needed to be addressed as part of the assessment community assets assessment. A summary of the relevant consultee responses are given in Table 9.3 below. A full summary of all Stage 2 consultation responses is provided in Chapter 1 -Overview of Environmental Assessment and consultations are provided in full in Appendix 1.1 – Copy of Consultation Responses.

**Table 9.3 – Summary of Consultation Responses**

Consultee	Summary of Responses
Buccleuch Estates	<p><b>Dated 17/03/2015</b></p> <p>Buccleuch Estates hold ownership of a significant portion of the land surrounding the A720 Sheriffhall Roundabout under various subsidiaries:-            “Buccleuch Property Shawfair” at Todhills;            “Buccleuch Estates” (BEL) to the east and northwest of the A7 and south of the A720;            Dalkeith Country Park to the south east;            “Buccleuch Property (Sheriffhall South)” further south of the BEL ownership. Buccleuch property is also a joint venture partner in Shawfair LLP in delivering the 4000 housing unit Shawfair development at the old Monktonhall Colliery site.</p> <p>Buccleuch Estates will view any requests for intrusive ground investigation works positively and not obstruct any reasonable requests to access Buccleuch land, should the resultant information be openly presented to them for review once completed.</p> <p>Buccleuch Estates preference in terms of the tabled options would be Option 6A (now Option B).</p> <hr/> <p><b>Dated 17/03/2015</b></p> <p>As a response on behalf of Dalkeith Country Park which is in Buccleuch Estates ownership, the proposed A720 Sheriffhall roundabout works are viewed as “a positive development to the roads network and in enhancing the accessibility to the Park”.</p> <p>Buccleuch Estates are keen to explore the opportunity to provide directional signage to Dalkeith Park sited on the bypass as part of the Sheriffhall Junction works, and also further at the A68 access point at the mid-point of the Estate as part of, or in advance of the works.</p> <p>Buccleuch Estates preference in terms of the tabled options would be Option 6A (now Option B).</p>

Individual consultations with land owners have also been undertaken throughout the process to inform them of the scheme options. These consultations will be ongoing as the Scheme design develops.

## 9.5 Baseline Conditions

### 9.5.1 Establishment of the Baseline Conditions

The baseline conditions for Community and Private Assets have generally been considered within a 500m study area around the A720 Sheriffhall Roundabout DMRB Stage 2 Scheme Options. A 1km study area has also been identified to provide a wider context, see Figure 9.1. – Community and Private Assets. All residential, community and business and industry receptors identified have been given a reference number which are shown on Figure 9.1 – Community and Private Assets.

Two site visits were undertaken on the 22<sup>nd</sup> of October 2014 and the 29<sup>th</sup> of January 2017. In addition, the baseline conditions were identified through a review of the following:

- The Edinburgh and South East Scotland Strategic Development Plan (SEsplan) (2013);
- The SDP 2 Proposed Strategic Development Plan (October 2016);
- Midlothian Local Plan (Adopted 2008);
- Midlothian Local Development Plan – Proposed Plan (2014)
- City of Edinburgh Council Local Development Plan (Adopted November 2016);
- AECOM’s GIS Database;
- Desk-top documentation review and web-based information sources (relevant references/links provided);
- Land Capability for Agriculture Map - Edinburgh Sheet 66 (The Macaulay Institute for Soil Research (MLURI)); and
- Ordnance Survey (OS) Explorer Maps 345 and 350.

## 9.5.2 Population

The population totals (based upon the 2011 Census) for localities which are within the study area and its immediate environs (e.g. Dalkeith, Bonnyrigg, Danderhall and Whitecraig) are shown in Table 9.4.

**Table 9.4 - Local Populations**

Locality	Population
Danderhall	2,732
Dalkeith/Eskbank	12,342
Bonnyrigg	15,677
Whitecraig	1,198

Source: [www.edinburgh.gov.uk/downloads/file/2937/census\\_2011\\_-\\_community\\_councils](http://www.edinburgh.gov.uk/downloads/file/2937/census_2011_-_community_councils)

## 9.5.3 Residential Properties

Within the wider 1km study area, there are a total of c.350 residential properties - with the majority of these located to the south of the Sheriffhall Roundabout e.g. in Eskbank, and the north-west side of Dalkeith.

Within the 500m study area there are around 20 residential property receptors located at:

- Summerside residences (Ref No. 1);
- Campend residences (Ref No 2);
- Old Sheriffhall Farmhouse residences (Ref No. 3);
- Melville Cottages (Nos. 1 to 6 Gilmerton Road) (Ref No. 4);
- Burndale (Ref No. 5);
- Melville Grange Farmhouse (Ref No. 6); and
- Nos. 612 to 618 Gilmerton Road (Ref No. 7)

As Figure 9.1- Community and Private Assets illustrates, the wider 1km study area contains a number of residential localities. In addition to these is the small village of Newton (<500 population) and the settlement of Millerhill (<100 population).

Residents travelling to/ from all these locations will likely travel the road network illustrated in Figure 9.1. – Community and Private Assets and potentially includes traversing the A720 Sheriffhall Roundabout.

It is clear from the review of planning policy and development plans, above, that the resident population within the wider 1km study area will increase considerably in future years and that the A720 Sheriffhall Junction will be a key transport access to/ from these locations. For the purposes of assessment the Midlothian Local Development Plan (LDP) – Proposed Plan has been used for the most up to date information on planning allocations in the local area. Reference has been made to the adopted plan which shows existing allocations. Table 9.5 below shows the housing development proposals for (sites of over 50 houses) within the wider 1km study area, all of which are in the Midlothian Local Authority area. A table of all proposed developments (economic and housing), that may be impacted by the development, in the wider area has been included in Appendix 9.1 – Planning Proposals and Applications to provide context.

**Table 9.5 – Midlothian Local Authority – Housing Allocations (Existing Local Plan and Proposed Local Development Plan) within 1km**

Name	Site Description
Hs1 – Newton Farm	Expected housing contribution up to 2024: 350 with an overall capacity of 480 homes. Development will need to take account of the impact of its location next to the City Bypass, on the setting of Newton House designed landscape, and on the scheduled monuments in the vicinity.
Hs2 – Larkfield West, Eskbank	Expected housing contribution up to 2024: 60 homes.
Hs3 – Larkfield South	Expected housing contribution up to 2024: 30 – 40 homes.

Name	Site Description
West, Eskbank	
H43 – Shawfair	Shawfair capacity estimated at 3,500 homes and to be delivered in line with Shawfair Masterplan/ Shawfair Design Guide/ Addenda as well as LDP sites h44 and h45.
H45 – South Danderhall	Shawfair capacity estimated at 300 homes and to be delivered in line with Shawfair Masterplan/ Shawfair Design Guide/ Addenda as well as LDP sites h43 and h44.

### 9.5.4 Community Facilities

Within the study area, there are a number of community facilities including;

- Within 500m:
  - Chapter One Childcare Nursery (Ref No.8);
  - Sheriffhall Park and Ride (Ref No.9);
  - Old Colliery Pub Restaurant (Ref No.10);
  - Spire Shawfair Park Hospital (Ref No.11);
  - Elginhaugh Farm Pub Restaurant (Ref No.12);
  - Dobbies Garden Centre and Butterfly World (Ref No.13); and
  - Melville Inn Pub Restaurant (Ref No.14)
- Within wider 1km:
  - Danderhall Leisure Centre and Library (Ref No.15);
  - Danderhall Police Station (Ref No.16);
  - Danderhall Medical Practice (Ref No.17);
  - Calvary Chapel of Edinburgh (Ref No.18);
  - Newton Parish Church (Ref No.19);
  - Melville Golf Centre (Ref No.20);
  - Cockatoo Restaurant (Ref No.21); and
  - King's Acre Golf Course (Ref No.22).

The Midlothian LDP Proposed Plan (2014) also contains significant new community facility proposals as part of the proposed Shawfair settlement including a supermarket, schools, sports facilities, a medical centre, library, and community woodland/ landscaping and open space provision.

It should also be noted that the Edinburgh Royal Infirmary is located about 4km on the A7 to the north and although outwith the study area is a regionally important facility and has been considered in this assessment.

### 9.5.5 Business and Industry

There are a number of Business and Industry receptors within the 1km study area including:

- Lowes Fruit Farm (to let), Didcock and Son Upholstery and Sheriffhall Café (Ref No.23);
- Shawfair Park (Ref No.24);
- Todhills Business Park and Drum Farm Antiques(Ref No.25);
- Beijing Banquet Chinese Restaurant (Ref No.26);
- Danderhall Co-operative Supermarket (Ref No.27);
- Premier Inn Edinburgh (Dalkeith) (Ref No.28); and
- Melville Castle Hotel (Ref No.29);



In addition to these receptors, the review of planning policy and development plans has identified a number of economic development areas located within the wider 1km study area, all of which are located in Midlothian Local Authority area. These are detailed in Table 9.6 below. A table of all proposed developments (economic and housing), that may be impacted by the development, in the wider area has been included in Appendix 9.1 – Planning Proposals and Applications to provide context.

**Table 9.6 - Midlothian Local Plan- Proposed Plan Economic Allocations within 1km**

Name	Site Description
E32 – Sheriffhall South	Site Area: 11.5ha Suitable for business (Class 4) use only and will remain part of green belt to avoid pressure from alternative land uses, and to ensure the layout of the development and provision of open space respects Green Belt objectives and the character of the surrounding area until all three parts of the site are developed.
E27 – Shawfair Park (west part)	Site Area: 9ha Site includes Sheriffhall Park and Ride, and the land for its extension. Part of site is developed for business use (both bespoke and speculative office space), and private hospital. Additionally a restaurant/ pub has been developed, as ancillary support use to the employment allocation. Site was initially identified for Business (Class 4) and Industry (Class 5) uses.
E27 – Shawfair Park (east part)	Site Area: 8.5ha As with e27, initially this site was identified for business (Class 4) and industry (Class 5) uses. The MLDP has altered the acceptable uses to business (Class 4) (plus ancillary support activities).
Ec1 – Shawfair Park extension 2	Site Area: 20ha The site should be masterplanned and access options reviewed. Access through Shawfair Park Extension 1 is the preferred option, but limited access from alternative points may be possible subject to Transport Appraisal. The MLDP has identified this site for business (Class 4) and industry (Class 5) uses.

A table of all proposed developments (economic and housing), that may be impacted by the development, in the wider area has been included in Appendix 9.1 – Planning Proposals and Applications.

### 9.5.6 Agriculture

A significant area of the land located within the wider 1km study area is agricultural and consists of a mixture of arable and grazing land.

Volume 11 of DMRB, Section 3, Part 6 '*Land Use*' recommends that the assessment of schemes should give an appreciation of the likely consequences of agricultural land take. The Macaulay Land Capability for Agriculture (LCA) classification is the official agricultural classification system widely used in Scotland as a basis of land evaluation. The Macaulay Institute classifies agricultural land into seven use capability classes with four of the classes further subdivided into divisions:

- Class 1 - Very Wide Range of Crops
- Class 2 - Wide Range of Crops
- Class 3 - Moderate Range of Crops
- Class 4 - Narrow Range of Crops
- Class 5 - Used as Improved Grassland
- Class 6 - Used Only as Rough Grazing
- Class 7 - Very Limited Agricultural Value

The "best and most versatile" (BMV) land is classified as Class 1, 2 and 3.1. These three classifications are deemed to be "Prime Quality Land" in DMRB Volume 11, Section 3 Part 6 '*Land Use*' (Chapter 7 - Paragraph 7.4). In essence, Class 1, 2 and 3.1 land which is the most flexible, productive and is most likely to deliver future crops.

A desktop review of the Macaulay Institute mapping (Sheet 66 – Edinburgh) indicates that the agricultural land classification around the A720 Sheriffhall Roundabout is Class 2 (Land Capable of Producing a Wide Range of Crops) whilst the agricultural land extending north-east from Sheriffhall Mains Farm is Class 1 (Land Capable of

Producing A Very Wide Range of Crops). Only a small area of agricultural land within the within 1km study area around the Options is not of a BMV classification – around the River Esk (Class 5.2) to the east of Sheriffhall.

### 9.5.7 Woodland

The Forestry Commission's GLADE Land Information Search shows no areas of Forestry Commission woodland located within the wider 1km study area. However the site visit highlighted an area of woodland (Lugton Bogs) located around the Dean Burn immediately north of the A772 Gilmerton Road between the A720 Gilmerton Junction and the A7 Gilmerton Road Roundabout – and which falls within the Edinburgh Green Belt area. Part of this woodland area is also used by Edinburgh Combat Challenge as a laser tag gaming location.

Chapter 3 -Nature Conservation provides further details on the woodland in the study area.

### 9.5.8 Green Belt Land

The remainder of the study area is largely currently designated as Green Belt by Edinburgh City Council and Midlothian Council:

- The land area to the north of the A720 Edinburgh City bypass between the Lasswade Junction and Sheriffhall Roundabout – bordered by the A7(north) and Gilmerton
- Most of the land area to the south of the A720 Edinburgh City bypass between the Lasswade Junction and Sheriffhall Roundabout – and including immediately adjacent land around the Sheriffhall Roundabout.

### 9.5.9 Network Rail Land

The Borders Railway line provides passenger services between Edinburgh (Waverley Station) and Tweedbank in the Scottish Borders. The route alignment (on Network Rail land) between Millerhill and Eskbank passes within 300metres to the east of the Sheriffhall Roundabout. A new station (Shawfair) with vehicle parking for c.60 cars is located north of Newton village – although the station is located just beyond the 1km study area.

### 9.5.10 Accesses

Within the study area there are 29 no. direct access points serving a mix of residential, business, community and agricultural land uses comprising:

- A7 North – 4 x Farm/Business/Residential property accesses (Campend, Summerside and Drum), and 3 no. field accesses (1 x Campend and 2 x Summerside);
- A7 South– 1 no field access;
- A6106 Millerhill Road – 6 no field accesses (3 x Campend and 3 x Sheriffhall Mains);
- A6106 Old Dalkeith Road – 1 no Residential access (Old Sheriffhall Farmhouse) and 1 x field access;
- Melville Gate Road – 1 no Business access (RBS Data Centre);
- B6392 Eskbank Road - Melville Castle Hotel access, and 3 no field accesses;
- A772 Gilmerton Road South – 2 no Business accesses (Dobbies Garden Centre/Melville Inn, and the Elginhaugh Inn/Edinburgh Combat Challenge), 2 x Residential accesses (Burndale and shared access to rear of Nos. 1-6 Gilmerton Road properties), 1 x Farm access (Melville Grange), and 1 x Chicken Run access;
- A722 Gilmerton Road North - 1 no shared Property access (Nos. 674/676/678/680 Old Gilmerton Road), and 1 x Field access (east of Nos. 674/676/678/680 Old Gilmerton Road).

## 9.6 Assessment of Potential Effects

This section details the potential impacts on Community and Private Assets for each of the options. This includes consideration of the potential construction effects.

### 9.6.1 Limitations to the Assessment

There have been no limitations encountered in this assessment, however, a number of assumptions have been made, these include:

- Referenced baseline information and data which has been accessed from a variety of publicly available sources is correct at the time of publication;
- Detailed consultation with affected landowners would be undertaken during the DMRB Stage 3 assessment to fully assess the impacts of the preferred scheme option on future business viability;
- The nature of the scope of the chapter topic requires objective and subjective (qualitative) assessments to be made of predicted impacts although quantitative assessment methods have been used where practicable.

### 9.6.2 Potential Land Take for Each Option

There will be no demolition of private property, however each of the options will require land take. Table 9.7 below, shows the areas and types of land take required for each option.

**Table 9.7 - Predicted Operational Impacts for Community and Private Assets**

	Option A m <sup>2</sup>	Option B m <sup>2</sup>	Option C m <sup>2</sup>
Housing/Residential	-	-	-
Business	30,728	17,602	18,357
Industrial	-	-	-
Existing Road Boundary	148,309	112,714	99,356
Agricultural (north-west quadrant)	14,530	12,512	53,051
Agricultural (other) (including any woodland)	65,720	52,366	77,579
Total footprint area	259,287	195,194	248,343

Land take from Network Rail land may also be required for all options to accommodate the extension of the A720 Borders Railway underbridge to accommodate new slip roads to the A720. At this stage the extent of land take is not known, however it is expected to be minor in nature.

It should be noted that temporary land take may require additional land to that identified in Table 9.7 during the construction period. It is not known in detail at this stage how much temporary land take may be required to facilitate construction but it is considered that the additional amount of land required as a percentage of overall required land take will be similar for all options.

Table 9.8 assesses the construction and operational impacts for all three options. Potential mitigation measures are also identified for the scheme options construction and operational phases.

### 9.6.3 Severance

There will be no severance impacts associated with any of the options. All options include indicative designs for realigning accesses for any affected residential and business properties or community facilities; these will be developed in more detail at Stage 3 in consultation with affected owners.

### 9.6.4 Construction Impacts

All options will result in land take during construction which may be slightly larger than the operational land take identified, however the extent of this land take is not known at present so for the purposes of this assessment all Options have been assessed as having the same impact. The significance of the effect has been assessed as slight adverse. Land take may also be required from Network Rail, assessed as slight adverse.

During construction temporary land take may be required for all options to areas of agricultural land and land proposed for economic allocations in the Midlothian Local Development Plan – Proposed Plan; the significance of the effect has been assessed as moderate adverse for economic allocations and slight adverse for agricultural land.

There will be disruption during construction to a number of residential and business properties; the significance of the effect has been assessed as moderate adverse. There may also be disruption to a number of field access, the significance of the effect has been assessed as slight adverse.

In terms of community facilities there may be disruption to the Spire Shawfair Park Hospital and Edinburgh Royal Infirmary (ERI) (situated 4km north on the A7), the significance of the effect has been assessed as moderate adverse for ERI and slight adverse for Shawfair Park Hospital.

### 9.6.5 Operational Impacts

Option C requires the most significant area of agricultural land take (130,630 m<sup>3</sup>), with Option A requiring (80,250 m<sup>3</sup>) and Option B (64,878 m<sup>3</sup>). Although Option C requires significantly more than Options A or B, given the scale of the surrounding agricultural land this is not deemed significant and the significance of effect for all options has been assessed as slight adverse.

All options require land take from proposed for economic allocations in the Midlothian Proposed Local Development Plan (E32 – Sheriffhall South and Ec1 Shawfair Extension Park). Option A (30,728 m<sup>3</sup>), followed by Option C at 18,357 m<sup>3</sup> and Option B at (17,602 m<sup>3</sup>). The significance of effect for all options has been assessed as moderate adverse.

Alternative accesses will be provide for all community facilities and residential and business properties, the significance of effect for all options has been assessed as slight adverse.

## 9.7 Potential Mitigation

Potential mitigation measures are identified for the scheme options construction and operational phases.

## 9.8 Summary of Effects

Table 9.8 below provides a summary of the impact on community and private assets for each of the three options, where mitigation is embedded in the Scheme design this has been taken into account in assessing the impacts. Otherwise the summaries provided below for construction and operational impacts are prior to any mitigation.

### 9.8.1 Residual Impacts

Residual effects have been identified in Table 9.8, for all options only slight adverse effects remain after mitigation, with the exception of the impact on the proposed economic development allocations in the Midlothian Proposed Local Development Plan, which remains after mitigation as moderate adverse.

**Table 9.8 - Predicted Construction and Operational Impacts for Community and Private Assets**

	Option	Predicted Effects	Magnitude of Predicted Impact	Sensitivity of Receptor	Significance of Effect	Potential Mitigation Measures	Residual Effects
<b>Land Take (Agricultural Land)</b>							
Construction	Common to all Options	Temporary agricultural (Class 2 and 3.1) land take will be required to facilitate construction for all Options	Minor	Medium	Slight Adverse	Pre-construction consultation with affected land owners to agree temporary access arrangements and land take requirements and where necessary provide appropriate compensation.	Slight Adverse
Operation	A	80,250 m <sup>3</sup> of Class 2 agricultural land take	Minor	Medium	Slight Adverse	Liaise with affected landowners at Stage 3 and where necessary ensure appropriate compensation for permanent loss of land.	Slight Adverse
	B	64,878 m <sup>3</sup> of Class 2 agricultural land take	Minor	Medium	Slight Adverse		Slight Adverse
	C	130,630 m <sup>3</sup> of Class 2 agricultural land take	Minor	Medium	Slight Adverse		Slight Adverse
<b>Land Take (Planning Allocations within Midlothian Local Development Plan – Proposed Plan)</b>							
Construction	Common to all Options	Temporary land take may be required to proposed economic allocations (Shawfair Park Extension Site (Ec1) and Sheriffhall South (E32)) to construct new roundabout layout and re-alignment of the A6106.	Moderate	Medium	Moderate Adverse	Pre-construction consultation with affected land owners to agree temporary access arrangements and land take requirements and where necessary provide appropriate compensation.	Slight Adverse
Operation	Common to all Options	Permanent loss of part of proposed economic allocations (Shawfair Park Extension Site (Ec1) and Sheriffhall South (E32)) to accommodate the operational realigned road connections and the new roundabout layout: Option A – 30,728 m <sup>3</sup> (mostly of Ec1, with a small area required from E31 along the A7 south) Option B – 17,602 m <sup>3</sup> (mostly of Ec1, with a small area required from E31 along the A7 south) Option C – 18,357 m <sup>3</sup> (required from E31 in the south to connect the proposed southern dumbbell roundabout to the A7. Less required of Ec1 than Options A and B, however land take will be required for the A6106 which would cut through the centre of this allocated site)	Major	Medium	Large Adverse	Ensure the minimises the permanent the land take requirements of proposed economic allocations Liaise with affected landowners at Stage 3 and where necessary ensure appropriate compensation for permanent loss of land.	Moderate Adverse
<b>Land Take (Network Rail)</b>							
Construction	Common to all Options	Temporary access required to Network Rail Land to construct an extension to the existing A720 Borders Railway underbridge	Minor	Medium	Slight Adverse	Pre-construction consultation with Network Rail to agree temporary access arrangements and land take requirements	Slight Adverse
Operation	Common to all	Permanent loss of Network Rail land to accommodate the extension of the existing A720 Borders Railway	Minor	Medium	Slight Adverse	If necessary ensure appropriate compensation to Network Rail for	Slight Adverse

	Option	Predicted Effects	Magnitude of Predicted Impact	Sensitivity of Receptor	Significance of Effect	Potential Mitigation Measures	Residual Effects
	Options	Underbridge.				permanent loss of land in its ownership.	
<b>Access to Residential Properties</b>							
Construction	Common to all Options	All Options will result in disruption during construction to a number of residential properties including: Summerside residences Campend residences Old Sheriffhall Farmhouse residences	Moderate	High	Moderate Adverse	Pre-Construction consultations to be undertaken with affected property owners and Construction working methods to minimise temporary disruption of property access	Slight Adverse
Operation	Common to all Options	All Options provide alternative access provision for residential properties including: Summerside residences Campend residences Old Sheriffhall Farmhouse residences	Moderate	High	Moderate Adverse	Consultations to be undertaken with affected property owners Access arrangements to be developed in more detail at Stage 3.	Slight Adverse
<b>Access to Existing Business Premises</b>							
Construction	A and C	Options A and C will result in disruption during construction to a number of business and industry premises including: Lowes Fruit Farm (To Let) Didcock and Sons Upholstery Sheriffhall Café	Moderate	High	Moderate Adverse	Pre-construction consultations to be undertaken with affected businesses. Construction methods will be used to minimise temporary disruption of business access.	Slight Adverse
<b>Access to Agricultural Land</b>							
Construction	Common to all Options	All Options will result in disruption during construction to field accesses associated with the A7 North, A7 South, A6106 Millerhill Road and A6106 Old Dalkeith Road.	Minor	Medium	Slight Adverse	Pre-construction consultations to be undertaken with the affected farmers. Construction methods will be used to minimise temporary disruption of farm operations.	Slight Adverse
Operation	Common to all Options	All Options will may require realignment of field accesses including: 1 x A7 North (Campend) 1 x A7 North (Summerside) 1 x A6106 (Millerhill Road – Campend) 1 x A6106 (Old Dalkeith Road – Sheriffhall Farm) 1 x A7 South (at/west of Sheriffhall Roundabout).	Minor	Medium	Slight Adverse	Agricultural landowner consultation at DMRB Stage 3 to confirm scheme design impacts significance on baseline field accesses. Potential mitigation: None – if alternative baseline field accesses available to maintain access to viable field unit(s). or Provision of alternative field accesses to	Slight Adverse

	Option	Predicted Effects	Magnitude of Predicted Impact	Sensitivity of Receptor	Significance of Effect	Potential Mitigation Measures	Residual Effects
						maintain access to viable field unit(s) if no suitable alternative baseline accesses available.	
<b>Access to Community Facilities</b>							
Construction	Common to all Options	Users of the Spire Shawfair Park Hospital may be disrupted during the construction phase	Minor	High	Slight Adverse	Pre-Construction consultation to be undertaken with the Spire Shawfair Park to inform them of construction programmes to.	Slight Adverse
	Common to all Options	There may be disruption during construction to those travelling to the Edinburgh Royal Infirmary (ERI) from the south, including ambulances.	Moderate	High	Moderate Adverse	Pre-Construction consultation to be undertaken with the ERI to inform them of construction programmes to allow alternative routes to be defined if necessary.	Slight Adverse
	A and C	Options A and C will result in disruption during construction to Chapter One Childcare Nursery.	Minor	High	Slight Adverse	Pre-Construction consultation to be undertaken with affected facility operator. Construction methods will be used to minimise temporary disruption of farm operations.	Slight Adverse
Operation	C	Option C provides alternative access to Chapter One Childcare Nursery	Minor	High	Slight Adverse	Consultations to be undertaken with affected community facility. Access arrangements to be developed in more detail at Stage 3.	Slight Adverse

## 9.9 Compliance with Policies and Plans

An assessment of the compliance of the A720 Sheriffhall Roundabout DMRB Stage 2 scheme options in relation to the policies and plans is summarised below.

The strategic benefits of the proposed A720 Sheriffhall Roundabout upgrade to the surrounding development of communities and future economic growth are reflected in a number of policies and plans including NPF3 (2014); SPP (2014); SESPlan (2013), the Edinburgh Local Development Plan (2016); the current Adopted Midlothian Local Plan (2008) and the proposed Midlothian Local Development Plan (2014).

### 9.9.1 Residential Property

NPF3 aims to facilitate new housing development, and in helping to unlock effective housing land in the Edinburgh and city region, NPF 3 identifies a requirement for strategic, cross-boundary transport infrastructure improvements and that road network capacity, including the proposed A720 Sheriffhall Roundabout interventions “has particular implications for future development”. The proposed grade-separation improvements to the A720 Sheriffhall Roundabout will provide a key transport access hub to both existing residential properties and future housing development locations around the south-east of Edinburgh and Midlothian.

SPP (2014) supports the housing aims of NPF3. Therefore, the proposed improvements to the A720 Sheriffhall Roundabout are compliant with the identified national cross-boundary transport improvement needs required to support future housing provision.

None of the DMRB Stage 2 Options physically impact on residential property supply (current or designated housing allocations) and therefore do not have the potential to conflict with the housing policies of the current Adopted Midlothian Local Plan (2008) or the Midlothian Proposed Local Development Plan (2014).

### 9.9.2 Business and Industry Property

The SPP (2014) recognises that the relationship between the strategic transport network (which includes trunk roads) and land use has a strong influence on sustainable economic growth. The strategic transport network, which includes trunk roads, is identified as being critical in supporting a level of national connectivity that facilitates sustainable economic growth. SESPlan (2013) supports the development of strategic transport and infrastructure networks to support economic growth and the A720 Sheriffhall Junction Upgrade is one of the key strategic improvements to transport and other infrastructure which SESPlan identifies as being required for existing and future development in the “Regional Core” sub-regional area of the SESPlan.

Therefore, the proposed upgrade to the A720 Sheriffhall Junction is compliant with the identified national and regional transport improvement needs required to support business and industry growth.

The permanent loss of land required to construct all three DMRB Stage 2 options has the potential to conflict with the Business and Industry economic growth policies (Shawfair Park Extension site) of the current Adopted Midlothian Local Plan (2008) and the Midlothian Proposed Local Development Plan (2014). Option C would also potentially conflict with the development of the western section of the Sheriffhall South site identified in the current Adopted Midlothian Local Plan (2008) and the Midlothian Proposed Local Development Plan (2014).

### 9.9.3 Community Facilities and Land

No significant adverse impacts on community land are expected for any of the three route options. Impacts on the woodland area at Lugton Bogs are expected to be minimal and the area of woodland at Lugton Bogs currently used by Edinburgh Combat Challenge would not be impacted by any of the three DMRB Stage 2 options. As such, no conflict with relevant planning policies is expected. Access to the Chapter One Childcare Nursery would be maintained through the Scheme option design process.

The Midlothian LDP Proposed Plan (2014) contains significant new community facility proposals as part of the proposed Shawfair settlement. The proposed grade-separation improvements to the A720 Sheriffhall Roundabout will provide a key transport access hub to the Shawfair settlement and be a key infrastructure improvement that supports the delivery of these proposals.



### 9.9.4 Agriculture and Woodland

All of the route options have the potential to conflict with SPP (2014) which states that development on prime Agricultural land should not be permitted except where it is essential and also with the current Midlothian Adopted Local Plan (2008) Policy RP4 (Prime Agricultural Land) and the proposed LDP (2014) Policy ENV4 (Prime Agricultural Land). However, the potential scope for conflict needs to be considered in the context of the strategic needs for the proposed A720 Sheriffhall Roundabout grade separation options.

None of the A720 Sheriffhall Roundabout DMRB Stage 2 options would result in the loss of commercial Woodland.

### 9.10 Conclusions

The anticipated effects during the construction phase are similar for all options. The effects relate to construction land take of agricultural land and on economic land-use allocations in the Proposed Midlothian Local Development Plan (2014). There will be disruption during construction to a number of residential and business properties, field accesses and community facilities.

During the operation phase, Option C requires the most significant area of agricultural land, followed by Option A and lastly Option B. All options require land take from economic land-use allocations in the Proposed Midlothian Local Development Plan (2014) (E32 – Sheriffhall South and Ec1 Shawfair Extension Park). Option A requires the most land take followed by Option C and lastly Option B.

Alternative accesses are provided for all community facilities and residential and business properties as part of the design of each option.

### 9.11 Scope of DMRB Stage 3 Assessment

The scope of the DMRB Stage 3 assessment will build upon the DMRB Stage 2 findings to update existing information, provide additional information, or to confirm/amend assessment conclusions and potential mitigation opportunities made during Stage 2 e.g. via additional landowner consultation. The DMRB Stage 3 scope is therefore likely to include:

- Further consultations with statutory consultees and affected landowners – particularly in relation to the requirement for any land take.
- Detailed consideration of land-take including consideration of likely effect on the future viability.
- Updating the Stage 2 assessment of land use severance and boundary impacts (i.e. field accesses) for individual farm units to give detailed coverage for farms that would be affected by the preferred route. This would include calculating the area of prime agricultural land which would be permanently lost taking into account possible mitigation measures and consideration of the likely future viability of individual farms should the preferred scheme option proceed.
- Taking into account any changes in local authority development policies e.g. if the Midlothian Local Development Plan – Proposed Plan (2014) is formally adopted and replaces the current Midlothian Adopted Local Plan (2008).
- Reviewing any new planning applications or changes in the status of applications which have been previously identified. The local planning authorities (e.g. the City of Edinburgh Council and Midlothian Council) would be consulted in relation to how the preferred option may affect their respective development designations.

## 10. Geology and Soils

### 10.1 Introduction

This chapter considers the potential effects of the proposed development on the study area geology and soils, and has been carried out in accordance with DMRB Volume 11, Section 3, Part 11 'Geology & Soils' with specific reference to Chapter 7 – Stages of Assessment.

It aims to identify the factors and impacts to be taken into account in the choice of a preferred scheme option, and to identify the environmental advantages, disadvantages and constraints associated with each of the three route options.

This chapter considers:

- Direct impact on underlying geology and soils;
- Direct impact on geological or geomorphological features which are of specific interest or importance;
- Direct impact on soils through loss and destruction of agricultural soils (see also Chapter 9 - Community and Private Assets which address land take of agricultural land); and
- Impact on contaminated land.

This chapter should also be read in conjunction with Chapter 5 – Road Drainage and the Water Environment, for an assessment of the water quality and drainage impacts of the proposed route options on groundwater, surface water, flooding areas and designated sites.

### 10.2 Approach and Methodology

#### 10.2.1 Study Area

The geology and soils study area includes the proposed A720 Sheriffhall Roundabout site and the wider immediate area of associated soils and geology that may be impacted by the proposed improvement scheme.

#### 10.2.2 Stages of Assessment

The assessment has included the following stages:

- Consultation with the relevant statutory and non-statutory bodies to establish geological receptors within the study area;
- Review of desk study information obtained for the scheme
- Site visit to assess baseline conditions within the study area;
- Identification of potential effects and consideration of the interactions between the proposed development and current site conditions;
- Assessment of the significance of potential effects by taking into account the sensitivity of the receiving environment and the potential magnitude of each effect; and,
- Mitigation measures devised to avoid or reduce any significant adverse effects.

#### 10.2.3 Field Survey

A site walkover survey was undertaken by AECOM (previously URS) personnel on 14<sup>th</sup> January 2014. During this walkover, personnel were granted access to the Borders Railway site and were therefore able to observe the on-going construction works at the underpass for the railway beneath the A720.

#### 10.2.4 Assessment of Effects

The significance of the potential effects of the proposed development have been categorised taking into account the sensitivity of the receiving environment and the potential magnitude of this effect. This assessment

methodology is based on experience of carrying out such assessments for a range of developments including knowledge of geology and soil characteristics in Scotland and cognisance of best practice and guidance.

### 10.2.5 Sensitivity/ Importance

The sensitivity and importance of the receiving environment has been categorised by taking into account the following range of criteria, as defined in Table 10.1.

**Table 10.1 – Scale of Importance of Geological Features**

Importance	Criteria	Examples
Very high	Attribute with a high quality and rarity, regional or national scale	Geological Site of Special Scientific Interest (SSSI) Regionally important Geological Site (RIGS); or aquifer within the zone of influence of a public water supply borehole; or supplying an SSSI.
High	Attribute with a high quality and rarity, local scale	Other exposed geological features of major or educational value; or mineral reserve allocated on Local Minerals Plan.
Medium	Attribute with medium quality and rarity, local scale.	Other areas of potential mineral resources
Low	Attribute with a low quality and rarity, local scale.	Other areas of superficial geology or geomorphological feature.
Negligible	Attribute with negligible quality and rarity, local scale.	

### 10.2.6 Magnitude of Effect

The magnitude is influenced by the timing, scale, size and duration of the potential effect. For the purposes of this assessment the magnitude is defined in Table 10.2. The level of magnitude can be difficult to quantify and professional judgement is often necessary to make an objective assessment.

**Table 10.2 – Magnitudes of Impact**

Scale of Impact	Description of degree of effect
Major	Loss or partial loss (>50%) of a designated geological site, or where there could be complete severance at a site such as to fundamentally affect the integrity of the site (Adverse) Major permanent or long term change. Existing resource use is irreparably affected, e.g. Loss of a designated geological feature (Adverse) Large scale or major improvement; extensive restoration or enhancement e.g. extensive stabilisation of valuable exposed rock slopes or undermined ground, reinstatement of open cast sites to match surrounding geomorphology (Beneficial)
Moderate	Loss of part (approximately 15-50%) of a geological site or unit, major severance, major effects to its integrity as a feature, or disturbance such that the value of the site would be affected, but not to a major degree, e.g. quarrying of rock for imported fill, or substantial changes due to cuttings (Adverse) Benefit or addition to key characteristics, features or elements; improvements of quality e.g. stabilisation of slopes or undermined ground, remediation of contaminated land (Beneficial)
Minor	Detectable but non-material effect on the geological site (up to 15%) or a medium effect on its integrity as a feature or where there would be a minor severance or disturbance such that the value of the site would not be affected, e.g. superficial disturbance to geology (Adverse). Minor benefit or addition to key characteristics, features or elements e.g. local rock slope improvements, local reinstatement of soils.
Negligible	Very minor change from baseline condition. Change hardly discernible e.g. local changes to made ground deposits (Adverse) or local removal of contaminated soils (Beneficial)
No Change	No loss or alteration or observable adverse or beneficial impact

### 10.2.7 Significance of Effect

The sensitivity of the receiving environment together with the magnitude of the effect defines the significance of the effect as outlined in Table 10.3

**Table 10.3 – Matrix for Determination of Level of Impact**

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

These significance ratings have been used in the assessment and potential effects are therefore concluded to be of Very Large, Large or Very Large, Moderate or Large, Moderate, Slight or Moderate, Slight, Neutral or Slight, or Neutral. The significance of effect is assessed initially before the consideration of the effectiveness of the design and committed/embedded mitigation measures. Further assessment is thereafter completed to assign significance of effect once appropriate mitigation measures have been implemented. It is reiterated that this assessment relies on professional judgement.

Effects that are Large or Very Large are considered to represent key factors in the decision making process. Those that are moderate are considered to be important but not likely to be key decision making factors. Effects which are slight are unlikely to be critical in the decision making process but are important in enhancing the subsequent design of the project. Neutral refers to those effects which are beneath levels of perception.

## 10.3 Planning Policy Context

The DMRB options assessment for upgrading Sheriffhall Roundabout will consider two different council administrative boundaries:

- City of Edinburgh Council, and;
- Midlothian Council.

The planning context for Sheriffhall must take a number of policy documents into consideration along with a high number of development designations in existing and forthcoming local plans / local development plans (LDPs).

The planning policies which are identified as relevant to the A720 scheme with respect to geology and soils are listed below.

### 10.3.1 National Policy and Guidance

#### **Scottish Planning Policy (2014)**

The Scottish Planning Policy (SPP) document is a statement of the Scottish Government's policy on nationally important land use matters. SPP subject policies which are relevant to geology and soils are listed in Table 10.4 below.

**Table 10.4 – Relevant SPP Policies**

Policy	Relevance to Geology & Soils
Valuing the Natural Environment	Considers impact on RIGS and peat land. Specifies protection of soils from damage and compaction. Considers impact on agricultural soils.
Promoting Responsible Extraction of Resources	Requirement to minimise sterilisation of mineral resources. Relates to use of site won fill and recycled aggregates where possible.

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Development of marginal land is relevant to stabilisation of (and potential improvement to) currently un-used land by mine workings treatment.

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## 10.3.2 Local Policy

### 10.3.2.1 City of Edinburgh Council

#### *Edinburgh Local Development Plan (Adopted November 2016)*

City of Edinburgh Council Local Development Plan (November 2016) policies which are relevant to geology and soils are listed in Table 10.5 below.

**Table 10.5 – Relevant City of Edinburgh LDP Policies**

Policy	Relevance to Geology & Soils
<b>Protection of Natural Resources</b>	
Policy Env 22 Pollution and Air, Water and Soil Quality	Considers impact on agricultural soils. Considers impact on ground stability – which relates to potential mine workings stabilisation works. Relevant to contaminated land.
<b>Minerals</b>	
Policy RS 5 Minerals	Requirement to minimise sterilisation of mineral resources.

### 10.3.2.2 Midlothian Council

#### *Midlothian Local Plan (Adopted December 2008)*

Policies from the Midlothian Adopted Local Plan which are relevant to geology and soils are listed in Table 10.6 below.

**Table 10.6 – Relevant Midlothian Council LP Policies**

Policy	Relevance to Geology & Soils
<b>Resource Protection – Natural Heritage</b>	
Policy RP4 - Prime Agricultural Land	Considers impact on prime agricultural land and whether the benefits outweigh the loss.
Policy RP8 - Water Environment	Relates to pollution of water from areas of contaminated land. Also relates to the disruption and pollution of the water environment from mine workings treatment.
Policy RP12 - Regionally & Locally Important Nature Conservation Sites	Considers impact on RIGS and peat land.
Policy RP 17 - Protection of the Mineral Resource	Requirement to minimise sterilisation of mineral resources.
Policy RP 19 - Peat Extraction	Considers impact on peat land.

#### *Midlothian Proposed Local Development Plan (2014)*

The Midlothian LDP will replace the current Midlothian adopted Local Plan and is scheduled to be adopted in spring 2017. Policies from the Midlothian LDP which are relevant to geology and soils are listed in Table 10.7 below.

**Table 10.7 – Relevant Midlothian Council Proposed LDP Policies**

Policy	Relevance to Geology & Soils
<b>Safeguarding and Managing Our Natural Environment</b>	

Policy ENV 4 – Prime Agricultural Land	Considers impact on prime agricultural land and whether the benefits outweigh the loss.
Policy ENV 5 - Peat and Carbon Rich Soils	Considers impact on deposits of peat or carbon rich soils.
Policy ENV 10 – Water Environment	Relates to pollution of water from areas of contaminated land. Also relates to the disruption and pollution of the water environment from mine workings treatment.
Policy ENV 16 - Vacant, Derelict and Contaminated Land	Encourages development of vacant land that could be considered marginal. Development of marginal land is relevant to stabilisation of (and potential improvement to) currently un-used land by mine workings treatment.
<b>Resource Extraction</b>	
Policy MIN 1 - Areas of Search for Surface Mineral Extraction	Considers hard rock quarrying. Requirement to minimise sterilisation of mineral resources.

## 10.4 Consultation

A range of consultations was undertaken to inform the Stage 2 assessment as described in Chapter 1 – Overview of Environmental Assessment. Stage 1 and Stage 2 consultation responses of specific reference to this chapter are listed below in Table 10.8:

**Table 10.8 – Summary of Consultation Responses**

Consultee	Response
BGS	<p><b>Dated 17/02/2014</b></p> <p>No known RIGS are situated within the study area.</p> <p>Data from the British Geological Survey has shown relatively low levels of seismic activity along the Sheriffhall Fault, some of which is likely to have been associated with deep mining, which has now ceased in the area.</p> <p>BGS were further consulted for information about the difference in geology mapped on the Sheet 32E and the 10,650 County Series map. They stated rock features exposed during the construction of the A720- city bypass may have been examined and subsequently lead to re-mapping of the solid geology.</p>
The Valuation Office Agency	<p><b>Dated 10/01/2014</b></p> <p>Consultation with the mining, minerals, waste management and contaminated land specialists of the Valuation Agency confirmed that coal mining is the main mineral activity affecting the study area. He noted that oil shale and limestone may have been worked to the west, but outwith the study area.</p>
Scottish Government Rural Payments and Inspections Directorate (SGRIPD)	<p><b>Dated 24/12/2013</b></p> <p>Consultation with SGRIPD provided details on agricultural land quality. However, although referring to the Macaulay Land Capability for Agriculture (LCA) classification mapping in their response the SGRIPD description of the land classifications differed to the publically available maps available on the James Hutton and the British Geological Survey websites. SGRIPD response was: <i>“The land in and around Sheriffhall roundabout is considered to be very good quality land and is mapped as land classification 2. The land extending east along the leg of your highlighted area towards Millerhill Junction is considered even higher and is mapped as land classification 1. You will thus gather that almost all of the land in your highlighted area is very capable land from an agricultural point of view. The only exception would be a very thin sliver on the south east of the area highlighted running in the general direction of the Millerhill Junction. This is confined to the edge of the river Esk and part of the wooded area. This thin sliver is considered to be in land classification 5.2 due to the natural water run-off to the lower area near the river”.</i></p> <p>[NOTE - For the purposes of this assessment the published mapping data has been used, which as per the SGRIP response recognise the high quality of the agricultural land]</p>
Environmental Health Officer – Midlothian Council	<p><b>Dated 20/12/2013</b></p> <p>Midlothian Council Environmental Health Officer stated they had checked their GIS and there was no information regarding potential contaminants on the site in question. There are a number of areas around Sheriffhall and the Gilmerton Junction where Giant Hogweed has been reported in this year and in previous years.</p>
Animal Health and Veterinary Laboratories Agency (AHVLA)	<p><b>By Phone</b></p> <p>The AHVLA were consulted about animal burial sites associated with disease. They confirmed there are no animal burial sites associated with disease in the area.</p>
BEAR	<p><b>By Phone</b></p> <p>Consultation with BEAR to determine if there had been any unusual road maintenance during their tenure as term maintenance contractor (as this may have been attributable to fault</p>

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movement). BEAR confirmed there had been no unusual road maintenance required. Arney had previously been consulted (by others in earlier stages of the scheme) and also recorded no unusual road maintenance.

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Buccleuch Estates

**In Person**

AECOM geotechnical engineers visited Buccleuch Estate offices to view their historic maps and plans and note evidence of historic shallow mine workings in the land to the west of the roundabout.

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## 10.5 Baseline Conditions

### 10.5.1 Review of Available Sources

A review of available sources of information has been undertaken to characterise the geology and soils of the study area. Sources comprised:

- Ordnance Survey (OS) data including current topographical maps historical maps and information;
- British Geological Survey (BGS) data including mapping, online data, previous Ground Investigations and Historical Borehole Records, BGS aquifer maps and accompanying report;
- 'As Built' plans and design drawings from the A720 City Bypass;
- Aerial photographs;
- Scotland and Northern Ireland Forum for Environmental Research (SNIFFER);
- Scottish Environment Protection Agency (SEPA) River Basin Management Plan (RBMP) Interactive map
- Coal Authority Reports and Mine Abandonment Plans;
- Landmark Information Group Envirocheck Reports;
- Published papers from various journals;

Environmental Information was obtained from an Envirocheck Report, available historic maps, photographs and aerial photographs. The environmental information contained in the Envirocheck Report included:

- Location and details of discharge consents;
- River quality information;
- Details of groundwater vulnerability;
- Flood data;
- Locations of registered landfills;
- Potentially contaminative land uses;
- Locations of environmentally sensitive areas such as Sites of Special Scientific Interest (SSSI); ancient monuments, and areas of archaeological interest;
- Information obtained from SEPA, SNH and the BGS.

An assessment of mining and quarrying in proximity to the site was undertaken from review and assessment of the Coal Authority Interactive Map Viewer, a Coal Authority Mining Report, Coal Authority mine abandonment plans, BGS Mining Plans Portal, BGS GeoIndex, and the Valuation Office Agency.

A Preliminary Sources Study Report (PSSR) has been produced separately (Ref. 47067662/DOC/C/002, dated July 2014). This was a refresh of a PSSR prepared by Atkins in 2007.

No intrusive ground investigation specific to the proposed A720 Sheriffhall Roundabout improvement has been undertaken. It is anticipated that ground investigation work to inform design of the scheme will be undertaken following selection of a preferred option.

### 10.5.2 Topography

The topography of the study area mainly consists of gently undulating ground with natural slope angles of around 5° to 10° typical. The land surrounding the site mainly consists of arable farmland with occasional small residential or industrial properties. Disused railway lines run north-south to the east of the roundabout, as does the new Borders Railway. The A720 road infrastructure is in cutting to the west of Sheriffhall and on embankment to the east.



### 10.5.3 Geology

The published drift and solid geological information within the study area is reproduced on Figure 10.1- Solid and Drift Geology (From BGS sheets 32 & 32E) and Figure 10.2 - Solid and Drift Geology (from Geology Map). Further details can be found in the Geotechnical PSSR.

### 10.5.4 Superficial Geology

The superficial geology of the study area predominantly consists of glacial till, which is anticipated to comprise firm to stiff, becoming very stiff with depth, very sand gravelly clay with occasional cobbles and boulders.

Directly beneath the Sheriffhall roundabout and extending north to Campend and south to Sheriffhall Mains, glaciofluvial sands and gravels are shown to be present, which are typically well graded loose to dense sand and gravel with varying proportions of clay and silt.

Made ground is likely to be present at the location of all man-made development and engineering infrastructure, for example existing roads and railway works, in particular the embankments of the existing A720 city bypass which can be up to 6m high. The embankment fill comprises red blaes (either well burnt colliery spoil or spent oil-shale waste) at the base of the embankment under black/grey colliery spoil (possibly unburnt colliery spoil) occasionally interbedded with thinner layers of sand fill and cohesive fill derived from natural soil deposits.

Made ground is also expected to be found from infilling old pits, such as the old infilled sand pit on the A772 Gilmerton Road, abandoned mines and mine shafts.

Alluvial deposits are not shown to be present beneath the study area but there may be isolated alluvial soils present along water courses which pass through the study area such as the Dean Burn. Also, around Lugton Bogs and Sheriffhall Mains alluvium may be present coinciding with water 'issues' and minor water features.

It is known from Borders Railway construction that the ground conditions in the vicinity of Sheriffhall Mains comprised sands with high groundwater, which resulted in 'running sands' in the cutting excavation.

Indicative drift thicknesses are shown on the BGS Environmental Geology Map "Thicknesses of Unconsolidated Deposits". These are indicated to be around 5m at Gilmerton, increasing to between 10m and 15m to the west of Sheriffhall roundabout. East of Sheriffhall roundabout drift thicknesses are shown as between 5m and 10m. In the Lugton Bogs area and east to the A6106 Old Dalkeith Road the thicknesses appear to increase to 30m with the thicker deposits shown to occur at the A7 road in the vicinity of Melville Gate.

Topsoil is recorded in historical boreholes to range in thickness between 0.1m and 0.9m but it varies more typically between 0.3m and 0.5m thick. The average thickness is estimated to be 0.4m.

### 10.5.5 Solid Geology

The bedrock underlying the study area predominantly comprises rocks belonging to the Middle and Lower Coal Measures with the Passage Group formation occurring in the area to the west of Gilmerton. The Middle and Lower Coal Measures are part of the Carboniferous Coal Measures (Scotland) formation which contains seams of coal and other minerals which are known to have been worked in the past.

The Carboniferous Coal Measures comprise grey/brown often micaceous and carbonaceous mudstone, grey siltstone, seatearths and black coals. They are typically weak to moderately strong sandstone and siltstone with weak mudstone and coal.

Fifteen coal seams are recorded to outcrop within the study area. Many seams are recorded as having been worked, either by older historic shallow 'stoop and room' type workings and more recently (up to 1980s) by deeper longwall workings. Future workings are not expected.

The Passage Formation comprises fine to coarse sandstone with clays and shales with only sparse thin coal seams.

### 10.5.6 Structural Geology

The ground is significantly faulted with a series of east-west and north south trending faults. The most persistent fault is the Sheriffhall Fault.

The major Sheriffhall Fault trends broadly east-west through the centre of the study area, downthrowing the strata to the north by approximately 175m. The position of this fault has been proven underground within mine workings within the vicinity of Sheriffhall and from this information it has been inferred that the fault is inclined to the north by around 50°. The geological memoir indicates that the Sheriffhall Fault is an oblique normal fault, with components of dip-slip (vertical) and strike-slip (lateral) movement, and that the strata on the northern (downthrown) side of the fault are shattered. Mine abandonment plans indicate that this zone of troubled or shattered strata is around 40m wide.

Several smaller southeast-northwest trending faults are also recorded within the study area, primarily to the north of the Sheriffhall Fault and generally terminating against this structure.

The geological maps indicate that the strata beneath the study area are generally inclined towards the east by around 10°, although local variations associated with folding and faulting are to be anticipated.

### 10.5.7 Seismicity

Seismic activity has been recorded in the past in the area, although the magnitudes of the seismic events were weak to very weak. Most of the recorded locations of the seismic activity in close proximity to Sheriffhall Roundabout correlate with the postulated outcrop location of the Sheriffhall Fault. The seismic events are understood to have been attributed to deep mining activity, which ceased shortly after these recordings. No recent seismic activity has been recorded and nor is any expected given the cessation of deep mining.

### 10.5.8 Mining and Quarrying

#### 10.5.8.1 Coal Mining

##### ***Mine Workings***

The Sheriffhall area has been subject to extensive underground coal mining from shallow depths to around 900m depth.

Deeper workings would be expected to collapse soon after extraction and taking cognisance of the significant depth of the workings and corresponding overburden pressures, it is considered that collapse, and any associated ground movements, will already have occurred. The method of workings associated with the older, shallower workings is not recorded. However, it is considered likely that they were worked using the 'stoop and room' extraction method. Collapse and associated ground movements may not yet have occurred so such workings can pose a risk to surface stability.

In addition there is considered to be a high likelihood of unrecorded coal mine workings beneath the study area, some of which may be at shallow depth and pose a risk to surface stability.

The extents of potential shallow mine workings which may pose a risk to surface stability is shown on Figure 10.3- Mining and Quarrying Construction Plan.

A targeted ground investigation and further study is required to fully confirm the position of any coal seams beneath the proposed scheme.

##### ***Mine Entries***

The approximate locations of mine entries are shown on Figure 10.3 - Mining and Quarrying Construction Plan. Review of the data suggests there could be in the order of fifteen mine entries in the vicinity of each option. There is a risk of additional unrecorded mine entries within the study area.

Mine entries, which lie directly below the existing A720 city bypass, are assumed to have been treated as per the design drawings. Treatment details for other mine entries are not available. However, mine entries are often backfilled with made ground and so mine entries are considered further in Section 10.5.14 'Contaminated Land and Site History'.

### 10.5.8.2 Other Mineral Extraction

Consultation with the Valuation Office Agency confirmed that coal mining is the main mineral activity affecting the study area.

Oil shale and limestone may have been worked to the west, and opencast coal mining sites have been exploited in this area but these are outwith the study area.

Several sand, gravel and clay pits are within, or within close proximity of, the study area. The total dimensions and depths of the opencast mine and clay and sand pits are unknown. Their approximate locations and maximum recorded extents are shown on Figure 10.3 - Mining and Quarrying Construction Plan. All of the excavations / pits appear to have been infilled at some time in the past but there is no record of the nature of the fill. These are considered further in Section 10.5.14 'Contaminated Land and Site History'.

### 10.5.9 Soil Quality

The agricultural land of the study area is classified by the Macaulay Institute Land Capability for Agriculture Survey. A summary plan of the Agricultural Land Capability is shown in Figure 10.4 - Agricultural Land Quality.

The soil quality in and around Sheriffhall Roundabout is classed as 'prime agricultural land' and is predominantly mapped as Land Classification 2 (land capable of producing a wide range of crops) with a section of Class 3.1 land (capable of producing a moderate range of crops) at the western end of the scheme. This is consistent with the observations of the site walkover where it was noted that the majority of the site was in use for arable farming.

The Soil Survey maps show the soils of the area to be of two main types, one described as fluvioglacial soils derived from carboniferous rocks, the other drift deposits derived from carboniferous sandstone, shales and limestone. Both are noted as soils capable of sustaining vegetation for arable farming and permanent pasture.

### 10.5.10 Geomorphology

Glacial mounds and ridges, possibly gravelly eskers, occur through the centre of the site within the vicinity of Sheriffhall and Dalkeith. A mound noted extending north of Sheriffhall to Campend may be such a feature. Despite this the site is predominantly reasonably level, gently sloping towards the A720.

No landslides or mass movements are recorded on the BGS database in the study area and Envirocheck reports a Very Low to Low Hazard Potential for landslide ground stability hazards. Table 10.9 summarises the ground stability risks for the site, as indicated by the BGS website.

**Table 10.9 – Table of Ground Stability Risk**

Ground Stability Hazard	Hazard Potential
Collapsible Ground	No Hazard – Very Low
Compressible ground	No Hazard – Moderate
Ground Dissolution	No Hazard
Landslide	Very Low
Running Sand	No Hazard – Low
Shrinking/swelling Clay	No Hazard – Very Low

Minor slope stability failures were observed during a 2007 walkover on the A720 embankment from the roundabout to 500m east of the roundabout but a later walkover in 2013 did not observe any such failures. Most of the existing embankment and cutting slopes across the site are vegetated with grass, small shrubs and occasionally small trees; therefore, there is the potential for failures to be obscured by this vegetation.

Difficult temporary conditions were encountered in excavations into water bearing glaciofluvial deposits ('running sands') on the Borders Railway construction in the Sheriffhall Mains area. Any excavation into these 'running sands' will require special dewatering and other construction measures.

### 10.5.11 Designated and Non-Designated Geological Sites

There are no Sites of Special Scientific interest (SSSI) designated as such for geology in the study area, neither are there any Regionally Important Geological Site (RIGS).

### 10.5.12 Hydrology and Hydrogeology

Refer to the Chapter 5 - Road Drainage and the Water Environment for details of hydrology and hydrogeology.

Groundwater strikes, where recorded in historic boreholes, vary widely between 0.6m below ground to 22.5m below ground level. They occur mainly between 1.5m below ground level to 10m below ground level. Environmental geology maps show a groundwater contour at around 60m AOD although it records that water level data is sparse and that aquicludes and perched water may also be present. This data suggests that typically groundwater could occur about 5m below ground level, which broadly agrees with the recorded groundwater levels. However, particular localised circumstances are likely to influence this generalised level markedly, particularly where infrastructure works and major surface or underground excavations for extraction of minerals have been created.

### 10.5.13 Man Made Features

There are a number of man-made features across the scheme area including:

- Road and rail infrastructure
- Utilities (pylons, masts, overhead and buried services)
- Buildings (occupied and derelict)
- Disused sewage works
- Mineral and quarrying works (backfilled pits, quarries, slag heaps, abandoned mines and mine shafts)
- Other (disused sewage works, small landfill, garden centre/nursery)

These are considered further in Section 10.5.14 'Contaminated Land and Site History'.

### 10.5.14 Contaminated Land and Site History

Contaminated land, as defined in Part IIA of Environmental Protection Act 1990, is assessed through the identification and assessment of pollutant linkages (contaminant-pathway-receptor relationships). Implicit in the guidance is the application of risk assessment to assess whether potential pollutant linkages may be significant. The risk-based methodology adopted in this report is based upon the Environment Agency's Model Procedures for the Management of Land Contamination (CLR11) together with the supporting guidance referenced within this document. The methodology adopted relies on the development of a site specific conceptual site model (CSM) consisting of three components:

- A source of contamination, for example due to historical site operations;
- A pathway, a route by which receptors can become exposed to contaminants. Examples include vapour inhalation, soil ingestion and groundwater migration;
- A receptor, a target that may be exposed to contaminants via the identified pathways. Examples include human occupiers/users of the site, surface water, groundwater, property or ecosystems.

For a potential risk to either environmental and/or human health receptors to exist, a plausible pollutant linkage involving each of these components must exist. If one of the components is absent then a pollutant linkage, and thereby potentially unacceptable risk, is also unlikely to exist. Where all three components are or maybe present, a potentially complete pollutant linkage can be considered to exist. This does not automatically imply the presence of unacceptable risk but further investigation of the potential pollutant linkages is required.

Desk study information provided in the 2007 Atkins and 2014 URS PSSR was reviewed in support of this chapter.

### **Site History and Contamination Potential**

The historical development of the site and surrounding area is described fully in the URS Geotechnical Preliminary Source Study Report. In summary the site and surrounding area has generally always been used for arable farmland, with mining and quarrying activity increasing in the early 20th century. By the 1980's the mining and quarrying activity was complete and the road infrastructure was as it is today. The railways to the east of Sheriffhall are visible on 1895 OS mapping.

### **Potential Contamination Sources**

Potential sources of contamination were identified from historic and current uses of the site and surrounding area and the site walkover. DoE Industry Profiles have been used to assess the potential of contaminants to be present on the site and immediate surroundings associated with former and current uses.

Potential sources of contamination are shown on Figure 10.5 - Plan of Potential Contamination Sources and are summarised below:

- A variety of chemicals within pesticides, insecticides and fertilisers due to the use of the land as arable farmland; Former pits, abandoned mines, abandoned mine shafts, colliery discard (slag heaps) relict from the historic mining activity at the site. Location of historical pits and shafts are shown on Figure 10.3- Mining and Quarrying Construction Plan. These are reported by Atkins to have been filled but the nature of the backfilling is unknown and may be a source of contamination. Contamination may be able to migrate to other areas of the site through permeable drift deposits. Disused mine shafts and old workings may also provide pathways for potentially contaminated mine water. Gas also has the potential to accumulate in the shafts and mines.
- Historical water works (in the past located north of the River North Esk) and associated infrastructure (e.g. underground piping).
- Disused railway recorded to intersect areas of the proposed road corridor (along the A720 and A6106). Potential made ground used for embankment construction (e.g. colliery spoil, blaes). Presence of made ground along the disused railway is anticipated.
- Disused sewage works previously located south of Dean Burn as shown on Figure 10.5 - Plan of Potential Contamination Sources.
- The existing road infrastructure is known to be constructed from colliery spoil and burnt oil shale which may represent a source of contaminants.
- Unknown fill materials used to backfill the historical landfills recorded north of South Melville Farm (approximate chainage 1,600).
- The tank within the premises of Melville Nursery located within the boundaries of the proposed site may contain/have contained fuel oil may be used on nurseries to heat glasshouses.
- Activities undertaken by Clearway Landscaping, a registered fuel dealers located east of the A7 within the study area (approximate chainage 2,000) may have led to potential release of fuel to the ground.
- The Environmental Health Officer (EHO) of Midlothian Council indicates that no information regarding potential contaminants was available for the proposed road alignment. However, the council's records indicate that there are a number of areas around Sheriffhall and the Gilmerton Junction where Giant Hogweed has been reported recently.

In summary potential contaminants present from historical and current sources within the route corridor include:

- Metals and metalloids such as As (Arsenic), Cd (Cadmium), Cr (Chromium)(trivalent and hexavalent), Cu (Copper), Hg (Mercury), Pb (Lead), Ni (Nickel) , Se (Selenium), V (Vanadium) Zn (Zinc);
- Inorganics – sulphur, sulphate, cyanide, ammonium;
- Organics – oil/fuel hydrocarbons, PAHs (polycyclic aromatic hydrocarbons), chlorinated aliphatic & aromatic hydrocarbons, PCBs (polychlorinated biphenyl), etc.;
- Pesticides – herbicides, insecticides, etc.;
- pH;

- Asbestos; and,
- Ground gases.

Other contaminants not identified in this review may also be present on site, in the soil and/or groundwater, although the potential for this is unknown at this stage of the assessment.

### ***Potentially Sensitive Receptors***

Potentially sensitive receptors with respect to current ground conditions at the proposed scheme are considered to be:

- Shallow and deep groundwater underlying the proposed scheme area, perched groundwater may also be present within potential made ground deposits. It is noted that locally groundwater is likely to have been impacted by former mining and quarrying activities;
- Surface waters including Park Burn, Dean Burn, River North Esk, River South Esk and unnamed streams flowing within the vicinity of the site.
- Nearby residents at farms located adjacent to the proposed road scheme;
- Future site end-users – people using the road;
- Construction/maintenance workers and members of the public; and
- Vegetation and fauna – the land adjacent to the proposed scheme is predominantly in agricultural use comprising fields of crops and pastures.

### ***Preliminary Conceptual Site Model***

Section 4.10.3 of the PSSR presents a summary of the preliminary CSM for the proposed site, representing the current baseline ground conditions. At this stage a qualitative risk assessment has been undertaken for the identified potential source-pathway-receptor linkages based on current DEFRA (Guidelines for Environmental Risk Assessment and Management) and CIRIA (C552) guidance.

It must be noted that this assessment is based solely on desk study information and will require revision following recommended intrusive site investigation works. Ground investigation works are planned to occur during Stage 3 of the DMRB scheme assessment for the selected option.

## **10.6 Assessment of Potential Effects**

### **10.6.1 Limitations to the assessment**

No recent site specific ground investigations have been carried out along the proposed route options. Therefore, the full and exact extents and depths of each geological deposit is uncertain.

Similarly, site specific ground investigation has not yet been undertaken to inform assessment of mine workings extents and mine entry positions. Targeted intrusive and non-intrusive investigations would be required to fully identify the areas affected by mine workings and in need of stabilisation works,

Furthermore, the assessment of contamination has so far been based on desk study review. Site specific ground investigation including chemical analysis of soil and groundwater samples, is required to determine the extents and severity of contamination.

A site specific ground investigation will be undertaken to inform the DMRB Stage 3 Assessment of the preferred option.

At this stage the assessment has been undertaken in line with DMRB guidance for Stage 2 Assessment and the above limitations are typical for Stage 2. The assessment is therefore considered robust and the level of investigation and detail is appropriate for the purposes of a DMRB Stage 2 assessment. Further detailed assessment will be undertaken at DMRB Stage 3.

## 10.6.2 Potential Construction and Operation Effects on Receptors

The environmental effects of the three options are discussed both in terms of the effects on the geology and soils during construction and the longer term effects on geology and soils once the scheme is in operation. The assignment of significance of effects is undertaken for both before and after mitigation measures.

Each of the junction options is fairly similar in the nature of the earthworks and structures involved. Details of the proposed works are provided in Chapter 1 – Overview of Environmental Assessment.

### 10.6.2.1 Geomorphology

In the study area the geomorphological features are assessed to be of 'Negligible' importance. Options A and B affect an area close to the existing A720 so their impact is assessed as being of 'Negligible' magnitude. Option C is largely off-line and impacts undeveloped land, as such a minor magnitude of impact is assigned. This produces an impact of 'Neutral' significance for Option A and B and of 'Neutral or Slight' for Option C both during construction and operation.

After consideration of any standard mitigation measures the significance of effect remains as 'Neutral'.

### 10.6.2.2 Drift Deposits

All of the scheme options will involve construction of earthworks in the form of embankments placed on the existing ground or cuttings excavated through the drift deposits. Where excavated materials are considered suitable for re-use, drift deposits may be excavated to provide material for embankment construction.

The drift deposits are considered to be of Low importance. The magnitude of impact varies depending on the scheme footprint and permanent land take thus potential disturbance to superficial deposits.

The design footprint for Option B affects the least area whereas the design footprint for Options A and C affects a greater area (both in terms of total area and area outwith the existing highway boundary i.e. potentially undeveloped natural soils).

As such, during construction and operation Option B is considered to have a minor magnitude of impact on the superficial deposits of the area, in particular as it is predominantly an on-line widening scheme. Option A and C are assessed to have a moderate magnitude of impact, mainly due to the greater area of land they impact.

Option B is assigned a 'Neutral or Slight' significance of effect while Options A and C are assigned a 'Slight' significance of effect.

After implementation of standard mitigation measures during construction such as limiting soil strips in poor weather, temporary support of excavation to prevent soil slippage, limiting haul routes etc. the significance of effects for all options is reduced to Neutral or Slight'. During operation adverse impacts on superficial deposits will be mitigated by scheme design however the assigned significance of 'Neutral or slight' is unchanged.

### 10.6.2.3 Solid Geology

The solid geology of the area is assigned a value of low importance, as other than the Sheriffhall Fault, there are no rock outcrops or local features of geological interest.

The works are likely to cause 'no change' to the solid geology as bedrock is unlikely to be exposed at any of the cutting excavations along the proposed route. Should piling into rock be required for the foundations at structures or if excavation and/or exposure of bedrock is required (even temporarily at structures), a 'Minor' impact would be considered appropriate due to the relatively localised disturbance to rock. As such the significance of effect on the solid geology, both during construction and operation, is assessed to be "Neutral or slight". After consideration of standard mitigation measures such as employing best practise during drilling, site supervision and monitoring the significance of effect remains as 'Neutral or Slight'.

New exposures provide potential opportunities for supplementing existing earth science knowledge. Therefore, it may also be considered as minor beneficial if the exposed rock (even if temporarily) reveals limited features of earth science interest, depending on what is exposed. Similarly, the ground investigation works that will be undertaken to inform the design could provide supplementary information of interest to the BGS. This is assessed as a beneficial effect of 'neutral or slight, significance as the ground investigation information will add to

the body of knowledge about the geological structure of the area. Mitigation is not required as the impact is assessed as beneficial.

#### 10.6.2.4 Mine Workings and Minerals

The Sheriffhall area has been subject to extensive underground coal mining. However, any seams of economic importance have already been exploited and there are no other minerals with economic potential recorded beneath the site. Therefore, no economically viable minerals will be sterilised by the proposed scheme. As such there is a "Neutral" effect of the scheme on the mineral resources of the area. Mitigation is not required as the significance of effect is 'neutral'.

Mine workings treatment will likely be necessary to stabilise the shallow mine workings and mine entries beneath affected part of the scheme. The extents of mine workings treatment is envisaged to be greater for Option C than for Options A and B and as such the magnitude of effect for Option C is considered to be 'Moderate' whilst for Option A and B it is considered to be 'Minor'. However, as the solid geology is of negligible value then the significance of effect will be only 'Neutral or Slight' for all options. Mine workings treatment may be considered as a beneficial impact as it will enhance the stability of the area. In this context Option C would have the greatest beneficial impact as it stabilises the largest area of underlying mine workings and allows development of land possibly considered as 'marginal' for development. Mitigation is not required as the significance of effect is 'neutral or slight' and can be considered beneficial.

There are not considered to be any impacts on the underlying mine workings or associated mine entries associated with the operation of the proposed scheme (i.e. significance of effect will be "Neutral")

#### 10.6.2.5 Agricultural Soils

All options will to some extent result in removal of Class 2 and Class 3.1 agricultural land at the site. The agricultural land is considered to be of medium and high importance.

The magnitude of impact during operation of the scheme is assessed as minor to moderate; minor for Option B and moderate for Options A and C where a larger design footprint will affect a larger area of agricultural soil. The significance varies from 'minor' to 'moderate' to reflect the greater area of loss in some options compared to others. Option C affects a greater area of Class 2 soil.

During construction, and without mitigation, there is potential for a higher significance of effect resulting from haul routes, temporary compounds, stockpiles disturbing agricultural soils. This effect is assessed as of 'moderate' significance for all Options A and C but 'slight' for Option B.

Mitigation measures, such as restriction of haul routes on agricultural soils and location of stockpiles / compounds away from areas of prime agricultural land would reduce the significance of effect during construction from 'Moderate' to 'Slight or Moderate'. Agricultural land will be lost during operation of the scheme but the loss will be mitigated where possible by scheme design. The assigned significance of effect is 'Slight or Moderate'.

#### 10.6.2.6 Designated and Non-Designated Sites

There are no designated or non-designated sites such as SSSI or RIGS in the study area. Therefore, the significance of effect for both construction and operation shall be 'Neutral' for all the options.

Mitigation is not applicable in the absence of this receptor.

#### 10.6.2.7 Groundwater

Impacts of the Scheme on the groundwater and hydrology of the area are discussed in Chapter 5 - Road Drainage and the Water Environment. Impacts specific to mine working treatment are considered below:

Where there are shallow mine workings beneath the route that will require treatment by grouting, the grouting will potentially interrupt the flow of groundwater, both during construction and operation.

During construction, the injection of grout into mine workings and mine entries has the potential to mobilise mine gases and contaminated groundwater within the Coal Measures. At this stage, treatment areas have not been confirmed and migration pathways for contaminated water and gas are unknown, however, there is a potential for these to impact on ground and surface water quality and human health.



The overall impact on groundwater, which is considered to be of Medium to Very High value, could range in magnitude from 'Minor to Major', depending on pathways, and so is assigned a "Slight" to "Very Large" significance of effect for all options. However, with implementation of mitigation measures such as such as construction controls to prevent grout run-off into water courses or contamination of groundwater and control of potentially contaminated mine gases and mine waters the adverse impacts can be reduced to a negligible magnitude and thus a 'Neutral or Slight' to 'Slight' significance of effect.

During operation, in areas where grouting has been undertaken the magnitude of impact on groundwater is considered to be Negligible to Minor. Since the Coal Measures bedrock is classed as a moderately productive aquifer of Medium value the significance of impact is taken as ranging from 'Slight' or 'Neutral or Slight'. The groundwater regime will be considered during design to ensure the design incorporates all necessary measures to prevent permanent disturbance to groundwater flow. After such mitigation measures the significance of effect is assessed as 'Neutral or Slight'

### 10.6.2.8 Contaminated Land – Construction Phase

Appendix E of the PSSR presents the preliminary CSM and summarises the contaminated land risk assessments carried out for site area for both the road construction phase and the operational phase. Reference to the potential pathways and receptors identified are also summarised in the PSSR Appendix E.

While no activities leading to significant sources of potential contamination have been identified within the footprints and near vicinity of the proposed scheme (e.g. gas works or similar), a number of historical activities leading to localised contamination were undertaken within or adjacent to the proposed road alignment boundaries.

Main sources of potential contamination which have been identified and may be directly affected by the proposed scheme include:

- Made ground associated with the existing road construction and disused railway;
- Activities associated with agricultural use; and
- Historical mine shafts and backfilled pits.
- In addition potentially contaminated sites Figure 10.4 - Agricultural Land Quality adjacent to the proposed scheme may also represent sources of contaminants.

During the construction phase, excavations and earthworks operations have the potential to disturb contaminated materials and create new pathways which may allow pollutant linkages to develop.

The site is underlain by workings in coal seams and as a result the potential for mine gas generation cannot be discounted. Foundation construction (e.g. piling) or ground improvement works may provide a preferential pathway for potential mine gas to migrate to surface. In addition ground gas associated with former landfilling activities may also be present. These pathways will have to be avoided by careful assessment and design together with close monitoring, verification testing protocols and supervision during the works.

As shown in the PSSR at Appendix E, the majority of the potential pollutant linkages that may occur during the construction phase were assessed as 'Low' or 'Moderate/Low Risk'. The highest risk categories 'Moderate' include the following:

- Exposure to mine gas; and
- Disturbance of contaminated soils during the construction phase which may adversely affect groundwater quality (e.g. via mine shafts, landfilled areas).

Available information shows a potential for ground contamination to be present, however, the impact of any contamination on the surrounding soils is considered to be Low.

Given the above information, the importance relating to contaminated land during the construction phase is considered to be Medium and the scale of impact is Minor. As such, the significance of effect is considered to be Slight for all three options for the construction phase.

### 10.6.2.9 Contaminated Land - Operation Phase

During the operation of the Development, the following potential sources of contamination are identified:

- Residual contamination on site; and,
- Oils/fuels from motor vehicles (including accidental spillage) using the proposed development.

The majority of the viable pollutant linkages during operational phase were assessed as 'Very Low Risk' or 'Low', based on the risk assessment categorisation given in Appendix E. However, 'Moderate Risk' categories were identified and associated with risk to maintenance workers from ground/mine gas.

With respect to other potential contaminants within the soil and/or groundwater, once the road has been constructed, it is necessary for the design and construction to break the pollutant linkage. Potentially contaminative materials will have to be removed from site where encountered within cut areas. The road construction would also provide a barrier, which would reduce infiltration and prevent direct contact with potentially contaminative soils where they had been left in-situ. Containment, barriers, modification or replacement with clean imported fill would have to be used to deal with made ground materials that were considered to represent a risk to the receptors.

Given the above information, the importance relating to contaminated land during the operation of the scheme is considered to be Low and the scale of impact of Minor. As such, the significance of effect is considered to be Neutral or Slight for all three options for the operational phase.

### 10.6.3 Potential Construction Effects

Disruption due to construction can arise as a result of work directly on the road scheme but also from associated advance works.

The impact of construction works is considered within the impact assessment and is summarised in Table 10.10 within Section 10.8. Disruption to the geology and soils arising from associated works during construction is considered below.

Temporary enabling works such as access tracks, site compound would disturb geology and soils of the area. This impact would be temporary and reinstatement would be undertaken to minimise long-term impact. Given the low significance of geology and soils resources the impact is assessed to be 'slight' or 'neutral'.

Mine workings treatment involves grouting into bedrock but the works are undertaken from existing ground level which would cause disturbance to superficial deposits and agricultural soils. Where the works are within the footprint of the new earthworks there is no additional impact. Areas affected beyond the earthworks footprint would be reinstated to minimise long-term impact. Given the low significance of geology and soils resources the impact is assessed as 'slight' or neutral'.

All three options have less cut volume than fill volume so imported fill will be required. Unless this fill is obtained from another nearby projects with a net surplus of suitable material there will be a need to source fill from a quarry or borrow pit which will impact on the geology and soils at the quarry or borrow pit site. The degree of impact will depend on the value of the geology and soils at the source location. It will be necessary to mitigate the importation of material by maximising the re-use of the materials arising from within the works. Similarly where the cement, PFA or aggregate used in the scheme is gained from geological sources (borrow pit, quarry) there will be an impact on the geology at the source location. However, this applies to all construction materials. The use of industrial by-products (such as PFA) and waste materials (such as colliery spoil) assists to reduce impact on finite natural resources.

River diversions etc. are considered in Chapter 5 - Road Drainage and the Water Environment. River diversions which affect new areas of land will disturb the geology and soils of the area but, given the low significance of geology and soils the impact is assessed as 'slight' or neutral'.

## 10.7 Potential Mitigation

Appropriate mitigation will be required, primarily during construction, to ensure that potential impacts are minimised wherever possible.

However, before the construction phase, a suitably designed and detailed ground investigation to determine the nature of the underlying ground conditions, and subsequent detailed design of the preferred option will reduce the impact of many of the receptors and allow site specific Method Statements to be produced by the Contractor carrying out the construction works.

Prior to commencing any work the contractor will obtain the consent of the controlling authorities, in particular SEPA and SNH, for an Environmental Method Statement.

A major part of the mitigation measures will also be to ensure the control of grout during mine workings treatment. Measures should be implemented during both the design and construction of the works to:

- Control grout run-off on the ground surface and prevent grout reaching agricultural soils, watercourses or causing contamination of groundwater;
- Prevent grout leaks below ground into mine workings or mine entries; and
- Control mine gases and mine waters which may be contaminated.

Further detailed measures will be provided in the later stages of the scheme development when the preferred route option is known and site specific ground investigation data is available.

## 10.8 Summary of Effects

Table 10.10 below summarises the information provided in Section 10.6 and Section 10.7 on the potential effects on geology and soils that could arise during the scheme construction and operation, including possible mitigation measures and likely residual impacts following the implication of these measures.

### 10.8.1 Residual Effects – Contaminated Land

Residual impacts are those that remain once the mitigation measures described in Section 10.7 have been implemented. With appropriate mitigation measures in place, the significant effect of all residual risks from contaminated land is assessed as 'Slight'.

Table 10.10 – Potential Construction and Operational Effects

	Option	Predicted Impacts	Magnitude of Predicted Impact	Sensitivity of Receptor	Significance of Effect	Potential Mitigation Measures	Residual Effects
<b>Drift Geology</b>							
Construction	A and C	Potentially compressible soils, running sands and localised failures may be encountered. Soil erosion caused by stripping of vegetation, excavations, ground disturbance, etc. Landslides.	Moderate	Low	Slight Adverse	Detailed ground investigation to determine nature of the soils and subsequent design of scheme to minimise impact on underlying soils. Programme of soil strips to consider weather and minimise erosion. Reinstatement on completion of construction. Stockpiles positioned to minimise disturbance to soils and run-off of sediments. Appropriate temporary works to ensure stability of excavations	Neutral or Slight Adverse
	B		Minor	Low	Neutral or Slight Adverse		Neutral or Slight Adverse
Operation	A and C	Potentially compressible soils, running sands and localised failures may be encountered. Soil erosion caused by stripping of vegetation, excavations, ground disturbance, etc. Landslides.	Moderate	Low	Slight Adverse	Scheme design will assess and mitigate adverse impacts where present.	Slight Adverse
	B		Minor	Low	Neutral or Slight Adverse		Neutral or Slight Adverse
<b>Geomorphology</b>							
Construction and Operation	A and B	Earthworks for the proposed scheme include cuttings and embankments which alter the geomorphology at the site	Minor	Negligible	Neutral Adverse	Construction controls to restrict disturbance of surrounding land. Scheme design will assess and mitigate adverse impacts where present.	Neutral
	C		Minor	Low	Neutral or Slight Adverse		Neutral or Slight Adverse
<b>Solid Geology (including mine working treatment)</b>							
Construction	Common to all Options	During construction, there will be no permanent exposure of bedrock but potential localised disturbance of bedrock associated with drilling for GI and piling. Mine workings treatment will disturb bedrock during drilling and grouting works.	Minor	Low	Neutral or Slight Adverse	Detailed ground investigation to identify underlying solid geology, depth to bedrock. Standard construction controls and best practise, including appropriate drilling methods, site supervision and monitoring to minimise unnecessary disturbance of bedrock. Maximise re-use of site won fill to limit requirement for imported aggregates. Cut / fill balance undertaken as part of	Neutral or Slight Adverse

Option	Predicted Impacts	Magnitude of Predicted Impact	Sensitivity of Receptor	Significance of Effect	Potential Mitigation Measures	Residual Effects	
	Temporary exposure of bedrock will allow inspection of solid geology features. GI will produce data about the solid geology to add to BGS knowledge.	Minor	Low	Neutral or Slight Beneficial	design.	Neutral or Slight Beneficial	
Operation	Common to all Options	Piles have localised impact on bedrock	Minor	Low	Neutral or Slight Adverse	Detailed ground investigation to identify underlying solid geology, depth to bedrock. Scheme design will minimise impact on solid geology.	Neutral or Slight Adverse
	A and B	Mine workings treatment, once complete, will stabilise the bedrock	Minor	Low	Neutral or Slight Beneficial	None required for beneficial effect	Neutral or Slight Beneficial
	C		Moderate	Low	Slight Beneficial	None required for beneficial effect	Slight Beneficial
<b>Minerals (excluding mine working treatment)</b>							
Construction and Operation	Common to all Options	Proposed works will not sterilise any mineral resources as there are none underlying the site and coal mining is complete.	No change	Negligible	Neutral	None required but consult with Coal Authority as required during design prior to grouting of shallow mine workings.	Neutral
<b>Agricultural Soils</b>							
Construction	A and B	Loss of Class 2 and Class 3.1 agricultural land	Minor	High /Medium	Slight or Moderate Adverse	Controls during construction e.g. limit soil strips in poor weather, temporary excavation support, limit haulage routes, consider compound and stockpile locations	Slight Adverse
	C		Moderate	Medium	Moderate Adverse		Slight or Moderate Adverse
Operation	A and B	Loss of Class 2 and Class 3.1 agricultural land	Minor	High /Medium	Slight or Moderate Adverse	Some loss of soils however, Scheme design will assess and mitigate adverse impacts where present.	Slight Adverse
	C		Moderate	Medium	Moderate Adverse		Slight or Moderate Adverse
<b>Geological Designated Sites</b>							
Construction and Operation	Common to all Options	No geologically designated sites will be affected by the proposed works	Neutral	Negligible	Neutral	None required	Neutral

	Option	Predicted Impacts	Magnitude of Predicted Impact	Sensitivity of Receptor	Significance of Effect	Potential Mitigation Measures	Residual Effects
<b>Contaminated Land</b>							
Construction	Common to all options	Disturbance of contaminated land and pollution of nearby receptors	Minor	Medium	Slight Adverse	Standard construction controls and best practise, including site supervision and monitoring to minimise unnecessary disturbance contaminated land.	Slight Adverse
Operation	Common to all Options	Disturbance of contaminated land and pollution of nearby receptors	Minor	Low	Neutral or Slight Adverse	Scheme design to include best practise measures to limit impact on contaminated land and will assess and mitigate adverse impacts where present.	Neutral or Slight Adverse
<b>Hydrogeology (relating to mine working treatment)</b>							
Construction	Common to all options	Disturbance of groundwater flow, and potential pollution of groundwater and aquifers from mine waters and mine gases resulting from consolidation grouting of mine workings and mine entries	Minor to Major	Medium to Very High	Slight to Very Large Adverse	Detailed ground investigation to identify areas of contamination and extent of any contamination. Standard construction controls and best practise, including site supervision and monitoring to prevent pollution of groundwater. Scheme design to minimise impacts on groundwater.	Neutral or Slight Adverse
Operation	Common to all options	Permanent disruption to groundwater regime resulting from consolidation grouting of mine workings and mine entries.	Negligible Minor to Negligible	Medium to Very High	Slight to Very Large Adverse	Detailed ground investigation to identify areas of contamination and extent of any contamination. Scheme design will minimise impact on groundwater regime and will assess and mitigate adverse impacts where present.	Neutral or Slight Adverse

## 10.9 Compliance with Policies and Plans

An assessment of the compliance of the proposed scheme options with the policies and plans that apply directly to the geology and soils of the Sheriffhall area has been undertaken. The tables (Table 10.11 to Table 10.14) below present the policies relevant to geology and soils and demonstrate the compliance of the proposed scheme options.

### 10.9.1 National Policy

#### **Scottish Planning Policy (2014)**

**Table 10.11 – Compliance with Scottish Planning Policy**

Policy	Compliance
Valuing the Natural Environment	There are no RIGS or peat land affected by the proposed scheme options. Soils will be protected from damage and compaction where possible, and reinstatement works will be undertaken as required. Some agricultural soils, generally Class 2 or Class 5.2, less Class 3.1 will be lost.
Promoting Responsible Extraction of Resources	There will be no sterilisation of mineral resources as the coal seams have been worked. The scheme benefits the area in that undermined land will be stabilised and developed. The scheme will maximise the use of site won fill and recycled aggregates where possible.

### 10.9.2 Local Policy

#### 10.9.2.1 City of Edinburgh Council

##### **City of Edinburgh Local Development Plan (Adopted November 2016)**

**Table 10.12 – Compliance with City of Edinburgh Council LDP Policies**

Policy	Compliance
<b>Protection of Natural Resources</b>	
Policy Env 22 Pollution and Air, Water and Soil Quality	The schemes will have only a slight adverse impact on soil quality and /or ground stability. The scheme benefits the area in that undermined land will be stabilised and developed.
<b>Minerals</b>	
Policy RS 5 Minerals	There will be no sterilisation of mineral resources as there are no economically viable mineral resources at the site and the coal seams underlying the site have been worked.

#### 10.9.2.2 Midlothian Council

##### **Midlothian Adopted Local Plan (Adopted December 2008)**

**Table 10.13 – Compliance with Midlothian Council LP Policies**

Policy	Compliance
<b>Resource Protection – Natural Heritage</b>	
Policy RP4 - Prime Agricultural Land	Prime agricultural land (Class 1 and 2) will be lost. However, the benefits of the development are considered to outweigh the minor loss of land.
Policy RP8 - Water Environment	There are no significant areas of contaminated land from which pollution of water can occur, Stabilisation of mine workings will be undertaken so as to minimise effects on the surface and sub-surface water environment.

Policy	Compliance
Policy RP12 - Regionally & Locally Important Nature Conservation Sites	There are no RIGS or peat land affected by the proposed scheme options.
Policy RP 17 - Protection of the Mineral Resource	There will be no sterilisation of mineral resources as there are no economically viable mineral resources at the site and the coal seams underlying the site have been worked.
Policy RP 19 - Peat Extraction	There is no peat land affected by the proposed scheme options.

### **Midlothian Proposed Local Development Plan (2014)**

The Midlothian LDP will replace the current Midlothian adopted Local Plan and is scheduled to be adopted in spring 2017.

**Table 10.14 – Compliance with Midlothian Council Proposed LDP policies**

Policy	Compliance
<b>Safeguarding and Managing Our Natural Environment</b>	
Policy ENV 4 – Prime Agricultural Land	Prime agricultural land (Class 1 and 2) will be lost. However, the benefits of the development are considered to outweigh the minor loss of land.
Policy ENV 5 - Peat and Carbon Rich Soils	There are no significant deposits of peat or carbon rich soils affected by the scheme options.
Policy ENV 10 – Water Environment	There are no significant areas of contaminated land from which pollution of water can occur, Stabilisation of mine workings will be undertaken so as to minimise effects on the surface and sub-surface water environment.
Policy ENV 16 - Vacant, Derelict and Contaminated Land	The scheme will develop vacant land which (due underlying mine workings) could be considered marginal.
<b>Economic Growth Policies</b>	
Policy MIN 1 - Areas of Search for Surface Mineral Extraction	Hard rock quarrying is not proposed. There will be no sterilisation of mineral resources as there are no economically viable mineral resources at the site and the coal seams underlying the site have been worked.

## 10.10 Conclusions

This section has considered the impact of the scheme on the geology and soils. All three options are broadly similar in terms of value (sensitivity) of receptors and the impacts thereon. They are each assessed to have a 'Negligible' to 'Minor' magnitude of adverse impact on the geomorphology, agricultural soils, drift geology and bedrock of the area resulting in a "Neutral" to "Slight" rating of residual significant effects after mitigation measures are employed.

Contaminated land and potential for contamination of sensitive receptors is not a significant issue within the site. Although there are potential sources of contamination they are generally considered to be low/moderate risk and there are no high sensitivity receptors.

The most significant environmental effect could result from the treatment of mine workings and the potential contamination of groundwater from mine waters, mine gases and grout which needs to be prevented by close control, adequate supervision and monitoring. In addition infilling mine workings may result in disruption of groundwater flow. By applying appropriate mitigation measures the risk of such events can be minimised such that the residual effects would be expected to be of slight to moderate significance. Groundwater is considered in detail in Chapter 5 - Road Drainage and the Water Environment.

There are a few instances where one option is considered to have a greater impact than the others as detailed below:

- Drift Geology: Options A and C have a greater footprint area than Option B so are considered to have greater magnitude of impact during construction and operation. Additionally Option A involves the largest volume of excavation of existing soils to form the new cuttings, while Option C has greatest impact on currently undeveloped land.



- Agricultural Soils: Option B has a greater impact on Class 2.1 agricultural soils, than Option A and Option C. However, the design footprint area (outwith the highway boundary) of Options A and C is comparable and may result in greater loss of Class 2 agricultural soils.
- Bedrock - Stabilisation from Mine Working Treatment: Grouting of mine workings to ensure their future stability is considered as a beneficial impact as it will enhance the stability of the area. A larger area of mine workings treatment is required for Option C, so it is assigned a 'Slight' significance of effect while Option A and B are assigned a 'Neutral or Slight' significance of effect.
- Groundwater - Mining and Quarrying: Option C has the largest area of mine working treatment so subsequently has a greater potential for contamination or disruption of the groundwater.

Although all three options are broadly comparable with regards to the effect on the geology and soils, Option B is the preferred option, mainly due to its lesser footprint area which results in least disturbance of geology and soils and smaller area of mine workings treatment. Option C is least preferred as it may have a slightly greater effect on a number of receptors, such as drift geology and groundwater.

Ground investigation data is required to fully assess the impact of the options on the geology and soils of the area.

### 10.11 Scope of DMRB Stage 3 Assessment

In accordance with DMRB Geology and Soils further assessment of the preferred option will be undertaken to refine the identification of any impacts of the scheme on the geology, soils and hydrogeology of the area. Any particular environmental issues associated with contaminated land will also be further considered in a detailed contamination risk assessment.

The assessment of the preferred option will be informed by ground investigation which is anticipated to be undertaken during Stage 3 of the scheme.

Mitigation measures currently proposed will be further developed in the assessment of the preferred option, in particular mitigation for any contaminated land issues identified by the ground investigation.

Ground investigation will also be necessary to determine the extents of potential mine workings treatment that may be required, which will in turn allow a more detailed assessment of the impact of any proposed works, relevant to both geology and soils and the hydrogeology of the area.

## 11. Materials

### 11.1 Introduction

This materials chapter considers material resources required and waste likely to be generated during construction for each of the route options using the Design Manual for Roads and Bridges (DMRB) Stage 2 Assessment.

The Highways Agency (HA) is currently modernising Volume 11 (Environmental Assessment) of the Design Manual for Roads and Bridges (DMRB). The Aims and Objectives of Environmental Assessment (DMRB, Volume 11, Part 1: HA 200/08) identifies in Table 1.1 the Environmental Impact Assessment topics. One of the topics identified is Materials for which no previous guidance is available. The consideration of the effects of the different options for the A720 Sheriffhall Junction Improvement on Materials has been undertaken with reference to the draft DMRB Vol. 11, S. 3, P. 6 'Materials' guidance and also to the Interim Advice Note 153/11 'Guidance on the Environmental Assessment of Material Resources'.

### 11.2 Approach and Methodology

The construction of any of the options will necessitate the consumption of materials and will also generate waste. The draft DMRB guidance identifies two levels of assessment which may be undertaken; a simple assessment or a detailed assessment.

With approval from Transport Scotland, the assessment has been limited to a simple comparative assessment of approximate volumes of materials used and waste generated to inform future decision making regarding a preferred option to be taken forward for more detailed assessment at DMRB Stage 3.

For the purpose of this Stage 2 study, simple assessment methodology will be used to inform a comparative assessment of the three options. The draft DMRB guidance recognises that varying degrees of information will be available when assessing options as designs are not developed in detail and specifically little quantifiable information will be available at options stage.

Project and baseline data has been assembled to allow an understanding of the likely environmental impacts of the three options.

DMRB identifies that at this stage in the assessment; information should be gathered relating to:

- Description of the site and type of scheme;
- Information about construction methods and techniques (where this is available at the time of assessment);
- Statutory requirements, such as the need for a Site Waste Management Plan and other regulatory requirements;
- High Level policy and strategy targets influencing materials use and waste management; and
- Data on material resource use and waste.

The assessment should also consider the available waste management infrastructure in the local area including:

- Types of waste management facilities, including landfill sites, materials recovery facilities, transfer stations and locations relative to the site;
- Capacities of identified waste management facilities.

In order to provide a meaningful assessment of waste it is necessary to identify and estimate all the likely waste arising as a result of the scheme.

The assessment has considered the potential for onsite reuse to meet material need for the scheme, this has been carried out by considering the cut and fill balance information available at this stage. The findings of the simple assessment have been reported in accordance with the reporting requirements in DMRB; identifying the environmental impacts/ effects at the simple assessment level and, where it has been possible to do so, the measures to mitigate those impacts/effects. Recommendations have been made for further assessment required at Stage 3 to ascertain more detailed impacts/effects. High level assessment of the CO<sub>2</sub>e of materials has been carried out using the Transport Scotland Carbon Management System Tool specifically for comparison of the three options.

The scale of impact magnitude for materials has been assessed using Table 11.1 below.

**Table 11.1 - Materials Assessment Definitions**

Scale of Impact Magnitude	Total CO2e of materials (tonnes)
No change	>1,000
Negligible	1,000 – 5,000
Minor	5,000 – 20,000
Moderate	20,000 – 40,000
Major	>40,000

Source: DMRB Vol 11 section 3 draft Part 6 (Materials)

For the assessment of waste, the sensitivity of the identified receptor and the magnitude of impact are determined using the following terminology:

**Table 11.2 - Waste Assessment Definitions****Sensitivity of Receptor**

Very High	There is no available waste management capacity for any waste arising from the project
High	There is limited waste management capacity in relation to the forecast waste arisings from the project
Medium	There is adequate waste management capacity for the majority of wastes arising from the project
Low	There is adequate available waste management capacity for all wastes arising from the project

**Magnitude of Impact**

Major	Waste is predominantly disposed of to landfill or to incineration without energy recovery with little or no prior segregation
Moderate	Wastes are predominantly disposed of to incineration with energy recovery
Minor	Wastes are predominantly segregated and sent for composting, recycling or for further segregation and sorting at a materials recovery facility
Negligible	Wastes are predominantly re-used on site or at an appropriately licensed or registered exempt site elsewhere.

Source: DMRB Vol 11 section 3 draft Part 6 (Materials)

Table 11.3 shows how the determination of the significance of effect is reached, by considering both the magnitude of impact and sensitivity of the receptor. Effects that are Large or Very Large are considered to represent key factors in the decision making process. Those that are moderate are considered to be important but not likely to be key decision making factors. Effects which are slight are unlikely to be critical in the decision making process but are important in enhancing the subsequent design of the project. Neutral refers to those effects which are beneath levels of perception.

The impact significance is determined by considering the Magnitude of a predicted effect on the Sensitivity scale of the receiving receptor. Effects can be either adverse or beneficial.

Effects that are Large or Very Large are considered to represent key factors in the decision making process. Those that are moderate are considered to be important but not likely to be key decision making factors. Effects which are slight are unlikely to be critical in the decision making process but are important in enhancing the subsequent design of the project. Neutral refers to those effects which are beneath levels of perception.

**Table 11.3 - Determination of Significant of Effect**

Magnitude of Impact	Sensitivity of Receptor			
	Very High	High	Medium	Low
<b>Major</b>	Very Large	Large or Very Large	Moderate or Large	Slight or Moderate
<b>Moderate</b>	Large or Very Large	Moderate or Large	Moderate	Slight
<b>Minor</b>	Moderate or Large	Slight or Moderate	Slight	Neutral or Slight
<b>Negligible</b>	Slight	Slight	Neutral or Slight	Neutral or Slight

## 11.3 Planning Policy Context

### 11.3.1 Policy Drivers/ Regulatory Framework

The following sections summarise the policy and legal framework for the sustainable use of resources. This is provided as baseline information, therefore only a high level assessment is provided against the policy framework as the drivers detailed below support the production of this assessment and its aspiration to reduce the environmental impacts associated with material resource use and waste generation.

Due to the relatively small size of this scheme, this baseline does not include the current waste arising from the operation of the road which is considered to be negligible.

### 11.3.2 National Policy and Guidance

#### ***Scottish Planning Policy (2014)***

The Scottish Planning Policy (SPP) provides national planning policy covering several themes, including; supporting sustainable development, encouraging the use of sustainable and recycled materials in construction; and promoting development design that would contribute positively to the built and natural environment.

#### ***Scotland's Zero Waste Plan***

Scotland's Zero Waste Plan (2010) outlines a vision for a zero waste society where all types of waste are dealt with regardless of where they come from. The plan sets out several objectives which include:

- Eliminating the unnecessary use of raw materials. This leads to further reductions in Greenhouse Gas Emissions in areas such as mining of raw materials, manufacturing and transport. There are also financial savings; and
- Producing energy savings from making products from recycled materials, rather than from virgin materials.

The Plan considers Construction and Demolition (C&D) waste and outlines ways in which future policy can be developed to support higher targets in recycling and recovery levels in this area.

### 11.3.3 Regional Policy

#### ***A Zero Waste Future for Edinburgh and Midlothian***

Zero Waste: Edinburgh and Midlothian is a major joint-project between the City of Edinburgh Council and Midlothian Council to deliver, through private sector partners, dedicated facilities for the treatment of waste under the Zero Waste Plan. The Zero Waste Plan which sets a target of 70% recycling for all waste arising in Scotland, restrictions on inputs to energy from waste plants, as well as progressive bans on the types of materials permitted for landfill, will also be introduced. The waste plan also sets targets, using the waste hierarchy of prevention, reduction, recycling, other recovery (e.g. energy recovery) and finally disposal.

### 11.3.4 Local Policy

#### **11.3.4.1 City of Edinburgh Council**

##### ***Edinburgh Local Development Plan (Adopted November 2016)***

City of Edinburgh Council's LDP is the land-use plan that will guide the development and investment in the region over the next 20 years. There are no specific policies in the City of Edinburgh Local Development Plan in relation to material use and waste.

#### **11.3.4.2 Midlothian Council**

##### ***Midlothian Local Plan (Adopted December 2008)***

The relevant policies in the 2008 adopted plan include:

- Policy WAST 4 – Waste Minimisation

*“Proposals for new built development shall demonstrate that the generation during construction period has been minimised, that residual waste will be utilised in a sustainable manner, and that recycled construction and demolition wastes are incorporated into the proposal as far as reasonably possible”.*

- Policy DP 2 – Development Guidelines

*“The Council will expect development proposals to have regard to the following principles of sustainability” including “e) recycling of construction materials and minimising the use of non-renewable resources”*

### **Midlothian Proposed Local Development Plan (2014)**

As the project falls within City of Edinburgh Council’s local authority area and Midlothian Council’s local authority area, both city of Edinburgh and Midlothian Waste Policies must be taken into consideration.

The proposed Midlothian LDP will replace the current Midlothian adopted Local Plan and is scheduled to be adopted in spring 2017. The relevant policies in relation to material use and waste in the proposed plan include:

- Policy DEV 5 – Sustainability in New Development

*“The Council will expect development proposals to have regard to the following principles of sustainability” including “recycling of construction materials and minimising the use of non-renewable resources”*

- Policy DEV 6 – Layout and Design of New Development

*“The Council will require good design and a high quality of architecture, in both the overall layout of development proposals and their constituent parts.”* One of the criteria listed for the design of development proposals is *“C. good quality materials should be used in design”*.

### **11.3.5 Legislation**

There is a range of legislation that is applicable to the management of waste from European Directives through to a National Acts and Regulations. This includes but is not limited to the following:

- Climate Change (Scotland) Act - The Act is key commitment of the Scottish Government to address climate change by reducing greenhouse gas emissions and transitioning to a low carbon economy. Part 1 of the Act, creates the statutory framework for greenhouse gas emissions reductions in Scotland by setting an interim 42 per cent reduction target for 2020, with the power for this to be varied based on expert advice, and an 80 per cent reduction target for 2050. Part 4 of the Act places duties on public bodies relating to climate change. These duties require that a public body must, in exercising its functions, act in the way best calculated to contribute to the delivery of emissions reduction targets (known as ‘mitigation’), in the way best calculated to help deliver any statutory climate change adaptation programme, and in a way that it considers is most sustainable.
- Directive on Waste (2008/98/EC) - Known as the Waste Framework Directive (WFD), the Directive establishes a framework for the management of waste across the European Community. It requires Member States to give priority to waste prevention and encourage reuse and recovery of waste.
- Environmental Protection Act 1990, Part II - This Act provides the basis for licensing controls and other provisions aimed at ensuring that waste handling, disposal and recovery options do not harm the environment
- Environmental Protection (Duty of Care) Regulations 1991, as amended - These regulations impose a duty of care on anyone who imports, produces, carries, keeps, treats or disposes of controlled waste to ensure it is not unauthorised or harmfully deposited, treated or disposed of; and if transferred, is only given to an authorised person.
- Landfill (Scotland) Regulations 2003 - The Landfill (Scotland) Regulations transposes the requirements of the Landfill Directive (Council Directive 1999/31/EC), which aims to prevent, or to reduce as far as possible, the negative environmental effects of landfill.
- Waste Management Licensing (Scotland) Regulations 2011 - these regulations implement the revised Waste Framework Directive 2008 and cover applications for waste management licences, which authorise the deposit, disposal and treatment of controlled waste.
- Waste (Scotland) Regulations 2012 - These regulations implement the remaining parts of the Waste Framework Directive 2008 that are not covered by the Waste Management Licensing (Scotland) Regulations 2011. A number

of amendments to related legislation are included, such as the Environmental Protection Act 1990, the Environment Act 1995 and the National Waste Management Plan for Scotland Regulations 2007 amongst others.

- Weeds Act 1959 – This Act allows measures of enforcement to be used in controlling injurious weed species throughout the UK.

## 11.4 Consultations

Consultation with key stakeholders was undertaken for the Stage 2 Assessment in February 2015 and again in November 2016. SEPA are the key consultee for this assessment chapter and in response to the initial Stage 2 Assessment (Dated 05/03/2015); they stated that they had nothing further to add to their DMRB Stage 1 Assessment Response (Dated 28/11/2013). The most recent consultation was carried out in 2016 (Dated 06/12/2016) which restated some key points from the 2013 response and is summarised in Table 11.4 below. For full responses see Appendix 1.1 – Copy of Consultation Responses.

**Table 11.4 – Summary of Consultation Responses**

Consultee	Response
Scottish Environmental Protection Agency (SEPA)	<p><b>Dated 06/12/2016</b></p> <p>In their December 2016, response SEPA noted that one of their key interests in relation to major developments is pollution prevention measures during the periods of construction, operation, maintenance, demolition and restoration. The construction phase includes construction of access roads, borrow pits and any other site infrastructure.</p> <p>They advise that the applicant should, through the EIA process or planning submission, systematically identify all aspects of site work that might impact upon the environment, potential pollution risks associated with the proposals and identify the principles of preventative measures and mitigation. This will establish a robust environmental management process for the development. A draft Schedule of Mitigation should be produced as part of this process. This should cover all the environmental sensitivities, pollution prevention and mitigation measures identified to avoid or minimise environmental effects.</p> <p>A Construction Environmental Management Document is a key management tool to implement the Schedule of Mitigation. They recommend that the principles of this document are set out in the ES outlining how the draft Schedule of Mitigation will be implemented. This document should form the basis of more detailed site specific Construction Environmental Management Plans which, along with detailed method statements, may be required by planning condition or, in certain cases, through environmental regulation.</p>

## 11.5 Baseline Conditions

### 11.5.1 Description of the Site and Type of Scheme

For details of the current site and type of construction/improvement, refer to Chapter 1 – Overview of Environmental Assessment.

Receptor types that are likely to be at risk of impacts in relation to use of material resources and the management of waste include:

- Quarries and other sources of minerals/ finite raw material resources. Specific sources of raw materials to be used for each route option have not yet been identified. Examples of materials that could be sourced from these quarries include sand, gravel, concrete, tarmac, bituminous products, rock armour and various types of stone.
- Registered landfill sites. Waste disposal facilities to be used for the route options have not yet been identified. However, SEPA's Waste Sites and Capacity Tool identifies that there is one non-hazardous waste landfill site in the region
- Soils and agricultural land in the surrounding area. Further baseline information is provided in Chapter 10 - Geology and Soils.
- Surface Water Features (SWFs). This includes the River Nairn and a number of smaller watercourses. Further baseline information is provided in Chapter 5 -Road Drainage and the Water Environment- of this report.
- Groundwater resources. Further baseline information is provided in Chapter 10 -Geology and Soils) of this report.

- The public, particularly local residents and commercial business. Further baseline information is provided in Chapter 9 - Community and Private Assets.
- Habitats and protected species. Further baseline information is provided in Chapter 3 -Nature Conservation- of this report.
- The global climate, through the use of energy and resultant greenhouse gas emissions. Further baseline information is provided in Chapter 7 - Air Quality.

## 11.6 Assessment of Potential Effects

### 11.6.1 Limitations to the Assessment

There are some limitations in this assessment due to a lack of detailed information available during the options assessment. These limitations are normal for a DMRB Stage 2 Assessment and this assessment is considered to be sufficient to enable differentiation between the different options. The level of detail provided at this time is limited by the available design information which is required to estimate material use and waste management. Therefore, estimates will need to be refined at later stages when additional information is available (i.e. DMRB Stage 3 Assessment). The haulage distances for delivery of materials and the removal of waste have not been included in the assessment. This is because the source of materials and the location of where the waste would be treatment have not yet been determined.

### 11.6.2 Waste Treatment in Scotland and Local Area

It is assumed that a large amount of waste generated from the project will be Construction and Demolition (C&D) waste. The Waste and Resources Action Programme (WRAP) defines C&D wastes as waste materials arising from UK commercial C&D sites. It includes, but not limited to, off-cuts and waste timber, plastics (such as uPVC & HDPE), glass (such as windows), packaging waste materials (for example card, wood and plastic film) and inert materials such as soils. The definition also includes aggregate materials (such as masonry, brick and block, paving, tiles and ceramics) and plasterboard in mixed waste.

SEPA produces reports relating to waste arising and treatment in Scotland. In their 'Waste Sites and Capacity Tool (2017)', SEPA identifies the waste managed in the Local Authority areas near Sheriffhall Roundabout for 2014. These wastes are shown in Table 11.55 below.

**Table 11.5 - Wastes Accepted by Local Authority (Tonnes)**

Local Authority Area	Waste Accepted at Landfill Site	Waste Accepted at Metal Recycler Site	Waste Accepted at Multiple Activity Site	Waste Accepted at Transfer Station Site	Total Tonnes of Waste Accepted
Edinburgh	0	50,680	43,608	211,779	360,562
Midlothian	0	2,698	89,732	104,948	199,701
East Lothian	300,097	243	205,087	5,342	515,805
Scottish Borders	50,193	3,876	44,303	15,935	122,176

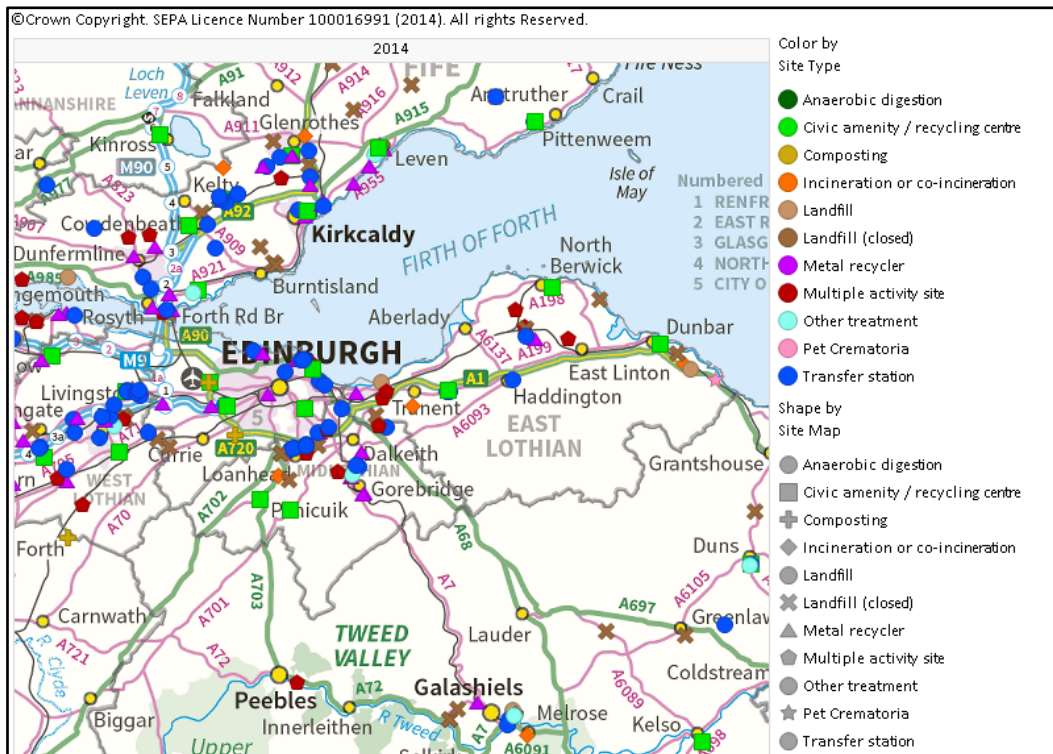
It can be seen from Table 11.55 that there are no landfill sites in Edinburgh and Midlothian and significant amounts of waste are recycled either through a transfer station or directly.

### 11.6.3 Existing Waste Management Infrastructure

SEPA produces maps that illustrate the waste management facilities in Scotland at a national and local authority scale. The most recent of these shows available facilities in 2014. Figure 11.1 – SEPA's Waste Management Facilities 2014, provides a map of Waste Management Facilities in area by type.

It is clear from the SEPA map of Waste Management Facilities and also the breakdown of waste treatment that facilities exist in the wider Edinburgh area for both disposal and recycling of construction and demolition waste.

Figure 11.1 – SEPA’s Waste Management Facilities 2014



Source: <http://www.sepa.org.uk/data-visualisation/waste-sites-and-capacity-tool/>

### 11.6.4 Construction Methods and Techniques

Construction techniques will be largely similar for all three options which all entail grade separation. The construction of the scheme will consist of several stages which will be programmed to ensure disruption is kept to a minimum. The proposed stages are as follows:

- Site setup and site clearance;
- Construction of offline works, including structures and accesses where possible; and
- Construction of online tie-in works.

The works will require the disposal of materials off site. The works will also require the importation of construction materials.

It is expected that most of the waste generated on site will be Construction and Demolition (C&D) waste, as ground investigation works have not yet been undertaken any potential sources of contamination are not know at this stage.

### 11.6.5 Generation and Management of Waste

Environmental impacts associated with waste during the construction period are considered short-term impacts while during the operational period, maintenance may result in the ongoing production of waste. Assessing the scale and significance of the impacts associated with the production and management of waste is based on a combination of the waste management methods identified and the effects that forecast waste arising will have on the available waste management infrastructure.

Impacts from use of material resources and the generation and management of waste, such as resource depletion and carbon release, are largely dispersed or generalised. Therefore, potential impacts are best determined from an assessment of the anticipated quantities of material required and waste generated from the route options. Impacts on baseline receptors are, where appropriate, covered within the other assessment chapters.

This assessment will consider the estimated material requirements for each option and also the likely waste arising based on current available information. A comparative assessment will then be undertaken and impacts discussed in terms of material use and waste. An assessment of the embedded carbon utilising the Transport Scotland Carbon



Management System (CMD) arising from the three options is not considered fully at this stage, but any further assessments should consider the impact of embedded carbon. Details of materials resource use and waste arising are presented in Table 11.6 and Table 11.7 respectively. The types of materials likely to be required for construction are common to all road schemes; this is not an exhaustive list but represents the key materials that are likely to be imported to site.

The main impact regarding materials and waste will arise from construction and clearance on site, preparation and earthworks stage. This arises as there are no proposed demolition works for this project and it is expected that the new scheme will have a similar use of materials and production of waste as to the current arrangement. Therefore, resulting in no additional impacts expected for the operation and maintenance asset.

### 11.6.6 Material Resources

The procurement process is essential to cutting waste in construction. Waste minimisation in procurement involves producing accurate and reliable estimates of material quantities required on a project and sourcing more resource efficient materials. The following recommendations should be taken into account:

- Procurement of products and materials with good practice levels of recycled content (relative to other products meeting the same specification);
- Material exchange with other construction projects within the vicinity of the works should be explored;
- Materials should be ordered to arrive when required for construction and the quantities should be accurately predetermined;
- Damage during receiving and storage should be minimised by ensuring storage in accordance with manufacturers' guidelines and in designated areas with offloading supervised by competent personnel using appropriate equipment;
- Ensure storage areas are safe, secure and weatherproof (where required); and
- Use of renewable materials from legal and sustainable sources (such as timber with appropriate certification).

Make use of existing waste management infrastructure for sourcing non-virgin and recycled materials. The baseline section identified a range of waste management facilities within the area. These facilities are also a source for recycled construction materials in Scotland in addition to accepting C&D waste for recycling. Sourcing materials as locally as possible will reduce impacts associated with transportation, and the identification of these sites in the locale confirm that recycled construction materials are readily available.

### 11.6.7 Potential Construction Effects

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

#### **Material Resources**

Use of material resources can have a significant impact on the environment through the use and depletion of finite natural resources, the energy and waste used and produces in their extraction, manufacture and transportation, and the energy consumption and durability during their use. Therefore, the route options with the greatest use of material resources are expected to have the greatest impact on the environment and its receptors. Table 11.6 - Material Resources Use shows the estimated volumes of materials expected to be used for each of the options.

Option A is estimated to require the greatest volume of materials. Option C has been estimated to require the least volume of materials. Mitigation as described in Section 11.7 is expected to reduce the impacts for materials for all of the route options.

#### **Wastes Arising**

The generation and management of waste can have a significant impact on the environment through its potential to contaminate sensitive receptors such as watercourses and soils, through its transport and processing and through the potential sterilisation of waste treatment facilities (i.e. by generating so much waste that it would result in a facility reaching capacity and waste having to be transported greater distances for disposal). Therefore, the route options with

the greatest levels of waste are expected to have the greatest impact on the environment and its receptors. Table 11.7 - Wastes Arising shows the estimated volumes of waste expected to be created by each of the options.

Option A is estimated to create the greatest volume of waste. Option C has been estimated to create the least volume of waste. Mitigation as described in Section 11.7 is expected to reduce the impacts of waste for all of the route options. In relation to compliance with planning policies, without mitigation all of the options have the potential to conflict with SPP, and Policy Dev 5 (Sustainability in New Development), Policy Waste 4 (Waste Minimisation) and Policy DP2 (Development Guidelines) of the Midlothian proposed Local Development Plan. With regard to sourcing materials sustainably, with appropriate mitigation as outlined in Section 11.7, it is expected that all the route options would comply with these policies.

Table 11.6 - Material Resources Use

Project Activity	Material Resources Required for the Project	Quantities of Material Resources Required				Additional Information		
		Option A	Option B	Option C				
Site Remediation/ Preparation	Extensive GI will be undertaken at the next stage of option development. This will provide information on the potential mine entry and mine working treatment required.					<ul style="list-style-type: none"> <li>• Ensure materials / suppliers are sourced as close to the site as possible to minimise transport emissions.</li> <li>• Re-use as much material as possible to reduce overall demand from external sources.</li> <li>• Procurement of products and materials with high levels of recycled content.</li> <li>• Minimise use of virgin material where possible.</li> <li>• Materials should be ordered to arrive when required for construction and the quantities should be accurately predetermined.</li> <li>• Use of renewable materials from legal and sustainable sources.</li> <li>• Damage during receiving and storage should be minimised by ensuring storage in accordance with manufacturers' guidelines and in designated areas with offloading supervised by competent personnel using appropriate equipment.</li> <li>• Ensure borrow pits are sourced as close to the site as possible to reduce transport emissions.</li> <li>• Minimise haul routes and double handling of materials.</li> </ul>		
Demolition	There are no proposed demolition works for this project.							
Construction	Major materials required include:							
	<b>Fencing</b>							
	Timber	6545	m	5694	m		5957	m
	<b>Road Restraint System</b>							
	Single Sided Barriers	4982	m	4467	m		6245	m
	Double Sided Barriers	1773	m	1600	m		1801	m
	Vehicle Parapets	140	m	230	m		150	m
	<b>Drainage</b>							
	Drainage Linear	8318	m	7294	m	7758	m	
	SuDs Basin Area	1990	m <sup>2</sup>	1720	m <sup>2</sup>	2070	m <sup>2</sup>	
	<b>Earthworks</b>							
	Excavated Materials (Acceptable Cut)	26386	m <sup>3</sup>	7746	m <sup>3</sup>	8934	m <sup>3</sup>	
	Imported Soil	444636	m <sup>3</sup>	448547	m <sup>3</sup>	344627	m <sup>3</sup>	
	Exported Material (Disposed)	63036	m <sup>3</sup>	33407	m <sup>3</sup>	23152	m <sup>3</sup>	
	<b>Road Pavements</b>							
	A720 - Surface (40mm)	1512	m <sup>3</sup>	1514	m <sup>3</sup>	1414	m <sup>3</sup>	
	A720 - Binder (60mm)	2268	m <sup>3</sup>	2271	m <sup>3</sup>	2121	m <sup>3</sup>	
	A720 - Base (250mm)	9449	m <sup>3</sup>	9463	m <sup>3</sup>	8837	m <sup>3</sup>	
	A720 - Sub-Base (330mm)	12472	m <sup>3</sup>	12491	m <sup>3</sup>	11665	m <sup>3</sup>	
	A720 - Total Area	37795	m <sup>2</sup>	37850	m <sup>2</sup>	35348	m <sup>2</sup>	

Project Activity	Material Resources Required for the Project	Quantities of Material Resources Required				Additional Information		
		Option A	Option B	Option C				
	Side Roads - Surface (40mm)	2027	m <sup>3</sup>	1669	m <sup>3</sup>	1942	m <sup>3</sup>	
	Side Roads - Binder (60mm)	3041	m <sup>3</sup>	2503	m <sup>3</sup>	2914	m <sup>3</sup>	
	Side Roads - Base (200mm)	10136	m <sup>3</sup>	8344	m <sup>3</sup>	9712	m <sup>3</sup>	
	Side Roads - Sub-Base (200mm)	10136	m <sup>3</sup>	8344	m <sup>3</sup>	9712	m <sup>3</sup>	
	Side Roads - Total Area	50681	m <sup>2</sup>	41722	m <sup>2</sup>	48562	m <sup>2</sup>	
	NMU Route - Surface (20mm)	141	m <sup>3</sup>	111	m <sup>3</sup>	140	m <sup>3</sup>	
	NMU Route - Base (40mm)	283	m <sup>3</sup>	222	m <sup>3</sup>	280	m <sup>3</sup>	
	NMU Route - Sub-Base (100mm)	707	m <sup>3</sup>	556	m <sup>3</sup>	699	m <sup>3</sup>	
	NMU Route - Total Area	7069	m <sup>2</sup>	5562	m <sup>2</sup>	6993	m <sup>2</sup>	
Operation and Maintenance	Materials will be required during the operation and maintenance of the new junction. However, at this stage there is little or no information available to indicate what these requirements would be.							

Table 11.7 - Wastes Arising

Project Activity	Material Resources Required for the Project	Quantities of Material Resources Required				Additional Information	
		Option A	Option B	Option C			
Site Remediation/ Preparation	Extensive GI will be undertaken at the next stage of option development. This will provide information on the potential mine entry and mine working treatment required.					<ul style="list-style-type: none"> <li>• A Materials and Waste Management Strategy (M&amp;WMS) shall be put in place to address the likely waste arising. A Site Waste Management Plan (SWMP) shall also be produced.</li> <li>• Materials should be ordered to arrive when required for construction and the quantities should be accurately predetermined.</li> <li>• Use of renewable materials from legal and sustainable sources.</li> <li>• Damage during receiving and storage should be minimised by ensuring storage in accordance with manufacturers' guidelines and in designated areas with offloading supervised by competent personnel using appropriate equipment.</li> <li>• Explore material exchange with other construction projects within the vicinity.</li> <li>• Re-use as much material on site if possible prior to recycling or disposal to reduce overall waste.</li> <li>• Ensure disposal / treatment / recycling facility is located as close to the site as possible to minimise transport emissions.</li> <li>• Topsoil can be removed, stockpiled and re-used as landscape material.</li> <li>• Soft materials from excavated cut should be reused on site.</li> </ul>	
Demolition	There are no proposed demolition works for this project.						
Construction	The anticipated waste arising from the project, include:						
	Exported Material (Disposed)	63036	m <sup>3</sup>	33407	m <sup>3</sup>		23152
	Construction Wastes - these have not been quantified at this stage of the design development.						
Operation and Maintenance	Materials will be required during the operation and maintenance of the new junction. However, at this stage there is little or no information available to indicate what these requirements would be.						

## 11.7 Potential Mitigation

The Waste Hierarchy is defined in the Article 4 of the Revised Waste Framework Directive (2008/98/EC), which states: The following waste hierarchy shall apply as a priority order in waste prevention and management legislation and policy:

- a. Prevention;
- b. Preparing for re-use;
- c. Recycling;
- d. Other recovery, e.g. energy recovery; and,
- e. Disposal.

The efficient use of materials reduces the quantity of materials required in the first instance, lowers the material purchasing costs, minimises waste and eliminates the need for subsequent handling and disposal costs. Developing a strategy to reduce waste is one of the most effective ways to address waste in construction. Once effective waste reduction measures are in place, it is then necessary to also consider how to reuse, recycle, recover or finally dispose of waste in a structured way.

Prescribing detailed mitigation measures at the option development stage is considered not feasible and may prejudice the final chosen option ahead of an Environmental Impact Assessment; however a number of mitigation measures can be recommended taking into account best practice, legislation and guidance which include the following:

- Minimise the total material demand of the design by ensuring that material inputs match demand as closely as possible;
- Minimise waste by matching material demand with material supply as closely as possible. Material supply can be met from the following prioritised sources:
  1. On-site reuse/ recycled;
  2. Off-site reuse/ recycled/ secondary materials/ sustainable sources; and
  3. Off-site primary material.
- Seek source materials in descending order of priority shown above, taking account of the associated impacts from transport and supply of materials;
- Where feasible, materials should be sourced locally in order to reduce potential environmental impacts such as from transport emissions and to support local businesses.
- Conform to waste hierarchy as strategy for dealing with any waste generated on site;
- Reduce the carbon emissions associated with the design as far as possible;
- If contaminated soils are encountered during the construction works, further investigation, testing and risk assessment should be undertaken to determine if the soils could stay on site, require treatment to make them suitable to remain on site or would need to be disposed of off-site;
- Where materials cannot be used for the route option, opportunities should be sought to re-use materials on other projects as part of the strategic commitment to waste management.
- A Construction Environmental Management Plan (CEMP) should be developed by the appointed contractor during the detailed design phase and implemented during the construction phase; and
- Devise a Materials and Waste Management Strategy (M&WMS) for both material procurement and waste management (this would include a Site Waste Management Plan).

Based on the assessment of likely waste arising, the following assumptions should be taken forward for treatment of waste generated on site:

- Existing A720 road pavement should be recycled for use; and
- Soft material from excavated cut should be reused on site.

Standard Practice requires compliance with legal requirements; Good and Best Practice goes beyond this to identify and implement ways to achieve significant reductions in waste and improvement in the materials resource efficiency of the project.

At a minimum any strategy for dealing with waste arising from the project should seek to align choices to the waste hierarchy.

The Contractor shall carry out the Works in such a way that, as far as is practicable, the amount of spoil and waste to be disposed of is minimised.

The Contractor shall identify the waste category and quantities, opportunities for recycling and or reuse, disposal routes and licensing requirements for all spoil and waste arising from the Works.

## 11.8 Summary of Effects

Table 11.8 below gives likely significance of impacts prior to mitigation, and likely significance with mitigation.

**Table 11.8 - Potential Construction Effects**

	Option	Predicted Impacts	Magnitude of Predicted Impact	Sensitivity of Receptor	Significance of Effect	Potential Mitigation Measures	Residual Effects
Site Remediation	Common to all Options	Extensive GI will need to be carried out at the next stage of option development to provide information on the potential mine entry and mine working treatment required.	None	None	None	None	None
Demolition	Common to all Options	There are no demolition works proposed for this project	None	None	None	None	None
Site Construction	Common to all Options	Use of materials for fencing: <ul style="list-style-type: none"> <li>Option A: 6545m</li> <li>Option B: 5694m</li> <li>Option C: 5957m</li> </ul>	None	Medium	None	Ensure suppliers are sourced as close to the site as possible to minimise transport emissions. Minimise use of virgin material where possible. Re-use as much material as possible to reduce overall demand from external sources.	None
	Common to all Options	Use of materials for road restraint systems: <ul style="list-style-type: none"> <li>Option A: 6895m</li> <li>Option B: 6297m</li> <li>Option C: 8196m</li> </ul>	None	Medium	None	Procurement of products and materials with high levels of recycled content. Materials should be ordered to arrive when required for construction and the quantities should be accurately predetermined. Damage during receiving and storage should be minimised by ensuring storage in accordance with manufacturers' guidelines and in designated areas with offloading supervised by competent personnel using appropriate equipment.	None
	Common to all Options	Use of materials for drainage systems: <ul style="list-style-type: none"> <li>Linear Drainage: <ul style="list-style-type: none"> <li>Option A: 8318m</li> <li>Option B: 7294m</li> <li>Option C: 7758m</li> </ul> </li> <li>SuD's Basin Area: <ul style="list-style-type: none"> <li>Option A: 1990m<sup>2</sup></li> <li>Option B: 1720m<sup>2</sup></li> <li>Option C: 2070m<sup>2</sup></li> </ul> </li> </ul>	None	Medium	None		None
	Common to all	Use of materials for earthworks: <ul style="list-style-type: none"> <li>Option A: 534,058m<sup>3</sup></li> </ul>	Minor	Medium	Slight Adverse	If borrow pits and quarries are used ensure they are sourced as close to the site as possible to minimise transport	Neutral



Option	Predicted Impacts	Magnitude of Predicted Impact	Sensitivity of Receptor	Significance of Effect	Potential Mitigation Measures	Residual Effects
Options	<ul style="list-style-type: none"> <li>Option B: 489,700m<sup>3</sup></li> <li>Option C: 376,713m<sup>3</sup></li> </ul>				<p>emissions.</p> <p>Re-use as much material as possible to reduce overall demand from external sources.</p> <p>Minimise haul routes and double handling of materials.</p>	
Common to all Options	<p>Production of inert waste arising from earthworks:</p> <ul style="list-style-type: none"> <li>Option A: 63,036m<sup>3</sup></li> <li>Option B: 33,407m<sup>3</sup></li> <li>Option C: 23,152m<sup>3</sup></li> <li>.</li> </ul> <p>There is adequate waste management capacity for the majority of the wastes. Wastes will be predominantly segregated and sent for composting, recycling or for further segregation and sorting at a materials recovery facility.</p>	Minor	Medium	Slight Adverse	<p>Ensure disposal / treatment / recycling facility is located as close to site as possible to minimise transport emissions. Re-use materials on site if possible prior to recycling or disposal. Topsoil can be removed, stockpiled and re-used as landscape material.</p> <p>Made ground has been identified where there are signs of historical development – there is scope for this material to be re-used subject to testing.</p> <p>Soft materials from excavated cut should be reused on site. Peat and other organic rich soils may be present in localised areas; this material is unsuitable for re-use and will require removal off site.</p> <p>Superficial deposits, glacial till and bedrock have all been identified and may be suitable for re-use as engineering fill subject to testing.</p>	Neutral
A	<p>The use of materials for road pavements:</p> <ul style="list-style-type: none"> <li>Option A: 52,172m<sup>3</sup></li> </ul>	Negligible	Medium	Neutral	<p>Ensure materials / suppliers are sourced as close to the site as possible to minimise transport emissions.</p> <p>Re-use as much material as possible to reduce overall demand from external sources.</p> <p>Procurement of products and materials with high levels of recycled content.</p> <p>Materials should be ordered to arrive when required for construction and the quantities should be accurately predetermined.</p> <p>Recycle planed material from the existing pavement in the makeup of new pavement layers as permitted by the SHW. Use of recycled material reduces need for disposal off site.</p>	Neutral
B & C	<p>The use of materials for road pavements:</p> <ul style="list-style-type: none"> <li>Option B: 47,488m<sup>3</sup></li> <li>Option C: 49,436m<sup>3</sup></li> </ul>	None	Medium	None	<p>Ensure materials / suppliers are sourced as close to the site as possible to minimise transport emissions.</p> <p>Re-use as much material as possible to reduce overall demand from external sources.</p> <p>Procurement of products and materials with high levels of recycled content.</p> <p>Materials should be ordered to arrive when required for construction and the quantities should be accurately predetermined.</p>	None

Option	Predicted Impacts	Magnitude of Predicted Impact	Sensitivity of Receptor	Significance of Effect	Potential Mitigation Measures	Residual Effects
					Recycle planed material from the existing pavement in the makeup of new pavement layers as permitted by the SHW. Use of recycled material reduces need for disposal off site.	

## 11.9 Compliance with Policies and Plans

Mitigation measures are necessary for the options to comply with the relevant policies and plans. Standard Practice requires compliance with legal requirements; Good and Best Practice goes beyond this to identify and implement ways to achieve significant reductions in waste and improvement in the materials resource efficiency of the project. Good and Best Practice mitigation measures set out in Section 11.7 is in line with the SPP and Midlothian proposed Local Development Plan policies Dev 5 (Sustainability in New Development), Dev 6 (Layout & Design in New Development), Waste 4 (Waste Minimisation) and DP2 (Development Guidelines). With regard to sourcing materials sustainably, with appropriate mitigation as outlined in Section 11.7, it is expected that all the route options would comply with these policies.

## 11.10 Conclusions

All three options have similar material resource requirements. Option A would require a greater number of material resources, which principally relates to the larger amount of excavation to be carried out in comparison to Options B and C.

In terms of waste production, Option A also performs worst, generating the most amount of waste in comparison to the other options. The amount of surplus excavated material required for Option A is the greatest influence upon waste.

## 11.11 Scope of DMRB Stage 3 Assessment

The DMRB Stage 3 Assessment for materials should develop as in-depth appreciation of the environmental consequences of material use and waste for the preferred option. It should involve a check of the data gathered within the DMRB Stage 2 Assessment and as a minimum should identify whether the impacts are positive/negative, permanent/temporary and direct/indirect.

The DMRB Stage 3 Assessment should use the methodology as described for a Detailed Assessment in the IAN153/11 and the draft DMRB Volume 11, Section 3, Part 6 (Materials). This assessment should therefore identify and quantify the following:

- the types and quantities of materials required for the proposed scheme;
- details of the source/ origin of materials, site-won materials to replace virgin materials, materials from secondary/ recycled sources or virgin/non-renewable sources;
- the cut and fill balance;
- the types and quantities of forecast waste arisings, including the identification of any forecast hazardous wastes;
- surplus materials and waste falling under regulatory controls;
- waste that requires storage on site prior to re-use, recycling or disposal;
- waste to be pre-treated on site for reuse within the project;
- wastes requiring treatment and/or disposal off site;
- the impacts that will arise from the issues identified in relation to materials and waste;
- the identification of measures to mitigate the identified impacts; and
- a conclusion about the significance of residual impacts, having taken into account magnitude and scale of identified impacts and proposed mitigation measures.

## 12. Summary of Environmental Assessment

### 12.1 Introduction

This chapter provides a summary of the environmental effects that have been described in each preceding topic specific chapter associated with each of the three options under consideration for the A720 Sheriffhall Roundabout Improvement.

A brief description is provided for each topic in Section 12.2 below and two summary tables are provided, Table 12.1 provides a summary of the potential construction effects and Table 12.2 provides a summary of the potential operational effects associated with each option.

Section 12.3 provides an overview of potential in-scheme cumulative impacts associated with each option.

### 12.2 Summary of Environmental Assessment

#### 12.2.1 Landscape and Visual

For both landscape character and visual effects during construction the effects of each of the options are anticipated to be largely similar.

During the operational phase, the landscape character assessment has identified that Options A and B are anticipated to result in similar effects on Landscape Character Areas (LCAs). Although the assessment has indicated that the levels of significance of effect would be the same for Options A and B, on balance Option B would result in slightly lesser effects as a result of it largely following the existing alignment and requiring a smaller land take. Option C would require the greatest land take and result in an increased loss and/or fragmentation of landscape features and as such it would result in the greatest effect of the three options. For all options the inclusion of mitigation planting, particularly on embankment slopes, would be important to help minimise potential residual and long term effects on the local landscape character.

During the operational phase, the visual assessment has identified that Options A and B have the potential to result in similar effects on residential receptor groups in close proximity to the Sheriffhall Roundabout. Option C is anticipated to result in the greatest level of effects, with more residential receptor groups experiencing a larger impact. In the long term, with the inclusion of extensive mitigation planting Option B is anticipated to result in the lowest level of effects, followed by Option A, with Option C anticipated to result in the greatest level of effects.

#### 12.2.2 Nature Conservation

During the construction phase it is anticipated that nature conservation effects are slightly greater for Options A and C, particularly relating to impacts on the Dean Burn and therefore on Otter Habitat.

During the operational phase the key ecological differences between the three options concern the loss of woodland (and associated potential impacts on protected species), lengths of required culverting (and associated potential impacts on protected species), and variability in likely increases in protected species road traffic casualties. In all these cases, it is anticipated that Option C will result in the greatest effect, since it results in significantly greater impact on ancient woodland, significantly more culverting and the greatest likelihood of increased protected species road traffic casualties (through significantly greater landscape dissection).

Options A and B have similar ecological effects, but owing to the significantly smaller land take and reduced culverting required for Option B; Option B is the most preferred ecologically. It is anticipated that the greatest effects are likely from Option C, with Option B resulting in the least effects, followed by Option A.

#### 12.2.3 Cultural Heritage

During the construction phase, Options A and C are anticipated to result in greater effects than Option B.

All three options have the potential to impact upon Dalkeith House (Palace) Garden and Designed Landscape. All options also have the potential to impact on the setting of a number of Scheduled Monuments and Listed Buildings. Options A and C are anticipated to have the greatest effects when compared to Option B.

Options A and C involve significant land-take in the vicinity of the present roundabout, these options are likely to result in greater effects on areas with archaeological potential. The effects of Option C are expected to be greater than Option A. There is potential of effects on areas with archaeological potential for Option B, however this is much less when compared to the other options.

On the basis of current information, Option B would be the preferred option as it has the smallest footprint and the least potential to impact upon cultural heritage assets.

It is anticipated that, while it may be possible to reduce or avoid some impacts through design solutions, archaeological mitigation works are likely to be required. These are likely to include set-piece excavations in advance of construction, and will lead to a need for post-excavation assessment, analysis and reporting works.

#### 12.2.4 Road Drainage and the Water Environment

Effects on the water environment during the construction phase include sediment mobilisation and spillage of pollutants to the Dean Burn and preferential pathways to groundwater. Regardless of which option is progressed, there will be a requirement for varying degrees of diversion of the Dean Burn channel and alteration of the floodplain in the vicinity of the proposed Scheme. The effects for Option C are anticipated to be greater than Options A and B.

Effects during the operation phase include a potential improvement in water quality in the Dean Burn through the use of Sustainable Urban Drainage Systems (SuDS) for road drainage for all options. There may also be an opportunity to improve current surface water flooding issues through the use of SuDS.

The hydromorphology of the Dean Burn may be degraded to some degree through channel modification and culverting. Overall Option C is anticipated to result in the greatest effects.

The assessment of options has indicated that Option B is anticipated to result in the least effects, as it results in the least intrusion into the floodplain of the Dean Burn and leads to the shortest length of channel diversion and culverting.

A flood risk assessment (FRA) should be undertaken to assess the potential impact of the preferred option on flood risk both locally and up and downstream of the development at Stage 3. Any loss of floodplain will be mitigated by the design and inclusion of compensatory storage, if required. The Contractor will be required to produce a Construction Environmental Management Plan (CEMP) which will describe the specific procedures to be put in place to control sediment mobilisation, surface water discharges, and spillages.

#### 12.2.5 Noise

During the construction phase the risk of vibration induced building damage is considered to be very low. The risk of annoyance due to construction vibration from standard construction works would be limited to the very closest receptors. Construction noise impacts are likely to extend over a larger area. Given the close proximity of receptors there is the potential for significant effects at nearby receptors. The magnitude of the impact and the significance of the effect at individual receptors will vary depending on their proximity to the works. Based simply on the physical extent of the works, Option B is likely to result in the lowest construction noise and vibration impacts and Option C the highest. However, at this stage before any specific construction information is available construction noise and vibration impacts should not be considered as a major factor in determining which option to take forward.

Due to the purpose of the Scheme being to reduce congestion at the Sheriffhall junction, an increase in traffic flows and speeds is anticipated on the A720, and the majority of the surrounding connecting roads, with all the options during operation. This results in a predominantly minor increase in traffic noise levels in the short term across the majority of the study area for all options. In the long term the magnitude of the increase is negligible across the majority of the study area for all options. The significance of the effect of all the options on traffic noise levels is classed as slight adverse. In comparing the three options for the Scheme, the traffic noise impact of each is very similar in its extent and magnitude. Overall the differences in operational traffic noise impacts between the options are minimal and limited to the very closest receptors to the junction, and as such operational noise should not be considered as a major factor in determining which Option to take forward.

### 12.2.6 Air Quality

During the construction phase, there may be short term impacts on air quality due to fugitive dust and vehicle emissions associated with activities on site. However, the impacts would be limited to the small number of receptors within close proximity to the roads. Due to the scale and extent of the work required, it is likely that the effects would be greatest for Option C and lowest for Option B. However, with appropriate best practice mitigation measures in place as part of a Construction Environmental Management Plan, the construction impacts are anticipated to be low risk or imperceptible for all options.

In terms of the local air quality operational effects are anticipated to be similar for Options A and B. Option C is anticipated to result in the greatest effects on a number of nearby residential properties and conversely greatest benefits for other nearby residential receptors. For Option C the anticipated effects are greater and changes are likely to take a longer time to reduce than for the other two options.

The regional impacts on emissions in the entire study area are anticipated to increase for all three options. The two main reasons for this increase are due to additional roads being constructed resulting in higher traffic flows in the study area and greater vehicle kilometres that would need to be travelled compared to the base DM (Do-Minimum) situation. The greatest effect on regional emissions is found with Option A.

### 12.2.7 Effects on all Travellers

During the construction phase the effects are anticipated to be similar for all options and include extended local journey times for vehicle travellers (including public transport travellers) and disruption to non-motorised users. For all options during the construction phase there is the potential to increase driver stress and for temporary adverse amenity effects on all users of the A720 Sheriffhall Roundabout.

During the operation phase all of the options will improve the current situation for users of the A720 Sheriffhall Roundabout as the creation of a grade separated junction will reduce congestion for both strategic and local road users. There are a number of receptors at in the study area which will be directly affected by the options proposed including core paths, other existing shared use paths, on-road cycling provision and bus stops. Each of the options has been designed to provide similar or enhanced provision for NMUs resulting in overall benefits. Option C provides shared cycleway/footpaths to allow NMUs to travel through Sheriffhall Roundabout which is set apart from traffic to a greater extent than Options A and B and with a dedicated NMU structure across the A720. None of the proposed options will result in any significant adverse effects, with beneficial effects expected for vehicle travellers including reduced driver stress. Options A and C introduce additional roundabouts which may result in some uncertainty for local road users navigating along the A7/A6106.

Option B could be considered to provide the best option for vehicle travellers as it is similar to the existing situation at Sheriffhall and therefore may be easier for local road users to navigate. Option C could be considered to provide the best option for NMUs as shared footway/cycleway is further segregated from traffic than Options A and B, however this is only a short section within the overall local network and all options include segregated shared footway/cycleway provision.

### 12.2.8 Community and Private Assets

The anticipated effects during the construction phase are similar for all options. The effects relate to construction land take of agricultural land and on economic land-use allocations in the Proposed Midlothian Local Development Plan (2014). There will be disruption during construction to a number of residential and business properties, field accesses and community facilities.

During the operation phase, Option C requires the most significant area of agricultural land, followed by Option A and lastly Option B. All options require land take from economic land-use allocations in the Proposed Midlothian Local Development Plan (2014) (E32 – Sheriffhall South and Ec1 Shawfair Extension Park). Option A requires the most land take followed by Option C and lastly Option B.

Alternative accesses are provided for all community facilities and residential and business properties as part of the design of each option.

### 12.2.9 Geology and Soils

During the construction phase it is anticipated that there may be greater effects on Options A and C for drift geology, geomorphology and agricultural soils. Effects are considered similar for solid geology, minerals, contaminated land and hydrogeology.

Although all three options are broadly comparable with regards to the effect on the geology and soils, Option B is the preferred option, mainly due to its lesser footprint area which results in least disturbance of geology and soils and smaller area of mine workings treatment. Option C is least preferred as it may have a slightly greater effect on a number of receptors, such as drift geology and groundwater.

### 12.2.10 Materials

All three options have similar material resource requirements. Option A would require a greater number of material resources, which principally relates to the larger amount of excavation to be carried out in comparison to Options B and C.

In terms of waste production, Option A also performs worst, generating the most amount of waste in comparison to the other options. The amount of surplus excavated material required for Option A is the greatest influence upon waste.

## 12.3 Potential Cumulative Effects

During construction there is the potential for cumulative effects for all options on receptors in close proximity to Sheriffhall Roundabout relating to construction activities. These impacts are likely to relate to visual impacts from construction compounds and construction vehicles and noise and air impacts from construction workings.

During operation there is the potential for cumulative effects for all options on residential properties in close proximity to Sheriffhall Roundabout. The potential effects relate to visual impacts from the new road layout, effects on setting of those buildings which are listed and noise and air effects. There is also the potential for cumulative effects relating to land take requirements and the loss of high quality agricultural soils. Cumulative effects will be explored in more detail at Stage 3 when a Preferred Option is taken forward for assessment; this is discussed further in Chapter 1 – Overview of Environmental Assessment, Section 1.6.2.

## 12.4 Environmental Assessment Summary Tables

Table 12.1, overleaf, provides a summary of the potential construction effects and Table 12.2 provides a summary of the potential operational effects associated with each option for each of the environmental assessment topics. It should be noted that the effects reported are residual effects following mitigation. Mitigation will be developed further during the Stage 3 Assessment but for the purposes of this Stage 2 assessment standard good practice mitigation for developing road schemes has been included, in addition to any embedded mitigation developed as part of the design of the options. The effects prior to mitigation can be found in the 'Potential Construction and Operational Effects' table in each of the topic chapters.

**Table 12.1 – Potential Construction Impacts Summary Table**

Impacts/issues	Receptors	Option A	Option B	Option C
<b>Chapter 2 - Landscape and Visual</b>				
Impacts on landscape character	Danderhall Settled Farmland LCA and Melville Nurseries LCA	Broadly similar for all options. Intensive direct change over a relatively small area, with potential for more widespread indirect change resulting primarily from loss of vegetation and increased movement and activity. Significance of Effect: Large Adverse		
	Dalkeith Palace LCA and Burdiehouse Farmland LCA	Broadly similar for all options Potential limited indirect change resulting from increased activity and movement within adjacent LCAs. Significance of Effect: Slight Adverse		
Impacts on visual receptors/ views	Sheriffhall Mains, Newton and Millerhill, Melville Grange Cottages, Burnside, Melville Nurseries (Dobbies, Butterfly Farm etc.)	Broadly similar for all options Change likely to be relatively limited, with a perceptible increase in activity, infrastructure or traffic visible from some locations. Significance of Effect: Moderate or Less Adverse		
	Campend, Summerside, and Old Sheriffhall	Broadly similar for all options Potential for close range views of construction activity and temporary compounds. Potential increased visibility of infrastructure and traffic resulting from removal of trees Significance of Effect: Large Adverse		
<b>Chapter 3- Nature Conservation</b>				
Pollution via contamination of surface or ground-waters	Dalkeith Oakwood SSSI Firth of Forth SPA/ Ramsar/SSSI Dalkeith Estate LWS Melville Castle LWS River North Esk LWS	Standard SEPA-approved pollution control measures & SUDS will mitigate. Significance of Effect: Neutral		
Loss of ancient woodland	Ancient woodland	Compensatory tree-planting can partially mitigate. This will not constitute ancient woodland, but given that this ancient woodland is species-poor plantation, the residual impact is considered slight. Significance of Effect: Slight Adverse		Compensatory tree-planting can partially mitigate (extent greater than A and B) Significance of Effect: Slight Adverse
Loss of other terrestrial habitats	Terrestrial habitats other than Ancient Woodland (see above)	Significance of Effect: Neutral		
Pollution during construction.	River North Esk	Implementation of SUDS can mitigate. Significance of Effect: Neutral		



Impacts/issues	Receptors	Option A	Option B	Option C
Culverting	Dean Burn	Significance of Effect: Slight to Moderate Adverse (depends on culvert design)	Significance of Effect: Neutral to Slight Adverse (depends on culvert design)	Significance of Effect: Slight to Moderate Adverse (depends on culvert design)
Partial / total loss of pond	Pond closest to existing bypass to the south	Compensatory pond creation can mitigate. Significance of Effect: Neutral		
Spread of invasive non-native species of plant	Invasive species including giant hogweed & salmonberry	Can be mitigated with appropriate management. Significance of Effect: Neutral		
Reduction in otter numbers/distribution through loss of pond and culverting of Dean Burn, and loss of lie-up.	Otter	Partly mitigated by culvert design / pond compensation. Significance of Effect: Slight to Moderate Adverse (depends on culvert design / pond compensation)	Partly mitigated by culvert design / pond compensation. Significance of Effect: Neutral to Slight Adverse (depends on culvert design / pond compensation)	Partly mitigated by culvert design / pond compensation. Significance of Effect: Slight to Moderate Adverse (depends on culvert design / pond compensation)
Destruction / disturbance of at least one badger sett	Badger	Can be licensed and mitigated. Further surveys required. Significance of Effect: Neutral		
Potential loss of roosts	Bats	Likely to be possible to license and mitigate. Further surveys required. Significance of Effect: Neutral		
If water vole is present along the suitable parts of the Dean Burn, significant water vole habitat could be lost.	Water Vole	Further survey to determine water vole presence/absence; if required, compensatory nearby habitat creation and licensed translocation of water voles. Significance of Effect: Neutral		
Potential loss of red squirrel dreys	Red squirrel	Survey and (if required) licensing can mitigate. Further surveys required. Significance of Effect: Neutral		
Partial or total loss of pond closest to existing bypass, with effect on great crested newt if present.	Amphibians, potentially including great crested newt	Further survey to determine great crested newt presence/absence; compensatory pond creation; if required, licensed translocation. Significance of Effect: Neutral		
Destruction of bird nests	Common wild birds, possibly also specially-protected species e.g. barn owl	Clear vegetation outwith breeding bird season Significance of Effect: Neutral		
Loss of plants during construction.	Only likely to affect common and widespread species.	Significance of Effect: Neutral		

Impacts/issues	Receptors	Option A	Option B	Option C
<b>Chapter 4 - Cultural Heritage</b>				
Permanent direct impact on setting of built heritage assets.	Summerside Farmhouse, Stables and Cottage Range. Category B listed building.	Moderate to Large Adverse impact on setting due to proximity of embanked roundabout and tie-in.	Neutral to Slight Adverse impact on setting due to proximity of embanked A720 to south and southeast.	Moderate to Large Adverse impact on setting due to proximity of embanked roundabout to west and tie-ins.
	Sheriffhall Farmhouse including Steading and Walled Garden & Sheriffhall Dovecot. Category B listed buildings.	Moderate to Large Adverse impact on setting due to proximity of embanked tie-in, A6106 and A720.	Slight to Moderate Adverse impact on setting due to proximity of embanked A720 to north and northeast.	Slight to Moderate Adverse impact on setting due to proximity of embanked A720 to north and northeast.
	Old Dalkeith Road, Campend Steading & Campend House, Boundary Walls, Gatepiers and Gates. Category C listed buildings. Form a B-Group.	Neutral to Slight Adverse impact on setting due to increased traffic and embanked tie-in.	Neutral to Slight Adverse	Slight Beneficial, reduction of traffic along the northbound A7 despite. New link road to A6106 to the southeast, and new roundabout.
	Dalkeith Park, King's Gate, Walls and Lodge. Category A listed building.	Slight to Moderate Adverse impact on setting due to embanked A6106 link and may be impacted by increased noise and visual intrusion from lighting from new roundabouts/link roads.	Neutral to Slight Adverse	Moderate to Large Adverse impact on setting due to new slip road from the A6106 at the junction with Melville Gate Road, embankment of the A6106 Old Dalkeith Road and new roundabout.
	Old Dalkeith Road, Campend House, Boundary Walls, Gatepiers and Gates. Category C listed building. B-Group with Campend Steading (listed separately).	Slight to Moderate Adverse direct impact on boundary walls resulting from verge works.	Neutral	Neutral
Permanent direct impact on setting on setting of historic landscape asset.	Dalkeith House (Palace), Inventory of Gardens and Designed Landscapes.	Slight to Moderate Adverse impact on setting due to embanked westbound off slip, embanked A720 and increased noise and visual intrusion from lighting.	Slight to Moderate Adverse impact on setting due to embanked westbound off slip, embanked A720 and increased noise and visual intrusion from lighting.	Slight to Moderate Adverse impact on setting due to embanked A720, new road to A6106 at King's Gate and increased noise and visual intrusion from lighting.
Permanent direct impact on setting of archaeological asset.	Elginhaugh Roman camp, fort and palisaded enclosure. Scheduled Monument.	Neutral to Slight Adverse impact on setting due to embanked A720 over the new junction.	Neutral	Slight to Moderate Adverse impact on setting due to the new slip road from the A6106 at the junction with Melville Gate Road and the embankment of the A6106 Old Dalkeith Road
Removal of archaeological deposits.	Sheriffhall, cropmarks of enclosure. Undesignated.	Slight to Moderate Adverse direct physical impact due to construction	Neutral to Slight Adverse	Slight to Moderate Adverse direct physical impact due to construction

Impacts/issues	Receptors	Option A	Option B	Option C
		of southern roundabout and slip roads.		of the new slip road from the A6106 at the junction with Melville Gate Road.
	Sheriffhall, possible Roman temporary camp; Campend, site of trackway; Lugton Bogs, cropmarks of ridge and furrow; Lugton Bogs, cropmarks of possibly industrial pit alignment and quarrying. All undesignated.	Neutral to Slight Adverse	Neutral to Slight Adverse	Neutral to Slight Adverse
	Lugton Bogs, cropmark of palisade enclosure and round house. Undesignated. Excavated.	Neutral	Neutral	Neutral to Slight Adverse
Permanent direct impact on setting of undesignated built heritage.	Edinburgh and Dalkeith Railway, Sheriffhall Bridge & railway linesman's hut.	Neutral	Neutral	Neutral to Slight Adverse
<b>Chapter 5 - Road Drainage and Water Environment</b>				
Surface Water Quality	Dean Burn River North Esk	Significance of Effect: Moderate Adverse		
Flood risk from development	Dean Burn River North Esk	Significance of Effect: Moderate Adverse		Significance of Effect: Large Adverse
Impact on watercourse geomorphology	Dean Burn	Significance of Effect: Moderate Adverse	Significance of Effect: Slight Adverse	Significance of Effect: Large Adverse
Damage to Drainage Infrastructure	Drainage Infrastructure	Significance of Effect: Large Adverse		
Groundwater Quality	Groundwater	Significance of Effect: Moderate Adverse		
Groundwater Flow	Groundwater	Significance of Effect: Moderate Adverse		Significance of Effect: Large Adverse
<b>Chapter 6 - Noise</b>				
Construction Vibration – Building Damage	Closest buildings	Significance of Effect : Neutral		
Construction Vibration – Annoyance	Closest residential properties	Significance of Effect : Slight Adverse		
Construction Noise	Noise sensitive receptors in close proximity to the works, predominantly	Significance of Effect: Large Adverse		

Impacts/issues	Receptors	Option A	Option B	Option C
	residential properties			
Construction Traffic	Noise sensitive receptors located along affected roads	Significance of Effect: Neutral to Slight Adverse		
<b>Chapter 7 - Air Quality</b>				
Fugitive construction dust and particulate emissions	Local air quality at residential buildings	Significance of Effect: Neutral to Slight Adverse (close to major earthworks)		
<b>Chapter 8 - Effects on All Travellers</b>				
Extended local journey times.	Vehicle Travellers	All options will be affected by extended local journey times for vehicles created by change to the Sheriffhall Roundabout baseline conditions during construction. Significance of Effect: Slight Adverse		
Disruption to a number of the baseline Non-Motorised User (NMU) receptors.	NMU provision: Edinburgh City Council Core Path CEC-4 Midlothian Council Core Path 4-34 Off road path sections linking each arm of the Sheriffhall Roundabout Off Road path sections on the A6106 Pavement provision on the A7 north and the A6106 Millerhill Road. On-road cycling	All options will cause disruption to a number of the baseline Non-Motorised User (NMU) receptors during construction Significance of Effect: Slight Adverse		
Public Transport Travellers	Current bus stops in each direction on the A7 north and the A6106 Old Dalkeith Road.	During construction, each of the options has the potential to impact on current bus stops located on the A7 north and the A6106 Old Dalkeith Road. On each of these roads there are stops travelling in each direction. Significance of Effect: Slight Adverse		
	Borders Railway	During construction, each of the options has the potential to cause disturbance to the operation of the Borders Railway to allow construction of the extension of the existing A720 Borders Railway underbridge to accommodate new slip roads onto the A720. Significance of Effect: Slight Adverse		
The loss of current lay-by at Sheriffhall Roundabout	Traffic control and monitoring layby at A720 Sheriffhall Roundabout	The current lay-by at Sheriffhall Roundabout will be lost for all three Options. Significance of Effect: Slight Adverse		
Driver stress caused by traversing the roundabout during construction activities.	Driver Stress	During construction there is the potential for driver stress whilst traversing the A720 Sheriffhall Roundabout due to construction activities. This could include the use of temporary traffic management measures such as temporary traffic lights, speed restrictions, diversionary routes, temporary closures, lane narrowing, construction vehicle movements etc. Significance of Effect: Slight Adverse		

Impacts/issues	Receptors	Option A	Option B	Option C
There will be temporary Adverse amenity impacts on all users during construction.	Amenity Changes (journey pleasantness)	There will be temporary adverse amenity impacts on all users during construction. Significance of Effect: Slight Adverse		
<b>Chapter 9 - Community and Private Assets</b>				
Temporary agricultural (Class 2 and 3.1) land take will be required to facilitate construction for all Options	Land take of agricultural land	Significance of Effect: Slight Adverse		
Temporary land take may be required to proposed economic allocations (Shawfair Park Extension Site (Ec1) and Sheriffhall South (E32)) to construct new roundabout layout and re-alignment of the A6106.	Land take of Midlothian proposed Local Development Plan allocations	Significance of Effect: Slight Adverse		
Temporary access required to Network Rail Land to construct an extension to the existing A720 Borders Railway underbridge	Land take of Network Rail land	Significance of Effect: Slight Adverse		
All options will result in disruption during construction to a number of residential properties	Access to residential properties: Summerside Residences Campend Residences Old Sheriffhall Farmhouse Residences	Significance of Effect: Slight Adverse		
Options A & C will result in disruption during construction to a number of business and industry premises	Access to existing business premises: Lowes Fruit Farm Didcock & Sons Upholstery Sheriffhall Café	Significance of Effect: Slight Adverse	Significance of Effect: None	Significance of Effect: Slight Adverse
All Options will result in disruption during construction to field accesses associated with the A7 and A6106	Access to agricultural land associated with the A7 North, A7 South, A6106 Millerhill Road and A6106 Old Dalkeith Road.	Significance of Effect: Slight Adverse		
There may be disruption during construction to those travelling to Spire Shawfair Park Hospital and the Edinburgh Royal Infirmary (ERI) including ambulances.	Access to community facilities: Spire Shawfair Park Hospital Edinburgh Royal Infirmary	Significance of Effect: Slight Adverse		
Options A & C will result in disruption during construction to Chapter One Childcare Nursery.	Access to community facilities: Chapter One Childcare Nursery	Significance of Effect: Slight Adverse	Significance of Effect: None	Significance of Effect: Slight Adverse

Impacts/issues	Receptors	Option A	Option B	Option C
<b>Chapter 10 - Geology &amp; Soils</b>				
Superficial geology - potentially compressible soils, running sands and localised failures may be encountered. Soil erosion caused by stripping of vegetation, excavations, ground disturbance, etc.	Drift Geology	Construction works will be required within deposits to form embankments and cuttings. Significance of Effect: Neutral to Slight Adverse		
Impact on existing soil slopes and drainage paths	Geomorphology	Mainly online widening so much of the works is within close proximity to existing road infrastructure Significance of Effect: Neutral	Offline works and situated on undeveloped Lugton Bogs land. Significance of Effect: Neutral to Slight Adverse	
Disturbance to bedrock strata during piling and mine workings treatment	Solid Geology	Localised disturbance to bedrock during drilling Significance of Effect: Neutral to Slight Adverse		
Knowledge gained about Sheriffhall fault and structural geology of the area during GI construction works	Solid Geology	Data will add to BGS knowledge about Sheriffhall fault Significance of Effect: Neutral to Slight Adverse		
Sterilisation of minerals	Minerals	There are no economically viable minerals beneath the scheme options. Significance of Effect: Neutral		
Loss of Class 1 and Class 2 agricultural soil	Agricultural Soils	Design footprint overlies Class 2 agricultural land Significance of Effect: Moderate Adverse	Design footprint overlies Class 3.1 and Class 2 agricultural land Significance of Effect: Slight Adverse	Design footprint overlies Class 2 agricultural land Significance of Effect: Neutral to Slight Adverse
Designated geological sites (RIGS)	Geological Designated sites	There are no RIGS at / near the site. Significance of Effect: Neutral		
Disturbance of contaminated land and potential pollution of surrounding geology and soils	Contaminated Land	No significant contamination issues anticipated for any option. Significance of Effect: Slight Adverse		
Consolidation grouting of mine workings and mine entries has potential to cause disturbance of groundwater flow, and potential pollution of groundwater and aquifers from mine waters and mine gases.	Hydrogeology	Mine workings and mine entry treatment is required for all options. Significance of Effect: Neutral to Slight Adverse		
<b>Chapter 11 - Materials</b>				
Site Construction	Use of Materials for fencing	Significance of Effect: None		
	Use of materials for road restraint	Significance of Effect: None		

Impacts/issues	Receptors	Option A	Option B	Option C
	systems			
	Use of materials for drainage systems (Linear & SuDs Basins)	Significance of Effect: None		
	Use of Materials for earth works	Significance of Effect: Neutral		
	Production of inert waste arising from earthworks	Significance of Effect: Neutral		
	Use of materials for road pavements	Significance of Effect: Neutral	Significance of Effect: None	

Table 12.2 – Potential Operation Impacts Summary Table

Impacts/issues	Receptors	Option A	Option B	Option C	
<b>Chapter 2 - Landscape and Visual</b>					
Impacts on landscape character	Danderhall Settled Farmland LCA	<p>The majority of change would be located within this LCA, resulting in an intensive change over a localised area.</p> <p>Due to the existing context of the junction, roads and associated traffic, change on the impression of the character of the wider extent of this LCA would be limited.</p> <p>Significance of Effect: Moderate at year 1, Slight at year 15 (with mitigation).</p>	<p>Predominantly within this LCA and therefore change would be both direct and indirect.</p> <p>This option Largely follows existing alignment of A720, although with a slightly Larger footprint and increased height.</p> <p>Bridge and embankments of the A720 would increase vertical prominence of junction within LCA.</p> <p>Significance of Effect: Moderate at year 1, Slight at year 15 (with mitigation).</p>	<p>Increase in overall footprint, and influence, of infrastructure within LCA.</p> <p>Some fragmentation of landscape pattern.</p> <p>Combined influence of new road bridge, raised southern roundabout and pedestrian bridge would increase vertical prominence of junction and traffic.</p> <p>Significance of Effect: Large at year 1, Moderate at year 15 (with mitigation).</p>	
	Melville Nurseries LCA	<p>New roundabout and realignment of short sections of road within this LCA and additional infrastructure in the neighbouring LCA to the north.</p> <p>Existing bands of woodland would limit the influence of change to a small part of this LCA.</p> <p>Significance of Effect: Slight at year 1, Slight at year 15 (with mitigation).</p>	<p>Largely located outwith this LCA, although it would be in close proximity to the north, resulting in indirect change.</p> <p>The increased height of the A720 carriageway and the slightly Larger footprint would result in a small change, limited to a very small area of this LCA.</p> <p>Significance of Effect: Slight at year 1, Slight at year 15 (with mitigation).</p>	<p>Increase in the amount of infrastructure within the LCA.</p> <p>Size of the proposed southern roundabout and associated roads and earthworks would likely cause considerable change to the experience of a small part of this LCA.</p> <p>Removal of parts of a woodland block which is an important feature within this LCA.</p> <p>Significance of Effect: Moderate at year 1, Slight at year 15 (with mitigation).</p>	
	Dalkeith Palace LCA	<p>Common to all options.</p> <p>Predominantly located outwith this LCA and as such direct change would be very limited.</p> <p>Wooded nature of this landscape would considerably limit potential indirect change to a very small area already influenced by existing infrastructure.</p> <p>Significance of Effect: Neutral at year 1 and year 15.</p>			
	Burdiehouse Farmland LCA	<p>Common to all options.</p> <p>Located outwith this LCA and as such would not result in any direct physical change.</p> <p>The existing A720 corridor and other infrastructure provide a context to potential indirect change.</p> <p>Options are likely to be perceptible from the LCA, but not anticipated to result in a noticeable change.</p> <p>Significance of Effect: Slight at year 1 and year 15.</p>			



Impacts/issues	Receptors	Option A	Option B	Option C
Impacts on visual receptors/ views	Sheriffhall Mains, Newton and Millerhill	<p>Common to all options.</p> <p>The majority of receptors within this group would gain very little or no visibility of all three options.</p> <p>A small number of receptors may gain some partial visibility of the raised carriage way of the A720 in Option A and Option B.</p> <p>Realignment of A6106 would result in the loss of poplar trees that cross part of the view, opening potential for glimpsed views of junction.</p> <p>Significance of Effect: Slight at year 1, Neutral at year 15 (with mitigation).</p>		
	Campend	<p>Realignment and widening of the A7 in foreground of the main views, resulting in loss of hedgerow and opening up of views to traffic on A720.</p> <p>Majority of change side on to main view and partially screened by shelterbelt trees.</p> <p>Removal of a line of mature trees to southeast would potentially increase the visibility of infrastructure and traffic.</p> <p>Significance of Effect: Moderate at year 1, Slight at year 15 (with mitigation).</p>	<p>Largely located outwith the main view and generally screened by intervening vegetation.</p> <p>Close range views of widening and realignment of the A7 from some receptors but change would be very minor.</p> <p>Potential increase in visibility of traffic on short section of A720, southwest of Summerside, oblique to main view.</p> <p>Significance of Effect: Slight at year 1, Neutral at year 15 (with mitigation).</p>	<p>Replacing existing A7 with a new carriageway further west, within the main view. Traffic would be slightly further away but new carriageway would be wider and include roundabouts and slip roads on embankment.</p> <p>Majority of change would be oblique to the main view, with some partial screening.</p> <p>Significance of Effect: Large at year 1, Moderate at year 15 (with mitigation).</p>
	Summerside	<p>New road infrastructure and traffic in closer proximity to the southeast, but traffic in northeast views more distant.</p> <p>New roundabout and associated traffic would increase influence of road infrastructure in views northeast.</p> <p>Views southeast Largely contained, but potential for close range glimpsed views of the A720 eastbound off slip, the raised A720 carriageway and associated traffic from small number of locations.</p> <p>Significance of Effect: Moderate at year 1, Slight at year 15 (with mitigation).</p>	<p>Largely follows existing alignment of A720 but increases the footprint and height of the junction.</p> <p>Eastbound off slip would extend road infrastructure and traffic slightly closer to the southeast and result in the loss of existing planting along the A720. This and increased height of the A720 carriageway and associated traffic would potentially increase visibility from some locations. However, views in this direction are screened from majority of receptors.</p> <p>Potential for marginal increase in visibility of traffic from a small number of receptors in views east.</p> <p>Significance of Effect: Moderate at year 1, Slight at year 15 (with mitigation).</p>	<p>Realignment of A7 North would introduce new features into westerly and northerly views.</p> <p>Eastbound on slip, and resultant loss of vegetation, would increase the visibility and influence of road infrastructure and traffic to south.</p> <p>Views east would benefit from removal of traffic which is currently prominent in the foreground.</p> <p>Significance of Effect: Large at year 1, Moderate at year 15 (with mitigation).</p>

Impacts/issues	Receptors	Option A	Option B	Option C
	Old Sheriffhall	Common to options A and B. Westbound off slip from the A720 would occupy the foreground of important section of views. Loss of block of woodland that currently screens the existing junction would increase visibility of road infrastructure and traffic. Increased height of the A720 would further increase the influence of road infrastructure and traffic in the foreground of views. Significance of Effect: Large at year 1, Moderate at year 15 (with mitigation).		New junction would be more distant than existing. Proposed embankments to south of A720 would be visible in foreground, although this would Largely appear as a reconfiguration of existing. Potential filtered views of proposed pedestrian bridge through existing woodland to northeast. Potential for glimpsed, side on views of raised structure of A7 to west. Significance of Effect: Moderate at year 1, Slight at year 15 (with mitigation).
	Melville Grange Cottages	Common to all options. Potential visibility would be very oblique to the main view, with little visibility from cottages. Visibility is anticipated to be limited to glimpsed or partially screened views of the elevated carriageways and traffic due to loss of existing vegetation. Significance of Effect: Slight at year 1, Neutral at year 15 (with mitigation).		
	Burnside	Common to all options. No visibility of options anticipated due to intervening topography and vegetation. Significance of Effect: Neutral at year 1 and year 15.		
	Melville Nurseries (Dobbies, Butterfly Farm etc.)	Common to options A and B. Majority of receptors in this group would experience no change. Potential for slight increase in visibility of road infrastructure and traffic in views northeast from the Melville Inn due to the loss of vegetation along A7 South. These views already heavily influenced by infrastructure and traffic and as such there would be limited apparent change. Significance of Effect: Slight at year 1, Neutral at year 15 (with mitigation).		Majority of receptors in this group would experience no change. Increase in visibility of road infrastructure and traffic from some locations due to removal of trees to accommodate realignment of A7 South. Significance of Effect: Moderate at year 1, Slight at year 15 (with mitigation).
<b>Chapter 3 - Nature Conservation</b>				
Pollution via contamination of surface or ground-waters	Dalkeith Oakwood SSSI Firth of Forth SPA/Ramsar/ SSSI Dalkeith Estate LWS Melville Castle LWS River North Esk LWS	SUDS will mitigate. Significance of Effect: Neutral		
Air Pollution effects	Scarce/rare lichens in Dalkeith Oakwood SSSI and wider area.	no significant change in air quality likely Significance of Effect: Neutral		

Impacts/issues	Receptors	Option A	Option B	Option C
Pollution during operation.	River North Esk	Implementation of SUDS. Significance of Effect: Neutral		
Increased otter traffic casualties as a result of culverting	Otter	Degree of mitigation depends on culvert design. Significance of Effect: Slight to Moderate Adverse	Degree of mitigation depends on culvert design, but significantly less culverting for this Option. Significance of Effect: Neutral to Slight Adverse	Degree of mitigation depends on culvert design. Significance of Effect: Slight to Moderate Adverse
Increased otter traffic casualties as a result of landscape dissection	Badger	Should be mitigated by mammal underpasses where necessary. Significance of Effect: Neutral		
Potential increased bat traffic casualties as a result of fragmentation of commuting corridors.	Bats	Likely negligible impact for this Option. Significance of Effect: Neutral		Likely negligible impact for this Option. Significance of Effect: Neutral to Slight Adverse (depending on mitigation success)
<b>Chapter 4 - Cultural Heritage</b>				
Permanent direct impact on setting of built heritage assets.	Summerside Farmhouse, Stables and Cottage Range. Category B listed buildings.	Moderate to Large Adverse impact on setting due to proximity of embanked roundabout and tie-in.	Neutral to Slight Adverse impact on setting due to proximity of embanked A720 to south and southeast.	Moderate to Large Adverse impact on setting due to proximity of embanked roundabout to west and tie-ins.
	Sheriffhall Farmhouse including Steading and Walled Garden & Sheriffhall Dovecot. Category B listed buildings.	Moderate to Large Adverse impact on setting due to proximity of embanked tie-in, A6106 and A720.	Slight to Moderate Adverse impact on setting due to proximity of embanked A720 to north and northeast.	Slight to Moderate Adverse impact on setting due to proximity of embanked A720 to north and northeast.
	Old Dalkeith Road, Campend Steading & Campend House, Boundary Walls, Gatepiers and Gates. Category C listed buildings. Form a B-Group.	Neutral to Slight Adverse impact on setting due to increased traffic and embanked tie-in.	Significance of Effect: Neutral to Slight Adverse	Slight Beneficial, reduction of traffic along the northbound A7 despite. New link road to A6106 to the southeast, and new roundabout.
	Dalkeith Park, King's Gate, Walls and Lodge. Category A listed building.	Slight to Moderate Adverse impact on setting due to embanked A6106 link and may be impacted by increased noise and visual intrusion from lighting from new roundabouts/link roads.	Significance of Effect: Neutral to Slight Adverse	Moderate to Large Adverse impact on setting due to new slip road from the A6106 at the junction with Melville Gate Road, embankment of the A6106 Old Dalkeith Road and new roundabout.
Permanent direct impact on setting of historic landscape asset.	Dalkeith House (Palace), Inventory of Gardens and Designed Landscapes.	Slight to Moderate Adverse impact on setting due to embanked westbound off slip, embanked A720 and increased noise and visual intrusion from	Slight to Moderate Adverse impact on setting due to embanked westbound off slip, embanked A720 and increased noise and visual intrusion from lighting.	Slight to Moderate Adverse impact on setting due to embanked A720, new road to A6106 at King's Gate and increased noise and visual intrusion from lighting.

Impacts/issues	Receptors	Option A	Option B	Option C
		lighting.		
Permanent direct impact on setting of archaeological asset.	Elginhaugh Roman camp, fort and palisaded enclosure. Scheduled Monument.	Neutral to Slight Adverse impact on setting due to embanked A720 over the new junction.	Significance of Effect: Neutral	Slight to Moderate Adverse impact on setting due to the new slip road from the A6106 at the junction with Melville Gate Road and the embankment of the A6106 Old Dalkeith Road
Permanent direct impact on setting of undesignated built heritage.	Edinburgh and Dalkeith Railway, Sheriffhall Bridge & railway linesman's hut. Undesignated.	Significance of Effect: Neutral		Significance of Effect: Neutral to Slight Adverse
<b>Chapter 5 - Road Drainage and Water Environment</b>				
Surface Water Quality	Dean Burn River North Esk	Significance of Effect: Moderate Beneficial		
Flood risk from development	Dean Burn River North Esk	Significance of Effect: Neutral		
Surface Water Flooding	Road Network	Significance of Effect: Moderate Beneficial		
	Vacant Land	Significance of Effect: Slight Beneficial		
Impact on watercourse geomorphology	Dean Burn	Significance of Effect: Slight Adverse		Significance of Effect: Moderate Adverse
Groundwater Quality	Groundwater	Significance of Effect: Neutral		
Groundwater Flow	Groundwater	Significance of Effect: Neutral		
<b>Chapter 6 - Noise</b>				
Operational Traffic Noise Levels	Noise sensitive receptors within the 600m quantitative study area, predominantly residential properties	Significance of Effect: Slight Adverse		
<b>Chapter 7 - Air Quality</b>				
Change in annual mean concentrations of NO <sub>2</sub> and PM <sub>10</sub>	Local air quality at residential buildings	Significance of Effect: Neutral		
<b>Chapter 8 - Effects on All Travellers</b>				
Removal of the traffic light controlled Sheriffhall Roundabout creates free-flow of	Vehicle Travellers	For all options removal of the traffic light controlled Sheriffhall Roundabout creates free-flow of A720 City Bypass traffic through Sheriffhall and less congestion.		

Impacts/issues	Receptors	Option A	Option B	Option C
A720 City Bypass traffic through Sheriffhall and less congestion.		Significance of Effect: Moderate Beneficial		
The realigned roads will impact on the current opportunities for on-road cycling; however the new road alignments will replace this provision.	NMU provision: Edinburgh City Council Core Path CEC-4 Midlothian Council Core Path 4-34 Pavement provision on the A7 north and the A6106 Millerhill Road. On-road cycling	Option A will result in the realignment of both the A7 (north) and the A6106 Old Dalkeith Road both of which are Core Paths (CEC4 and 4-34 respectively). The design proposes to retain the current road alignments as shared cycleway/footpaths segregated from traffic. Option B will retain the alignment of the current Core Paths, CEC4 and 4-34 and provide shared footpath/cycle way to connect across Sheriffhall Roundabout with at grade crossings. Option C involves the movement of Sheriffhall Roundabout 250m west of its existing location and will result in the realignment of all roads currently linking to the Roundabout. This Option allows each of the existing road alignments to be utilised as segregated shared cycleway/footpaths with provision of a footbridge to cross the A720.		
Impact on the current bus stops on the A7 north. At this stage the design is not developed to include new bus stop locations and this would be investigated at Stage 3.	Current bus stops located on the A7 north and the A6106 Old Dalkeith Road in both directions.	Both Options A & B will impact on the current two bus stops on the A7 north (one in each direction). At this stage the design is not developed to include new bus stop locations and this would be investigated at Stage 3. It is considered likely that replacement bus stops could be provided at or near their current location. Significance of Effect: Slight Adverse		Option C requires the realignment of the A7 (north) and the A6106 Old Dalkeith Road in the south. It will not be possible to provide replacement bus stops at or near their current location. Significance of Effect: Slight Adverse
The loss of current lay-by at Sheriffhall Roundabout	Traffic control and monitoring layby at A720 Sheriffhall Roundabout	The current lay-by at Sheriffhall Roundabout will be lost for all three Options. Significance of Effect: Slight Adverse		
All of the Options have the potential to reduce driver frustration as A720 traffic will be free flowing by the introduction of grade separation at Sheriffhall. Local traffic should also flow more freely reducing delays and the potential for frustration. Driver stress also considers fear of potential accidents.	Driver Stress	All Options will provide enhanced safety benefits for users of the A720 as access will be via slip roads and all junctions will be designed to improve alignment and visibility. All Options will also improve consistency of speeds on the A720 between Gilmerton Junction and the Millerhill Junction. Significance of Effect: Moderate Beneficial		
	Driver Stress	Both Options A & C introduce additional roundabouts which may provide some uncertainty for road users navigating along the A7/A6106. Significance of Effect: Slight Adverse	Significance of Effect: None	Both Options A & C introduce additional roundabouts which may provide some uncertainty for road users navigating along the A7/A6106. Significance of Effect: Slight Adverse
The A720 will be raised on an embankment, thereby providing better views from the road.	Amenity changes for users of the A720	Significance of Effect: Slight Beneficial		Significance of Effect: Slight Adverse
Local road users will remain at grade; however, new bridge structures will restrict views.	Amenity changes for local road users of the A7/A6106	Significance of Effect: Slight Adverse		Significance of Effect: Slight Beneficial

Impacts/issues	Receptors	Option A	Option B	Option C
NMUs will have segregated footway/cycleway provision.	Amenity changes for NMUs	NMUs will have segregated footway/cycleway provision, however this is adjacent to the road side for the majority of this Option meaning NMUs will be still be exposed to impacts relating to traffic noise, dirt, air quality etc. The introduction of segregated provision is an improvement on the current situation; however at grade crossings will be required. Significance of Effects: Slight Beneficial		NMUs will have segregated footway/cycleway provision to the east of the new road alignment, further separated from traffic than in Options A & B. A dedicated footbridge across the A720 means that at - grade crossings are limited to A6106 Old Dalkeith Road /Millerhill Road. Significance of Effect: Slight Beneficial

### Chapter 9 - Community and Private Assets

Agricultural (Class 2 and 3.1) land take will be required to facilitate use for all Options	Land take of agricultural land	80,250 m3 of Class 2 agricultural land take Significance of Effect: Slight Adverse	64,878 m3 of Class 2 agricultural land take Significance of Effect: Slight Adverse	130,630 m3 of Class 2 agricultural land take Significance of Effect: Slight Adverse
Permanent loss of part of proposed economic allocations (Shawfair Park Extension Site (Ec1) and Sheriffhall South (E32)) to accommodate the operational realigned road connections and the new roundabout layout.	Land take of Midlothian proposed Local Development Plan allocations	30,728 m3 of proposed economic allocations land take (mostly of Ec1, with a small area required from E31 along the A7 south) Significance of Effect: Moderate Adverse	17,602 m3 of proposed economic allocations land take (mostly of Ec1, with a small area required from E31 along the A7 south) Significance of Effect: Moderate Adverse	18,357 m3 proposed economic allocations land take (required from E31 in the south to connect the proposed southern dumbbell roundabout to the A7. Less required of Ec1 than Options A & B, however land take will be required for the A6106 which would cut through the centre of this allocated site) Significance of Effect: Moderate Adverse
Permanent loss of Network Rail land to accommodate the extension of the existing A720 Borders Railway Underbridge.	Land take of Network Rail land	Significance of Effect: Slight Adverse		
All Options provide alternative access provision for residential properties (moving residential accesses to new road alignments)	Access to residential properties: Summerside Residences Campend Residences Old Sheriffhall Farmhouse Residences	Significance of Effect: Slight Adverse		
Alternative access provision for residential properties (moving residential accesses to new road alignments) where necessary	Access to existing business premises: Lowe's Fruit Farm Didcock & Sons Upholstery Sheriffhall Café	Significance of Effect: None	Significance of Effect: None	Significance of Effect: Slight Adverse
Alternative access provision for agricultural land (moving accesses to new road)	Access to agricultural land including:	Significance of Effect: Slight Adverse		

Impacts/issues	Receptors	Option A	Option B	Option C
alignments) where necessary.	1 x A7 North (Campend) 1 x A7 North (Summerside) 1 x A6106 (Millerhill Road – Campend) 1 x A6106 (Old Dalkeith Road – Sheriffhall Farm) 1 x A7 South (at/west of Sheriffhall Roundabout.			
Alternative access provision for community facilities (moving accesses to new road alignments) where necessary.	Access to community facilities: Chapter One Childcare Nursery	Significance of Effect: None	Significance of Effect: None	Significance of Effect: Slight Adverse
<b>Chapter 10 - Geology &amp; Soils</b>				
Superficial geology - potentially compressible soils, running sands and localised failures may be encountered. Soil erosion caused by stripping of vegetation, excavations, ground disturbance, etc.	Drift Geology	Permanent works comprise new embankments and cuttings Significance of Effect: Slight Adverse (Option B has least permanent land take)		
Impact on existing soil slopes and drainage paths	Geomorphology	Mainly online widening so much of the works is within close proximity to existing road infrastructure Significance of Effect: Neutral		Offline works and situated on undeveloped Lugton Bogs land. Significance of Effect: Neutral to Slight Adverse
Disturbance to bedrock strata due to pile loading	Solid Geology	Localised disturbance to bedrock during drilling Significance of Effect: Neutral to Slight Adverse		
Mine workings once complete will stabilise previously undermined land	Solid Geology	Mine workings and mine entry treatment is required for all options Significance of Effect: Neutral to Slight Beneficial		Mine workings and mine entry treatment is required for all options. Option C will improve a greater area of currently undermined land. Significance of Effect: Slight Beneficial
Sterilisation of minerals	Minerals	There are no economically viable minerals beneath the scheme options. Significance of Effect: Neutral		
Loss of Class 1 and Class 2 agricultural soil	Agricultural Soils	Design footprint overlies Class 2 agricultural land Significance of Effect: Slight to Moderate Adverse	Design footprint overlies Class 3.1 and Class 2 agricultural land Significance of Effect: Slight Adverse	Design footprint overlies Class 2 agricultural land Significance of Effect: Slight to Moderate Adverse
Designated geological sites (RIGS)	Geological Designated sites	There are no RIGS at / near the site. Significance of Effect: Neutral		

Impacts/issues	Receptors	Option A	Option B	Option C
Disturbance of contaminated land and potential pollution of surrounding geology and soils	Contaminated land	No significant contamination issues anticipated for any option. Significance of Effect: Neutral to Slight Adverse		
Consolidation grouting of mine workings and mine entries has potential to cause disturbance of groundwater flow, and potential pollution of groundwater and aquifers from mine waters and mine gases.	Hydrogeology	Neutral or Slight (Adverse) Mine workings and mine entry treatment is required for all options. Significance of Effect: Neutral to Slight Adverse		
<b>Chapter 11 - Materials</b>				
Not Applicable				



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