

4. Iterative Design Development

4.1 Introduction

- 4.1.1 The DMRB Stage 3 design of the Proposed Scheme as reported in this Environmental Statement (ES) is the result of approximately 30 months of design development of the preferred option as identified at the Stage 2 DMRB Assessment. During this time the design has been informed by a range of surveys including environmental, ground investigations and traffic.
- 4.1.2 The design has also been influenced by stakeholders, through a range of forums, including workshops, meetings and written consultation. The consultation undertaken is described fully in Chapter 7 – Consultation and Scoping.
- 4.1.3 The EIA process has been integral to the iterative design process and opportunities to avoid or mitigate potential effects have been explored through changes to the design such as road alignment, land requirement and the type and form of earthworks and structures. As a result, a range of measures has been incorporated into the design of the Proposed Scheme to prevent, reduce or offset significant adverse effects, referred to as ‘embedded mitigation’. In some cases, as the design has evolved, it has been possible to ‘design out’ some significant effects. Those aspects of the design which have been considered as embedded mitigation are described in Section 4.3 of this chapter.

4.2 Iterative Design Process

Constraints Review

- 4.2.1 Geographic Information System (GIS) mapping has been a key tool of the Environmental Impact Assessment (EIA) process. All environmental data has been mapped using GIS and updated as survey information was gathered. Mapping of the environmental baseline ensured the design of the scheme minimised impacts on sensitive receptors where possible.
- 4.2.2 As the design progressed it was overlaid onto the constraints mapping to identify potential issues and inform the design.

Design Assessment

- 4.2.3 The scheme has considered various sub-options throughout the Stage 3 scheme assessment process, including high level assessments to inform design development, and environmental assessment has fed into this process.
- 4.2.4 Preliminary assessments of the scheme were carried out to inform discussions at the Wider Stakeholder Workshops described below, and the Stage 3 Value Management and Risk Workshop.
- 4.2.5 Non-motorised user (NMU) facilities, bridge structure form, sustainable drainage systems (SuDS) pond provision and earthworks design have been the main design developments in Stage 3, resulting in various design fixes as these elements were confirmed.

Workshops

- 4.2.6 A series of three Wider Stakeholder Workshops were held during the Stage 3 scheme assessment which worked to identify the preferred NMU facilities to be included in the scheme. Stakeholders included representatives from Midlothian Council (MLC), City of Edinburgh Council (CEC), East Lothian Council (ELC), SEStran, Sustrans, Spokes, The British Horse Society (BHS), Scotways, Cycling UK and Scottish Natural Heritage (SNH). The first workshop held on 30 August 2017 looked at a total of 17 NMU preliminary options. The Workshop used the scheme objectives

as a basis to develop WCHAR (Walking, Cycling, Horse Riding Assessment and Review) Opportunities (see Appendix 14.1 - Walking, Cycling and Horse-Riding Assessment and Review). The WCHAR Opportunities were then used to sift the NMU options down to six options which went forward for further development.

- 4.2.7 These six NMU options were then developed further, these were modelled in 3D to establish the geometry and extents of each option, and comparative cost estimates were also prepared. The six options underwent a high-level engineering and environmental assessment which was summarised at the second Wider Stakeholder Workshop held on 11 October 2017. Following review, all six options were felt to be worthy of further consideration.
- 4.2.8 Further design development was carried out, rationalising layouts and most notably providing open aspect NMU subways following Stakeholder feedback, ultimately shortlisting Options 5a and 7a for final consideration at the third Stakeholder Workshop held on 14 August 2018. Option 7a was identified as the preferred NMU Option and was recommended for inclusion in the overall scheme proposals.
- 4.2.9 Design workshops and meetings were also held with the wider project team throughout the Stage 3 design process.

Stakeholder Input

- 4.2.10 As detailed in Chapter 7 – Consultation and Scoping, a range of consultations have been ongoing throughout the EIA process and at prior stages. In addition to the input to environmental mitigation as described in the respective chapters of this ES, statutory consultees were able to advise and influence various aspects of the design as it developed. Statutory consultees input informed the design of the Proposed Scheme, for example:
- NMU route design;
 - location of SuDS measures;
 - the realignment of the Dean Burn;
 - compensatory flood storage; and,
 - landscape and ecology mitigation measures.
- 4.2.11 The Proposed Scheme design has also been informed by discussions with landowners and owners of affected properties. Discussions held have influenced:
- realignment of accesses to properties at Summerside, Campend and Sheriffhall Farm;
 - design and location of field accesses;
 - design of the proposed landscape and ecology planting; and,
 - location and sizing of SuDS ponds.

4.3 Embedded Mitigation

- 4.3.1 There were a number of design considerations during Stage 3 that were developed collaboratively to ensure that potential impacts were avoided or reduced. The design was developed in response to the key issues below and 'embedded' into the final design for assessment in this ES. Details of the Proposed Scheme design can be found in Chapter 5 – The Proposed Scheme.

NMU Routes

- 4.3.2 The design of the NMU provision was developed through workshops as detailed above and in further detail in Chapter 7 – Consultation and Scoping. A key objective for the Proposed Scheme was to reduce severance by improving

accessibility across the A720 Edinburgh City Bypass ('the A720') for all users. The final design reflects the input from the environment team and wider stakeholders and was the result of several design iterations which sought to best meet the Scheme Objectives and reflect the future development planned for this area of Edinburgh. The Landscape team proposals were integral to the final design to ensure that the NMU routes will provide a pleasant journey experience and the scale of the proposals reflect the needs of users traversing this busy junction. The provision of segregated NMU routes from busy traffic was key to developing the design.

4.3.3 Dedicated NMU facilities are incorporated in the scheme in the form of a shared footway/cycleway with dedicated grade separated NMU subways provided under the new roundabout. NMU routes are provided within the verge of the A7 North, the A7 South and A6106 South (Old Dalkeith Road). Further embedded mitigation that has emerged from this process includes:

- the provision of open aspect NMU subway structures, rather than structures with vertical walls, which provide enhanced visibility for users
- where possible, on sections of the NMU routes inside the new roundabout, the embankment slopes have been slackened, to provide a more open aspect for users.

SuDS and Flood Storage Design

4.3.4 The development of the drainage design and the requirement for provision of flood compensation storage provided an opportunity to create an enhanced blue/green network. The design was developed to ensure that the SuDS ponds to the south of the A720 could be located adjacent to the flood storage area thereby offering the potential to create functionally linked ecological areas. The extensive use of native seed mixes in areas such as verges and around SuDS ponds will provide further gains in floristic diversity, much enhanced beyond the existing more species-poor grassland habitats, with associated benefits for other organisms such as invertebrates. The SuDS ponds themselves will retain water for the benefit of multiple fauna types, including amphibians and invertebrates. Connectivity between habitats will be maintained and enhanced through the proximity of SuDS ponds and flood storage areas, and the considered placement of planted woodland, trees and hedging. Finally, realignment of the Dean Burn has been taken as an opportunity to significantly enhance this watercourse, which currently exhibits reduced morphological diversity. The realigned section will provide a more natural meandering riffle system, with sown riparian seed mix and scattered native waterside trees on the banks.

4.3.5 The SuDS ponds have been designed to be integrated into the existing landscape character and topography.

Land Take Minimisation

4.3.6 Throughout the Stage 3 design efforts were made to ensure that land take was kept to a minimum. This ensured that impacts on local receptors were reduced where possible. This also ensured that impacts on ancient woodland were kept to a minimum.

4.3.7 The Preferred Scheme (Option B) was recommended at Stage 2 in part due to having the smallest footprint of all options considered.

4.3.8 The alignment of the proposed A6106 North (Millerhill Road) and the A7 South were both optimised providing tighter road geometry, resulting in shorter lengths of realigned road, minimising the impact on adjacent land and reducing the land take.

4.3.9 The geometry standards adopted for the NMU routes have been optimised, including with respect to the longitudinal gradients adopted, ensuring that the impact of the NMU routes on adjacent land is minimised whilst still satisfying design standards. Similarly, the headroom clearance provided for the NMU subways allows for dismounted

equestrians only, which minimises the structure headroom and therefore the extents of the NMU routes and the land take requirements.

Geotechnical Design

- 4.3.10 The design of the slopes was a key element, both within the roundabout and along the slip roads. A balance was sought between steep slopes that minimised land take while also providing slope stability.
- 4.3.11 Work between the landscape and geotechnical teams meant that a solution was reached to allow slopes to be planted as far as possible ensuring the experience of both road and non- motorised users was enhanced. As a result, the design of the Proposed Scheme contributed to the landscape character of the local area.
- 4.3.12 In agreement with Transport Scotland (TS), the extent of the ground treatment works for the scheme has been optimised, such that grouting shall be provided for the road carriageways only, with a proportionate ground treatment provided for the NMU routes and SuDS ponds. This has also minimised the land take requirements.

Bridge Design

- 4.3.13 Various designs were considered for the two road underbridge structures and these were assessed from an environmental and engineering perspective to ensure that the optimum design solution was achieved.
- 4.3.14 Open aspect structures have been selected for the structures to minimise the visual impact of the Proposed Scheme. Where possible, the inclined surfaces in front of the bridges shall maintain the gradient of the adjacent earthwork slopes, to aim to provide the appearance of a family of structures.

Low Noise Surfacing

- 4.3.15 Low noise surfacing has been included within the Proposed Scheme to minimise noise impacts on local receptors.

4.4 Conclusion

- 4.4.1 The DMRB Stage 3 design of the Proposed Scheme is the result of an iterative design development process that avoids or reduces the potential for impacts on the surrounding environment. It has developed and improved the preferred option that was identified at DMRB Stage 2 (refer to Chapter 3 - Alternatives Considered) to reach a design that is described in Chapter 5 - The Proposed Scheme and assessed as part of the DMRB Stage 3 EIA.