

Department for Infrastructure  
The Roads (Northern Ireland) Order 1993  
The Local Government Act (Northern Ireland) 1972

**A1 JUNCTIONS PHASE 2 ROAD IMPROVEMENT SCHEME  
PUBLIC INQUIRY  
March 2020**

**Proof of Evidence  
Scheme Development up to Publication of Draft Orders**

**By**

**Conor Doonan**

Mr Conor Doonan MEng (Hons) CEng MIEI  
RPS-Sweco Consortium  
Elmwood House  
74 Boucher Road  
Belfast  
BT12 6RZ

## Table of Contents

<b>1</b>	<b>INTRODUCTION .....</b>	<b>1</b>
1.1	Personal Details.....	1
1.2	Project Role .....	1
<b>2</b>	<b>SCOPE OF EVIDENCE.....</b>	<b>2</b>
<b>3</b>	<b>BACKGROUND TO THE SCHEME.....</b>	<b>3</b>
<b>4</b>	<b>EXISTING CONDITIONS .....</b>	<b>5</b>
4.1	Existing Highway Network .....	5
4.2	Public Utilities .....	8
4.2.2	Northern Ireland Water (NIW).....	8
4.2.3	British Telecom (BT).....	8
4.2.4	Northern Ireland Electricity (NIE).....	8
4.2.5	Phoenix Gas .....	9
4.2.6	Firmus Gas .....	9
4.2.7	Street Lighting and Other Department for Infrastructure Apparatus .....	9
4.3	Geology and Soils.....	10
4.3.1	Bedrock Geology .....	10
4.3.2	Superficial Geology .....	10
4.3.3	Soils .....	11
4.4	Hydrology and Hydrogeology .....	11
4.4.1	Hydrology.....	11
4.4.2	Hydrogeology.....	11
4.5	Mining, Mineral Extraction and Contaminated Land.....	12
4.5.1	Mining and Mineral Exploration .....	12
4.5.2	Active Quarries .....	12
4.5.3	Contaminated Land .....	12
4.6	Engineering Assessment.....	13
4.6.1	A1 Mainline .....	13
4.6.2	Visibility at Junctions .....	13
4.6.3	Structures .....	13
4.7	Road Safety.....	14
4.7.1	2010-2017 Accident Statistics .....	14
<b>5</b>	<b>DEVELOPMENT OF SCHEME.....</b>	<b>15</b>
5.2	Stage 1: Preliminary Options Assessment .....	15
5.3	Stage 2: Preferred Option Assessment.....	16
5.4	Stage 3: Proposed Option Assessment .....	18
<b>6</b>	<b>DESCRIPTION OF SCHEME.....</b>	<b>21</b>
6.1	Minor Road Junction Strategy – Left In/Left Outs (LILOs) .....	21
6.2	Compact Grade Separated Junctions (CGSJs) .....	21
6.3	Milebush Link Road (also referred to as Junction 2).....	22
6.4	Castlewellan Road On-Slip (also referred to as Junction 6) .....	22
6.5	Side Roads .....	22
6.6	Private Access .....	23
6.7	Sustainable Urban Drainage Systems (SuDS).....	23
6.8	Pre-earthworks Drainage.....	24
6.9	Outline Road Drainage Design.....	24
6.10	Culvert Design .....	25
6.11	Earthworks.....	25
6.12	Street Lighting.....	26

6.13	Intelligent Transport Systems (ITS).....	26
6.14	Signage Strategy .....	27
6.15	Crossing Closures .....	27
6.16	Turning Heads .....	27
6.17	Central Reserve Treatment and Emergency Crossing Point (ECP) Facilities .....	28
6.18	Non-Motorised Users.....	29
6.19	Public Transport.....	29
6.20	Design Standards .....	30
<b>7</b>	<b>CONSTRUCTION MANAGEMENT .....</b>	<b>31</b>
7.1	Programme .....	31
7.2	Pre-Main Construction Works.....	31
7.3	Main Construction Works .....	32
7.3.1	Legislation.....	32
7.3.2	Drainage .....	33
7.3.3	Earthworks Cut/ Fill.....	33
7.3.4	Structures .....	34
7.3.5	Carriageway Works and Traffic Management .....	34
7.3.6	Construction Traffic .....	34
7.3.7	Stockpile Areas.....	34
7.4	Site Compound and Offices.....	35
7.5	Operation and Maintenance of the scheme .....	36
7.5.1	Post Construction .....	36
<b>8</b>	<b>CONCLUSION.....</b>	<b>37</b>

#### **APPENDIX A – LOCATION PLAN**

#### **APPENDIX B – STAGE 1 (PRELIMINARY OPTION ASSESSMENT) OPTION LAYOUTS**

#### **APPENDIX C – STAGE 2 (PREFERRED OPTION ASSESSMENT) OPTION LAYOUTS**

#### **APPENDIX D – STAGE 3 (PROPOSED OPTION) LAYOUTS**

# 1 INTRODUCTION

## 1.1 Personal Details

1.1.1 My name is Conor Doonan and I am a Technical Director in RPS Consulting UK & Ireland. I have an MEng degree in Civil Engineering (2002). I am a Chartered Engineer (2007) and I am a Member of the Institution of Engineers of Ireland (MIEI).

1.1.2 I have over 17 years of experience in various aspects of highway design and scheme development. Notably, I was involved in the Construction Stage of the A1 Junctions Phase 1 project (also known as DBFO2 Scheme 2) from 2006 to 2010, whereby I acted as the RPS Design Manager to our Client, Lagan Ferrovial (Contractor for this project).

## 1.2 Project Role

1.2.1 In September 2015 I was appointed as the RPS-Sweco Consortium Project Manager for the Stage 3 Scheme Assessment of the A1 Junctions Phase 2 Project. I am responsible for the general progression of the project, overseeing the roads design input and co-ordinating the other design teams who specialise in areas such as structural & geotechnical design, environmental assessment and traffic and economic analysis.

1.2.2 DfI Roads have outlined their strategy for upgrading this section of the existing A1 dual carriageway, which is identified as a strategic route in a European, Regional and local context. The brief under which the RPS-Sweco Consortium were appointed to carry out the assessment work on this project included the provision of consultancy services to assist Southern Division with the progression of a Stage 3 DMRB scheme assessment, resulting in the production of a Stage 3 Scheme Assessment Report, Environmental Impact Assessment Report and Draft Statutory Orders.

It should be noted that prior to the involvement of RPS-Sweco, AECOM had been commissioned by the Department to provide consultancy services in connection with the development of the A1 Junctions Phase 2 Road Improvement Scheme, up to the completion of the Stage 2 Scheme Assessment.

## 2 SCOPE OF EVIDENCE

2.1 A significant volume of detailed information has been prepared during the development of the Proposed Scheme, which has been published in report form and has been summarised for Public Exhibition at various stages. In addition to my submission and attendance at this Inquiry, the Department is represented by other Experts who are available to provide clarification on elements of the scheme, such as Environment, Traffic & Economics.

2.2 The scope of my evidence will provide a summary of the technical aspects of the road scheme presented in the draft Statutory Orders. I will focus on the decisions made during the three Stages of the Scheme Assessment Process and provide a summary of the Proposed Scheme Option, including the anticipated impacts on the surrounding environment and measures included to mitigate these.

My evidence will include:

- A general background to the scheme;
- A brief description of the existing conditions along the A1 scheme extents;
- A summary of the development and assessment of the road scheme showing how the Proposed Option was identified;
- A description of the Proposed Scheme; and
- Some of the Construction Management considerations

### 3 BACKGROUND TO THE SCHEME

- 3.1 The strategic context for the Proposed Scheme is described separately in the Proof of Evidence submitted by the Project Sponsor, Mr. Liam McEvoy of DfI Roads.
- 3.2 The current programme to improve transportation links in Northern Ireland has evolved over the last twenty years or so. Key documents and strategies guiding this programme have been published during this time. The consistent vision of these strategies is, *“to have a modern, sustainable, safe transportation system which benefits society, the economy and the environment and which actively contributes to social inclusion and everyone’s quality of life”*<sup>1</sup>. The A1 scheme meets this vision by upgrading a strategically important route and improving safety along a 25.2km stretch of road.
- 3.3 A location plan is included within Appendix A.
- 3.4 The assessment of strategic road improvements is outlined in the Design Manual for Roads and Bridges (DMRB) and is defined as a three-stage process:
- Stage 1 Scheme Assessment: Preliminary Option Assessment
  - Stage 2 Scheme Assessment: Preferred Option Assessment
  - Stage 3 Scheme Assessment: Proposed Option
- 3.5 The level of detail and scope of the assessment at each stage is appropriate to the type of decision that can be reasonably taken at that time. The outcomes of the assessment process were reported at each stage and exhibited as work progressed between 2009 and 2019.
- 3.6 The Environmental Impact Assessment Report for the scheme was published in March 2019. The Environmental Impact Assessment Report was issued in accordance with the EIA Directive and Article 67 (5) (e) of The Roads (Environmental Impact Assessment) Regulations (Northern Ireland) 2017 which amends Part V of The Roads (Northern Ireland) Order 1993 and the requirements of the DMRB. Draft Vesting and Direction Orders were also published in March 2019.
- 3.7 The environmental aspects of the proposed scheme are described in detail in the separate Proof of Evidence prepared by Mr. Raymond Holbeach of RPS-Sweco.

---

<sup>1</sup> Regional Transport Strategy for NI 2002-2012 (RTS) – July 2002

- 3.8 The proposed scheme is anticipated to bring considerable benefits to road users, with a projected Benefit to Cost Ratio (BCR) of 2.11. The traffic and economic aspects of the Proposed Scheme are described in detail in the separate Proof of Evidence prepared by Mr. Ross Coulthart of RPS-Sweco.

## 4 EXISTING CONDITIONS

### 4.1 Existing Highway Network

- 4.1.1 The A1 forms part of the Eastern Seaboard Key Transport Corridor providing access between Belfast and the border with the Republic of Ireland.
- 4.1.2 Based on the 2016 traffic surveys carried out for the Stage 3 development studies, the A1 caters for approximately 26,000 vehicles per day at the southern stretch of the proposed scheme on the A1 at Loughbrickland, increasing to approximately 37,000 vehicles per day along the northern stretch of the proposed scheme on the A1 close to Hillsborough.
- 4.1.3 Since the dualling of the A1 carriageway between Hillsborough and Dromore in 1971, the route has undergone a series of improvements over the past 40+ years.
- 4.1.4 In recent years, there has been significant investment in upgrades to the southern stretches of the A1. Between Beech Hill and the border, completed in 2010, the A1 has been upgraded to a high standard dual carriageway with access restricted to grade separated junctions and no direct access to adjacent land or property. The A1 Loughbrickland to Beech Hill dual carriageway, completed in 2006, provides a central reserve safety barrier, with right turn crossing of the central reserve restricted to at-grade junctions with the local road network.
- 4.1.5 By contrast, along the northern section of the A1, between Hillsborough Roundabout and Loughbrickland, the existing road is a 2 lane dual carriageway with a central reserve of varying width with only short sections of central reserve barrier and many gaps that permit crossing manoeuvres. The presence of these gaps directly contributes to the high number and severity of accidents on this section of dual carriageway. In the period 2010-2017 inclusive, 45% of 195 accidents (Fatal, serious or slight) recorded within the 25.2km scheme extents, occurred at or adjacent to a gap in the central reserve where manoeuvres such as right turns, u turns, slowing down for private accommodation gaps or vehicle overhang are possible.<sup>2</sup>
- 4.1.6 The construction of four new compact grade separated junctions in 2007-2010, between Hillsborough and Loughbrickland, as part of the Design Build Finance and Operate Package 2 (DBFO2) contract, aimed to close high priority gaps in the central reserve and provide safe crossing opportunities to address high accident rates and the comparatively high number of right turn manoeuvres being undertaken at those

---

<sup>2</sup> A1 Junctions Phase 2 – Stage 3 Scheme Assessment Report, 2.10.2



locations. The four compact grade separated junctions constructed at that time are as follows from North to South;

- Dromore Road, Hillsborough;
- Banbridge Road, Dromore;
- Dromore Road, Banbridge; and
- Dublin Road, Loughbrickland.

4.1.7 With the construction of these junctions, there are now eight grade separated junctions along the A1 between Hillsborough Roundabout and Loughbrickland with other junctions located at:

- the compact connector road linking the northbound carriageway of the A1 at Dromore to Lurgan Road (completed in 1998);
- Rathfriland Road grade separated junction, Banbridge (completed in 2004);
- Hillsborough Road underpass, Dromore (completed in 2005); and
- Newry Road (Cascum Road), Banbridge (completed in 2007).

4.1.8 The 36 remaining minor road junctions within the 25.2km length of the A1 project extents operate as simple priority junctions with the A1 mainline.

4.1.9 The project includes a total of 111 gaps in the central reserve along this stretch of the A1, serving minor roads, residences, commercial premises and agricultural accesses. The 111 gaps allow cross-carriageway access to the 36 minor road junctions, 5 commercial premises, 22 residential properties, 31 agricultural accesses and 17 maintenance crossovers/other use. The gaps are also used by vehicles performing u-turn manoeuvres, in addition to right turn manoeuvres across the carriageway.

4.1.10 Based on guidance within Table 4 of DMRB TD9/93: "Highway Link Design", the existing dual carriageway between Hillsborough Roundabout and Loughbrickland would be considered a Category 5 dual carriageway.

4.1.11 The national speed limit for dual carriageways applies along the A1 except within the environs of Banbridge and Dromore where speed is restricted to a maximum of 60mph.

4.1.12 There are hard shoulders to both carriageways along the majority of the route with the exception of the Banbridge Bypass section of the A1, which features a 1m hard strip only.

- 4.1.13 There is little provision of pedestrian and cyclist facilities on the A1 dual carriageway. There are no dedicated equestrian facilities within the scheme extents. On account of the heavily trafficked, high-speed nature of the existing carriageway, pedestrian and cycling activity is minimal.
- 4.1.14 There are currently 37 bus stops along the mainline within the scheme extents. Existing bus stop facilities along the A1 are used by two bus services operated by Translink; these are the 38 and 538 services. In addition, these bus stops are also used by a number of local school bus routes. The existing bus stop facilities range from a simple arrangement of paved area and flag post to covered bus shelters. There are no dedicated diverge, merge or layby facilities associated with these bus stops. Current bus stop usage figures provided by Translink show that there are very low passenger numbers using the existing bus stops on the A1 with an average of 1-2 patrons per day at the more frequented bus stops. There are some bus stops on the route that do not see any regular use.
- 4.1.15 The minor road network surrounding the A1 within the study area ranges from rural lanes and thoroughfares up to A class roads. The A and B class roads which link into the A1 within the study area are as follows:
- A26 Newry Road/Dromore Road, Banbridge
  - A50 Castlewellan Road
  - B177 Dromore Road;
  - B2 Hillsborough Road/Banbridge Road/Lurgan Road, Dromore;
  - B25 Gowdystown Road;
  - B10 Rathfriland Road; and
  - B3 Grovehill Road/Main Street Loughbrickland.
- 4.1.16 These A and B roads within the minor road network provide transport links to the A1 for a number of towns and villages, local businesses as well as the wider local community.
- 4.1.17 There are also numerous C class roads and unclassified roads serving various hamlets, farms and individual dwellings in the area. The standard of the minor road network in the vicinity of the A1 varies significantly. Localised issues are present within the minor road network including sections of reduced visibility, inconsistent horizontal and vertical alignments and carriageway cross sections. Traffic volumes on the minor road network also vary significantly, however current traffic survey data indicates that generally the minor road network is lightly trafficked.

## 4.2 Public Utilities

4.2.1 Details of existing public utilities within the study area were obtained through liaison with the various owners. The existing utilities are noted as follows:

### 4.2.2 Northern Ireland Water (NIW)

4.2.2.1 NIW is responsible for water supplies and sewers within the study area.

4.2.2.2 A water main is present along the A1 throughout the study area. This is shown as being in the verge, it regularly switches between the northbound and southbound verge. A water main is also shown in the verge of most of the public side roads.

4.2.2.3 The existing sewer network appears to be confined to the built-up areas. At Banbridge the sewer is shown to be in the verge of the Castlewellan Road crossing the A1 and outside of Loughbrickland the sewer is shown to run along the A1 in the verge of the northbound carriageway from Newry Road, Banbridge to the junction at Banbridge Road, Loughbrickland where it returns into the built up area of Loughbrickland.

### 4.2.3 British Telecom (BT)

4.2.3.1 BT apparatus is present throughout the study area. Typically this is shown as a buried duct within the verge of the A1, but at times it switches to being an overhead cable. The cable regularly switches between the northbound and southbound verge apart from the section between Glen Road and Hillsborough Road where cables are present in both verges. Most of the apparatus within the A1 verge/hard shoulder is of fibre optic type.

4.2.3.2 In addition, BT apparatus is present in most of the public roads joining the A1. These are typically overhead cables but in the more densely populated areas, such as Hillsborough, Dromore, Banbridge and Loughbrickland, the apparatus is shown as a buried duct.

### 4.2.4 Northern Ireland Electricity (NIE)

4.2.4.1 There is a range of NIE services shown throughout the study area. Typically these form part of the local distribution network and are rated at 11kV or less but there is a 33kV overhead transmission route that crosses the existing Waringsford Road and travels alongside the A1 for a distance of approximately 500m. There is also a 33kV underground transmission route in the northern verge of the Castlewellan Road, Banbridge where it crosses the A1.

4.2.4.2 A 33kV route is also present in the southbound verge of the A1 between Old Manse Road, Banbridge and the off-slip for 'The Boulevard' at Newry Road, Banbridge.

4.2.4.3 The local distribution network is generally outwith the existing A1 road boundary except where the two cross; these crossings being a mixture of overhead and buried cables. Most notably, there are two overhead poles, carrying low-voltage cables, located in the central reserve in close proximity to the Milebush Road (north) junction. In built-up areas such as within Hillsborough, Dromore, Banbridge and Loughbrickland the local distribution network is typically provided by buried cables in the footways or verges.

#### **4.2.5 Phoenix Gas**

4.2.5.1 Phoenix Gas apparatus is present on the Moira Road, Hillsborough. The gas main currently crosses the A1 at the Moira Road. It is noted that Phoenix Gas are currently planning to extend their services east towards Hillsborough and Dromore utilising the local road network.

#### **4.2.6 Firmus Gas**

4.2.6.1 Firmus Gas apparatus is present within the study area. The gas main currently runs from the Rathfriland Road Junction in the verge of the northbound carriageway to Lisnaree Road. The gas main then follows Lisnaree Road, crossing the Dromore Road before returning to cross the A1 just north of the existing Dromore Road CGSJ. The gas main continues north in the southbound verge to Kilmacrew Road. A local spur serving the Old Manse Road, Banbridge also crosses the A1 at the Old Manse Road junction with the A1.

#### **4.2.7 Street Lighting and Other Department for Infrastructure Apparatus**

4.2.7.1 Along the existing A1, a street lighting system is provided at a number of the existing junctions as follows:

- Hillsborough Roundabout;
- Moira Road Junction;
- Dromore Road Junction, Hillsborough (Pantridge Link);
- Hillsborough Road Junction, Dromore;
- Lurgan Road Junction, Dromore;
- Banbridge Road Junction, Dromore;
- Dromore Road Junction, Banbridge;
- Old Manse Road Junction, Banbridge;
- Rathfriland Road Junction, Banbridge;

- Newry Road Junction, Banbridge;
- Banbridge Road Junction, Loughbrickland; and
- Dublin Road Junction, Loughbrickland.

## **4.3 Geology and Soils**

### **4.3.1 Bedrock Geology**

- 4.3.1.1 The bedrock geology of the area was obtained from a desktop study of the Geological Survey of Northern Ireland (GSNI) website. The predominant bedrocks beneath the study area are sandstone, siltstone and mudstone, from the Wacke Formation. The ground investigations also recorded the presence of shale and basalt.
- 4.3.1.2 The most predominant rock in the area is a Rhuddanian - Telychian sandstone from the Gala Group Formation. The ground investigations primarily recorded the presence of shale. The shale is from the Moffatt Shale Group Formation, consisting of Caradoc – Llandovery age mudstone formation. A number of igneous intrusions are also identified on, or in close proximity to, the study area. These Palaeogene dykes consist of either Felsite or Microgabbro.
- 4.3.1.3 Bedrock was encountered in over 26% of boreholes and trial pits. It has been described as highly weathered shale, with sections of weathered basalt. The deepest rock head recorded is in BH06 at the Skeltons Road/Drumneath Road Junction where bedrock was encountered at 13.8m below ground level (bgl). The shallowest rock head encountered is at BH02 at the Waringsford Road Junction at 1.10m bgl.
- 4.3.1.4 In general, the rock encountered can be described as highly weathered shale, with a rock strength classification typically being weak.

### **4.3.2 Superficial Geology**

- 4.3.2.1 Throughout the study area the bedrock is overlain by superficial deposits of varying thickness. Exposure of the bedrock at the surface is not common, however some outcrops were identified at the northern section of the Listullycurran Road / Backnamullagh Road Junction.
- 4.3.2.2 Generally the superficial deposits throughout the study area are composed of sands and gravels of glacial origin from the Quaternary Period. These deposits also contain clays and silts. Peat deposits are also evident towards the centre of the study area at the Gowdystown Road junction.

4.3.2.3 Groundwater was encountered in a number of the borehole and trial pit locations during the Stage 2 and Stage 3 site investigation. Typically, groundwater was encountered between 0.3 and 3.7m and as such it is likely that groundwater will be encountered during the earthworks operation. In particular, a high groundwater table was identified within the major area of soft ground location at the Gowdstown Road junction.

### **4.3.3 Soils**

4.3.3.1 The Craigavon 1:50,000 scale Soil Map (Sheet 20), produced by the Department of Agriculture for Northern Ireland and Ordnance Survey of Northern Ireland in 1993, has been consulted to gain a greater understanding of the agricultural potential of the soils at each of the junction upgrade locations.

4.3.3.2 Typically throughout the study area, the soils are classified as surface-water gleys. These are poorly drained soils that remain waterlogged for significant periods. Areas classified as brown earth are also found within the study area. These are free draining soils and their presence indicates that they are underlain by permeable drift deposits.

## **4.4 Hydrology and Hydrogeology**

### **4.4.1 Hydrology**

4.4.1.1 A number of watercourses intersect the A1 within the study area. Hillsborough Park Lake Stream, noted to be of poor status, crosses the A1 just south of Hillsborough. The River Lagan, Edenordinary Stream and the River Bann cross the A1 carriageway at Dromore, between Dromore and Banbridge and at Banbridge respectively, while Loughbrickland Stream is located in proximity to the scheme end.

4.4.1.2 All these watercourses are noted to be of moderate status and to contain economically significant species.

### **4.4.2 Hydrogeology**

#### **4.4.2.1 Bedrock Aquifer**

4.4.2.1 A review of the GSNi website was conducted for the study area. The entire route falls over a bedrock aquifer classified as Bl(f). This indicates a limited potential productivity fracture flow bedrock aquifer. Moderate yields from the aquifer are unusual with low yields more common. Flow is mainly shallow and local with limited regional flow.

4.4.2.2 The proposed junctions are predominantly located in an area with limited shallow groundwater underlain with impermeable rocks. Some sections of the scheme such as the area surrounding the River Bann are within the location of an aquifer with limited or local potential.

#### **4.4.2.2 Superficial Aquifer**

4.4.2.1 Areas of superficial aquifer are identified within the study area.

#### **4.4.2.3 Groundwater Vulnerability**

4.4.2.1 The majority of the route within the study area falls over class 2 representing a relatively low risk with regard to groundwater vulnerability. Areas of class 4e are identified along the route where the superficial aquifer has been identified, representing higher groundwater vulnerability. Class 5 areas are also identified along the route where bedrock is anticipated to be present at or near the surface, indicating high groundwater vulnerability.

### **4.5 Mining, Mineral Extraction and Contaminated Land**

#### **4.5.1 Mining and Mineral Exploration**

4.5.1.1 There is no recorded history of mining within the A1 study area.

#### **4.5.2 Active Quarries**

4.5.2.1 At present, there are two existing aggregate quarries located within the study area just north of Banbridge and in close proximity to the proposed CGSJ at Waringsford Road. These are known as Tullyraine Quarries Limited, which is located adjacent to the A1 just south of the existing Waringsford Road junction and Gibson Bros Ltd, which is located adjacent to the A1 just south of the existing Kilmacrew Road junction.

#### **4.5.3 Contaminated Land**

4.5.3.1 A number of potentially contaminating land uses were identified along the length of the proposed A1 upgrade within the Preliminary Risk Assessment. The main source of potential contamination was considered to be the presence of made ground as the existing site is developed. A number of current and historical potentially contaminating land uses were also identified in the area surrounding the site, including an agricultural dairy, a tyre company, petrol filling stations, quarries, mills and a railway line. Chemical analysis of soil samples taken as part of the Generic Quantitative Risk Assessment (GQRA) did not identify any contamination within soils and as such no risk to human health is considered to exist. Leachate analysis of a number of soil samples was used to identify any potential risk to groundwater and surface water receptors. A number of exceedances of the screening values were noted for metals; however these were from samples taken from natural ground. Therefore, these metal exceedances were considered to result from natural concentrations of the metals within the soils and no risk is considered to exist.

4.5.3.2 Japanese Knotweed has been identified within the study area at two locations. These locations are:

- Listullycurran Road / Backnamullagh Road Junction – Approximately 118m north east of the existing Listullycurran Road junction with the A1. The presence of Japanese Knotweed was discovered approximately 12m east of the southbound verge.
- Gowdystown Road Junction – Approximately 14m North West of the existing Gowdystown Road (West) junction with the A1. The presence of Japanese Knotweed was discovered at the back of the existing verge.

## 4.6 Engineering Assessment

### 4.6.1 A1 Mainline

4.6.1.1 The section of the A1 under consideration provides varying levels of design standards. A large number of inherent Departures from Standard, related to the primary geometric criteria defined within TD 9/93, had been identified (342 in total based upon a Design Speed of 120A kph).

4.6.1.2 These findings have been reported in an Inherent Geometric Departures from Standards Report to serve as a fixed point record of the inherent TD 9/93 Departures from Standard that currently exist on the A1 between Hillsborough Roundabout and Loughbrickland.

### 4.6.2 Visibility at Junctions

4.6.2.1 There are a number of accesses onto the A1 where visibility is less than the current recommended standard. Standards outlined in the DMRB Vol6, Section 2, Part 6, TD42/95 “Geometric Design of Major/Minor Priority Junctions”, state that priority junctions for a design speed of 120kph (70mph), should have sightlines with a desirable ‘x’ distance of 9m and a minimum ‘y’ distance of 295m. Measurement of available sightlines at these junctions shows that the visibility at some junctions falls below these DMRB recommendations; however visibility is generally achieved at a reduced ‘x’ distance of 4.5m with a relaxation from standard for lightly trafficked junctions and 2.4m for exceptionally difficult circumstances.

### 4.6.3 Structures

4.6.3.1 Twenty one structures have been identified within the scheme study area. The majority of structures are road overbridges, underpasses, culverts or accommodation passes i.e. cattle crossings.



## 4.7 Road Safety

### 4.7.1 2010-2017 Accident Statistics

4.7.1.1 Statistics show that for the period 2010-2017, there were a total of 195 Personal Injury Accidents (PIA) on the 25.2 km stretch of the A1 between Hillsborough and Loughbrickland. The accidents include a total of 25 serious accidents and 7 fatal accidents.

4.7.1.2 During the eight year period from 2010 to 2017 inclusive, there were a total of 9 fatalities, 31 serious injuries and 300 slight injuries recorded, along the study area.

4.7.1.3 A more detailed review of the information provided for the accident history and type of accidents highlighted the following:

- Over the eight year period a total of 195 accidents were recorded along this 25.2km section of the A1 with seven of these accidents resulting in fatalities;<sup>3</sup>
- In the period 2010-2017 inclusive, 45% of 195 accidents (Fatal, serious or slight) recorded, occurred at or adjacent to a gap in the central reserve where manoeuvres such as right turns, u turns, slowing down for private accommodation gaps or vehicle overhang are possible;
- In the period 2010-2017 there were 7 recorded crossover incidents (where errant vehicles cross the central reserve), of which 57% have been fatal;
- The overall percentage of recorded central reserve crossover incidents on this stretch of the A1 is 3.9% compared to 2.2% for the annual average recorded central reserve crossover incidents (as a total of the total annual accidents on dual carriageways) within Northern Ireland in the period 2011 to 2016<sup>4</sup>;
- The most common type of accident appears to be caused by vehicles with insecure loads;
- The other common types of accidents appear to be vehicles changing lane without care, vehicles merging from minor roads without care, vehicles travelling at excessive speed having regard for conditions, vehicles overtaking on offside without care, rear end shunts due to vehicles driving too close and turning right without care; and
- There would appear to be no significant relationship with the time of day, day of the week or the month that the accidents occurred.

---

<sup>3</sup> A1 Junctions Phase 2 – Stage 3 Scheme Assessment Report, 2.10.2

<sup>4</sup> Based on an interpretation of accident statistics recorded by PSNI

## 5 DEVELOPMENT OF SCHEME

5.1 The Design Manual for Roads and Bridges (DMRB) identifies a 3-stage process for developing the Proposed Scheme Option for a Trunk Road improvement scheme. These stages are outlined in TD 37/93 of the DMRB (Scheme Assessment Reporting) and are summarised as follows:

- Stage 1 Scheme Assessment: Preliminary Option Assessment

Identify the environmental, engineering, economic and traffic advantages, disadvantages and constraints associated with broadly defined improvement strategies.

- Stage 2 Scheme Assessment: Preferred Option Assessment

Identify the factors to be taken into account in choosing alternative routes or improvement schemes and to identify the environmental, engineering, economic and traffic advantages, disadvantages and constraints associated with those routes or schemes.

- Stage 3 Scheme Assessment: Proposed Option

Identify clearly the advantages and disadvantages, in environmental, engineering, economic and traffic terms, of the Overseeing Department's preferred route or scheme option. A particular requirement at this stage is an assessment of the significant environmental effects of the project.

### 5.2 Stage 1: Preliminary Options Assessment

5.2.1 A Preliminary Options Report which summarises the outcome of a DMRB Stage 1 Scheme Assessment was published in October 2011. It had already been identified through earlier studies<sup>5</sup> that the preferred strategy for this scheme involved the closure of all central reserve gaps within the scheme extents and the provision of compact grade separated junctions to accommodate any displaced movements. The location of the compact grade separated junctions was determined based on the '5km' guide, whereby any resultant round trips would be limited to approximately 5km (RSPPG E038). This resulted in proposed compact grade separated junctions being sited at the following locations:

---

<sup>5</sup> Roads Service papers; Median Closures Draft Appraisal Report (February 2005): A1 Strategy for Closing Gaps in the Central Median (July 2005): AECOM paper Median Closures Study – Draft Strategy Summary (November 2005): Proposed Upgrading of the A1 Junctions Strategy (April 2006):

- Listullycurran Road
- Gowdystown Road
- Skeltons Road

5.2.2 A review of traffic movements at side roads along the A1 within the study area led to the inclusion of a compact grade separated junction at Waringsford Road and a proposed northbound on-slip at Castlewellan Road.

5.2.3 A number of preliminary compact grade separated junction options and options for the Castlewellan Road On-slip were prepared for consideration. It was recommended that these options should be taken forward to Stage 2 for further consideration.

5.2.4 Drawings showing the Options prepared at Stage 1 are included in Appendix B.

### **5.3 Stage 2: Preferred Option Assessment**

5.3.1 At Stage 2 a number of assessments were carried out on the scheme proposals to permit consideration of the likely environmental, economic, engineering and traffic impacts of potential options. Due to the nature of the scheme and the improvements being considered, these assessments have been tailored to consider proposals either on a whole scheme basis or focussing at a more localised level on individual compact grade separated junction options, as deemed appropriate.

5.3.2 The options being considered during Stage 2 were exhibited at a non-statutory public consultation event in three locations during November 2013, as noted below:

- 7 November 2013 at Old Hillsborough Courthouse
- 13 November 2013 at Old Town Hall, Dromore
- 19 November 2013 at Old Town Hall, Banbridge

The purpose of the event was to invite comments from the public on the options being considered. The findings from this consultation event were one of many factors taken into consideration during the assessment and identification of the preferred option.

5.3.3 The following is a summary of the Preferred Option that was developed at Stage 2:

5.3.1.1 Minor Road Junction Strategy

The Junction Strategy assessment identified the minor road junctions within the scheme extents to be retained on a Left In/Left Out basis (LILO) or closed, and identified recommended improvements including diverge and/or merge lanes at the reconfigured LILO junctions. This is summarised as follows:

- 22 junctions to remain open and operate on a LILO basis;
- All LILO junctions to have diverge lanes and 5 LILO junctions to have merge lanes;
- 8 minor road junctions on the A1 to be closed;
- One of the 22 junctions, Springwell Loanin minor road junction, north of Loughbrickland is to be amended to operate as left-in only; and
- Construction of a new link road connecting Milebush Road with the existing Hillsborough Road CGSJ, at Dromore.

#### 5.3.1.2 Central Median

The central median is to be closed along the entire scheme length and a central reserve safety barrier installed.

#### 5.3.1.3 Listullycurran Road/Backnamullagh Road

Three junction options were assessed. The balance of benefits indicates that the Blue Option is the most favourable in terms of achieving the scheme objectives. It is estimated to be the lowest cost, promotes many of the objectives and other considerations, has lower economic risk than the Brown Option and the engineering layout complements the surrounding topography.

It was recommended that the Blue Option is taken forward as the preferred option.

#### 5.3.1.4 Gowdystown Road

Three junction options were assessed. The Green Option is estimated to be the lowest cost of the options, has the lowest potential for engineering risk and its engineering layout suits the surrounding topography, and whilst the Pink Option may perform better against the Environment objective, the Green Option is considered to perform best overall.

It was recommended that the Green Option is taken forward as the preferred option.

#### 5.3.1.5 Skeltons Road/Drumneath Road

Three junction options were assessed. The Purple Option was considered to have a more balanced impact on local landowners than the Green Option, in that, there was an inconvenience placed upon all properties which was balanced between all parties. The Green Option had a much more severe impact upon the residences in the northwest quadrant. The Purple Option was favoured under the economic objective as it is the lowest cost option.

It was recommended that the Purple Option is taken forward as the preferred option.

#### 5.3.1.6 Waringsford Road

Three junction options were assessed. The Brown Option is favoured under the economic objective as it is the lowest cost option and is more favourable than the Green Option under the environment objective. The Brown Option also requires less fill import than the Green Option and is thus favoured from an engineering perspective.

It was recommended that the Brown Option is taken forward as the preferred option.

#### 5.3.1.7 Castlewellan Road

Due to the limited nature of proposed improvements at Castlewellan Road and the constrained site, the Stage 2 Assessment at Castlewellan Road considered a single option – Green Option only. This option achieves the stated objectives and it was therefore recommended that the Green Option be taken forward for further assessment at Stage 3.

5.3.4 The Economic Assessment of the Preferred Option resulted in a Benefit to Cost Ratio (BCR) of 3.030 for the scheme and is considered good value for money.

5.3.5 Drawings of the Options considered during the Stage 2 Scheme Assessment, including the Preferred Option are included in Appendix C.

## 5.4 Stage 3: Proposed Option Assessment

5.4.1 The Stage 2 Preferred Option was subjected to a Stage 3 assessment which has involved:

- Further environmental assessment, predicting the environmental effects that the Proposed Scheme will have and identifying appropriate mitigation resources (presented in the Environmental Impact Assessment Report);

- Preparation of a scheme cost estimate, including construction, property and land costs;
  - Development of the engineering aspects of the Proposed Scheme; and
  - Further economic appraisal of the scheme, incorporating an assessment of existing conditions and an assessment of the Proposed Scheme.
- 5.4.2 During the Stage 3 Scheme Assessment process two further non-statutory community consultation events were convened during June 2017 and February 2018 at the same locations as identified in 5.3 above. As with the earlier 2013 consultation event, the purpose of these events was to offer further opportunities for the public to engage in the design process so that their issues/concerns could be considered by the Project Team and to keep stakeholders informed of any developing design rationale.
- 5.4.3 Throughout the Stage 3 process, there was continued liaison and consultation with relevant landowners and members of the Public as necessary to inform the developing design.
- 5.4.4 The development of the Stage 2 Preferred Option during the Stage 3 Scheme Assessment resulted in further refinement of the design. The resultant Proposed Option at the end of the Stage 3 Scheme Assessment is summarised as follows:
- Closure of all gaps in the central reserve between Hillsborough Roundabout and Loughbrickland and the provision of a continuous central reserve safety barrier
  - The construction of 4 new Compact Grade Separated Junctions (CGSJs) at:
    - Listullycurran Road
    - Gowdystown Road
    - Skeltons Road/Drumneath Road
    - Waringsford Road
  - A northbound on-slip to the A1 from Castlewellan Road, Banbridge
  - 21 minor road junctions to remain open and operate on a LILO basis including Springwell Loanin. All LILO junctions to have diverge lanes and 16 LILO junctions to have merge lanes;
  - Closure of 9 minor road junctions;
  - Construction of a new link road connecting Milebush Road with the existing Hillsborough Road CGSJ, at Dromore (Facilitating the closure of Milebush Road South (West) Junction);

- Closure of a number of Private Accesses along the route with the remainder operating as left-in / left-out only. Private accesses affected by the works will have alternative access provided where necessary. Accommodation lanes have also been provided at a number of locations in order to mitigate increased journey lengths for affected properties.
  - Closure of all mainline bus stops with new bus stops provided at the 4 new compact grade separated junctions
  - Provision of Intelligent Transport Systems (ITS) proposals such as Variable Message Signs (VMS), Closed Circuit Television (CCTV) and Automatic Number Plate Recognition (ANPR)
- 5.4.5 Consultation with public utility companies has also been undertaken to identify apparatus in conflict with the works. Where necessary, suitable diversionary resources have been identified and agreed with the utility companies and C3 cost estimates provided.
- 5.4.6 Consideration has been given to the method of construction to reduce impact to the existing road network and limit disruption. It is considered that the scheme design would not pose any major problems to a competent contractor during construction, subject to a suitable traffic management strategy being adopted.
- 5.4.7 The Economic Assessment of the Stage 3 Proposed Option resulted in a Benefit to Cost Ratio (BCR) of 2.11 for the scheme and is considered good value for money.
- 5.4.8 The Stage 3 Scheme Assessment concluded that implementation of the Proposed Scheme would greatly improve conditions for both strategic and local road users. It is therefore recommended that the scheme is taken forward through Statutory Order publication stages.
- 5.4.9 Drawings of the Stage 3 Proposed Option are included in Appendix D.

## 6 DESCRIPTION OF SCHEME

### 6.1 Minor Road Junction Strategy – Left In/Left Outs (LILOs)

6.1.1 The minor road junction strategy is summarised as follows:

- 21 junctions to remain open and operate on a LILO basis including Springwell Loanin;
- All LILO junctions to have diverge lanes;
- 16 LILO junctions to have merge lanes, with the remaining 5 having give-way access to the mainline;
- The closure of 9 minor road junctions;
- Construction of a new link road connecting Milebush Road with the existing Hillsborough Road CGSJ, at Dromore (Facilitating the closure of Milebush Road South (West) Junction); and
- Construction of a new link road, as part of the proposed Listullycurran Road CGSJ, connecting Backnamullagh Road with the proposed Listullycurran Road CGSJ (Facilitating the closure of the Backnamullagh Road Junction).

### 6.2 Compact Grade Separated Junctions (CGSJs)

6.2.1 The closure of the central reserve gaps and provision of a central reserve safety barrier along the entire length of the scheme would invariably cause severance issues with properties whose ability to access both the northbound and southbound carriageways of the A1 would be affected by the gap closures. In order to minimise the extra distance people might need to travel, the Preferred Scheme includes four compact grade-separated junctions. These are located at:

- Listullycurran Road (also referred to as Junction 1);
- Gowdystown Road (also referred to as Junction 3);
- Skeltons Road / Drumneath Road (also referred to as Junction 4); and
- Waringsford Road (also referred to as Junction 5).



### 6.3 Milebush Link Road (also referred to as Junction 2)

6.3.1 A link road between Milebush Road and the Hillsborough Road CGSJ, Dromore is to be provided. This will facilitate the closure of the Milebush Road (south) junction with the northbound carriageway of the A1. The benefits of this proposal include:

- closure of Milebush Road (south) removing an existing conflict point where minor road traffic meets with traffic on the mainline A1
- closure of Milebush Road (south) removing the existing weaving traffic associated with the close proximity of this junction and the existing northbound diverge at Hillsborough Road CGSJ
- provision of direct access from Milebush Road to the existing Hillsborough Road CGSJ, thereby facilitating safer access arrangements to both the northbound and southbound carriageways of the A1 and Dromore town.

### 6.4 Castlewellan Road On-Slip (also referred to as Junction 6)

6.4.1 The Stage 2 Preferred Option Assessment included an On-slip from the Castlewellan Road overbridge to the northbound carriageway of the A1, which would facilitate the modification of the Old Manse Road Junction with the A1 to a LIFO junction and mitigate potential detour lengths for the significant number of right turn movements from Old Manse Road to the northbound carriageway.

6.4.2 As part of the Stage 3 Scheme Assessment and following representations by the public, the alignment of the On-slip was amended to move the On-slip in an easterly direction away from Chinauley Park to minimise the impact. This requires the northbound carriageway to be widened into the central reserve to maintain the required lane widths.

6.4.3 It is also proposed to construct an environmental barrier at the top of the slope at a location between the front face of the retaining wall and Chinauley Park to mitigate concerns regarding visual impact and possible increased levels of noise within Chinauley Park. Significant planting is also proposed along this boundary to replace lost vegetation and mitigate visual impact.

### 6.5 Side Roads

6.5.1 The alignment of side roads has been refined to strike a balance between the standards being provided, impact on adjacent land and the cost of provision. Departures from Standard have been incorporated in the Side Roads where the cost of applying full standards could not be justified or where the impact was considered excessive. These Departures have been reviewed in draft format by the DfI Technical Standards team and

have been accepted in principle. It is noted however, that full approval of the Departures from Standard for this Project will be considered at the detailed design stage.

## **6.6 Private Access**

6.6.1 In general, any private accesses affected by the works will either be maintained or have alternative access provided where necessary. A number of private accesses along the mainline will be closed with the remainder operating as left-in / left-out only. Where possible, private accesses onto the A1 within the vicinity of work zone areas have been considered for closure on safety grounds. Accommodation lanes have also been provided at a number of locations in order to mitigate increased journey lengths for affected farm holdings, which also has the added benefit of reducing the number of slow moving vehicles on the mainline.

## **6.7 Sustainable Urban Drainage Systems (SuDS)**

6.7.1 To comply with the Water Framework Directive (WFD) and ensure adequate drainage could be achieved, drainage is to be provided by means of SuDS (Sustainable Drainage Systems). This provision allows for surface water draining from the new road to be treated before outfalling to existing watercourses and to ensure that the flow into the watercourse is no greater than the existing flow.

6.7.2 A number of levels of treatment are to be provided but the provision of SuDS ponds is the most significant in terms of land take, however the shape of the proposed compact connector road creates an area of land within the junction which can be used to facilitate the provision of SuDS ponds. SuDS ponds have been sized to treat the catchment area served by the outfall and accommodate a 1:100 year storm event plus climate change. Maintenance access to these ponds has also been included in the design. A total of 8 SuDS retention ponds are proposed to be provided across the scheme – two at each of the CGSJs.

6.7.3 The greenfield runoff rate has been estimated to be 10 litres per second per hectare. This has allowed for the development of appropriately sized ponds to retain the flow from the highway drainage network and outfall to the nearest watercourse at the greenfield runoff rate.

6.7.4 It is noted that in order to avoid excessive impact on land and property take, retention ponds will not be provided at the LILO junctions. Given additional run-off from the proposed LILO junctions is expected to be minimal, attenuation and treatment will be provided by online storage within pipes and manholes, with treatment being provided by infiltration ditches where required.

## 6.8 Pre-earthworks Drainage

6.8.1 The DMRB promotes the use of either filter drains or open ditches to intercept run-off from adjacent land to prevent it from reaching the road infrastructure. Open ditches are less expensive, can support a greater flow capacity and are easier to maintain than filter drains; therefore, where possible, open ditches have been adopted. Only where levels do not permit the use of open ditches have filter drains been included. Run-off flow rates will be similar to existing flows and therefore in some instances are proposed to discharge directly to watercourses, however these will be collected and connect to the proposed drainage system where possible.

## 6.9 Outline Road Drainage Design

6.9.1 The outline drainage design for the project has been considered in accordance with the requirements of the DMRB HD 33/16: "Design of Highway Drainage Systems", which are as follows:

- Quick removal of surface water to improve safety and minimise nuisance;
- Provision of effective sub-surface drainage to maximise longevity of the pavement and its associated earthworks; and
- Minimisation of the impact of the run-off on the receiving environment.

6.9.2 In developing the road drainage outfall design, a number of criteria were considered, including:

- Locations of high and low points in the vertical alignment;
- Vertical gradient and carriageway cross-fall;
- Location of structures (it is preferable to locate drainage discharge facilities upstream of bridge structures to avoid the need to incorporate drainage pipes within structures);
- Opportunities to discharge to watercourses;
- Run-off area;
- Floodplain levels, ensuring sufficient clearance is provided to finished road levels; and
- Proposed outfall levels.

- 6.9.3 Following consultation with DfI, a gully and carrier drain network is proposed to collect surface run-off. The carrier pipes will then convey flow toward SuDS retention ponds prior to release into existing watercourses. Where retention ponds are not proposed (e.g. proposed LILO upgrades), the piped network will be sized to cater for any additional attenuation required, prior to discharge.

## 6.10 Culvert Design

- 6.10.1 The culvert design and assessment works have been undertaken in accordance with the requirements set out in the DMRB and by DfI. The design process which has been undertaken in establishing the junction proposals comprised hydrologic analysis of catchments to determine design flows and hydraulic modelling to determine appropriate culvert dimensions that would meet a variety of criteria including the passing of flood flows.
- 6.10.2 Culvert dimensions have been established using the C689 report and the DMRB HA107/04: "Design of Outfall and Culvert Details", and include a minimum 300mm freeboard during the 100-year return period storm event +20% for the potential additional flow due to climate change

## 6.11 Earthworks

- 6.11.1 The developed scheme design will require the removal of material in cuttings and areas of known poor ground and the placement of material to construct the new road design profiles. Due to the nature of the works, this will create a cut-fill imbalance for the construction of the proposed works.
- 6.11.2 The preliminary estimate of the earthworks cut/fill volumes indicate that the total gross volume of cut material i.e. material to be excavated is approximately 552,220 m<sup>3</sup>. This material includes areas of poor or soft ground, largely consisting of peaty and alluvium rich soils. This material may need to be disposed of at suitable locations in a manner as to ensure no impact on the receiving environment. However, it is envisaged that subject to more detailed testing, some of this material may be able to be reused or processed into suitable material for potential use in landscaped areas. There may also be potential for improving existing areas of poor ground by preloading or soil stabilisation instead of replacement.
- 6.11.3 The preliminary estimate of the total gross volume of fill material required is approximately 352,522 m<sup>3</sup>. It is estimated that approximately 42% of this material will be sourced from areas of cut along the proposed scheme, whilst the remainder of material will have to be imported to site from other sources. It will be the responsibility of the contractor appointed to identify appropriate locations from which to source suitable materials and appropriate locations for disposing excess unsuitable spoil.

## 6.12 Street Lighting

- 6.12.1 DfI policy is to keep the extent of lighting to a minimum, however, street lighting will be required to be provided within the extents of all the CGSJs, the junction of the Milebush Link Road with the Hillsborough Road CGSJ connector road and at the Castlewellaan Road On-Slip.
- 6.12.2 Where LILO junctions are located within lit sections of the existing carriageway, the extent of lighting is required to be maintained. This will include:
- Moira Road;
  - Old Manse Road; and
  - Banbridge Road, Loughbrickland

## 6.13 Intelligent Transport Systems (ITS)

- 6.13.1 It is proposed to install enhanced ITS infrastructure. ITS is the collective name given to a range of electronic systems and services which enhance the movement of people and goods by optimising the effective management of the road infrastructure, by providing reliable and timely travel information. Advantages through the provision of ITS on roads such as the A1 can include;
- Enhancing road safety;
  - Mitigating the effects of traffic congestion;
  - Effective management of incidents;
  - Improvements in reliability of journey times;
  - Improvements in air quality; and
  - Provision of reliable and timely information to road users.
- 6.13.2 The provision of ITS will consist of three elements; variable message signs, CCTV and Automatic Number Plate Recognition (ANPR).
- 6.13.3 It is proposed that variable message signs (VMS) are provided on the route at key locations (usually 1km before a major junction/ decision point), to provide advisory speed limits, alternative routes, warning messages, road condition information, safety advice and travel times. These may be located in the verge. A typical type of sign that may be used is the MS4. The MS4 sign is capable of displaying both pictograms and

text. A typical VMS is usually mounted within the verge or on a roadside gantry with a display screen 4440 x 3160mm.

- 6.13.4 CCTV cameras may be installed to monitor traffic at major junctions, locations with significant congestion and collision hotspots. Information from the cameras will be used in conjunction with VMS to inform drivers of unusual road conditions or incidents. It is envisaged, that if installed the cameras will be mounted on posts in the verge, in a similar arrangement to those already on the route.
- 6.13.5 ANPR cameras are usually installed to provide accurate journey time information for the VMS infrastructure and the traffic watch website. They are usually installed on passively safe lattice poles at VMS sites at 10km intervals.

## **6.14 Signage Strategy**

- 6.14.1 Traffic, regulatory and warning signs will be provided in accordance with the Traffic Signs Manual, (February 2017, Department of Transport) and will comply with all statutory requirements. Due to the nature of the A1 dual carriageway it is envisaged that a new signage strategy will be required for the route to provide clarity and consistency for drivers on the mainline. The signage strategy will be developed in further detail as the Project progresses.

## **6.15 Crossing Closures**

- 6.15.1 There are 111 gaps within the central reserve on the 25.2km stretch of the A1 mainline between Hillsborough Roundabout and Loughbrickland, which present a hazard to the mainline traffic. It is proposed that gaps will be broken out, the existing hard surfacing perforated, then backfilled with soil and seeded to match the existing central reserve. Pavement edge details will comprise kerbs and gullies or concrete channels to provide positive drainage. It is noted that pavement surfaces at gaps forming Emergency Crossing Points will be retained for future use.

## **6.16 Turning Heads**

- 6.16.1 As part of the Proposed Scheme, it is proposed to close 9 minor roads at their junction with the A1 mainline. It is proposed that each closure will include perforation of the existing hard surface which will then be backfilled with soil and seeded. Pavement edge details will comprise kerbs and gullies or concrete channels to provide positive drainage.
- 6.16.2 Where the existing road is to be stopped up, a turning head facility will be provided to allow vehicular traffic to turn around at the dead end. The turning head facility shall be formed using kerbs and gullies or concrete channels to provide positive drainage where required. A landscaped bund which will include an antidazzle fence and / or screen

planting to match existing will be provided between the minor road turning head and the A1 mainline to ensure closure to vehicular traffic.

## 6.17 Central Reserve Treatment and Emergency Crossing Point (ECP) Facilities

6.17.1 A double sided vehicle restraint system (VRS), typically Brifen wire rope, as consistent with other central reserve VRS across the road network in N. Ireland, will be installed. Where existing geometry dictates, bifurcated VRS may be required. Specific VRS arrangements will be used around existing structures where there is limited working width. There will be approximately 17,100m of VRS to be installed within the scheme extents.

6.17.2 As part of advanced works, on the grounds of improving safety along the A1, central reserve gaps and sections of VRS have already been installed at the locations below:

Section	Section Description	Length (m)
PA1	Hillsborough Roundabout to Pantridge Link, Hillsborough	1975
PA2a	Springwell Loanin to Bannview Road Overbridge, Banbridge	1525
PA2b	Bannview Road Overbridge to Castlewellan Road Overbridge, Banbridge	1575
PA3a	Banbridge Road to Lower Quilly Road, Dromore	390
PA3b	Maypole Hill to Milebush Road, Dromore	560
PA3c & d	Glen Road to Pantridge Link, Hillsborough	430

6.17.3 In each case the existing gaps were broken out, kerbed and grassed to match the existing, with the exception of the emergency crossing points which have been retained to ensure flexibility for routine maintenance and road closures. (It is noted that any gaps closed as part of the advanced works have been included within the total figure of 111 gaps identified in this document)

6.17.4 Approximately 20 Emergency Crossing Points (ECP) will be retained along the route, which will enable flexibility in the management of incidents along the route, in addition to facilitating online maintenance without having to detour traffic for excessive distances off the mainline. The ECPs will be located at existing locations and will have removable safety barrier installed to allow for the conversion to contra-flow of traffic in the event of an emergency or maintenance requirements.

## 6.18 Non-Motorised Users

6.18.1 The use of the existing carriageway by non-motorised users such as pedestrians, cyclists and equestrians was assessed and the impact of the proposed development on these users was considered. It is noted that the construction of the new compact grade separated junctions will reduce the effects of severance created by the road in addition to providing new safer crossing points due to the presence of the new overbridges and associated footpaths. On account of the heavily trafficked, high-speed nature of the existing A1 dual carriageway, pedestrian and cycling activity is minimal and it is not considered appropriate to encourage any further pedestrian and cycling activity along the mainline. It is also noted that there are no dedicated equestrian facilities within the scheme extents.

## 6.19 Public Transport

6.19.1 There are currently 37 bus stops along the mainline within the scheme extents. Existing bus stop facilities along the A1 serve two bus service routes operated by Translink; these are the 38 and 538 services. In addition the facilities also serve a number of local school bus routes. The facilities range from a simple arrangement of paved area and flag post to covered bus shelters. There are no dedicated diverge, merge or layby facilities associated with these bus stops – the buses simply stop on the hard shoulder at the designated bus stop locations for pick-up / drop-off. There are a number of undesirable characteristics associated with this practice as follows:

- Patrons typically access these bus stops either by foot which can mean crossing the dual carriageway on either their outbound or homebound journey or by vehicles stopping on the hard shoulder for drop offs / pick ups
- There are no dedicated stopping facilities for buses which can create diverging / merging hazards for mainline traffic

6.19.2 The existing bus stop usage figures provided by Translink show that there are very low passenger numbers on the local service on the A1 with an average of 1-2 patrons per day at the more frequented bus stops. There are some bus stops on the route that do not see any regular use<sup>6</sup>.

6.19.3 Therefore, through consultation with Translink, it is proposed that the bus stops currently located on the mainline are removed and replaced with bus stop facilities at the four proposed compact grade separated junctions. The layout of the proposed bus stop facilities have been designed to be consistent with those recently provided on the A26 and A8 road schemes. These facilities allow buses to access from either side of the

---

<sup>6</sup> A1 Junctions Phase 2 – Stage 3 Scheme Assessment Report, 2.3.2



carriageway and provide a limited number of parking bays for drop-off/pick up of patrons. It is considered that the proposed bus stop provisions provide a safer arrangement than currently exists thereby removing the hazards associated with the existing mainline facilities.

## 6.20 Design Standards

6.20.1 The following documents are considered to be particularly relevant to the development of the Preferred Scheme:

- Design Manual for Roads and Bridges (DMRB). It is noted that the Stage 3 design was carried out using the current DMRB standards at that time, up to the date of Publication of the Draft Statutory Orders i.e. 25<sup>th</sup> March 2019. It is noted however, that the DMRB has undergone a transformation in the intervening period, with many standards amended. An ongoing check is being carried out to compare current and previous standards; to date this check has not identified any significant impacts on the Stage 3 design. Moving forward, the current DMRB standards will be referenced until such time as a stand-still date may be identified for the Project. The following is a list of the DMRB Volume 6 Standards used during the Stage 3 design development (the updated standards are referenced in brackets):
  - TD 9/93 – Highway Link Design (superseded by CD109);
  - TD 27/05 – Cross-Sections and Headrooms (superseded by CD127);
  - TD 42/95 – Geometric Design of Major/Minor Priority Junctions (superseded by CD123);
  - TD 40/94 – Layout of Compact Grade Separated Junctions (superseded by CD122);
  - TD 22/06 – Layout of Grade Separated Junctions (superseded by CD122);
  - TD 19/06 – Requirement for Road Restraint Systems;
  - HD 45/09 – Road Drainage and the Water Environment (superseded by LA 113; and
  - TD 41/95 – Vehicular Access to All-Purpose Trunk Roads (superseded by CD123).

6.20.2 Other Standards:

- DEM118/16 - Director of Engineering Memorandum (DEM): “Design Speed for Roads”

## 7 CONSTRUCTION MANAGEMENT

### 7.1 Programme

The overall construction period is anticipated to be in the region of 3 years for the entire A1 Junctions Phase 2 Works. It is acknowledged that there is scope to deliver the Works in a phased manner by prioritising sections of the works and delivering these as discrete works packages. The advantage of this approach is that discrete works packages would require smaller funding commitments, thereby allowing sections of Improvement Works to commence without having to rely on a larger funding commitment to deliver the entire project as one contract. It is likely however, that if a phased approach were adopted, construction of the entire project could extend to 10 years or more. If a phased approach to construction is adopted then it will be conducted in such a way that gaps within the central reserve are not closed until adjacent compact grade separated junctions have been built to facilitate the alternative movement of vehicles.

7.1.1 Once appointed, the main Contractor shall be required to provide a detailed programme prior to commencement of the works. This shall set out:

- The overall programme of construction;
- Programming of the key elements and phases of construction;
- Programming of environmental mitigation and monitoring; and
- The duration of each element and phase.

7.1.2 Normal working hours are likely to be 07.00 to 19.00 Monday to Friday and 08.00 to 16.30 on Saturdays. Works outside these hours may be permitted in special circumstances subject to advanced approval. Earthworks operations are assumed to take place from April to October inclusive to avail of the better weather conditions. However, it is likely that there will be some earthworks operations ongoing throughout the duration of the construction phases of the development.

### 7.2 Pre-Main Construction Works

7.2.1 It is anticipated that some works may be undertaken as part of an advance works contract prior to the main construction works commencing. Examples of such advance works contracts include:

- Archaeological surveys and testing in order to resolve archaeological issues;

- Fencing works;
- Site clearance and tree and hedgerow removal works;
- Ecological Surveys and mitigation;
- Utility and Drainage Diversions;
- Removal of any invasive species within the site;
- Surface water and groundwater quality monitoring; and
- Detailed ground investigation works.

7.2.2 During this stage the site boundary will be fenced off and site access points will be constructed to provide access for construction vehicles from the existing road network. This will involve some works adjacent to existing roads and may require temporary traffic diversions.

7.2.3 Before earthworks commence the Contractors must prepare the Construction Environmental Management Plan (CEMP), which must set out the Contractors approach to managing environmental issues associated with the construction phase and provide a documented account to the implementation of the environmental commitments as set out in the EIAR and any approval/consent as may be granted.

7.2.4 All on site drainage, erosion and sediment control measures for the construction works must be in place and functioning prior to the commencement of earthworks/site clearance.

## **7.3 Main Construction Works**

### **7.3.1 Legislation**

7.3.1.1 Prior to construction beginning on site the contractor and client will need to ensure that the environmental recommendations and guidance noted within the EIAR are adhered to, in order to reduce any effects on the natural environment, residents and adjacent receptors.

7.3.1.2 The contractor will need to produce a number of documents for approval prior to undertaking the proposed works. These will detail the construction methodology, site controls, procedures and site specific actions that will be implemented during construction. These documents include;

- Construction Phase Health and Safety Plan (CDM 2016 NI)
- Construction Environmental Management Plan (CEMP)
- Site Waste Management Plan
- Method Statements
- Risk Assessments

### **7.3.2 Drainage**

7.3.2.1 The Contractor will be responsible for obtaining all necessary temporary discharge consents from DfI Rivers and NIEA Water Management Unit. Pre-earthworks drainage such as top and bottom of slope filter drains and cut-off ditches will be provided in advance of the bulk earthworks. Road drainage and slope drainage (where necessary) will be provided upon completion of earthworks and in advance of pavement works.

### **7.3.3 Earthworks Cut/ Fill**

7.3.3.1 The current conceptual design for the proposed works will require the removal of material in cuttings and areas of known poor ground and the placement of material to construct the new road design profiles. This will create a cut-fill imbalance for the construction of the proposed works.

7.3.2 The preliminary estimate of the earthworks cut/fill volumes indicate that the total gross volume of cut material i.e. material to be excavated is approximately 552,220 m<sup>3</sup>. The preliminary estimate of the total gross volume of fill material required is approximately 352,522 m<sup>3</sup>. It will be the responsibility of the contractor appointed to identify appropriate locations from which to source suitable materials and appropriate locations for disposing excess unsuitable spoil.

7.3.3.1 Due to the disjointed nature of the earthworks locations it is likely that each location will be managed in isolation. Any opportunity to manage the cut and fill balance between junctions will be explored by the Contractor, but it is envisaged that this will be minimal due to the distance between work sites.

7.3.3.2 It is expected that any import or export of material will predominantly use the public road network since there is little scope for the use of haul routes.

### 7.3.4 Structures

7.3.4.1 The main structures include the following:

- 4 overbridges at the CGSJs (2-span, reinforced concrete piers/abutments most likely on spread footings, reinforced earth abutment walls, pre-cast beams and in-situ deck slab)
- Piled retaining walls at the Castlewellan On-slip
- Retaining walls to deal with localised level differences
- Culverts and headwalls where existing watercourses/culverts have been affected by the works

### 7.3.5 Carriageway Works and Traffic Management

7.3.5.1 As the majority of the Works is online, it is likely that Temporary Traffic Management will be employed at each of the active work locations to facilitate construction activities. It will be a Contract requirement that 2-lanes of mainline traffic will be provided in each direction at all times except under special circumstances when lane/road closures may be required to facilitate certain activities, such as bridge beam lifts etc.

### 7.3.6 Construction Traffic

7.3.6.1 Due to the online nature of the scheme the majority of all materials will be transported along the public road network, primarily the A1 dual carriageway. Localised haul routes can be used at each of the works site locations but these will be minor given the compact nature of each of the Works sites. The appointed contractor will identify suitable locations to source materials (ideally local quarries) and locations for disposing unacceptable materials.

7.3.6.2 The transport of bulk material (including earthworks materials, capping, sub-base and bituminous materials) is likely to result in approximately 75,000 tipper lorry movements to and from the site over the construction period. It is expected that most of these movements will be primarily along the A1 and will be relatively evenly spread across the 25km route length.

### 7.3.7 Stockpile Areas

Due to the compact nature of the junctions there will be limited scope within the permanent land take area for the storage of large quantities of materials. As noted it is envisaged that construction materials may be stored offsite locally and delivered to site when required. This will be co-ordinated by the contractor and any potential mitigation measures noted with the contractors CEMP.

## 7.4 Site Compound and Offices

- 7.4.1 The construction compound is likely to include stores, offices, welfare facilities, materials storage areas, material processing areas, plant storage and parking for site and staff vehicles. The site is anticipated to remain in place for the duration of the works. The compound will have appropriate levels of security. The Contractor will be required to manage parking and deliveries at the compound and other areas in such a manner as to ensure that there is no obstruction to traffic or sightlines during construction.
- 7.4.2 While potentially suitable locations may be identified at detailed design stage the final decision regarding locations will be decided by the appointed Contractor, in agreement with local landowners and the client.
- 7.4.3 Since the land to be permanently acquired though the vesting process is to be utilised for the permanent works aspects of the scheme there may not be enough land available to accommodate the local and main works compounds. Therefore, provisional areas have been identified within the current permanent vesting line for construction compounds local to the grade separated junctions. These will be located either within the connector road loop, on the site of the bus stop area or in parcels of surplus ground being vested by DfI.
- 7.4.4 It is envisaged that there will be a central compound on the A1 to act as a central administrative area. This area has not been identified and will be agreed with the Contractor. Factors to be considered when deciding upon the preferred central compound area will include:
- Proximity to watercourses/floodplains and ecologically/environmentally sensitive areas
  - Impact on adjacent properties (noise, traffic and visual intrusions)
  - Impact on amenity
  - Accessibility from public road network
  - Proximity to services (e.g. water & wastewater, telecommunications, electricity)
- 7.4.5 In order to minimise any impact on surface water and groundwater from material spillage, oils, solvents, paints and other potential contaminants used during construction they will be stored within suitably designed bunded areas. Secured oil and fuel storage tanks will be stored on designated areas of hardstanding. These areas will be bunded to a volume of 110% of the capacity of the largest tank/container within the bunded area(s)

- 7.4.6 Following the completion of the construction phase these areas will be cleared and reinstated by the Contractor to their original condition prior to occupation.

## **7.5 Operation and Maintenance of the scheme**

### **7.5.1 Post Construction**

- 7.5.1.1 Once the construction phase of the scheme is completed, the operation and term maintenance of the mainline will be undertaken by Amey under an existing Design-Build-Finance-Operate (DBFO) contract. Maintenance of the adjacent side roads will be undertaken by DfI Roads.

## 8 CONCLUSION

8.1 The development of the Proposed Scheme has been carried out in accordance with the requirements of the Department and the need to comply with relevant standards, which has resulted in a scheme which:

- Reduces journey times for strategic A1 traffic;
- Improves journey time reliability for strategic A1 traffic;
- Contributes positively to transport economic efficiency;
- Contributes positively to road safety;
- Provides the least environmental impact;
- Justifies the land contained within the Vesting Order to be acquired to enable the scheme to be constructed; and
- Is economically robust.



Appendix A - Location Plan

Appendix B - Stage 1 (Preliminary Option Assessment) Option Layouts

Appendix C - Stage 2 (Preferred Option Assessment) Option Layouts

Appendix D - Stage 3 (Proposed Option) Layouts