

**Department for Regional Development – Roads Service**

**A55 KNOCK ROAD WIDENING SCHEME**

**Public Inquiry**

**November 2010**

**Proof of Evidence – DRD A55/28**

**(Submission on Development  
and Design of the Scheme)**

**by**

**GARY LIVINGSTONE, CEng, FICE**

Gary Livingstone CEng FICE  
Amey Consulting  
Rushmere House  
46 Cadogan Park  
Belfast  
BT9 6HH

# CONTENTS

	Page No.
<b>CONTENTS .....</b>	<b>2</b>
<b>1. INTRODUCTION.....</b>	<b>1</b>
<b>2. SCOPE OF PROOF .....</b>	<b>2</b>
<b>3. DESCRIPTION OF THE SCHEME .....</b>	<b>3</b>
<b>4 EXISTING SITUATION .....</b>	<b>6</b>
<b>5 DEVELOPMENT OF SCHEME.....</b>	<b>11</b>
<b>6 PREFERRED OPTION .....</b>	<b>28</b>
<b>7 DEVELOPMENT OF THE SCHEME SINCE PREFERRED OPTION.</b>	<b>30</b>
<b>8 SUMMARY.....</b>	<b>36</b>

## 1. INTRODUCTION

- 1.1 My name is Gary Livingstone. I am a Chartered Engineer and Fellow with the Institution of Civil Engineers.
- 1.2 As a member of the Institution of Civil Engineers I am bound by the ICE's Code of Professional Conduct and ICE By-laws. This ensures that all members observe the highest standards of conduct and professionalism.
- 1.3 I have twenty four years experience in the delivery of engineering related projects in four different countries.
- 1.4 I have been employed by Amey (previously Owen Williams) for over five years, where I manage a multi-disciplinary team in the delivery of major projects. Prior to joining the firm, I was a consultant with (WS) Atkins for five years and before that worked for an international engineering consultancy, and a number of local councils in New Zealand.
- 1.5 I am currently the Programme Manager for the delivery of schemes under the Major Project Framework for Roads Service.
- 1.6 I have been responsible for the scheme development of a number of schemes within Northern Ireland including:
  - Armagh North & West Link Road
  - Cherrymount Link Road
  - Belfast City Centre Ring – South Section
  - A55 Knock Road
  - Sion Mills Bypass – Feasibility Study
  - Sandyknowes Roundabout – Feasibility Study
- 1.7 As part of my role with Amey I have been responsible for the overall development of the A55 Knock Road scheme. This has included the co-ordination and management of all project disciplines.

## **2. SCOPE OF PROOF**

- 2.1 My evidence will take in the following aspects in relation to the scheme:
- Description of the scheme
  - Development of the scheme prior to and following the preferred option announcement.
  - Design aspects of the scheme.
- 2.3 My evidence will be restricted to aspects associated with the engineering details of the Scheme. Specialist detail in other areas such as economic assessment and environmental assessment of the preferred option will be addressed by my colleagues in their evidence.

### **3. DESCRIPTION OF THE SCHEME**

- 3.1 All following statements should be referenced using plan 400445-SK-067-02.
- 3.2 The proposed scheme will widen a 1.3km stretch of the existing Knock Road carriageway between Glen Road and Kings Road, providing two lanes in each direction together with a central median to accommodate right turning vehicles. This will be designed to four lane single carriageway (with right turning facility) standards, with a 30mph speed limit.
- 3.3 The proposed carriageway will consist of two lanes westbound made up of 3.5m and 3.3m lane widths, 4.5m wide central median hatching and two similar lanes eastbound. A combined footway/cycleway on the northern side (City side) will vary from 4.5m to 5.0m width and on the southern side (Dundonald side) will be a constant 3.5m width.
- 3.4 On the approach to the Shandon/Sandown junction there will be solid splitter islands on each direction to prevent conflict between lanes of queuing traffic with right turning vehicles from properties. The width of these islands will vary between 1m and 3m and will extend approximately 115m to the west of the junction (Forestside side) and 75m to the east (Newtownards Road side).
- 3.5 There will be an improved junction layout at Sandown Road/Shandon Park which will be traffic signal controlled and incorporate controlled facilities for pedestrians.
- 3.6 There will be a reduction in the number of direct accesses onto Knock Road, there will be two service roads constructed on the southern side of Knock Road. One service road will be constructed from Shandon Park serving Ascot Park and Ascot Gardens. Another service road will be constructed to serve Nos. 60-68 Knock Road as well as 1 & 1a Kingsden Park and adjacent lands.
- 3.7 Retaining walls and safety fencing will be provided along selected lengths of the verge, where potential hazards pose a particular level of risk to road users.

Roads Service  
A55 Knock Road Widening Scheme

- 3.8 An existing culvert will be extended by 10m, located approximately 100m north of Cherryvalley, to carry the new widened road over the Knock River.
- 3.9 The environmental impacts as a result of the scheme have been assessed within the Stage 2 scheme assessment report and the Environmental Impact Statement. Evidence pertaining to this will be presented by Mr Raymond Holbeach.
- 3.10 In respect to the overall drainage strategy, the widened road will be drained through kerbside drainage systems and fed to the nearest watercourses. These systems may freely discharge to the Knock River at different locations dependent on the timing of the East Belfast Flood Alleviation Scheme (FAS) in the area. We have had numerous consultations with the Rivers Agency and agreement has been reached were in the event the FAS commences ahead of the road scheme, then permission will be granted to freely discharge to the Knock River. If the road scheme commences prior to the FAS, methods of attenuation will be required, to control the discharge into the watercourse to the equivalent of the 'greenfield runoff rate' for these two networks. As informed by Rivers Agency, this is equivalent to 10 litres / second / hectare (l/s/ha).
- 3.11 Throughout the preparation of the Scheme and in particular following the announcement of the Preferred Option, contact has been maintained with residents of those properties that are directly affected by the scheme.
- 3.12 Further meetings will be held as the Scheme develops through the detailed design to discuss potential accommodation works to existing dwellings.

***Legislative Plans***

- 3.13 Details pertaining to the legislative plans and in particular the timing of the trunk road order, Vesting of land and prohibition of the right hand turn have been delivered in evidence given by Mr Stephen Pollock.

## 4 EXISTING SITUATION

### *Local Road network*

- 4.1 The A55 runs from the Antrim Road in North Belfast through West Belfast and into South Belfast, where it forms a trunk road at Stockman's Lane before continuing on to Balmoral Avenue and the Malone Road. It then continues past Shaw's Bridge, alongside Belvoir Estate to Milltown Road. Here, it becomes a dual-carriageway and continues east, passing major at-grade junctions at Forestside (A24 Saintfield Road), the A23 Castlereagh Road, the A20 Upper Newtownards Road, and the Hollywood Road before eventually connecting with the A2 Sydenham Bypass.
- 4.2 The A55, connecting the A24 and the A20, provides orbital movements around Belfast. It is a strategic route and part of the trunk road network. The majority of this route is served by a dual carriageway, with two lanes in each direction. However, a section between Knockmount Park and Cherryvalley has one lane in each direction, which contributes to congestion at peak times with associated safety problems. All the junctions are at-grade.

### *A55 Knock Road*

- 4.3 The part of the A55 Knock Road that has been identified as a problem runs from Knockmount Park to Cherryvalley. The carriageway width, over this section, varies and is approximately 10.0m wide at its narrowest point.
- 4.4 Along the A55 Knock Road there are numerous residential roads, junctions and private residents with direct accesses. All of residential roads are as follows:
- Cherryvalley
  - Knockcastle Park
  - Kensington Road
  - Knockvale Park
  - Kingsden Park



- Sandown Road
- Shandon Park
- Ascot Park
- Knockmount Park
- Knockwood Park

4.5 There are approximately 51 private accesses in total; 47 on the northern side and 4 on the southern side (Kingsden Park, 60 Knock Road, 62 Knock Road, and 66 to 68 Knock Road).

4.6 Existing high walls, fences and hedges in some areas especially where the footways are narrow limit the visibility of vehicles exiting from existing properties and therefore raise safety issues for pedestrians and cyclists.

4.7 The existing horizontal and vertical alignments along this section of the A55 are sub-standard in certain areas. This results in poor forward visibility and sight-lines, which can be contributory factors to accidents. The existing geometric standards have been assessed in the geometric standards assessment report. Summary of geometric problems:

- Vertical crest curve between Ascot Park and Knockwood Park
- Vertical alignment between Knockwood Park and Shandon Park (steep incline).
- Horizontal alignment between Knockcastle Park and Cherryvalley.
- Sub-standard sight-lines from individual properties and non-signalised access roads.

#### ***Existing traffic conditions***

4.8 The A55 Knock Road carries approximately 39,000 vehicles a day (Roads Service Traffic Census Report 2006). Flows on the road vary throughout the year with a significant drop during university and school holidays. Commuter traffic results in marked morning and evening peak periods.

4.9 The A55 Knock Road carries approximately 1900 vehicles during the AM peak hour (2006). In accordance with TA 79/99 of the Design Manual for Roads and Bridges (DMRB) (ref: DRD A55/20) states that the existing road

capacity for a 10.0m wide Urban All Purpose road category 2 (UAP2) is 1650 vehicles per hour in each direction. This indicates that the single carriageway section between Shandon Park and Cherryvalley is operating beyond capacity in the AM peak hour.

### ***Operation of junctions***

- 4.10 Analysis of existing junctions, using LINSIG and TRANSYT for traffic signals, confirm that the network suffers from congestion in the morning and evening peak hours of traffic flow

### ***Traffic growth***

- 4.11 Traffic growth on the road network in the study area has been constrained by lack of capacity at peak times and is currently less than 3% per annum.

### ***Road safety***

- 4.12 A total of 74 recorded accidents have taken place within this 1.3km length of the A55 Knock Road between Knockwood Park and Kings Road from 2001 to 2008. There were 14 recorded serious accidents and no fatal accidents during this time period.
- 4.13 The majority of the accidents took place in dry road surface condition and did not relate to bad weather or poor lighting conditions. 88% of accidents took place at junctions. One fifth of accidents recorded were shunts while over a third of all accidents were caused by turning conflicts.

### ***Cyclists***

- 4.14 Existing cyclist's facilities along this stretch of road are poor especially compared with the rest of the A55 where, in most cases dedicated cyclist lanes are provided. Cyclists, at present are forced to use the existing carriageway which is considered to be dangerous especially along the section of road where the road converges into a single lane.

### ***Public Transport Services***

- 4.15 The only public transport available in the area is a bus service. Translink operates a number 18 Metro bus service which stops on the Knock Road and turns right into and left out of Knockwood Park.

### ***Drainage***

- 4.16 The Knock River originates on elevated land in the townland of Ballymiscaw and due to the topography of the area this river eventually converges with the Loop River approximately 2.5 km downstream of the crossing point. The combined rivers at this location become the Connswater that flows through Victoria Park and into Musgrave Channel (part of Belfast Lough).
- 4.17 A kerb and gully system is used throughout the existing Knock road which collects the surface runoff from the carriageway and all its hardstanding areas.
- 4.18 On the A55 from Knockmount Park down to the petrol stations situated 100m north of Glen Road, the surface water is conveyed in a 225 diameter clay pipe storm sewer before discharging into an existing culverted watercourse. A 1200mm diameter concrete culvert is used which runs from the Shandon Park Golf Course side of the Knock Road under the Knock Rd, under the Laburnum Playing Fields, through the Schools playing fields, for a distance of 950m to its outfall into the Knock River behind Sandhill Park. The connection of the storm sewer to this culvert was proved through the undertaking of a dye test on site and the culvert route was verified through a walk-over survey. This is the only section of the Knock Road to use a storm sewer system.
- 4.19 The section of the existing Knock Rd from Knockmount Park to Sandown Rd collects and conveys the surface water in 300mm and 225 mm diameter combined sewers respectively with both connecting into a 450mm diameter combined sewer which runs down the Sandown Rd to an outfall under NI Water control.

- 4.20 The surface water drained from the section of the existing road from Knockvale Park to Cherryvalley is conveyed in a 300 diameter combined sewer, and the remaining surface water drained from the section of the Knock Rd up to the King's Rd junction is collected and conveyed in a combination of 675mm, 1000mm, and 1200mm diameter combined sewers.
- 4.21 The proposed scheme has two surface watercourse crossings. One is with the Knock River, which occurs at Ch 1080. The other crossing is Orangefield Stream which passes through Shandon Park Golf Club at Ch 0050.

### ***Environment***

- 4.22 The scheme lies in an undulating urban landscape on the eastern edge of Belfast City. The landscape is much modified by human activity. The topography is elevated above the City Centre and gradually rises to the east and northeast to form the Castlereagh Hills and Craigtantlet Hills that dominate the eastern part of Belfast.
- 4.23 Shandon Park Golf Course is located in a parkland setting of rolling hills within a wooded framework. Built development surrounds the golf course and is clearly visible from within. However, the open character of this landscape allows panoramic views west to Belfast City Centre and the Belfast Hills beyond.
- 4.24 The Knock River valley consists of mature trees set in the back gardens of houses in the Cherryvalley area.

### ***Utilities***

- 4.25 A range of services including Gas, Electricity, Water, Foul water, NTL and BT are present throughout the area. An electrical sub station is located at Cherryvalley, in the north of the scheme boundary.
- 4.26 A standby generator on the property of Marie Curie will also require relocation.
- 4.27 Services will need to be diverted, or temporarily halted in order to carry out the construction works.

## **5 DEVELOPMENT OF SCHEME**

- 5.1 The scheme has been developed through a three stages in accordance with the Design Manual for Roads and Bridges (DMRB) and the Department for Transport's Transport Analysis Guidance (TAG) (ref: DRD A55/36). It also follows prescribed procedures set out in Roads Service Policy & Procedure Guide (RSPPG) E030 (ref: DRD A55/10).
- 5.2 Stage 1 was deemed unnecessary for this scheme. Previous assessments that ultimately led to the scheme being included in the Belfast Metropolitan Transport Plan (BMTP) (ref: DRD A55/2) and subsequent approval of Gateway 0 was considered to be adequate for Stage 1. It is also important to note that Stage 1 assesses various transport corridors for a transportation scheme. Due to the existing A55 strategic route this part of the assessment process was deemed to be complete.
- 5.3 Stage 2 Scheme Assessment Report (ref: DRD A55/22) produced in April 2007 follows a prescribed procedures set out in Roads Service Policy & Procedure Guide (RSPPG) E030, and draws on the Design Manual for Roads and Bridges (DMRB) and the Department for Transport's Transport Analysis Guidance (TAG). I will now summarise the relevant points from the Stage 2 report.
- 5.4 The BMTP identified the requirement to alleviate the sub-standard on the A55 at the location under consideration. It prescribed the widening of the section between Shandon Park and Cherryvalley from one-lane in each direction to two lanes in each direction with right-turn provision.
- 5.5 Options were developed and recommended for further assessment. There are various ways in which options could differ:
- Carriageway Alignment
  - Different junction arrangements
  - Restricted or unrestricted access
  - Different cross-sections
  - Widening of one side of the existing road

5.6 Options were developed to test the effect of the above variations, accepting that the eventual preferred solution might differ from any of the original options.

5.7 Four options were considered and examined in the Stage 2 Scheme Assessment Report. The proposed options all involve widening of the existing carriageway and vary mostly by the extent of widening and up-grade of existing standards. Table 1.0 provides a brief summary of the four options.

Option	Description	Cost (Million £) 2005
Option A	Widening carriageway to 2 lanes in each direction.	£5.3
Option B	Widening of the carriageway to 2 lanes in each direction with right-turn pockets at each minor junction and a central hatched area between junctions.	£8.8
Option C	Widening of the carriageway to dual-carriageway standard with central median plus a 6 metre wide service road and Ascot Park Link.	£14.6
Option D	Widening of the carriageway to 2 lanes in each direction with right-turn pockets at each minor junction and a central hatched area between junctions.	£9.7

Table 1 – Stage 2 Assessment Options Summary

### ***Addition to Options***

5.8 Originally three options were tabled at a Public Consultation Event in June 2006. As a result of feedback from the residents in the vicinity of the scheme it was decided to include Ascot Park link and amended carriageway widths into a hybrid option. This resulted in the project team producing Option D which was included in the Stage 2 assessment. As of note, Option D is a combination of public preferences from Options B & C. To avoid confusion it was decided to name this Option D. Further details in respect to Public Consultation have already been outlined by Mr Stephen Pollock.

### ***Road Cross Section***

- 5.9 As the impact of the widening on adjacent property was a major concern, we considered the proposed road's cross-section carefully during Stage 2. We concluded that there was good reason to depart from the standards set out in *TD27/05 Cross-Sections and Headrooms* of the DMRB, which relates primarily to new trunk roads.
- 5.10 According to advice note *TA 79/99 Traffic Capacity of Urban Roads of the DMRB*, the existing 2 lane carriageway was not adequate for the current and predicted traffic flows (see 4.9). In accordance with TA 79/99 the existing road capacity for a 10.0m wide Urban All Purpose road category 2 (UAP2) is 1650 vehicles per hour in each direction.
- 5.11 Interpolating from the capacities indicated in Table 2 of TA79/99 we concluded that the new road should be at least 14.6m wide.

### ***Engineering Issues***

- 5.12 The engineering assessment of the options looked at the road layout (design speed, number of lanes, typical cross section) and considered earthworks, structures, drainage, utilities, buildability, compliance with standards and road safety. Cost estimates were also prepared.
- 5.13 The main engineering issues related to fitting a new or improved road into an established urban area. At least 4 lanes would be required for traffic flows, with provision for pedestrians and cyclists. For safety reasons and operational efficiency a 2-lane single carriageway in each direction with right turn pockets was preferred to a single carriageway.
- 5.14 Not all of the options examined would require the demolition of properties; however 3 properties will require demolition for Options C and D. Roads Service already own 2 of these properties (11 and 13 Shandon Park) with an additional property (64 Knock Road) being demolished as a result of the proposals.

- 5.15 Retaining walls would be required on the southern side of the Knock Road for all options to minimise the impact on property. Beyond that the main engineering issues would be associated with minimising the effects of construction on adjacent properties and traffic. Some will be new and some will replace existing structures.
- 5.16 No engineering issue was identified that would prevent any of the options from being delivered.



### ***Severance Issues***

#### 5.17 Option A

Although the widening is relatively small scale, the change from a 2-lane single carriageway to a 4-lane single carriageway may contribute to a perceived barrier for pedestrians. This option makes no provision for pedestrian refuges at crossing points therefore four lanes of traffic in one pedestrian phase would be more daunting, especially the more vulnerable in society such as children and the elderly. Local people are dissuaded from making journeys on foot, which will involve crossing the Knock Road. This may affect 'neighbourhood' lifestyle and may result in residents using cars where once they used to walk. This will also apply to cyclists where there would be limited provision for shared cyclist facilities.

#### Option B

The increase in carriageway crossing distance due to an additional turning lane should not be significantly detrimental to pedestrian trip times. This widening of the exiting road to a 4 lane single carriageway with right turning facilities will increase the capacity of the A55. The widening of the road may have a slightly adverse effect on the more vulnerable members of society such as children or the elderly, who may find crossing the road slightly more daunting. However the provision of safety features such as traffic islands at crossing points will mitigate this risk making people feel safer when crossing. This in turn will not dissuade people from making journeys that cross the Knock Road thus mitigating possible pedestrian severance issues.

#### Option C

Crossing points will remain in place at Sandown Road, Shandon Park and King's Road, although the pedestrian crossing outside the PSNI HQ would be moved to a major new junction at Cherryvalley. This however, is not envisaged to cause any trip diversion. The increase in kerb to kerb width from the existing conditions could be quite dramatic, with some locations increasing by over 30 metres.

The upgrading of the existing road to a dual-carriageway would undoubtedly create physical and psychological barriers. The increased speed limit from 30mph to 40mph and the overall carriageway width would be the main factors on this stretch of A55 where residential properties are in close proximity. Due to a proposed service road on the north side of the Knock Road, Option C would have differing effects on pedestrians on the north and south sides of the road. The presence of a service road on the north side would provide a 'buffer' from the noise pollution, air pollution and any perceived danger. As for pedestrians on the south side, the relatively close proximity of a dual carriageway would have a detrimental effect on the noise and air pollution as well as increasing perceived dangers of walking on the footway. This may be alleviated by wider footpaths, but only to a small degree. For Option C, significant widening of the Knock Road as well as an increased speed limit may dissuade certain people from crossing on foot, due to the perceived danger of multiple lanes and fast moving vehicles. In saying that, pedestrians and residents on the north side of the road may enjoy greater social freedom with their immediate neighbours due to the removed nature of the main carriageways.

#### Option D

Any severance experienced in Option D would be similar to that experienced in Option B. The only exception would be that footpaths on the north side of the Knock Road would be wider in Option D than in B. Although this is only a difference of 0.5m it is still considered to reduce the impact of increased noise and air pollution for pedestrians at that point as well as facilitating a reduction in perceived danger.

### ***Environmental Issues***

5.18 This section is intended to provide you with a background on the key environmental points within each sub chapter when considering each option. The environmental evidence for the preferred option will be delivered by Mr Raymond Holbeach.

### ***Policy and Planning***

5.19 The options proposed are in general conformity with the policies contained in Northern Ireland Planning and Transportation Policies. The Belfast Metropolitan Area Plan (BMAP) (ref: DRD A55/7), the Belfast Metropolitan Transport Plan (BMTP) and the Regional Transport Strategy (RTS) (ref: DRD A55/5) all identify the need for the improvement of the Knock Road, *“to improve the safety and efficiency of the Outer Ring such that it can better perform its strategic function.”*

5.20 As the A55 no longer merges into a single lane, the proposed options will create a safer environment for road users. The additional lanes and turning pockets will alleviate congestion on the Knock Road, allowing right turning traffic to do so safely and lead to improved accessibility due to more freely flowing traffic along the A55.

5.21 In line with planning and transportation policy, the options also provides for sustainable and healthier modes of transport by providing improved facilities for pedestrians and cyclists who may encourage vehicle users to walk or cycle. The option will improve accessibility for cyclists as they will no longer be required to share road space with vehicular traffic. Pedestrians will also benefit from wider footpaths.

### ***Landscape and Visual Effects***

5.22 All of the route options have adverse effects in terms of landscape character and visual intrusion.

- 5.23 Option C would have the greater impact on the Parkland Landscape at Cherryvalley/old railway corridor due to the design consisting of 5 lanes of carriageway and the need for a new access road to Cherryvalley. When landscape character was used to assess the impact of the options, Options A, B, & D are preferred.
- 5.24 The options continue to use the existing A55 Knock Road. Although widening of the road would adversely affect the townscape, particularly in the short term when the demolition of buildings and removal of mature vegetation will be most noticeable, over time with careful mitigation the changes eventually would be partially reabsorbed into the landscape.

### ***Noise and Vibration***

- 5.25 Overall, all of the options will result in slight increases and decreases in noise levels at 9 locations along the proposed road when compared with the Do Nothing scenario.
- 5.26 Options B and D would cause the greatest effect on current noise levels and would impact upon the greatest number of receptors.
- 5.27 Properties on the A55 Knock Road currently experience noise associated to traffic on the A55 so, although there would be changes to noise levels at individual properties, the overall impact would not be significant.

***Air Quality***

- 5.28 The relative change in air quality would be greatest for Option C which will show a slight overall improvement in concentrations for all receptors in the free flowing traffic situations. Overall the preferred route option in terms of air quality is Option C followed by Options B, D and A.
- 5.29 Properties along the A55 Knock Road currently experience a degree (albeit within current acceptable limits) of air pollution associated with existing traffic. Concentrations are exacerbated by the intermittent flow during periods of congestion. It was anticipated that by allowing traffic to flow more freely then the options could improve air quality.

***Land Use, Agriculture and Geology***

- 5.30 With respect to residential, commercial, educational and community buildings Option C would be expected to have a greater property loss (i.e. demolition) than Option A, B and D. However a significant number of gardens would be reduced to achieve the carriageway widening required for Option D.
- 5.31 The loss of community land (development land etc.) would be significantly greater for Option C which would require additional land take. Of the other options, Option A would require the least land take compared to the other options.

***Ecology and Nature Conservation***

- 5.32 With respect to ecology and nature conversation Option A was considered to be neutral due to following an existing disturbed corridor and therefore not impacting on any areas of ecological constraint. Both Options B and D were assessed to have a slight adverse effect due to the furthering proposed width of the road while Option C performed the worse having a moderate adverse.

***Water Quality and Drainage***

5.33 Water quality and drainage would not be a significant issue in selecting a preferred option, but would be an important design issue. This has been commented on in 3.10, 4.16 – 4.21 and again further on in this proof of evidence. All options will cross the Knock River near the PSNI HQ and the Orangefield Stream at the southern limit of the scheme. All of the options would have issues of pollution control during the construction of the works.

***Disruption Due to Construction***

5.34 All of the options would cause temporary disruption to residents of the A55 Knock Road area and users of the Knock Road during the construction period, with the potential for access difficulties and disruption to utilities.

5.35 There would be traffic disruption on the A55 Knock Road and on the adjacent local road network. There would also be disruption to pedestrians, cyclists and local residents. However, these residual impacts can be minimised through the development and implementation of an effective Traffic Management Plan. Option A would potentially cause the least amount of disruption because it is the smallest scheme and would potentially take the least amount of time to construct. Conversely Option C would have the greatest amount of disruption because it is the largest scheme.

***Pedestrian, Cyclists, Equestrians and Community Effects***

5.36 Options A, B and D were considered to have the greatest adverse effect on non-motorised road users and the community. They would provide no reduction in severance. However they would improve the existing pedestrian and cycle amenity as a result of increased footpath widths.

5.37 All options would have an adverse effect on the Knock Nature Walk by increasing severance.

***Driver Stress***

- 5.38 Options B, C and D would lead to an overall reduction in driver stress. Options B and D would be the most beneficial as right turn facilities will be provided for junctions at Knockwood Park, Knockmount Park, Sandown Road/Shandon Park, Kensington Road and Cherryvalley leading to a reduction in driver stress. Direct access to Ascot Park and several dwellings being removed would decrease the number of junctions accessing the A55 Knock Road ensuring that traffic flows better and hence decreases driver stress.
- 5.39 Option A would have limited beneficial effects on driver stress due to the lack of turning provision provided. Residential accesses will remain the same which will lead to access remaining difficult during peak periods.

***Traffic and Economics***

- 5.40 Traffic modelling of the strategic effects of the scheme for the Stage 2 Scheme Assessment used the existing TRIPS Belfast Transport Model (BTM). The Department for Transport's (DfT) TUBA<sup>1</sup> (ref: DRD A55/37) and COBA (ref: DRD A55/39) programmes was utilised to carry out an indicative economic assessment of each scenario.
- 5.41 Economic analysis was carried out using methods in the DfT's Transport Appraisal Guidance.
- 5.42 Information pertaining to the modelling process and results throughout the scheme development will be provided by Mr Rodney Moffett.

---

<sup>1</sup> TUBA - Transport User Benefit Appraisal. It implements a 'willingness to pay' approach to economic appraisal for multi-modal schemes with fixed or variable demand.

## **Safety**

5.43 An objective of all new highway, public transport and non-motorised modes of transport schemes is to design and implement a safe route, with high visibility standards appropriate to the design speed, ensuring accident numbers and subsequent casualties are minimised on the new or improved route.

5.44 TAG provides structured guidance relating to the issue of safety, which is addressed under the following sub-objectives:

- Accidents

Improvements to safety for all travellers are directly related to the impact on road accidents and subsequent casualties.

- Personal Security

Personal security is related to the number of users affected within each category, i.e., road users, public transport and other users, and to changes in the level of security. Fear of crime is the key consideration.

### **Accidents**

5.45 The number of accidents, as well as numbers of injuries and their severity, along the length of the Knock Road from the end of the dual carriageway at Knockwood Park to the King's Road over a 5-year period from 2001 until 2005, inclusive, were recorded for the Stage 2 report.

5.46 Although no fatalities occurred during that period, there have been a number of serious accidents with the majority occurring at the Cherryvalley, Ascot Park and King's Road junctions of the Knock Road.

5.47 At Ascot Park, serious injuries were primarily as a result of speeding and losing control of the vehicle, whereas at Cherryvalley and King's Road the serious injuries were a result of confusion and misjudgement arising from right turns from the Knock Road into minor roads.



- 5.48 The major source of accidents on this section of road is the junction of Knock Road and Shandon Park/Sandown Road. Although there are relatively few serious accidents at this point, the large number of minor accidents seems to be a result of confusion arising from right turns from Shandon Park/Sandown Road onto the Knock Road. Of particular note is the give way from Shandon Park onto the Knock Road, where conflicts occur with vehicles making right turns out of Sandown Road.
- 5.49 A symptomatic problem of the section of road in front of the PSNI HQ is where the road diverges from a 2-lane single carriageway to a 4-lane carriageway (travelling towards Upper Newtownards Road). As a result, two accidents have occurred during right-turn manoeuvres leaving the HQ onto the Knock Road. On two occasions traffic approaching the HQ from the Sandown Road direction has slowed to let traffic turn right from the HQ onto Knock Road. The driver assumed that this was a two-lane single carriageway, and so they could safely turn right. When they attempted to turn right, they collided with a car travelling on the outside of the slowed traffic.

### ***Visibility***

- 5.50 Under existing conditions there are between 55 and 58 occurrences of sub-standard visibility, depending on the length of the proposed option. Option A reduces that number to 23, primarily due to the introduction of wider footpaths, which enables exiting cars to have greater visibility. Options B and D reduce the number of occurrences from 58 to 19 and 12, respectively. This is due to both horizontal realignment and wider footpaths. The reason for Option D having fewer occurrences than Option B is that Option D has 5m wide footpaths on the north side, whereas Option B has 4.5m wide footpaths. Option C has the lowest occurrences of substandard visibility due to horizontal and vertical realignment and the provision of a service road on the north side of the Knock Road.
- 5.51 There are inevitably a number of accesses on the northern side of the Knock Road that would still have sub-standard visibility after any changes proposed by Options A, B or D. Alternative routes exist for residents on the northern side who do not wish to turn right out of their property.

- 5.52 It should be noted that these were merely suggestions to satisfy the fact that alternative routes are available.

***Junctions***

- 5.53 As the majority of accidents occur at minor/major junctions, the mitigation of their causes needs to be addressed in the design of the proposed options.

Option A

- 5.54 The widening of the stretch of 2-lane single carriageway to 4-lane single carriageway would help eliminate any confusion for drivers negotiating manoeuvres into and out of Knockcastle Park, Kensington Road, Cherryvalley and PSNI HQ. It would also make it easier for vehicles to pass other vehicles making turns into minor roads; however the right-turning traffic will block the outside lane of the carriageway at peak times. The banned right turn from Knock Road to Sandown Road/Shandon Park at peak times would remain in force. The formalisation of four lanes in this area will help to alleviate lane discipline problems and driver confusion.
- 5.55 The widening of the footways will increase the sight distances for individual properties and will make the manoeuvring into and out of the driveways easier. The widened footways will also help to improve the safety of cyclists and pedestrians by helping to reduce the perceived sense of danger while travelling along the road.
- 5.56 The provision of a shared surface cycleway will increase safety for cyclists on both sides of the road.

Option B

- 5.57 Option B also includes the carriageway widening to four lanes, footway widening and provision of shared cycleways, therefore the benefits discussed in Option A are similar. The creation of right-turn pockets and right-turn filters at signalised junctions will help to alleviate the problem of right-turn conflicts (from major to minor road) by:

- Removing the turning vehicles from the main carriageway, which in turn will increase capacity;
- At signalised junctions all of right-turns will be made with a filter thereby removing an element of potential hazard;
- Reducing the pressure a driver may feel when making the manoeuvre i.e. no feeling of holding up the traffic behind.

5.58 The provision of a central hatched area can increase the perceived sense of safety felt by a vehicle driver due to the segregation from oncoming traffic.

5.59 An additional safety feature in Option B is the horizontal realignment of the carriageway between Knockwood Park and Knockmount Park. The revised alignment provides slight improvements to the horizontal geometry at this location and improves sight-lines for Knockmount Park and some private entrances on the northern side of the road.

5.60 Widened footways/cycleways will help to reduce the perceived sense of danger of walking or cycling along the A55 and may indeed encourage more pedestrians and cyclists to use this stretch of road.

#### Option C

5.61 The additional safety benefits over and above Option B are as follows:

- The provision of a service road on the Northern side of the Knock Road from Knockwood Park to Cherryvalley effectively collects all residential properties and minor entrances along the Northern side. The main A55 can be accessed through two junctions, one a non-signalised junction at Knockwood Park and the other a signalised junction at Cherryvalley. This effectively removes the majority of the minor right-turn conflicts, but will increase journey times for those residents to access their properties.
- The provision of a central median effectively prevents right turns from the southern side of the carriageway, which forces residents to turn left only from private entrances and Kensington Road. This removes the right-turn

conflict; however it is likely to increase the attempts of drivers to make u-turns at junctions or inappropriate places.

- The Ascot Park Link Road would remove the Ascot Park junction from the A55 and traffic will access onto Shandon Park, thereby removing one of the more hazardous minor road junctions.

#### Option D

5.62 Option D benefits are similar to Option B but with the following additional safety features:

- The Ascot Park Link Road would remove the Ascot Park junction from the A55 and traffic will access onto Shandon Park, thereby removing one of the more hazardous minor road junctions.
- Five metre wide footways on the northern side of the scheme will allow vehicles emerging from local residences greater sight distances for on-coming traffic.
- An increase in the central median width from 3.5m to 4.5m. This would allow traffic exiting and turning right from residences on the north side of the Knock Road to make the manoeuvre in two steps.

#### **Security**

5.63 In the roads context, security includes the perception or risk of personal injury, damage to or theft of vehicles, and theft of property from individuals or vehicles. There are three locations in which security issues may arise when using roads:

- on the road itself (e.g. being attacked whilst broken down);
- in service areas, car parks, etc (e.g. vehicle damage while parked at a service station, being attacked while walking to parked car); and,
- at signals or junctions (e.g. smash and grab incident while queuing at lights).

5.64 All Options are expected to result in improvements for cyclists and pedestrians due to increased facilities.

Roads Service  
A55 Knock Road Widening Scheme

- 5.65 The perceived security at signalised junctions will be neutral, by the introduction of additional lanes. There is a proposed additional junction in Option C at Cherryvalley, however this is located adjacent to the PSNI HQ and is unlikely to make drivers feel at risk.
- 5.66 It is anticipated that, in respect to landscaping, all areas will have clear sight lines with no concealed areas and will be clearly visible from a distance. In respect to lighting and visibility, all areas will be well lit and not obscured from view.

## **6 PREFERRED OPTION**

- 6.1 An assessment of the options were undertaken in accordance with the Government's five criteria of safety, environment, economy, accessibility and integration.
- 6.2 After full consideration of the findings of the public consultation and Stage 2 Assessment, the project team recommended the Preferred Option to be Option D.
- 6.3 The main objectives of the A55 Knock Road widening scheme are:
- to improve road safety by providing facilities for turning traffic at junctions;
  - to reduce traffic congestion for strategic traffic by providing more capacity along the road;
  - to provide a more consistent standard of carriageway appropriate to the Outer Ring Road as part of the strategic road network;
  - to improve the air quality by reducing the amount of congestion;
  - to minimise the impact on the natural and built environment.
- 6.4 Although it did not have the lowest estimated cost of the four options, Option D did however have a positive net present value, less impact on residential property and less severance than the full dual carriageway improvement. Option C performed poorly economically.
- 6.5 Boundary works would lie outside the corridor. Changes in level would generally be accommodated by retaining walls and/or side slopes to minimise land take from adjacent properties. With the exception of the road adjacent to Marie Curie, between Shandon Park and Kensington Road it was decided to employ the use of a low retaining wall and 1:2 landscaped slopes to soften the visual impact of the scheme. Due to its proximity to the road, the curtilage of the Marie Curie Hospice building will be retained by a 3m wall (see Artists Impression).
- 6.6 The proposed layout would prevent right-turning movements in and out of properties approximately 130m south of Shandon Park junction and 80m north of the junction.

***Preferred Option Announcement***

- 6.1 The project team recommended the Preferred Option to the Roads Service Board on 7<sup>th</sup> February 2007 and the recommendation was ratified. The decision was made public by the Minister for Regional Development in May 2007.

***Residents Association Options Report***

- 6.2 Following the announcement of the Preferred Option the Department received a number of suggested alternatives proposals from the Residents Association of Cherryvalley, Kensington and Shandon (RACKS). These were assessed against the Stage 2 Preferred Option with each Option being scored using key criteria as set out in the Department for Transport's Transport Analysis Guidelines (TAG) and the Design Manual for Roads and Bridges (DMRB) TD 37/93 Scheme Assessment Reporting.
- 6.3 Whilst none of the residents' association proposals scored favourably in this appraisal, there were elements that were taken onboard by the Department (e.g. traffic calming in the area).
- 6.4 The findings of these assessments are contained within the Residents Association Options Report (ref: DRD A55/24).

## **7 DEVELOPMENT OF THE SCHEME SINCE PREFERRED OPTION**

### ***Engineering Design Development***

- 7.1 The Preferred Option for the Scheme was specified in the Stage 2 Scheme Assessment Report (ref: DRD A55/22) and illustrated in Figure 400445-SK-035 of that report. We coordinated the development of that proposal in sufficient detail to enable an Environmental Impact Assessment (ref: DRD A55/16) to be completed, for a Direction Order (ref: DRD A55/12) to be prepared and to define additional land that will be vested for the scheme (ref: DRD A55/13).
- 7.2 However, a more precise horizontal and vertical alignment of the road is to be refined in accordance with standards and guidelines in the Design Manual for Roads and Bridges (DMRB). Similarly the layout of the Shandon Park/Sandown Road junction with the Knock Road was also developed in accordance with the DMRB.
- 7.3 Once elements of the design were established, they were checked against the standards of the DMRB, or against any guideline that was relevant (for example Development Control Advise Note DCAN 15 (ref: DRD A55/19) or Creating Places (ref: DRD A55/18)). Road designs are a balance of safety (in accordance with the design standards), impact on the environment and cost. Where the design did not comply with aspects of the standards, then Departures from Standard were sought from Roads Service Headquarters, in accordance with Roads Service procedures.

### ***Assessment of Compliance with Engineering Standards***

- 7.4 The alignment was optimised as far as possible to follow the existing carriageway alignment and consequently will result in minimum disruption to adjacent properties and have least cost and social implications.
- 7.5 Alterations required to make the vertical alignment at the crest of the hill south of Ascot Park conform to standards would present serious engineering



economic & environmental issues. This is primarily due to the close proximity of existing residential development and public road which would have a detrimental affect on numerous residential properties adjacent to this section of the road and would involve substantial additional expense in accommodation works.

- 7.6 The horizontal and vertical alignments throughout the scheme were designed to follow the existing carriageway as closely as possible. This is to ensure no land take along the northern side of the of the scheme minimising disturbance to the adjacent properties. The proposed new layout will ensure a substantial improvement on the existing sightlines to properties.
- 7.7 The alignment connects two side roads across a slightly staggered signalised junction, resulting in a reverse curve alignment which closely follows the existing layout. There is little or no scope to improve the layout of the junction as there is significant residential development on all approaches to the junction.
- 7.8 Application to relaxations an departures relating to the above geometric information have been approved by Roads Service Headquarters.

#### ***TD 19/93 Road Safety Audit***

- 7.9 In accordance with the requirements of TD19/93 of the DMRB, a road safety audit of the proposed scheme was carried out by an independent team. They formally presented their findings in the audit report Stage 1 Road Safety Audit December 2007 (ref DRD A55/23). The design team considered the audit recommendations and in accordance with DMRB prepared a response to those recommendations not accepted. This Exception report was subsequently approved by Roads Service and has been submitted to the Auditor for review.

#### ***New Junctions***

- 7.10 Ten junctions and 46 private accesses are to be amended and improved as part of the Scheme. The junctions at Knockwood Park, Knockmount Park,

Ascot Park, Knockvale Park, Kingsden Park, Knockcastle Park, Kensington Road, Cherryvalley, and at the PSNI Headquarters are presently simple priority (T) junctions and are considered to have similar characteristics: close proximity to residential properties in an urban setting.

- 7.11 The Preferred Option will provide a hatched central reserve to accommodate right turning vehicles, thereby improving safety for right turning vehicles at 9 of the 10 junctions. The Preferred Option introduces splitter islands either side of the Knock Road/Sandown Road junction and therefore prevents right-turning movements in and out of properties either side of the junction. .
- 7.12 We concede that there will be restrictions to some properties, namely those either side of the Knock Road/Sandown Road junction which will add time and distance to their journeys. Alternative routes have been investigated for those affected and deemed to be reasonable.

***Access arrangements - Kingsden and Ascot Link***

- 7.13 There will be two service roads constructed on the southern side of Knock Road. One service road will be constructed from Shandon Park serving Ascot Park and Ascot Gardens. Another service road will be constructed from the Knock Road to serve Nos. 60-68 Knock Road as well as 1-1a Kingsden Park and adjacent lands.
- 7.14 Ascot Link Road would remove the Ascot Park/A55 junction, thereby removing one of the more hazardous minor road junctions. Motorists wishing to make a right turn out of Ascot Park onto the Knock Road have poor visibility over the steep hill at Knockmount Park.
- 7.15 One of the key design objectives of the A55 Knock Road widening scheme was to minimise the number of accesses onto the trunk road to enhance the safety of access to properties for residents living on the Knock Road between Shandon Park and Kensington Road. Currently, these dwellings have substandard accesses with poor visibility. The construction of the Scheme would affect these accesses further by increasing their gradients beyond recommended levels in DMRB.
- 7.16 As part of the on-going design process, numerous options for the alternative access arrangements were considered, appraised and costed.
- 7.17 In November 2009 we produced the Access and Central Median Appraisal Report (ref: DRD A55/25) which assessed the three option's advantages, disadvantages and associated costs. During this time consultation with the affected residents and landowners was carried out.
- 7.18 After further junction assessment and consultation with the affected residents and landowners, an access road exiting directly onto Knock Road was put forward as a preferred option. This option would facilitate access to all the properties on the southern side (existing and future) between Shandon Park and Kensington Road. The access would join with the A55 on Roads Service land next to Marie Curie before traversing down and terminating at Kingsden Park. This option has moved the access as much as possible onto land already purchased by Roads Service.

***Banning Right Turn Manoeuvre at Knockwood Park***

- 7.19 Currently the central median at the Knockwood Park junction is 2.3m wide. A banned u-turn currently is in place. Right turning traffic out of Clarawood has difficulty crossing four lanes. A two stage manoeuvre is often required which leaves traffic in the narrow central area partially exposed to oncoming traffic.
- 7.20 Amey has observed and collected photographic and video evidence of the dangerous methods employed by some road users to perform a U-turn within the mouth of the junction.
- 7.21 It was deemed that banning the right turn out, which accounts for 20% of the total junction movements would significantly improved safety at this location as it removed this right turning conflict associated with the Clarawood Estate.
- 7.22 Although this option affects the level of accessibility for the residents of Clarawood Estate consultation with local community groups have supported this proposal. This proposal leaves the local bus service unaffected. Alternative routes journey times and distances were investigated as part of the decision process and can be found in the Access Option and Median Appraisal Report (ref DRD A55/25).

***Traffic and Economic Assessment***

- 7.23 The development of the scheme from the Preferred Option was undertaken whilst retaining the requirement that the scheme must be economically sound. Having reviewed the cost estimate to the value given above, the economic value of the Scheme was re-appraised. The COBA appraisal, described in Rodney Moffett's evidence, shows a positive net present value of £23.3M and a benefit to cost ratio of 2.2. We are satisfied therefore that the Scheme has positive financial benefits and is value for money over the 60 year assessment period.

***Environmental Assessment***

7.24 The development of the scheme from the Preferred Option was undertaken in conjunction with sub consultants who were carrying out an environmental assessment of the scheme in accordance with DMRB Vol. 11: Environmental Assessment. The findings of the assessment, published in November 2009 as the Environmental Statement (ref: DRD A55/16), and the commitments made by Roads Service to mitigate the environmental impacts are included in Mr Raymond Holbeach's evidence.

***What remains to be done***

7.25 In the event of the Scheme proceeding to implementation, further detailed work will be necessary. This would include the detailed design of the road drainage system, the diversion and protection of utilities' apparatus, and the design of retaining walls and culverts with application for various formal approvals as appropriate.

7.26 The findings of the Public Inquiry would be considered and changes made to the scheme as appropriate. The commitments of the Environmental Statement shall be incorporated into the Scheme. Discussions will take place in order to resolve all accommodation works where possible, to all parties' satisfaction. Finally, prior to construction, a detailed construction phase plan will be developed, taking cognisance of accommodation work negotiations, to ensure that the impact of the widening scheme will be kept at an acceptable level.

## **8 SUMMARY**

- 8.1 The A55 Knock Road scheme has been developed through the relevant stages in accordance with the Design Manual for Roads and Bridges (DMRB) and the Department for Transport's Transport Analysis Guidance (TAG). It also follows prescribed procedures set out in Roads Service Policy & Procedure Guide (RSPPG) E030.

The assessment of the scheme has been undertaken by carefully taking all considerations into account under the prescribed framework for transportation projects. We believe that the preferred option is the best solution to the existing problems encountered along this stretch of the A55 and will achieve the objectives of the scheme in accordance with Roads Service strategy.