

Junctions 10 to 13 Improvement | **M1**

Junctions 11 and 12

Scheme Assessment Report - November 2009



Managed Motorways



M1 Junctions 10 to 13 Improvement Junctions 11 and 12

Scheme Assessment Report

Report No: D123846/6/08

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1. EXECUTIVE SUMMARY

- 1.1 In January 2006 the Secretary of State for Transport announced the Preferred Route for the improvement of the M1 Motorway between Junction 10 and 13. The announcement confirmed that the improvement would consist of widening the motorway to 4 lanes in each direction and associated improvements to Junction 11 and 12. Draft orders for these improvements were published in March 2007.
- 1.2 Following the successful trial of Hard Shoulder Running on the M42 motorway, in 2008, the Highways Agency carried out a study to determine whether the implementation of Hard Shoulder Running techniques would be an alternative means of increasing the capacity of the M1 Motorway between Junctions 10 and 13.
- 1.3 The study confirmed that Hard Shoulder Running could be implemented to reduce congestion and improve journey time reliability. In January 2009, the Secretary of State announced that the M1 between Junctions 10 and 13 would be improved using Hard Shoulder Running (HSR). The draft Orders for the widening scheme were subsequently withdrawn on 19th March 2009.
- 1.4 Options were examined for improvement to Junctions 11 and 12 to maximise the benefits of HSR by preventing queues building up over the length of the slip roads and onto the motorway. The location of Junction 11, within the urban area of Luton limited the number of practicable options. Only one was identified that would not require land from residential properties, and this was taken forward for Public Consultation.
- 1.5 At Junction 12 more options could be considered, and six were examined. Of these six Options three were taken forward to Public Consultation, and three shown as rejected options as they would not have achieved the scheme objectives.
- 1.6 At both junctions, an option of retaining the existing layout was considered (called the Do-Nothing Option). These were rejected as they would not have achieved the scheme objectives.

Objectives

- 1.7 The transport and safety objectives of the scheme include providing a high value for money trunk road that:
 - Reduces queues and delays on the slip roads at Junctions 11 and 12.
 - Improves Road Safety by reducing congestion.
 - Makes journey times shorter and more reliable.
 - Maintains or improves facilities for pedestrians and cyclists.
 - Achieves these aims whilst minimising environmental impacts.
 - Provides value for money.

Existing Conditions

Junction 11

- 1.8 Junction 11 is situated in a built up area, with surrounding buildings acting as a major constraint on any changes to its layout. Close to the junction are located Luton and Dunstable Hospital, Challney Schools and commercial and residential property.
- 1.9 The Junction consists of a roundabout passing through 2 bridges under the existing M1 motorway. Some of the approaches to the junction are traffic signal controlled, but there are currently no controlled crossing facilities for Non Motorised Users (NMUs) including pedestrians, cyclists and horse riders, although paved footways are provided.

Junction 12

- 1.10 Junction 12 is situated in a rural area between the villages of Toddington and Harlington, with isolated properties in the immediate vicinity.
- 1.11 The Junction consists of four slip roads connecting the motorway to the A5120 Harlington Road. Traffic signals control movements between the slip roads and the A5120. A single bridge carries the A5120 over the motorway.
- 1.12 The distance between the junction and the Toddington Motorway Services Area (MSA) is shorter than recommended for traffic to make lane changes.

Improvement Schemes

Junction 11

- 1.13 The form of Junction 11 would remain largely as existing but would become fully signalised and enlarged.
- 1.14 Localised widening of the roundabout and A505 Dunstable Road is required. The junction would be fully signal controlled and would incorporate controlled pedestrian crossing facilities across slip roads.
- 1.15 This proposal would require land acquisition to widen the northbound exit slip road. This would affect a commercial property, currently operating as a paper mill. All other areas of improvement would be achieved within highway land.

Junction 12

- 1.16 Three half cloverleaf layouts were developed to address the issue of substandard weaving between the MSA and Junction 12.
- 1.17 The geometry of the proposed layouts has been designed to the Highways Agency's Standards and Advice Notes. A number of Geometric Departures from Standard have been identified and preliminary discussions have been held with the Highways Agency.

Alternative schemes

- 1.18 A Do-Nothing option was investigated for Junction 11 but this would result in unacceptable queuing on the A505 or slip roads and this option was abandoned.
- 1.19 A Do-Nothing option was also investigated for Junction 12 but this would result in unacceptable queuing on the A5120 or slip roads and this option was abandoned.
- 1.20 Three versions of a Diamond Layout were considered at Junction 12; they were all rejected on safety grounds or cost grounds.
- 1.21 Three versions of a half cloverleaf layout at Junction 12 were taken to the Public Consultation.

Traffic and economics

- 1.22 Traffic analysis shows that Junctions 11 and 12 currently experience significant congestion; particularly at peak travel times. This results in traffic queuing on the slip roads, which will extend onto the M1 as traffic volumes increase. It is essential that this is removed to allow hard shoulder running to operate safely and effectively on the M1.
- 1.23 Junction 11 is used by many pedestrians including school children. Dedicated crossing phases will be included in the new traffic signals on the motorway slip roads, circulatory carriageway and A505.
- 1.24 The economic appraisal results indicate that the proposed junction improvements would provide good value for money on their own as a separate scheme independent of the HSR improvements.

Environmental

- 1.25 An environmental assessment has been carried out and summarised in an Environmental Summary Appraisal.

Air Quality

- 1.26 It is considered unlikely that the proposed changes to the layout of Junction 11 would have a significant effect on air quality at sensitive receptors close to the junction.
- 1.27 At Junction 12, the half cloverleaf layouts are considered likely to have slight adverse effects in terms of overall air quality.

Noise

- 1.28 There is a large number of sensitive receptors in the study area around Junction 11. A significant number of these are very close to the motorway and the slip roads. Overall, any change in noise levels as a result of the Scheme at J11 is considered likely to be negligible.
- 1.29 Noise levels at the few properties in the vicinity of Junction 12 are dominated by road traffic on the motorway, not on the junction, due to the relatively large

distances from the motorway. Any changes in noise levels at these properties are likely to be negligible.

Landscape

- 1.30 During construction of Junction 11 impacts on townscape character would be of moderate significance, declining to slight adverse significance at opening and slight beneficial significance at Year 15. During construction, adverse visual impact would be of medium magnitude decreasing to low magnitude at opening and neutral magnitude by Year 15.
- 1.31 Landscape impacts at Junction 12 would occur both through loss of existing vegetation and through landform change. Visual impacts would occur through the introduction of additional engineered landforms although mitigation planting would in time aid integration of these into the landscape. The specific extent of these impacts would vary dependant on the option selected but in all cases the effects would be slight to negligible at Year 15.
- 1.32 There are no direct physical or setting impacts on any archaeological assets, historic buildings or historic landscape receptors associated with the Junction 11 improvement works. There would be slight adverse effects on known archaeological remains of low and medium value located within the area of new land-take surrounding Junction 12.

Ecology

- 1.33 The potential effect on ecology and nature conservation as a result of the improvements to Junctions 11 and 12 is considered to be slight adverse

Water Quality

- 1.34 The overall effect on water quality and hydrology of receiving ditches and watercourses, with mitigation in place, would be anticipated to be neutral.

Land Use

- 1.35 Land-take would be kept to a minimum at both junctions. Junction 12 would require land-take from best and most versatile agricultural land however this would be below the 20 hectares threshold for which consultation with the Defra Rural Development Service would be recommended.

Geology

- 1.36 No significant impacts on Geology and Soils are anticipated for the Scheme.

NMU and Travellers

- 1.37 The Scheme should not result in significant adverse effects on Non-motorised Users (NMUs) or on community facilities.
- 1.38 The Scheme would have a slight beneficial effect on travellers' views at Junction 11 and a slight adverse effect on travellers' views at Junction 12. All options would have a beneficial effect on driver stress.

Public Consultation

- 1.39 The Public Consultation for the Junction Improvement Scheme began on Thursday 25th June 2009 and lasted for 13 weeks, ending on Thursday 24th September 2009.
- 1.40 A total of 378 people visited the exhibitions. A total of 104 questionnaires were returned. The responses were also received via 9 comments from the exhibitions, 13 letters, 46 emails and 16 from the Highways Agency website. A total of 105 exit surveys were collected. The vast majority of respondents were from the local community.
- 1.41 A majority of respondents supported the proposed improvement to Junction 11.
- 1.42 Of the three options presented for Junction 12, the Orange option was the most popular preference.
- 1.43 It is recommended that, as design of this scheme progresses, due consideration is given to the comments and concerns raised during the Public Consultation Period.

Conclusion

- 1.44 The proposed solution of an enlarged roundabout with traffic signals at Junction 11 satisfies all the technical requirements and scheme objectives. It also received strong support amongst the respondents at the Public Consultation.
- 1.45 Of the three options offered for improvement of Junction 12, the Orange Option satisfies all the technical requirements and scheme objectives. It would have the least environmental impact and offers the best value for money. It was also the most popular option amongst the respondents at the Public Consultation.

2. INTRODUCTION

- 2.1 The M1 Motorway is a strategic route in England, linking London with the Midlands and the North.
- 2.2 The three-lane section of the M1 between Junction 10 and Junction 13 currently carries between 115,000 and 140,000 vehicles per day with a high proportion of heavy goods vehicles. It is heavily congested, particularly at peak times. Roadworks and incidents cause further delays, increasing the risk of collisions.
- 2.3 In February 2003 the London to South Midlands Multi-Modal Study recommended that the M1 should be widened to four lanes between Junctions 6A and Junction 13. In July 2003 the Secretary of State confirmed that a proposal to widen the M1 between Junctions 10 and 13 had been added to the Highways Agency's Targeted Programme of Improvements.
- 2.4 On the 20th September 2005, the Costain Mowlem Joint Venture (CMJV) was awarded the contract to develop the project under a full Early Contractor Involvement (ECI) commission. Scott Wilson was appointed by CMJV as their Designer. Subsequently Carillion acquired Mowlem and the joint venture was rebranded Costain Carillion Joint Venture (CCJV). Parsons Brinckerhoff are the Highways Agency's Supervisor
- 2.5 The scheme was to widen the existing M1 between Junctions 10 and 13 from three to four lanes in each direction to provide additional capacity and reduce congestion. It also included proposals to reduce congestion at Junctions 11 and 12 and measures were included to improve the road layout between Junction 12 and the Motorway Service Area (MSA) at Toddington, to facilitate manoeuvres for traffic using the Junction or MSA.
- 2.6 There were also proposals to construct a new Junction 11A on the M1 as part of a separate scheme, known as the A5-M1 Link (Dunstable Northern Bypass). For brevity this scheme is referred to as the A5-M1 Link. This scheme is currently being taken forward through statutory processes.
- 2.7 The Preferred Route Announcement for the M1 Widening Scheme was published on 12th January 2006 and draft Orders and Environmental Statement were published in March 2007. Subject to the completion of Statutory Procedures, construction was anticipated to start in November 2008, with the works programmed to be completed by the end of 2011.
- 2.8 Following the successful trial of Managed Motorway methods, including Hard Shoulder Running (HSR) on the M42, in April 2008, the Highways Agency (HA) carried out a study to determine whether the implementation of HSR techniques would be an appropriate solution for increasing the capacity of the M1 Motorway between Junctions 10 and 13. HSR allows traffic to use the hard shoulder as a running lane during periods of congestion.
- 2.9 The study confirmed that HSR could be implemented to reduce congestion and improve the reliability of journey times.

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- 2.10 In January 2009, the Secretary of State announced that the M1 between Junctions 10 and 13 would be improved using HSR. The draft Orders for the widening scheme were subsequently withdrawn on 19th March 2009.
- 2.11 The HSR Improvements on the motorway between Junctions 10 and 13 will be carried out within existing motorway land and can progress independently of improvements to Junctions 11 and 12. Construction of the HSR Improvements is expected to start by the end of 2009.
- 2.12 Options for improvements to Junctions 11 and 12 have been studied and presented to the public for comment in a Public Consultation. The results of the study and the views of the respondents to the consultation are presented in Technical Appraisal Report (No. D123846/6/02) and Public Consultation Report (No. D123846/6/04) respectively.
- 2.13 For clarity, the options considered and the engineering and environmental assessments at each junction are described in separate sections of this report. Traffic and economics matters are described for both junctions combined as, if approved by the Secretary of State, the improvements would be taken forward as a single scheme.
- 2.14 This report summarises the results of the study and the Public Consultation and recommends preferred solutions for improvements at each junction.

3. THE PROBLEM TO BE SOLVED

- 3.1 M1 Junction 11 is a two level junction located in the urban area within Luton, where the motorway passes over a roundabout on the A505 Dunstable Road. Four slip roads connect the roundabout to the motorway, and traffic signals control traffic movements on some approaches to the roundabout.

There is frequent congestion at the junction with queuing on the slip roads and the A505 approaches to the roundabout. As traffic volumes are forecast to increase in the future, the queuing will become worse and extend back on the motorway. To prevent this happening, improvements to the slip roads and roundabout are needed.

- 3.2 M1 Junction 12 is located in the rural area, 1.4km to the north of the Toddington MSA, where the motorway passes under the A5120 Harlington Road. Four slip roads connect the motorway with the A5120, and traffic signals operate at all times to control traffic movements between the slip roads and the A5120.

There is frequent congestion at the junction with queuing on the slip roads and the A5120 approaches to the junction. As traffic volumes are forecast to increase in the future the queuing will become worse and extend back on the motorway. To prevent this happening, improvements to the slip roads and the A5120 are needed.

- 3.3 Options for improvements to Junctions 11 and 12 have been studied and presented to the public for comment in a Public Consultation. The results of the study and the views of the respondents to the consultation are presented in Technical Appraisal Report (No. D123846/6/02) and Public Consultation Report (No. D123846/6/04) respectively.

- 3.4 The improvements required at Junctions 11 and 12 would be taken forward as a single scheme. The junction improvements are compatible with the planned A5-M1 Link Road, and also with the HSR Improvements, which are soon to start.

4. EXISTING CONDITIONS

4.1 Description of Area

- 4.1.1 The M1 Motorway in this area was originally built in the late 1950s. Between Junction 10 and 13 is approximately 24km in length and lies about 45km to north-west of the centre of London.
- 4.1.2 At its southern end, the motorway passes between the urban areas of Luton and Dunstable. Further north, the motorway passes through a mainly agricultural area, and is relatively close to a number of towns with large commuter populations including Milton Keynes, Bedford and Northampton.
- 4.1.3 The area and proposed schemes are shown on drawing D123846/GD/DEV/00.030 in Appendix 1.

4.2 Existing highway network

M1 Motorway

- 4.2.1 Between Junction 10 and 13, the M1 motorway has 3 traffic lanes and a hardshoulder in each direction. It is a designated Heavy Load Route, but not a designated High Load Route. There is a scheme to improve the M1 between Junctions 10 and Junctions 13 by implementing Hard Shoulder Running (HSR). Construction is expected to commence in December 2009.
- 4.2.2 Junction 10 is located at the northern end of the section of motorway that was recently widened to four lanes in each direction. Luton Airport is located close to Junction 10.
- 4.2.3 Junction 11 is located at the crossing of the A505 Dunstable Road, 5.4km north of Junction 10 in the urban area between Luton and Dunstable. There are school, residential and industrial properties adjacent to the motorway boundary. The existing junction is shown on drawing D123846/GD/DEV/00.001 in Appendix 2.
- 4.2.4 Junction 12 is located near Toddington, and is 1.4km north of Toddington Motorway Service Area. The existing junction is shown on drawing D123846/GD/DEV/00.002 in Appendix 2.
- 4.2.5 Junction 13 is 10.5km north of Junction 12, at the crossing of the A421 trunk road. An improvement scheme for the A421 is currently under construction, which includes an enlarged Junction 13.
- 4.2.6 This section of road falls within the Highways Agency's Area 8, which is maintained by the Managing Agent Contractor (MAC) Carillion-WSP.
- 4.2.7 The Junctions also lie within the following local government administrative areas:
- Central Bedfordshire Council (CBC)
 - Luton Borough Council (LBC)

Adjacent Schemes

- 4.2.8 The M1 Widening Junction 6A to Junction 10 scheme was constructed between 2006 and 2008. The M1 between Junction 6a and Junction 10 is now dual 4-lane motorway standard. The layout of Junction 10 was upgraded as a part of this scheme.
- 4.2.9 The A1081 Airport Way is a new dual carriageway to the south of Luton that was opened to traffic in December 2008. The road links the M1 at Junction 10, 10A and Luton Airport.
- 4.2.10 The A421 M1 Junction 13 to Bedford Improvement Scheme commenced construction in early 2009. M1 Junction 13 is being upgraded as part of this scheme.
- 4.2.11 The A421 Improvement between Junction 13 and Milton Keynes is a Regional Scheme to improve the southeast approach to Milton Keynes from the M1 motorway. It is unlikely to be constructed before 2016.
- 4.2.12 The A5-M1 Link is a Regional Scheme which is currently being progressed through statutory processes, and would include a new Junction 11A on the motorway to the north of Luton. The scheme is reliant on the capacity of the motorway being improved to the south of Junction 11A due to the additional traffic that the link would transfer to the motorway.
- 4.2.13 The Luton Northern Bypass is another Regional Scheme being taken forward by Luton Borough Council that would connect to Junction 11A. At present there is no definite programme for the project, but the Highways Agency has given an undertaking that the layout of Junction 11A would not preclude a connection of the Luton Northern Bypass.
- 4.2.14 Woodside Connection is a Regional Scheme being promoted through the Local Development Framework. The Preferred Route for the scheme would provide a new link between Dunstable and Junction 11A, bypassing Houghton Regis.
- 4.2.15 All of the road schemes listed above have the potential to increase the amount of traffic arriving at Junction 11 and Junction 12.
- 4.2.16 The Luton Dunstable Guided Busway (formerly known as Translink) has been through its statutory processes and received Department for Transport conditional approval. Construction is currently programmed between late 2009 and 2012. The Busway would cross the motorway at the location of the existing disused railway bridge to the south of Junction 11. The existing bridge is currently owned by BRB (Residuary) Ltd.

5. PLANNING BRIEF

5.1 The Client Scheme Requirements for the HSR Improvements and the Junctions Improvements schemes were approved on 14 August 2009 and include:

Overall Objectives

- To deliver capacity improvement through dynamic use of the hard shoulder and managed motorway technology.
- The project shall provide high value for money against its actual total outturn cost over its appraisal life.
- Current design standards should be adhered to unless there is an economic case for a departure. Any relaxation or departure from standard will need to be justified by the project team. Approval will need to be sought and gained before any relaxation or departure can be designed into the scheme.

Transport and Safety

- The scheme shall reduce the number of times, measured monthly, that there is queuing traffic on the motorway.
- The scheme shall improve journey time reliability on the M1 between junctions 10 -13 for both south bound and north bound traffic.
- The scheme shall reduce the number of fatalities, casualties and incidents on the M1 between junctions 10-13, per vehicle kilometre.
- The scheme shall reduce congestion / queuing at Junctions 11 and 12.
- The safety of the improved scheme, for both motorists and maintainers, shall be As Low As reasonably Practicable (ALARP).
- Unless otherwise stated, all objectives shall be compared against the “do nothing” baseline set for economic appraisal of the scheme.

Environment

- The detrimental environmental effects of the scheme should be offset by mitigation efforts where technically feasible and economic to do so.
- No worsening of air quality for residents in the air quality management area in Luton and no exceedance of EU air quality limit values.

Accessibility

- The scheme should not worsen the severance of local thoroughfares for non-motorised users.

Integration

- The scheme should support local and regional development plans and government policy.

Interfaces

- Ensure that the scheme takes into account the planned A5 – M1 Link project, the Luton guided busway (local authority scheme) and the A421 project.
- Allow for the proposed new Junction 11a (A5-M1 Link Road) to be built concurrently with M1 Junctions 10-13.

Other Objectives

- Take account of PSA Journey Time Reliability Targets in the design and during the project works.
- Provide Managed Motorway infrastructure.

5.2 In addition, the following targets for the Junctions Improvements were described in the Public Consultation leaflet issued in June 2009:

- Reduces queues and delays on the slip roads at Junctions 11 and 12.
- Improves Road Safety by reducing congestion.
- Makes journey times shorter and more reliable.
- Maintains or improves facilities for pedestrians and cyclists.
- Achieves these aims whilst minimising environmental impacts.
- Provides value for money.

6. JUNCTION 11

6.1 Layout

- 6.1.1 Junction 11 is situated in a built up area, with surrounding buildings acting as a major constraint on any proposed re-design. Close to the junction are Luton and Dunstable Hospital, Challney School as well as commercial and residential property. Between Junctions 10 and 11 the motorway provides the Emergency Route between Luton Airport and Luton & Dunstable Hospital.
- 6.1.2 The existing Junction 11 layout is shown on D123846/GD/DEV/00.001 contained in Appendix 2. It consists of a roundabout passing under the motorway, which connects the motorway to the A505 Dunstable Road, one of the main east-west routes between Luton and Dunstable.
- 6.1.3 It is partially traffic signal controlled, with signals situated at the ends of both the northbound and southbound exit slip roads, and on the circulatory carriageways approaching those slip roads.
- 6.1.4 Despite the junction being located in an urban area, there are currently no controlled crossing facilities for Non Motorised Users (NMUs), although paved footways are provided.

Drainage

- 6.1.5 The Junction is situated within the main river catchment area of the River Lea.
- 6.1.6 In some areas groundwater (water below the soil surface in the saturation zone) is particularly vulnerable. Junction 11 is located within both Total Catchment and Outer Ground Water Source Protection Zones (SPZs), which are associated with the Upper Lea catchment chalk strata. Leagrave Stream is also within the Total Catchment SPZ.
- 6.1.7 The existing surface water drainage from the motorway discharges by gravity to adjacent outfalls. No attenuation or mitigation measures were provided. There were no purpose-built facilities to mitigate the effects of either the rate of surface water runoff or pollution from the existing motorway when it was first constructed, although some spillage containment measures have since been added.
- 6.1.8 The highway discharge from the Junction is collected by a positive drainage system consisting of kerbs with gullies.
- 6.1.9 A survey of drainage in the vicinity of J11 was carried out by CCJV in 2008. The survey confirmed the poor condition of the drainage network with many pipes having a reduction in diameter due to a build-up of debris, and in many cases the survey had to be abandoned due to blockages in the pipe or the inability to locate chambers.

Structures

- 6.1.10 At Junction 11, there are 2 bridges which carry the motorway over the A505 roundabout. There are also large retaining walls supporting the motorway slopes on the south side of the junction.
- 6.1.11 The structures would not be affected by the options considered for the junction improvements.

Earthworks

- 6.1.12 The cutting and embankment slopes at Junction 11 of the existing M1 are in fair condition.

Public Utilities

- 6.1.13 Statutory Undertakers Plant that passes through Junction 11 includes:

- a 150mm water main;
- three 11kv underground power lines;
- underground telecommunications cables;
- storm and foul sewers;
- fibre optic cable; and
- gas pipelines (2 x 150mm low pressure).

6.2 Traffic

Surveys

- 6.2.1 The traffic surveys, including manual classified counts, 2-weeks of automatic counter records and single-day queue-length surveys were collected on 1st or 2nd July 2009. Traffic data was collected at both Junction 11 and Junction 12.
- 6.2.2 The queue-length surveys indicated queues forming on the approach to the Junction 11 roundabout, in both the AM and PM periods, on all approaches. On the M1 exit slip roads, queue lengths were observed to exceed 100 metres at times. On the A505 east, queue lengths in excess of 160 metres were observed; and on A505 west queue lengths exceeded 300 metres.
- 6.2.3 Observations of non-motorised user (NMU) movements were also made on the same day as the traffic surveys at both Junctions 11 and 12. These observations were made on a weekday during the school summer term. Further NMU surveys were undertaken on a Sunday in August during the school holidays.
- 6.2.4 The July 2009 weekday survey counted a total of 959 NMU movements at Junction 11, of which 132 were cyclists, over the 12-hour period (0700-1900). This is more than the 601 NMU movements, of which 71 were cyclists, observed on a weekday during a similar survey in July 2006.
- 6.2.5 At Junction 11 there are traffic counter sites on the A505 on both the east and west side of the motorway. In May 2004 these counters recorded two-way flows on the A505 (west) of 37,000 vehicles per day. The daily flows on the east side of Junction 11, recorded in May 2004, were 36,000 vehicles per day (AADT).

- 6.2.6 There is frequently heavy congestion and queuing on the slip roads and A505, particularly at peak times.

Motorway Traffic

- 6.2.7 The M1 motorway is a very heavily used strategic route linking London with the Midlands and the North. Between Junctions 10 and 13, the volume of flow over the 12-hour day between 0700 and 1900 has a flat profile; the morning and evening peaks are not as pronounced as a typical motorway.
- 6.2.8 The existing M1 motorway between Junction 11 and 12 carried 130,800 vehicles annual average daily traffic (AADT) in 2005. Flows on the M1 dropped over the period 2006 to 2008, most likely because of widening works on the M1 between J6a and J10. However in 2009 the flows appear to have returned to their former 2005 levels. By 2014, two-way AADT flows on the motorway (J11 to J12) are forecast to increase to 187,600 vehicles, and by 2029 to 219,800 vehicles, including the A5-M1 Link Road.
- 6.2.9 An exceptional feature of the traffic flows on this section of the M1 motorway is the proportion of heavy goods vehicles that are carried. A manual classified traffic count over a 24-hour weekday period in April 2006 recorded 21% heavy vehicles.

Collisions and Safety

- 6.2.10 The M1 between Junctions 10 to 13 has an overall collision record similar to the national average. The collision rate is the number of Personal Injury Collisions (PIC) per 100 million vehicle kilometres. On the northbound carriageway over the period 2003 to 2005 the collision rate was 7.9. On the southbound carriageway the collision rate was higher at 8.3. Both are slightly less than the motorway average for this period of 9.2.
- 6.2.11 However, there have been a number of collisions due to the high volume of traffic that the motorway carries. Between Junctions 10 and 13, including the slip roads, the 513 Personal Injury Collisions (PIC) that occurred in the five years 2001 – 2005 have resulted in 877 casualties, including 148 fatal or serious injuries.
- 6.2.12 The severity index is a measure of the proportion of the PIC that contained killed and serious casualties. The severity index of 0.13 for this section of motorway is similar to the national average.
- 6.2.13 Although the M1 motorway, in terms of its PIC record, is slightly safer than a typical inter-urban motorway, there are a number of areas where the PIC record is notable.
- 6.2.14 The number of shunt type collisions between Junctions 10 and 11 are over-represented compared with the other sections of the motorway. Further analysis of the collision record revealed that a high proportion of shunts involved stationary vehicles. These problems are likely to be related to the local conditions, which include: high volumes of traffic (particularly in the peak hours when queues are observed to form), the entry slip road from Junction 11, the high percentage of HGVs combined with a 3% uphill gradient southbound and the sub-standard visibility at Junction 11.

Journey Time Reliability

- 6.2.15 Delays are exacerbated by the particularly high frequency of incidents on the section of the motorway between Junctions 10 and 11. This results in variable speeds and unreliable journey times.
- 6.2.16 The HA collates data in the form of a journey time database, which is derived from a combination of sources including automatic number plate recognition (ANPR) cameras (e.g. National Traffic Control Centre (NTCC) and Traffic Master), induction loops (e.g. Motorway Incident Detection and Automatic Signalling (MIDAS)) and other systems (e.g. Global Positioning System in vehicles). By comparing the recorded journey times against the journey times under 'free-flow' conditions, it is possible to calculate the delays being incurred on sections of the motorway throughout the year. Delay is defined as the time travelled by a vehicle compared to a situation with no other traffic on the road.
- 6.2.17 The M1 motorway between Junctions 10 and 13 experiences the largest journey delays for all the trunk roads in the East of England region (Observed Delay-Total Vehicle Hours Delay 2006).
- 6.2.18 Using the average travel times contained in the HA's journey time data base for 2005, the delays in each of three time periods AM peak (0800 to 0900), Inter-peak (1200 to 1300) and PM peak (1700 to 1800) may be computed. The following Table 6.1 presents the delays (in minutes) experienced by an average vehicle travelling one kilometre along the motorway.

Average vehicle delay to travel one kilometre, in minutes.				
Section between Junctions			Northbound	Southbound
10-11	AM peak		0.13	2.13
	Inter-peak		0.15	0.40
	PM peak		0.42	0.90
11-12	AM peak		0.35	1.27
	Inter-peak		0.27	0.22
	PM peak		0.37	0.53
12-13	AM peak		0.26	0.35
	Inter-peak		0.22	0.20
	PM peak		0.24	0.34
13-14	AM peak		0.06	0.36
	Inter-peak		0.08	0.38
	PM peak		0.06	0.34

Table 6.1. Delays between Junctions 10-14 on M1 (per link)

6.3 Environment

Topography, Land Use, Property and Industry

- 6.3.1 The motorway passes through some large urban areas at Luton and Dunstable, and close to some smaller urban areas at Chalton, Tingrith and Toddington.

6.3.2 The Luton and Dunstable residential areas extend up to the highway boundary.

6.3.3 The majority of the industry in the vicinity of this section of the M1 is concentrated in the Luton/Dunstable area including some significant medium / heavy industrial units such as the Vauxhall vehicle plant.

Climate

6.3.4 The motorway is located in an area that in terms of rainfall, sunshine and temperatures is fairly close to the all-England statistical norm.

6.3.5 Although the motorway has a number of locations where radiation fog is known to regularly form, in low-lying cooler areas, it is unlikely to have a bearing on the selection of a preferred option for Junction 11.

Geology, Soils, Quarrying and Mining

6.3.6 Solid geology underlying the M1 between Junctions 10 and 13 comprises strata of Upper Jurassic to Upper Cretaceous age, with progressively older deposits being crossed going northwards from Junction 10 to Junction 13. From Junction 10 to south of Junction 12 the Cretaceous geology consists of Lower, Middle and Upper Chalk, with Lower Greensand in the area of Ridgmont and Oxford Clay in the north.

6.3.7 The superficial deposits overlying the solid geology are variable, and include Clay-with-Flints, Boulder Clay, Glacial Sand and Gravel, Head, Dry Valley River Deposits, River Terrace Deposits and Alluvium.

6.3.8 There is widespread evidence of previous quarrying activities along the scheme route, including; small and large scale pit extraction from the Lower, Middle and Upper Chalk, small scale pits in the Gault Clay, Oxford Clay, and Clay-with-Flints, mineral extraction from glacial sands and gravels, and excavation within the Melbourn Rock and Totternhoe Stone for building stone. There is evidence of two recorded cavities associated with subsurface mineral extraction of chalk. These are located outside the scheme boundaries.

6.3.9 There are currently no designated Regionally Important Geological Sites (RIGS) within the scheme area. There are, however, a number of sites in the vicinity of the scheme, which may be considered to be of geological importance.

Noise

6.3.10 There are a large number of sensitive sites in the study area around Junction 11. A significant number of these are very close to the mainline motorway and the slip roads. Noise levels at the closest properties are dominated by road traffic noise from the mainline and the adjacent slip road. Noise levels at the more distant properties are dominated by road traffic noise from the mainline.

Air Quality

6.3.11 Junction 11 is located within Luton Borough Council's Air Quality Management Area (AQMA) No. 2 for NO₂, covering 431 premises in the vicinity of the M1 motorway either side of Junction 11. This places limits on the levels of NO₂ within the area.

6.3.12 There are a number of automatic monitoring stations in the area operated as part of the Hertfordshire and Bedfordshire Air Pollution Monitoring Network (Kings College, 2006). The last period prior to the introduction of traffic management measures within AQMA No.2, for the duration of the construction phase of the M1 Widening Scheme between Junctions 6A and 10, was the year 2005. For the years 2006 and 2007 it is likely that measured concentrations were not representative of baseline conditions. Therefore, the year 2005 has been used as the baseline year for this assessment and measured pollutant concentrations for 2005 are set out in Table 6.2 below.

Site Code	Location	Easting	Northing	NO ₂ (µg/m ³)
M1	Belper Road	505492.65	222607.05	46.7
M2	Longfield Drive	505512.34	222469.67	43.8
M3	Raleigh Grove	505526.90	222401.88	40.0
M4	Armitage Gardens	505623.95	222323.80	39.0
M5	Bradley Road, East of M1	505617.66	222234.69	43.6
M6	Bradley Road, West of M1	505484.13	222232.92	36.3
M7	Eldon Road	505379.10	222459.47	37.1
M8	Dunstable Road	505320.75	222739.05	45.2
M9	Wyndham Road	505324.54	222812.39	47.0
M10	Abingdon Road	505283.41	223065.79	36.1
M11	Lime Avenue	505195.06	223295.78	34.0
M12	Seabrook	505147.54	223383.90	32.8
M13	Leagrave High Street	505245.65	223474.25	54.8
M14	Copperfields	505014.58	223538.01	35.6
M15	Bank Close	505072.05	223709.38	49.6
LN1	Challney High School and Community Centre	505573.67	222778.62	28.1
Air Quality Objective Value				40

Data from Herts and Beds Air Quality Monitoring Network (Kings College, 2006)

Table 6.2. Measured Annual Mean Concentrations of Nitrogen Dioxide in 2005

6.3.13 Of the monitoring sites detailed in Table 6.2 above, Luton Borough Council's nitrogen dioxide diffusion tube sites M8 and M9 are close to Junction 11. In 2005 annual mean concentrations in excess of the limit value were reported at these locations. In contrast the corresponding annual mean concentration of nitrogen dioxide at monitoring station LN1 (approx 150 m from the motorway) meets the limit value by a margin of 30 %.

Landscape and Townscape

- 6.3.14 The context of Junction 11 is wholly urban, including the Luton and Dunstable Hospital complex to the west and Challney High School to the east. The context of the school includes green space/open land in the form of the sports fields. The sensitivity and quality of each of the townscape types at Junction 11 is described below:

Area	Name	Townscape Sensitivity		Townscape Quality	
		East Side	West Side	East Side	West Side
T4	Dunstable Road	Medium	Medium	Low	Low
T5	Lewsey Farm & Leagrave	Medium	Medium	Low	Low

Table 6.3. Sensitivity and Quality of Townscape Types

Cultural Heritage

- 6.3.15 Junction 11 lies within an urban area in which the extent of the visual envelope is limited to 500m in all directions around the junction. Within this visual envelope three built heritage receptors have been identified which may experience an impact as a result of the scheme. All three are original motorway structures designed by Sir Owen Williams: the Dunstable Road Interchange underbridge (No.13 m1/54.40/1), Dunstable Road Interchange underbridge (No. 14 – M1/54.4/2), and the Challney School Subway. Although undesignated, these structures have some historic value and group value since they belong to the original M1 design. Consequently, the motorway structures are assessed to be of low value. There are no archaeological assets recorded within the area of construction and operational impact for the proposed Junction 11 improvement works, and no designed historic landscape features within the 500m visual envelope around Junction 11.

Biodiversity

- 6.3.16 There are no internationally designated sites (Special Protection Areas, Special Areas of Conservation or Ramsar Sites) within 5km of the Scheme, nor are there any Special Areas of Conservation for bats within 30km. Seven nationally designated sites (SSSIs and LNRs) are present within 5km of the Scheme, although none of these have habitat connections with the Junction 11 site. Similarly there are eight County Wildlife Sites (CWS) within 2 km of Junction 11, of which none appear to have direct habitat connections with the Junction 11 site. The Dunstable to Luton disused railway CWS is the closest located approximately 500m to the south, with the River Lea CWS located approximately 600m to the north.
- 6.3.17 Junction 11 occurs within an urban environment. Habitats occurring within this area predominantly associated landscaped areas such as that along the soft estate and the roundabout. The roundabout is characterised by amenity grassland and planted ornamental shrubs. There is a large area of amenity grassland associated with a school to the north-east of Junction 11.

- 6.3.18 Junction 11 is considered to be of negligible value for bats, with the Keltonstone Recycling building being of low potential. There are no records of other legally protected species at Junction 11.

Water Environment

- 6.3.19 Junction 11 is situated within the built up area of Luton within the catchment area of the River Lea. The nearest surface watercourse is Leagrave Stream which is crossed by the motorway approximately 600m north of the slip roads of the junction. There is currently no provision for the collection, attenuation or treatment of highway runoff in this area. There is no published water quality information for the Leagrave Stream, although the surface water quality of watercourses in the vicinity of the Scheme is likely to be affected by drainage from the existing motorway runoff, as currently the mainline has no provision for the collection, attenuation or treatment of highway runoff.
- 6.3.20 There are no licensed surface water abstractions within 300m of Junction 11. The area around Junction 11 is however underlain by major aquifer and soils of high permeability. Junction 11 is situated within a Source Protection Zone (SPZ), with north of the roundabout being in the Total Catchment area SPZ, and south of the roundabout being within the Outer Zone SPZ. Public water abstraction takes place approximately 1.6km south of the proposed junction improvement.

Physical Fitness/Non-Motorised Users (NMUs)

- 6.3.21 Pedestrians, cyclists and equestrians are referred to as Non-Motorised Users.
- 6.3.22 Junction 11 has considerable NMU movement (noting the schools and hospital either side of the motorway). There is no crossing provision for NMUs to the south and west slips, with informal crossing on the north and east-bound slip roads. A report compiled by the Area 8 Managing Agent in 2003 indicated that the Personal Injury Collision rate involving NMUs is high at Junction 11, with a total of sixteen in the previous five years. This can be attributed in part to substandard slip road design and visibility (two northbound and two southbound slip roads), congestion and lack of appropriate demarcation of crossings on the slip road surfaces.

Journey Ambience

- 6.3.23 Northbound on the mainline at Junction 11 lighting columns become particularly prominent as one approaches Junction 11, as they are present on the carriageway side verges and central reservation and also the junction slip roads. Pylons are close to the carriageway and are therefore prominent. No views out to the wider townscape are available over the junction due to noise fencing, except tops of taller trees and taller residential buildings. Noise fencing dominates this stretch of the motorway to both sides. The northbound slip road appears enclosed by the commercial building immediately adjacent to it. For users of the A505 Dunstable Road the mass of the overbridge dominates and adds to the dominance of a relatively unattractive and hard townscape.
- 6.3.24 Southbound on the mainline at Junction 11 the motorway enters the Luton and Dunstable conurbation and noise fencing appears in the foreground with only restricted views of higher residential buildings on the outskirts of Luton and rooflines of houses and buildings including Luton and Dunstable Hospital, and a hotel. Light columns and pylons are also prominent. On approach to Junction 11

there are views of more signage and increased numbers of lighting columns. The motorway remains tree lined, behind the noise fencing, through the conurbation, although the predominant view is still that of built structures and boundary treatments. After the junction there are open views of higher ground ahead but then vegetation, along with fencing and retaining walls, restricts any other views beyond the carriageway itself.

Planning Policies

6.3.25 Government advice on land use planning has been given at a national level in a series of Planning Policy Guidance Notes (PPGs), now being superseded by Planning Policy Statements (PPSs). Those PPGs and PPSs current at the time of Public Consultation and considered of most significance to this study are:

PPS1	Delivering Sustainable Development (2005)
PPG2	Green Belts (2001)
PPS3	Housing (2006)
PPS6	Planning for Town Centres (2005)
PPS7	Sustainable development in Rural Areas (2004)
PPS9	Biodiversity and Geological Conservation (2005)
PPS10	Planning and Sustainable Waste Management (2005)
PPS11	Regional Spatial Strategies (2004)
PPS12	Local Spatial Planning (2008)
PPG13	Transport (2001)
PPG15	Planning and the Historic Environment (1994)
PPG16	Archaeology and Planning (1990)
PPS23	Planning and Pollution Control (2004)
PPG24	Planning and Noise (1994)
PPG25	Development and Flood Risk

6.3.26 At the regional level, a number of bodies provide guidance on land use planning, development and transport. These include Regional Assemblies, Government Offices and Regional Development Agencies.

6.3.27 The study area is largely within Luton and Bedfordshire which falls within the East of England area. However, the motorway lies within a growth area which is covered by the East of England Plan; the East Midlands Regional Spatial Strategies (RSS) and the South East RSS. Overlapping all of these is the Milton Keynes South Midlands Sub-Regional Strategy (MKSM).

6.3.28 The East of England Plan and the MKSM in combination provide the scale of growth to be accommodated in the route corridor. These policy documents also include the regional transport strategy.

6.3.29 At the local level, guidance on planning and development is given in the following documents:

-
- The Bedfordshire and Luton Structure Plan 2016 Deposit Draft.
 - Luton Local Plan 2001-2011 (adopted on 30th March 2006 but some policies expired on 31st March 2009 following a statement from the Secretary of State).
 - South Bedfordshire District Council Local Plan (2004, Policies GB1, GB2, GB3, NE1 to NE8, NE10, T5 & T12)
 - Mid Bedfordshire District Council Local Plan (1997, Policies CS3, CS4, CS5, CS9 & TP11)

[Note: The above two Districts joined into one unitary authority, Central Bedfordshire Council, on 1st April 2009.]

- Milton Keynes Local Plan (2000)
- Milton Keynes and South Midlands (MKSM) Sub Regional Strategy

Local planning authorities are now beginning to prepare Local Development Framework (LDF) plans which will, together with the regional plans, replace Structure Plans, Local Plans and Unitary Development Plans.

6.3.30 Local Transport Plan and Proposals include;

- Luton – Dunstable Local Transport Plan (April 2001 – March 2006)
- The Luton – Dunstable Guided Bus Scheme (formerly Translink)
- Luton Northern Bypass

6.3.31 The East of England Plan now forms part of the formal development plan, and further, development proposals need to accord with the development plan (PPS1).

6.3.32 The Plan identifies considerable new housing and employment growth and opportunities for regeneration along the route corridor within:

- Milton Keynes;
- The Marston Vale – A421 to M1J13; and
- Luton/Dunstable.

6.3.33 Within the Plan it is stated that this growth corridor is not intended to be a “continuous corridor of development”, rather it is based upon a “key movement corridor” where significant growth will be achieved over the long term. (Ref Plan para 3.7). Further (para 3.8) “growth areasprovide a framework for helping to prioritise investment in infrastructure”.

6.3.34 The Plan’s Policy H1 seeks to “coordinate development with necessary transport land other infrastructure provision”. Beyond that (para 7.3) it is stated that “existing transport network and the scope for service improvement was an important factor in shaping the spatial strategy of the RSS”. Since the Key Diagram refers to the M1 as a strategic route it is clear that the Government’s growth agenda is facilitated by expected improvements to the M1 corridor. However, neither the Plan nor the more detailed Regional Transport Strategy

specifies what form of improvement is required. The land use context therefore does not prioritise one option against another.

- 6.3.35 Nonetheless it can be concluded that a delay in the improvement of the motorway corridor is likely to result in the Government's growth strategy being delayed. The A5-M1 Link is central to achieving growth in the Luton/Dunstable area. That cannot proceed without the strategic highway improvements being in place reinforcing the East of England Plan's policy that land use and transport policy and decision-making needs to be coordinated.

6.4 Summary of Do-Nothing consequences

- 6.4.1 Traffic analysis shows that Junction 11 currently experiences significant congestion; particularly at peak travel times. This results in traffic queuing on the slip roads.
- 6.4.2 The queue-length surveys indicate queues forming on the approach to the Junction 11 roundabout, in both the AM and PM periods, on all approaches. On the M1 exit slip roads, queue lengths were observed to exceed 100 metres at times. On the A505 east, queue lengths in excess of 160 metres were observed; and on A505 west queue lengths exceeded 300 metres.
- 6.4.3 Junction 11 has a high NMU demand including school children. Doing nothing will leave this junction without dedicated crossing facilities for pedestrians.

6.5 Proposed Improvement

Alternatives considered

- 6.5.1 The location of Junction 11 within the Luton urban area places constraints upon potential improvements. Also, a scheme objective is to provide an improvement without the need to demolish residential properties. Consequently the form of improvement that is possible is essentially an enlargement of the existing junction and additional traffic signals. This single concept was presented at Public Consultation and is shown on drawing D123846/GD/DEV/00.037 in Appendix 3.
- 6.5.2 The improvement would consist of widening the carriageways of the four slip roads and providing additional lanes on the roundabout, and at the A505 approaches to the roundabout. All approaches to the roundabout would have traffic signals that would operate at all times.
- 6.5.3 Facilities for pedestrians would be improved by providing signal controlled crossings at the slip roads.
- 6.5.4 The form of the Junction would remain largely as existing but would become fully signalised.
- 6.5.5 A plan of the Junction 11 proposals is included in Appendix 6, D123846/GD/DEV/00.038.
- 6.5.6 The slip roads onto the M1 would be widened to two lanes on the exit from the A505 roundabout. Two lanes would be maintained for approximately 50m before becoming to a single lane. The roundabout circulatory carriageway would retain three lanes of traffic, except between the entries and adjacent exits. In these areas the circulatory carriageway would also be widened.

- 6.5.7 All slip roads would have cross sections comprising 1 or 2 traffic lane(s). All slip road layouts require Departures from Standard.
- 6.5.8 Localised widening of the A505 Dunstable Road is required on the entries to the roundabout. The junction would be fully signal controlled and would include controlled NMU crossing facilities across the slip roads.
- 6.5.9 This proposal would require landtake to widen the northbound exit slip road. This would affect a commercial property, currently operating as a paper mill. All other areas of improvement would be achieved within highway land.

Design of Traffic Signals

- 6.5.10 The standard used to design traffic signal junctions is TD50/04 (DMRB, Volume 6, Section 2, Part 3).
- 6.5.11 The design flows are around 34% to 50% higher than the existing peak hour flows currently using the roundabout.
- 6.5.12 On 1 July 2009, the traffic surveys recorded queue lengths of approximately 160 and 300 metres on the A505 east and west approaches and exceeded 100 metres on the slip road approaches. These observations were snap-shots on a random weekday and these lengths are likely to vary from day-to-day.
- 6.5.13 The trip demands, and hence queue lengths, on the slip roads will tend to increase in future years. By 2013, the M1 motorway upstream of each exit slip road, will be operating with hard shoulder running in the peak periods. There would be a potentially serious safety risk if the lengths of the queues were allowed to increase such that the queue length reached the hard shoulder area. In such a case the hard shoulder running would need to be turned off.
- 6.5.14 Queue length detectors could be installed into the top of the existing slip roads. When queues lengths exceed the storage lengths available on the slip roads, then the green phases could be adjusted to provide more green-time for the slip roads and thus attempt to reduce queue lengths. The main disadvantage of this strategy is that the additional capacity provided to the slip roads would be at the expense of extra delays to local traffic on the A505.
- 6.5.15 The A505 is a local distributor road linking the urban centre of Luton with urban area of Dunstable. The A505 is marked with dedicated bus lanes that carry many bus services between the urban centres. The bus lanes stop about 200 metres either side of the J11 roundabout and therefore buses approach the roundabout in the same queues as other road users. The A505 west of the motorway also provides access to the main Accident and Emergency hospital for the area. Severe additional delays to traffic on the A505 are unlikely to be acceptable to the local highway authorities.
- 6.5.16 In order to permit the M1 HSR scheme to operate acceptably and to control the queues at Junction 11 to an acceptable level, capacity improvements are required.
- 6.5.17 The proposed layout would implement traffic signal control to all four of the approach roads and provide local widening of the exit slip roads and A505

approaches to allow more vehicles to run through the traffic signals in each cycle of the lights.

Pedestrian Crossings

- 6.5.18 At Junction 11 roundabout there are a large number of pedestrians crossing between east and west, passing under the motorway. Surveys in 2006 and in 2009 indicate that there are approximately 600 to 959 movements in a 12-hour day.
- 6.5.19 The existing crossings of the slip roads are identified by drop kerbs, but there is no formal control of the crossing movements. Vehicles circulating the roundabout can be moving quickly, but to the pedestrian it is difficult to identify if individual vehicles are intending to exit the roundabouts at the slip roads. This makes the crossing of the slip roads difficult. The existing width of the slip roads varies from about 5.5 metres to 6.0 metres wide.
- 6.5.20 With the proposed improvement to J11, the slip roads would need to be widened to accommodate two full width lanes (7.3 metres) plus any over-widening required to accommodate long vehicles. As a result of the M1 Junctions 10 to 13 Improvement, and other highway infrastructure improvements, traffic flows on the roundabout are expected to increase. The combination of these factors will make the crossing of the slip roads more difficult for pedestrians.
- 6.5.21 The proposed improvements to Junction 11 include proposals to traffic signal control the pedestrian crossings of all four of the slip roads.
- 6.5.22 The pedestrian crossings should not be positioned too far up the slip roads. This is for two reasons. Firstly, the slip roads are under motorway regulations and as such, pedestrian movements are banned. Any length of slip road that has to be used by pedestrians to reach the crossing points would need to be de-regulated. Secondly, if pedestrians have to divert far from their route, then users will start to cross the slip roads without using the provided crossing facility. This is a potential safety risk, particularly as large and heavy vehicles are likely to be using the slip roads. For these reasons, the proposed controlled crossings would be located relatively close to the circulating carriageway.
- 6.5.23 It is expected that pedestrian control would be achieved with either pelican or puffin crossings. The green-man phases would be synchronised with the traffic signal control proposed on the roundabout. The sequencing is likely to be coordinated so that the pedestrian crossings of the two entry slip roads are called at the same time as left-turn phases from the A505 approach roads. Some vehicle queues are to be expected when the pedestrian phases are called and these vehicle queues would be stored adjacent to the kerb line and may back-up to the previous entry. This is an unavoidable impact of implementing controlled crossings of the exit slip roads.

Summary of Environmental Effects

6.5.24 The following paragraphs provide a brief synopsis of the key findings together with comments on any limitations on the assessments undertaken.

Air Quality

6.5.25 Although there is potential for exceedances of the air quality objectives around Junction 11 in the baseline scenario, it is considered unlikely that the proposed changes to the layout of Junction 11 would have a significant effect on air quality at sensitive receptors close to the junction.

Noise and Vibration

6.5.26 There is a large number of sensitive receptors in the study area around Junction 11. A significant number of these are very close to the mainline and the slip roads. Noise levels at the closest properties are dominated by road traffic noise from the mainline and the adjacent slip road. Noise levels at the more distant properties are dominated by road traffic noise from the mainline. The incorporation of enhanced noise barriers to the mainline motorway and slip roads, and the incorporation of low noise surfacing as part of the Hard Shoulder Running (HSR) Scheme, which is also anticipated to become operational in 2013, would offset the effects of the widened north bound exit slip and the south bound exit slip. Overall, any change in noise levels as a result of the Scheme at J11 is considered likely to be negligible.

Landscape & Visual

6.5.27 During construction, impacts on townscape character would be of Moderate significance, declining to Slight adverse significance at opening and slight beneficial significance at Year 15. During construction, adverse visual impact would be of medium magnitude decreasing to low magnitude at opening and neutral magnitude by Year 15.

Cultural Heritage

6.5.28 There are no direct physical or setting impacts on any archaeological assets, historic buildings or historic landscape receptors associated with the Junction 11 improvement works.

Ecology and Nature Conservation

6.5.29 Whilst Junction 11 is located within an urban environment, which limits the occurrence of semi-natural habitats, there is potential for impacts on grassland, hedgerows, scrub and mature trees within the soft estate as well as on protected species such as bats and breeding birds. The potential effect on ecology and nature conservation as a result of the Scheme at J11 is considered to be slight adverse.

Road Drainage and the Water Environment

- 6.5.30 At Junction 11, the Scheme would include the installation of new kerb and drainage units. It is currently proposed that any additional road drainage from Junction 11 would be discharged via the existing road drainage system, provided that the existing system has the capacity to accept the additional drainage volume. If necessary, consideration would be given to the possibility of installing some form of attenuation system, e.g. oversized pipes, beneath the new areas of carriageway. Within this area drainage is likely to be directed to either the Leagrave Stream or the surface water drains in Luton. Prior to discharge to the Leagrave Stream drainage water would pass through a sustainable natural treatment system to reduce pollutants, together with a facility to contain accidental spillages. The Scheme should therefore have a neutral effect on water quality and hydrology of receiving watercourses.
- 6.5.31 Although land-take would be kept to a minimum, the demolition of the Keltonstone Recycling building (the paper mill) would be required to facilitate the construction of Junction 11.

Geology and Soils

- 6.5.32 No significant impacts on Geology and Soils are anticipated for the Scheme, with the caveat that there could be waste disposal issues should either soil contamination or asbestos-containing materials be encountered.

Pedestrians, Cyclists, Equestrians and Community Effects

- 6.5.33 The Scheme should not result in significant adverse effects on Non-motorised Users (NMUs) or on community facilities.
- 6.5.34 At Junction 11, the provision of traffic signals with appropriate phasing at the foot of slip roads would benefit the large number of pedestrians passing through this junction.

Vehicle Travellers

- 6.5.35 The Scheme would have a slight beneficial effect on travellers' views at Junction 11. There would be a beneficial effect on driver stress, though driver stress would remain in the moderate category for all options at Junction 11.

7. JUNCTION 12

7.1 Layout

- 7.1.1 Junction 12 is situated in a rural area between the villages of Toddington and Harlington, with only isolated properties in the immediate vicinity.
- 7.1.2 The existing Junction 12 layout is shown on Drawing D123846/GD/DEV/00.002 contained in Appendix 2. It consists of a single bridge passing over the existing M1 and four slip roads. It is fully signal controlled. The slip roads connect into the A5120 Harlington Road.
- 7.1.3 The distance for vehicles to change lanes between the Junction and the northern slip roads at Toddington Motorway Service Area (MSA) less than that required by standards. This is known as the weaving length.
- 7.1.4 There is only minimal provision for NMUs on the A5120 Harlington Road to the west of the motorway.
- 7.1.5 There is a paved footway for NMUs to the west of the motorway. To the east is a grass verge.
- 7.1.6 The Motorway Service Area (MSA) at Toddington, immediately south of Junction 12, is owned by the HA and operated by MOTO under a 50 year lease. It comprises two sites, one either side of the motorway, linked by a pedestrian bridge. The lease places specific requirements on the operators to provide certain basic facilities and minimum parking spaces. The sites include shopping, dining and rest facilities for motorists, including a lodge on the southbound side. Other areas of the site comprise motorway maintenance workshops and a police facility. These areas are not included in the lease.

Drainage

- 7.1.7 The Junction is situated within the main river catchment areas of the River Flit.
- 7.1.8 The existing surface water drainage from the motorway discharges by gravity to adjacent outfalls. No attenuation or mitigation measures were provided. There were no purpose-built facilities to mitigate the effects of either the rate of surface water runoff or pollution from the existing motorway when it was first constructed, although some spillage containment measures have since been added.
- 7.1.9 The motorway discharge is collected by a positive drainage system in fill situations consisting of mastic asphalt kerbs with offset gullies spaced to allow some flooding of the hard shoulder under normal design conditions. On embankment discharge is down to toe ditches via surface water chutes. In cut situations the run off is collected in filter drains or filter drains with carrier drains.

Structures

- 7.1.10 The existing bridge at Junction 12 carries a single carriageway with turning lanes on the approach to the traffic signals. This contributes to the congestion problem.

Earthworks

- 7.1.11 The cutting and embankment slopes at Junction 12 of the existing M1 are in variable condition and exhibit several areas of significant instability. It is thought that this is due to the earthworks at this junction being formed from locally won Gault Clay, a material with notoriously poor stability characteristics.
- 7.1.12 At Junction 12, earthworks that are currently in a poor condition will be repaired. New slopes will be constructed at stable angles. Due to the problematical nature of Gault Clay, it is recommended that this material is not used as embankment fill.

Public Utilities

- 7.1.13 At Junction 12, a 200m intermediate pressure gas pipeline runs parallel with the northbound side of the motorway. Other services are located within the existing overbridge, all of which would require diversion. These include:
- a medium pressure gas pipeline,;
 - 11kv overhead power lines;
 - BT underground cables; and
 - NTL underground fibre optic cables.

7.2 Traffic

Surveys

- 7.2.1 During the surveys at Junction 12, there were also queues observed on all approaches in both the AM and PM peak periods. Queue-lengths on the exit - slip roads were observed to exceed 100 metres on the north side and in excess of 180 metres on the south side, which is the length of the slip road.
- 7.2.2 The queues on the A5120 were particularly long on the approach from the east. Queues frequently reached back to the A5120/Harlington roundabout 750 metres away from the junction; and extended along both approaches to the roundabout from points 180 metres towards Flitwick and 150 metres towards Harlington. Feedback from local residents suggests that these observations might have been less than normal. On the day of the survey, queues on the A5120 on the west side of the motorway reached back towards Toddington to a length of 90 metres.
- 7.2.3 The July 2009 weekday survey counted a total of 25 NMU movements at Junction 12 over the 12-hour period (0700-1900). The August 2009 Sunday survey counted a total number of 36 NMU movements at Junction 12 over the 12-hour period (0700-1900). This is more than The Summer 2006 Survey which counted a total number of 10 cyclist movements across Junction 12 over the two days of the survey with no other NMU movements recorded.
- 7.2.4 The Traffic Forecasting Report predicts AADTs of 18500 and 31300 vehicles on the two approaches to the junction in the design year and although current NMU movements are low, Central Bedfordshire Council and Toddington Parish Council have both requested a cycle route across the junction to encourage movements between Harlington and Toddington.

Daily Flows on A5120 at Junction 12

- 7.2.5 The A5120 is an A-road that connects Dunstable and Houghton Regis with the A507 at Ampthill. The road passes through the middle of the communities of Toddington and Flitwick.
- 7.2.6 Between Toddington and Flitwick the road passes over the M1 Motorway with which it connects at Junction 12.
- 7.2.7 The daily two-way traffic flows, recorded by automatic traffic counters in April 2006 and located on the A5120 between Toddington/B579 junction and the M1 were about 18,000 vehicles per day (AADT).
- 7.2.8 The daily flows on the A5120 between the M1 motorway and west of the Harlington roundabout and the M1, were recorded in April 2006 and were about 22,000 vehicles per day (AADT).

Collisions and Safety

- 7.2.9 Changing lane types of collision are more frequent on the motorway length between Junctions 12 and 11 southbound. This length contains the Toddington Motorway Service Area and incidents appear to be associated with the traffic leaving and joining the carriageway at this point. The MSA attracts about 9% of passing motorway vehicles in the peak hours and can be as high as 20% of passing traffic around lunch time.
- 7.2.10 The collision history of the length of the M1 between Junction 11 and Junction 12 has been analysed over the five year period (2001 to 2005). Collisions in the vicinity of the MSA and at the Junction 12 slip roads have been identified separately. There were 138 PIC as shown in Table 7.1 below.

	Shunt	Changing Lane	Loss of Control	Total
N/B mainline J11-J12	27	12	27	66
J12 N/B Exit Sliproad	0	0	0	0
Northbound MSA	0	3	0	3
S/B mainline J11-J12	35	20	12	67
J12 S/B Entry Sliproad	1	0	0	1
Southbound MSA	0	1	0	1
Total	63	36	39	138

Table 7.1. PIC Collision Record Jan 2001 to Dec 2005

- 7.2.11 All 4 PIC's at the MSA are shown to involve lane change collisions. One of these collisions involved a left hand drive HGV.

7.3 Environment

Topography, Land Use, Property and Industry

7.3.1 The majority of the scheme passes through agricultural land and woodland areas. The existing M1 crosses three landscape character areas:

- the chalk escarpment of the Chilterns;
- the gently undulating arable landscape of the Bedfordshire and Cambridgeshire Claylands; and
- the narrow escarpment of the Bedfordshire Greensand Ridge, characterised by deciduous and coniferous woods, heath and pasture.

7.3.2 The motorway also passes through some large urban areas at Luton and Dunstable, and close to some smaller urban areas at Chalton, Tingrith and Toddington. There are a number of Public Rights of Way within the area of the scheme, including several long distance recreational routes, namely the John Bunyan Trail, the Greensand Ridge Walk Way, the Chiltern Way and the Ickneild Way. Other leisure facilities in the vicinity include Woburn Abbey and Safari Park, Whipsnade Zoo, other parks and recreational fields, golf clubs and rugby grounds.

Climate

7.3.3 The motorway is located in an area that in terms of rainfall, sunshine and temperatures is fairly close to the all-England statistical norm.

7.3.4 Although the motorway has a number of locations where radiation fog is known to regularly form, in low-lying cooler areas, it is unlikely to have a bearing on the selection of a preferred option for Junction 12.

Geology, Soils, Quarrying and Mining

7.3.5 Solid geology underlying the M1 between Junctions 10 and 13 comprises strata of Upper Jurassic to Upper Cretaceous age, with progressively older deposits being crossed going northwards from Junction 10 to Junction 13. From Junction 10 to south of Junction 12 the Cretaceous geology consists of Lower, Middle and Upper Chalk, with Lower Greensand in the area of Ridgmont and Oxford Clay in the north.

7.3.6 The superficial deposits overlying the solid geology are variable, and include Clay-with-Flints, Boulder Clay, Glacial Sand and Gravel, Head, Dry Valley River Deposits, River Terrace Deposits and Alluvium.

7.3.7 The scheme is underlain by a Mineral Consultation Area (MCA) in the area between Chalton and Toddington Services. There is also a MCA to the north of Junction 13. These MCAs relate to the extraction of sand and gravel. However, there are currently no extraction activities in operation in these areas.

- 7.3.8 There is widespread evidence of previous quarrying activities along the scheme route, including; small and large scale pit extraction from the Lower, Middle and Upper Chalk, small scale pits in the Gault Clay, Oxford Clay, and Clay-with-Flints, mineral extraction from glacial sands and gravels, and excavation within the Melbourn Rock and Totternhoe Stone for building stone. There is evidence of two recorded cavities associated with subsurface mineral extraction of chalk. These are located outside the scheme boundaries.
- 7.3.9 There are currently no designated Regionally Important Geological Sites (RIGS) within the scheme area. There are, however, a number of sites in the vicinity of the scheme, which may be considered to be of geological importance.
- 7.3.10 Approximately two-thirds of the land adjacent to the M1 is occupied by agricultural land. From the Agricultural Land Classification (ALC) Maps, approximately thirty-nine percent of this land would be classified as grade 3a, with fifty-seven percent classified as grade 3b and four percent classified as grade 4. Land of grade 3a is considered to be 'best and most versatile' agricultural land, together with grades 1 and 2. No land of grade 1 or 2 is shown on the ALC maps.

Noise

- 7.3.11 At Junction 12, there are few properties within the study area around the junction. Noise levels at these properties are dominated by road traffic on the mainline, not on the junction, due to the relatively large distances from the motorway.

Air Quality

- 7.3.12 The nearest receptors to Junction 12 are set far enough back from the motorway carriageways to experience air pollutant concentrations at near background levels. Measured background concentrations in the general area are reported in Table 7.2 below. The maximum measured annual mean concentration of Nitrogen Dioxide, recorded in 2007 was 32.1 $\mu\text{g}/\text{m}^3$ at the Harlington Road monitoring station. This was well below the annual mean nitrogen dioxide limit value for the Air Quality Objective of 40 $\mu\text{g}/\text{m}^3$.

Location	2006	2007
Chalton Heights, Chalton	24.1	21.5
Harlington Road, Toddington	31.2	32.1
Air Quality Objective Value	40	40

Data from Air quality Monitoring Report D110842/5/42.

Table 7.2. Measured Annual Mean Concentrations of Nitrogen Dioxide Outside Luton for 2005 ($\mu\text{g}/\text{m}^3$)

Landscape and Townscape

7.3.13 Junction 12 lies within regional landscape character area Landscape Character Area 90 - The Bedfordshire Greensand Ridge. At the next level of landscape assessment *The Landscape Character Assessment of Bedfordshire* identifies that Junction 12 is located within Landscape Type 5A (Settled and Farmed Clay Vales), in close proximity to Landscape Type 8 (Settled and Farmed Clay Hills). Designated sites of relevance to the assessment of landscape and visual effects include in particular, a number of listed buildings and County Wildlife Sites in the vicinity of J12. North of Junction 12, land on both sides of the motorway falls within an Area of Great Landscape Value. Marston Vale Community Forest is located to the east of the motorway from Ridgmont Road to Junction 13.

Cultural Heritage

7.3.14 On the northbound side of the Junction 12 archaeological remains include:

- Neolithic and Bronze Age occupation activity evidence by flint scatters identified during field walking, this area has been designated an Archaeological Notification Area (ANA) by Bedfordshire County Council (low value);
- medieval rural settlement at Nuppings Green designated an ANA (medium value);
- an undated brick well head and faint linear features identified by geophysical survey (low value); and
- an extant historic hedge bank boundary of uncertain date (low value).

7.3.15 Archaeological remains located on the southbound side of the junction are considered to be of medium value and include:

- Neolithic and Neolithic and Bronze Age occupation activity evidence by flint scatters identified during field walking, the area is designated an ANA (low value);
- a multi-phased Early and Middle Iron Age settlement site confirmed by trial trench evaluation with associated enclosures identified from crop marks on aerial photographs designated as an ANA (medium value); and
- evidence for the remains of medieval agriculture comprising the ploughed out remains of ridge and furrow with headlands identified from aerial photographic evidence and geophysical survey, designated as an ANA (low value).

7.3.16 In the field to the southwest of the existing A5120 junction, geophysical survey has also identified possible late prehistoric field systems and occupation in the form of linear ditches and ring ditches of medium value overlain by the remains of medieval ridge and furrow agriculture of low value. Fields to the north of the junction also display evidence of ridge and furrow.

- 7.3.17 Within 500m of the junction there are six built heritage receptors. Of these six built heritage receptors two are Grade II statutorily listed structures: Mill Farm, Toddington and Redhills Farm, Toddington (the setting of which falls within 500m of the scheme). Both of these built heritage receptors are assessed to be of Medium value. The remaining built heritage receptors comprise four undesignated motorway structures. Two of these motorway structures (the Toddington Interchange overbridge and the Redhills Farm access underbridge) are assessed to be of low value, whilst the other two motorway structures (the Harlington Stream Culvert and the Redhill Culvert) are assessed to be of Negligible value.
- 7.3.18 A single historic landscape feature of low value comprising an extant hedge banked boundary has been identified bounding fields immediately to the west of Junction 12.

Biodiversity

- 7.3.19 There are no internationally designated sites (Special Protection Areas, Special Areas of Conservation or Ramsar Sites) within 5km of the Scheme. Eight nationally designated sites (SSSIs and LNRs) are present within 5km of the Scheme. There are also seven County Wildlife Sites (CWS) within 2km of Junction 12, 2 of which, the River Flit CWS and Poplars Nursery CWS, have direct habitat connections with the Scheme.
- 7.3.20 Habitats at Junction 12 comprise mainly arable fields with areas of woodland, hedgerows, mature trees, amenity grassland, improved grassland and semi-improved grassland. The soft estate of the motorway at this location includes neutral grassland, scrub, scattered trees and hedgerows.
- 7.3.21 Legally protected species in the vicinity of Junction 12 include badger. Junction 12 is considered to be low potential for bats. Although reptiles were not recorded in the vicinity of Junction 12, habitat in the soft estate at Junction 12 is suitable for reptiles.
- 7.3.22 Poplars Nursery CWS is near to the proposed junction improvement.

Water Environment

- 7.3.23 Junction 12 is situated within the predominantly rural area north of the Toddington Motorway Service Area (MSA). The nearest surface watercourses are the River Flit, 100m east of the southerly end of the junction, the Harlington Stream, and Redhill Stream Culvert. There is no published Environmental Assessment water quality information for the Harlington Stream, or the Redhill Stream. The chemical water quality of the River Flit from Chalton to Priestly Farm has been assessed by the Environment Agency as fair for recent years, with biological quality assessed as good to fairly good.
- 7.3.24 There are no licensed surface water abstractions within three hundred metres of Junction 12. The area around junction 12 is underlain by land classified as being non aquifer, with some areas of minor aquifer associated with river terrace deposits associated with Harlington Stream and the River Flit. Although there are no SPZ at Junction 12, there are five groundwater abstractions localities within 1km of the area surrounding the junction.

- 7.3.25 There are flood risk areas associated with the Houghton Brook, the River Flit north of Toddington Services, a tributary of the River Flit to the north of Junction 12.

Physical Fitness/Non-Motorised Users (NMUs)

- 7.3.26 The components of the Non-Motorised User (NMU) network most relevant is the overbridge at Junction 12. Redhill Farm access underbridge is also located close to Junction 12. These crossings are important to the accessibility of local community facilities, and in the case of the Redhill Farm access underbridge, may form an important component of the wider recreational NMU network.
- 7.3.27 Junction 12 is not deemed an existing pedestrian crossing point, and there are no linkages with the Public Rights of Way network at this location. However, other than general lack of safe provision and adequate space for pedestrians, there are paved surfaces throughout.

Journey Ambience

- 7.3.28 Northbound on the mainline at Junction 12 there is localised screening associated with Toddington MSA and intermittent views of Toddington settlement on higher ground but views in this stretch are dominated by the MSA, associated slip roads, signage and footbridge. Lighting is particularly prominent due to the increased number of columns associated with the MSA. Shortly after the MSA footbridge the signage for Junction 12 begins. As one passes under Old Park Farm Overbridge and Toddington Interchange Overbridge, vegetation consists of grass with clusters of trees on both sides of the carriageway.
- 7.3.29 Southbound on the mainline at Junction 12 there are views of the elevated Junction 12, and Toddington MSA with associated increased lighting, but some open views of distant countryside and farm buildings, with pylons and overhead power lines dominating. Features crossing the road are Old Park Farm Overbridge and the footbridge associated with the MSA. For users of the slip roads and A5120 Harlington Road the existing junction is confusing and hesitation of drivers unfamiliar with the layout, particularly turning right, is apparent.

Planning Policies

- 7.3.30 The relevant policies are similar to those described for Junction 11 above.

7.4 Summary of Do-Nothing consequences

- 7.4.1 A Do-Nothing option requiring no land take was investigated. However, phasing of the traffic signals to ensure that traffic did not queue back onto the motorway would result in unacceptable queuing on the A5120 and this option was abandoned.
- 7.4.2 Traffic analysis shows that Junction 12 currently experiences significant congestion; particularly at peak travel times. This results in traffic queuing on the slip roads.
- 7.4.3 At Junction 12, there were also queues observed on all approaches in both the AM and PM peak periods. Queue-lengths on the exit-slip roads were observed to

exceed 100 metres on the north side and in excess of 180 metres on the south side, which is the length of the slip road.

- 7.4.4 The queues on the A5120 were particularly long on the approach from the east. Queues frequently reached back to the A5120/Harlington roundabout 750 metres away from the junction; and extended along both approaches to the roundabout from points 180 metres towards Flitwick and 150 metres towards Harlington. Feedback from local residents suggests that these observations might have been less than normal. On the day of the survey, queues on the A5120 on the west side of the motorway reached back towards Toddington to a length of 90 metres.
- 7.4.5 In order for the HSR scheme to operate safely it is essential that both J11 and J12 are improved to remove existing problems of traffic queuing which could extend back onto the motorway.
- 7.4.6 Doing nothing will fail to address the current congestion experienced at both junctions.
- 7.4.7 Doing nothing will fail to address the current sub-standard weaving length between Toddington MSA and Junction 12. Significant safety benefits can be achieved by moving Junction 12 further away from the Motorway Service Area.

7.5 Proposed Improvement

Alternatives considered

- 7.5.1 The main constraint on the layout of an improvement to Junction 12 is the proximity of the Toddington Motorway Service Area (MSA) to the south. One of the scheme objectives is to improve the road layout between the junction and the MSA to facilitate lane-changing manoeuvres for traffic to improve safety. This means that the slip roads at Junction 12 cannot be moved further south, as the existing distance between the junction and the MSA is substandard.
- 7.5.2 The open countryside around the junction allowed the examination of options for the improvement:
- Using the existing location of Junction 12; or
 - Locating the Junction further to the north.

Using the existing location

- 7.5.3 Three options were examined that would use the existing location. All of the options included 4 slip roads that connected the motorway to the A5120, with 2 being located to the south of the junction bridge, and 2 to the north of the bridge. This is similar to the existing junction, and is known as a diamond layout. Traffic signals would control traffic movements to and from the A5120 to the slip roads.

Option 1

- 7.5.4 Option 1 was similar to the existing layout, with the addition of a new footbridge to provide a separate route for pedestrians and cyclists to cross the motorway. The cost of this option would have been in the range £26.9M to £41.8M. This option is shown on drawing no.: D123846/GD/DEV/00.031 in Appendix 4.

- 7.5.5 The main disadvantage of this option was that the distance between the junction and the MSA was not increased, so it did not satisfy the scheme objective of improving safety, and would have required a permanent 60mph speed limit on the motorway.

Option 2

- 7.5.6 Option 2 was similar to the existing layout, with the addition of a road bridge to provide increased traffic capacity. The cost of this option would have been in the range £27.6M to £42.8M. This option is shown on drawing no.: D123846/GD/DEV/00.032 in Appendix 4.
- 7.5.7 The main disadvantage of this option was that the distance between the junction and the MSA was not increased, so it did not satisfy the scheme objective of improving safety, and would have required a permanent 60mph speed limit on the motorway.

Option 3

- 7.5.8 Option 3 was similar to the existing layout, with the addition of a new road bridge to provide increase capacity and improved facilities for pedestrians and cyclists to cross the motorway. Also, the traffic leaving the MSA and travelling north would be routed along parallel connector roads to the slip roads at Junction 12 before joining the motorway. Traffic travelling south would be routed along the slip roads at Junction 12 to parallel connector roads before entering the MSA. The cost of this option would have been in the range £43.2M to £67.6M. This option is shown on drawing no.: D123846/GD/DEV/00.033 in Appendix 4.
- 7.5.9 Parallel connector roads would require landtake and would impact on a commercial vehicle recovery business, water storage tanks for Toddington MSA, Highways Agency Traffic Officer compound and a Managing Agent Contract (MAC) 8 maintenance compound all to the west of the motorway.
- 7.5.10 Adjacent service access roads would be required parallel to the connector roads to provide access to the MSA for non motorway traffic.
- 7.5.11 In order to provide for the increased carriageway area from connector and service roads a new structure would be required at Old Park Farm.
- 7.5.12 Option 3 was rejected on cost and safety grounds. Overall this would be the most difficult option to build. Numerous new structures would be required over and above that of the other options. This option also impacts on a local county wildlife site located to the east of the M1 between the junction and the MSA.
- 7.5.13 These options were not taken forward to the Public Consultation as they were rejected on grounds of safety, and in the case of option 3 also due to the high cost. They were included in the Public Consultation information described as Rejected Options.

Locating the Junction further north

- 7.5.14 The other approach that was examined was to move the junction further to the north to increase the distance between the Junction and the MSA. In order to minimise the land that would required a different type of junction layout was

considered, called a half-cloverleaf. Three alternatives were examined, described as the Red, Blue and Orange options respectively.

Red Option

- 7.5.15 The Red Option would include new slip roads built to the north of the existing bridge at Junction 12, which would connect the motorway to the A5120 at junctions controlled by traffic signals. The existing bridge would remain, with improved facilities for pedestrians. New underpasses would be built under the slip roads to maintain access to fields and routes for pedestrians, and existing underpasses under the motorway would be extended. The cost of this option would be in the range of £43.8M to £70.6M. This option is shown on drawing no.: D123846/GD/DEV/00.034 in Appendix 4.
- 7.5.16 The existing overbridge, which would be retained, is the constraint in this option. The width between abutments prevents slip roads from commencing/terminating further south. The width of the deck also places limits on the storage of the high number of right turning vehicles, which inhibits the efficient operation of the adjacent traffic signals.
- 7.5.17 The Red Option improves the existing substandard weaving length. Northbound weaving would increase from 365m to 1070m. Southbound weaving between the Junction and the MSA would be increased from 517m to 1090m. Departures from Standard would still be required as the proposed weaving would still be less than required by current standards.
- 7.5.18 The slip roads would connect to the A5120 at fully signal controlled junctions. The northbound slip roads would form a staggered cross roads arrangement at the junction of the slip road, A5120 and B579. The southbound slip roads would form a T junction arrangement with the A5120.
- 7.5.19 The existing A5120 overbridge would be reconfigured to maximise the structure width and benefit traffic and NMUs.
- 7.5.20 It would be necessary to extend the existing Redhill Underbridge and Redhill Culvert in order to accommodate the new slip roads. New structures would also be provided under the northbound and southbound slip roads in order to maintain agricultural vehicle access. Additional culverts would also be required to maintain existing watercourses.

Blue Option

- 7.5.21 The Blue Option would include new slip roads built to the north of the existing bridge at Junction 12, which would connect the motorway to the A5120 at junctions controlled by traffic signals. The slip roads would follow similar alignments to those in the Red Option, but they would be closer to ground level. The existing bridge would remain, with improved facilities for pedestrians. Existing underpasses under the motorway would not be extended but alternative accesses would be provided for farm vehicles. The cost of this option would be in the range of £32.1M to £50.5M. This option is shown on drawing no.: D123846/GD/DEV/00.035 in Appendix 4.
- 7.5.22 New pedestrian underpasses would be provided under the northbound and southbound slip roads in order to maintain NMU access. It would be necessary

to divert the route of Footpath 34 to utilise these new subways. Additional culverts would also be required to maintain existing watercourses.

7.5.23 The Blue Option would improve weaving lengths similarly to the Red Option.

Orange Option

7.5.24 The Orange Option would also include new slip roads built to the north of the existing bridge at Junction 12, which would connect the motorway to the A5120 at junctions controlled by traffic signals. The slip roads would be closer to the bridge than those in the Red or Blue Options. The existing bridge would be demolished and a new bridge built carrying a wider road and a separate route for pedestrians and cyclists. New underpasses would be built under the slip roads to maintain access to fields and routes for pedestrians, and existing underpasses under the motorway would be extended. The cost of this option would be in the range of £32.4M to £47.9M. This option is shown on drawing no.: D123846/GD/DEV/00.036 in Appendix 4.

7.5.25 In this option the slip roads would be further south, in order to reduce the overall junction footprint and reduce landtake but would not fit under the existing bridge. The existing A5120 would be realigned over a new overbridge and the existing overbridge would be demolished.

7.5.26 The Orange Option would also improve the existing substandard weaving length. Northbound weaving would increase from 365m to 865m. Southbound weaving between the Junction and the MSA would increase from 517m to 985m. Departures from Standard would be required.

7.5.27 The slip roads would connect to the A5120 at fully signal controlled junctions. The northbound slip roads would form a staggered cross roads arrangement at the junction of the slip road, A5120 and B579. The southbound slip roads would form a T junction arrangement with the A5120.

7.5.28 It would be necessary to extend the existing Redhill Underbridge and Redhill Culvert in order to accommodate the new slip roads. A new structure would also be provided under the southbound slip roads in order to maintain agricultural vehicle access. Additional culverts would also be required to maintain existing watercourses.

7.5.29 The new A5120 Overbridge would provide enhanced facilities for pedestrians and cyclists. A paved route would be provided on the south side of the structure and pedestrians and cyclists would be able to use the proposed new Underbridge under the southbound slip road. This would maintain the route of Footpath 34; however, a diversion would be necessary.

7.5.30 The Red, Blue and Orange Options were presented in the Public Consultation as viable alternative solutions for improvement of Junction 12. All of the options would reduce existing congestion, and improve journey time reliability and road safety.

Design of Traffic Signals

7.5.31 The standard used to design traffic signal junctions is TD50/04 (DMRB, Volume 6, Section 2, Part 3).

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- 7.5.32 The Design Flows are approximately 29% to 35% higher than the existing peak hour flows currently using the traffic signal junctions.
- 7.5.33 In terms of the traffic signal analysis, the two options for Junction 12 can be divided into two groups. All of the 'Diamond' layouts would operate in a similar manner. The 'half-cloverleaf' layouts would all operate in the same way.
- 7.5.34 With the 'Diamond' layouts, the right-turn traffic to the entry slip roads would need to be stored on the bridge over the motorway. With Option 1, the existing bridge has three lanes marked, but could be converted to four lanes wide if the bridge parapets were strengthened and pedestrians taken on a separate structure. However, there would be no space for a central reserve to separate opposing traffic streams. Because of the shortage of width it would not be possible to provide the required capacity. Additional capacity could be obtained by permitting vehicles to turn right through opposing traffic movements but because the opposing traffic would be in multiple lanes this would impose a significant safety risk. In conclusion, Layout Version 1 would not satisfy the design criteria.
- 7.5.35 With 'Diamond' Option 2, the extra bridge would permit more space for the provision of additional lanes. In this version, right turns could be accommodated in a separate stage without compromising capacity of the junction. The traffic signals could be configured to operate acceptably.
- 7.5.36 The traffic signals aspects of 'Diamond' Option 3 would be similar to Option 2. The traffic to and from the MSA would be routed through the junction and additional lanes would be required to accommodate these extra traffic flows. The traffic signals could be configured to operate acceptably.
- 7.5.37 In terms of traffic signals, all three 'Half-Cloverleaf' Layout versions would operate in exactly the same way. The traffic signalled nodes would be sufficiently distant from the M1 over-bridge such that the approach roads could be widened. The LINSIG analysis shows that all three 'Half-Cloverleaf' versions could be configured to operate acceptably.
- 7.5.38 The traffic signals aspects of 'Diamond' Option 1 could not be configured to work safely or would not provide the desired capacity.
- 7.5.39 With the 'Diamond' Option 3, the traffic to and from the MSA would be routed through the junction and additional lanes would be required to accommodate these extra traffic flows.
- 7.5.40 For the 'Diamond' Option 2 and all three of the 'Half-Cloverleaf' layout versions, the traffic signals could be configured to operate acceptably.

Summary of Environmental Effects

- 7.5.41 The following paragraphs provide a brief synopsis of the key findings together with comments on any limitations on the assessments undertaken. Refer to Appendix 5.

Air Quality

- 7.5.42 At Junction 12, Diamond Layout Options 1 and 2 are considered unlikely to have an overall significant effect in terms of air quality. Diamond Layout Option 3 and

Half Cloverleaf Layout Red, Blue and Orange Options are considered likely to have slight adverse effects in terms of overall air quality.

Noise and Vibration

- 7.5.43 Noise levels at the few properties in the vicinity of Junction 12 are dominated by road traffic on the mainline, not on the junction, due to the relatively large distances from the motorway. Due to the relatively large distances from the motorway to these properties, any changes in noise levels at these properties as a result of the Scheme at Junction 12 are likely to be negligible. This would be the case for each of the options considered.

Landscape & Visual

- 7.5.44 Landscape impacts would occur both through loss of existing vegetation, as a result of expansion of the footprint of the junction, and through landform change to achieve appropriate gradients. Visual impacts would occur through the introduction of additional engineered landforms although mitigation planting would in time aid integration of these into the landscape. The specific extent of these impacts would vary dependant on the option selected but in all cases the effects would be slight to negligible at Year 15.

Cultural Heritage

- 7.5.45 The Scheme would result in slight adverse effects on known archaeological remains of low and medium value located within the area of new land-take surrounding Junction 12. Whilst there would be temporary and longer term operational impacts on the setting of built heritage receptors and existing motorway structures due to visual intrusion, the overall effect on these features would be neutral.

Ecology and Nature Conservation

- 7.5.46 Potential impacts on ecology and nature conservation as a result of the Scheme at Junction 12 would include impacts on protected species (bats, breeding birds and badger), impacts on undesignated woodlands, grassland, hedgerows, scrub and mature trees and potential indirect impacts on the River Flit County Wildlife Site. There could also be some direct impacts on the River Flit County Wildlife Site, subject to whether any land-take is required for culvert extensions at Harlington Stream. For Diamond Layout Option 3, land-take from the CWS would also be required for construction of a new overbridge at Old Park Farm. Overall, the effect on ecology and nature conservation as a result of the Scheme at Junction 12 is considered likely to be slight adverse
- 7.5.47 Poplars Nursery CWS is near to the proposed junction improvement and may be directly affected by the Orange Option.

Road Drainage and the Water Environment

- 7.5.48 At Junction 12, the Scheme would include the provision of new drainage and ponds to reduce peak flow, which would also provide some treatment of the run-off. Flood compensation measures would also be provided where required. The overall effect on water quality and hydrology of receiving ditches and watercourses, with mitigation in place, would be anticipated to be neutral.

7.5.49 Each of the Junction 12 options would require land-take from best and most versatile agricultural land. All requirements for permanent land-take from best and most versatile agricultural land are below the 20 hectares threshold for which consultation with the Defra Rural Development Service would be recommended.

Geology and Soils

7.5.50 No significant impacts on Geology and Soils are anticipated for the Scheme, with the caveat that there could be waste disposal issues should either soil contamination or asbestos-containing materials be encountered.

Pedestrians, Cyclists, Equestrians and Community Effects

7.5.51 The Scheme should not result in significant adverse effects on Non-motorised Users (NMUs) or on community facilities.

7.5.52 The Right of Way through the Redhill Farm Access Underbridge would be maintained through Junction 12 with each option. Impacts on NMUs in the vicinity of Junction 12 would be dependant on the option selected.

Vehicle Travellers

7.5.53 The Scheme would have a slight adverse effect on travellers' views at Junction 12. All options would have a beneficial effect on driver stress, though driver stress would remain in the moderate category for all options at Junction 12.

8. CHANGES SINCE THE PUBLIC CONSULTATION

Junction 11

- 8.1 Further work has been undertaken to confirm the traffic signals design, including the location of controlled crossings for pedestrians and cyclists at the slip roads. This has identified the need for more lanes on the A505 approaches and the roundabout. It will also be necessary to divert or protect more statutory undertakers equipment.

Junction 12

- 8.2 The design of the signals layout at Junction 12 has continued and indicated that the staggered junction arrangement shown in the Red and Blue Options should be replaced by a cross roads, similar to that in the Orange Option for the junction to operate effectively. The design of the slip roads and bridge has also progressed, with access routes, statutory undertakers works and drainage ponds added.

Cost Estimate

- 8.3 The estimated cost of the junctions was updated taking into account these changes, and this gives a revised total range estimate of £58.8m to £84.9m for the scheme.

9. TRAFFIC AND ECONOMICS

Traffic Analysis

- 9.1 The transport analysis of the Junctions is underpinned by the traffic modelling. The approach to traffic modelling was originally developed to support the M1 Widening Junction 10 to Junction 13 scheme.
- 9.2 The proposed improvement to the capacity of the M1 would have impacts both at the local level and strategically. The overall approach was therefore to combine the strategic impacts represented by the East of England regional transport model (EERM) with the local detail that can be obtained from a local transport model (LAM).
- 9.3 The EERM trip demand forecasts are based upon a reference case forecast from the National Trip End Model NTEM v5.3. The trip end forecast also used planning data that is compatible with the East of England Plan and the development growth targets in the Milton Keynes and South Midlands (MKSM) sub-regional spatial strategy.
- 9.4 The trip demands modelled in EERM respond to the increases in capacity in the road network. The variable demand modelling is compliant with the Department for Transport's modelling advice contained in WebTAG. The improvement to the M1 motorway is forecast to attract between 15% and 20% more trips per day to the motorway.
- 9.5 The EERM and the local traffic model represent similar transport interventions. Within the LAM's model area the following highway improvement schemes are represented: M1 Widening Junction 6a to Junction 10; M1 Improvement Junction 10 to Junction 13; A1081 Airport Way; A421 Dualling from M1 Junction 13 to Bedford; A421 Dualling from M1 Junction 13 to Milton Keynes (after 2016); and A507 Ridgmont Bypass.
- 9.6 The A5-M1 Link (Dunstable Northern Bypass) is a regional scheme that runs between the A5 and a new Junction 11a on the M1 motorway. The Link road would be aligned to the north of Dunstable and Houghton Regis and would relieve both Junction 11 and Junction 12 of some of the trips passing through these junctions.
- 9.7 Design reference flows (DRF) for junctions design have been extracted from the LAM. The forecast-year models of 2029, without the A5-M1 Link, and 2031 with the A5-M1 Link, were used to extract the demand turning movements. The DRF flows are extracted from the models as average-weekday AM peak hour (0800-0900) and average-weekday PM peak hour (1700-1800) vehicle movements.
- 9.8 Site observations indicate that the peak hour levels of flow are often sustained for a half-hour to an hour both before and after the peak hour. To ensure that the junction designs are robust to fluctuations in the arrival flow, the layouts have been designed so that the arrival flow would not exceed 90% of the capacity of each junction approach.
- 9.9 The traffic signal layouts have been appraised using two alternative software packages: Linsig2 and TRANSYTv12. LINSIG is a software package used to appraise single junctions such as those proposed at Junction 12. TRANSYT is

used to assess traffic signals that are linked together, for example on a signalised roundabout, such as the layout that is proposed at Junction 11.

- 9.10 The design of traffic signals for each Junction is described in sections 6.5 and 7.5 above, and indicates that satisfactory signal arrangements can be designed for each of the options presented for Public Consultation.

Costs

- 9.11 The estimated cost of each option presented at Public Consultation has been prepared as a range estimate in accordance with Highways Agency procedures. The ranges at the Public Consultation were:

Junction	Option	Range Estimate
11	Single	£10.9m to £16.0m
12	Red	£43.8m to £70.6m
12	Blue	£43.1m to £50.5m
12	Orange	£32.4m to £47.9m

Table 9.1. Range estimate

- 9.12 Based upon the range estimates the Orange Option would be the least expensive to construct at Junction 12.
- 9.13 The updated cost estimate described in paragraph 8.3, taking into account the changes since the Public Consultation is £58.8m to £84.9m for the scheme including the Orange Option for Junction 12. The estimate has been used in preparing the economic assessment for the scheme.

Economic Assessment

- 9.14 Economic appraisals are calculated using the software TUBA and COBA. TUBA calculates the economic benefits using trip matrices from the traffic models. COBA calculates accident saving benefits.
- 9.15 Previously, the economic appraisals of the M1 Junction improvements have been considered as an integral part of the M1 Hard shoulder running scheme. The results were reported in the M1 J10-13 HSR Improvements Economic Assessment Report (No. D123845/4/05, August 2009).
- 9.16 The whole scheme (i.e. the HSR and the Junction Improvements combined) has a Transport Economic Efficiency benefit of £234 million (2002 market price discounted to a 2002 present value year).
- 9.17 The present value of cost (PVC) was £65 million and produced a Net Present Value of £169 million and a benefit to cost (BCR) ratio of 3.6.
- 9.18 The M1 HSR and Junction Improvement scheme would deliver good value for money.

- 9.19 In terms of the COBA safety appraisal, the M1 motorway improvement scheme would attract more trips to the motorway. This factor on its own would have a detrimental impact on road safety numbers.
- 9.20 However, the managed motorway is likely to reduce the accident rate on the motorway and this factor would tend to counteract the impact of increased traffic flows.
- 9.21 Overall the COBA analysis suggests that the safety impact of the HSR scheme and Junction Improvements is likely to be neutral.

Junction Scheme

- 9.22 The transport economic appraisal and the safety assessment of the Junction Improvements in isolation were reported in the M1 10-13 Junction Improvements PCF Stage 3 Economic Assessment Report (No D123846/4/03 September 2009).
- 9.23 Alternative scenarios have been tested which include or exclude some development and the A5-M1 Link road. A Lowest Benefits Scenario was tested which would include the minimum benefits that the scheme would be expected to deliver. Other scenarios would be expected to deliver higher benefits. So the results from the lowest benefits scenario would give a conservative estimate of the economic value of the scheme.
- 9.24 The lowest benefits scenario does not include the A5-M1 Link in the transport networks appraised. It is these lowest benefit economic appraisal results that are present in this report. The total monetised costs and benefits were:

Analysis of Monetised Costs /Benefits	Junction 11 plus J12 Half-Cloverleaf
Consumer User Benefits	55.05
Business User Benefits	64.38
Carbon Benefits	0.08
Noise Benefits	0.23
Accident Benefits	-10.80
Net present Value of Benefits (PVB)	108.93
Net present Value Costs (PVC)	46.00
Net present Value (NPV)	62.93
Benefit to Cost Ratio (BCR)	2.40
Values are 2002 prices, in £millions, discounted to a 2002 present value year.	

Table 9.2. Traffic Economics

- 9.25 The lowest benefit economic appraisal results indicate that the proposed junction improvements would provide good value for money on their own as a separate scheme.
- 9.26 The core benefits scenario represents the most likely outcome anticipated and includes the A5-M1 Link in the transport networks appraised. The total monetised costs and benefits are shown in the table 9.3 below:

Analysis of Monetised Costs /Benefits	Junction 11plus J12 Half-Cloverleaf
Consumer User Benefits	53.17
Business User Benefits	62.71
Carbon Benefits from Local Model	0.08
Noise Benefits	0.23
Accident Benefits	33.01
Net present Value of Benefits (PVB)	149.19
Net present Value Costs (PVC)	43.92
Net present Value (NPV)	105.27
Benefit to Cost Ratio (BCR)	3.40
Values are 2002 prices, in £millions, discounted to a 2002 present value year.	

Table 9.3. Traffic Economics

- 9.27 The core benefits economic appraisal results indicate that the proposed junction improvements would provide good value for money on their own as a separate scheme, using the latest range estimate.

10. PUBLIC CONSULTATION

10.1 Consultation details

- 10.1.1 Public Consultation for the Junction Improvement Scheme began on Thursday 25th June 2009 and lasted for 13 weeks, ending on Thursday 24th September 2009.
- 10.1.2 The Public Consultation Report D123846/6/04 contains detailed analysis of the findings.
- 10.1.3 The consultation sought the views of the public and stakeholders on the proposals for improvements to M1 Junctions 11 and 12.
- 10.1.4 A single option for Junction 11 and the three alternative options for Junction 12 were presented. The three rejected options for Junction 12 which were also presented.
- 10.1.5 Information was distributed to the public and key stakeholders in the form of leaflets, questionnaires and press announcements. The leaflet and questionnaire were distributed in advance of the Public Consultation to approximately 1074 local residents. Further copies were placed at deposit points including local authorities, town councils and libraries. Details were also published on the HA's website.
- 10.1.6 Public Consultation Exhibitions were held in July 2009. Three exhibitions were held locally to allow the public to view the single option for Junction 11 and the three alternative options for Junction 12. The three rejected options for Junction 12 were also presented. The exhibitions were attended by staff from the Highways Agency (HA), Costain Carillion Joint Venture (CCJV), Scott Wilson (SW), and Parsons Brinckerhoff (PB) who were there to explain the proposals, answer questions from the public and accept written comments.
- 10.1.7 In addition to the questionnaires, public responses were received via post, telephone, email, and the Highways Agency website.
- 10.1.8 As part of the consultation, meetings were arranged and proposals circulated to stakeholders including county councils, local authorities, Joint Local Access Forum, the Environment Agency, English Nature, the emergency services, parish councils, action/user groups and land owners. Comments and feedback were invited, and the opportunity for further consultation offered.
- 10.1.9 A total of 378 people visited the exhibitions. A total of 104 questionnaires were returned. The responses were also received via 9 comments from the exhibitions, 13 letters, 46 emails and 16 from the Highway Agency Information Line. A total of 105 exit surveys were collected. The vast majority of respondents were from the local community.
- 10.1.10 General concerns raised during the public consultation included:
- Safety of motorists, pedestrians and cyclists.
 - Traffic queues and congestion.
 - Improving facilities for Non-Motorised Users.
 - Dealing with environmental issues including ecological, landtake and heritage.

10.2 Effectiveness of Consultation

- 10.2.1 The aim of the public consultation is to give the public and stakeholders an opportunity to express their views on the options under consideration and allow additional evidence to be sought from a range of interested parties so as to inform the development of the policy or its implementation.
- 10.2.2 The level of attendance at Public Consultation Exhibitions was low at 378, but generally in line with expectations.
- 10.2.3 Feedback from the Exhibition Survey was positive with 90% finding the exhibition useful. It was concluded that visitors to the exhibition appreciated the Highways Agency's efforts in involving them and the information presented was well received.
- 10.2.4 Taking into account the value and scope of the improvement scheme, and the dense population around Junction 11, combined with the efforts to publicise the public consultation, participation is considered to have been limited and with a disproportionate number of responses from men and those 65 and over.

10.3 Comments

- 10.3.1 Comments were recorded at the Public Exhibitions, completed on the questionnaire and sent in by e-mail. Some comments were also recorded on the Highways Agency Information Line.
- 10.3.2 A summary of responses is shown in Table 10.1 below.

Method	Number	Comment/ Suggestion
Questionnaires	104	56
Letters	12	10
e-mails	47	17
Highways Agency Information Line	16	3
Exhibition Exit Survey	105	9

Table 10.1. Summary of Comments

- 10.3.3 The key subjects raised in comments included:
- Junction 11 and 12 – improve NMU access.
 - Junction 12 – increase distance between service area and junction and improve safety.
 - Junction 11 and 12 – improve safety and reduce congestion.
 - Junction 12 – need to improve roads around this Junction.
 - Concern over value for money of all proposals.
 - Concern over disruption during construction.
 - Concern over land-take and environmental issues.
 - M1 widening and/or Junction 11a needed.

10.3.4 Of the comments that stated a preference, eleven were in favour and eight against the proposed improvements at Junction 11.

10.3.5 Of the comments that stated a preference, twenty three were in favour and eight against the improvement options at Junction 12.

10.3.6 Comments were also received on other schemes not directly linked to the proposals.

10.4 Other Routes Suggested at Public Consultation

10.4.1 During the consultation period, three respondents suggested an alternative route as summarised in Table 10.2 below.

Suggestion	Comment
Do nothing	In order for the HSR scheme to operate safely it is essential that both J11 and J12 are improved to remove existing problems of traffic queuing back onto the motorway. In addition significant safety benefits can be achieved by moving J12 further away from the Motorway service Area
Close Junction 12	Junction 12 could not be closed as part of the M1 Junction 10 to 13 HSR scheme. The possible closure of Junction 12 is linked to the proposed A5-M1 Link and also the proposed Luton Northern Bypass, the Programmes for which are uncertain.
An alternative layout was provided for the east slip road at Junction 12. The proposal shows the slip road joining the existing roundabout on A5120	A formal assessment will be made and response issued.

Table 10.2. Summary of Alternative Routes

10.5 Comments

10.5.1 Forty-seven e-mails were received during the Public Consultation. Of these fifteen made specific comments about the proposals. The subjects raised are summarised in Table 10.3 below.

10.5.2 Twelve letters were received during the Public Consultation. Of these ten made specific comments about the proposals. The subjects raised similar concerns to those returned on the questionnaires and are summarised in Table 10.3 below.

Subject	Number of e-mails	Number of letters
Cost	2	1
Congestion	4	7
Safety	5	7
NMU	5	6
Environment	7	16
Other M1 Schemes		2

Table 10.3. Summary of Comments from letters and e-mails

10.6 Preferences

- 10.6.1 There is strong overall support for improvement at Junction 11 with 60% of those returning the questionnaire supporting the scheme. There are a few strongly against, indicating that it will be a waste of public money.
- 10.6.2 The Orange Option for Junction 12 is the favourite option with nearly half of those returning the questionnaire identifying this as their first choice. The Red option was the least liked, being selected most often as the 3rd choice. Again a small minority indicated disapproval for the scheme as a waste of money.
- 10.6.3 The most important design consideration is safety with Journey time reliability and protecting the environment a little way behind.

11. SUMMARY AND CONCLUSIONS

11.1 The problem to be solved

In sections 6 and 7 of this report the results of traffic surveys have been presented that demonstrate that both Junctions 11 and 12 currently experience congestion and queuing. These sections also indicate that the forecast flows on the motorway and junctions will increase following the improvement in traffic capacity that the HSR Scheme will bring.

To do nothing would result in increased congestion and reduced road safety.

11.2 Junction 11

In section 6 the constraints on any improvements are described. Principally the location of the junction within the urban area limits the options for improvements if no land is to be taken from residential properties.

Consequently improvements are limited to an enlargement of the existing roundabout and approaches, and improved signalling. This concept was presented at Public Consultation and received strong support, with over 60% of respondents in favour.

The concept has been developed and traffic signals design carried out to ensure that the proposed would provide satisfactory capacity. The signals design has included the provision of controlled crossings of the slip roads to improve facilities for pedestrians.

An environmental assessment has been carried out that has not identified major detrimental effects from the proposal.

One industrial property would be demolished. No land would be required from residential properties.

The proposal would reduce queuing on the slip roads and A505 approaches to the junction and improve road safety.

This proposal is shown on drawing D123846/GD/DEV/00.038 in Appendix 6.

11.3 Junction 12

Section 7 of this report describes the options examined for Junction 12.

The principal constraints upon the design were the proximity of the Toddington Motorway Service Area and the desire to minimise environmental impacts.

Two concepts were identified, i.e. maintaining the location of the existing junction by constructing 'diamond' layouts or building a new junction further to the north using half-cloverleaf layouts.

Diamond Options

Two diamond options did not achieve the road safety objective as they did not improve the weaving length between J12 and the MSA. It would also have been necessary to implement a permanent 60mph speed limit on the motorway, which would be unacceptable. A third diamond option included parallel connector roads that would divert traffic from the MSA through Junction 12. This option would have also required new overbridges, and access roads to the MSA. It was the most expensive option and did not provide value for money.

Consequently the diamond options were described as rejected options at the Public Consultation.

Half cloverleaf options

Three half cloverleaf options, referred to as Red, Blue and Orange were presented at the Public Consultation. The respondents to the consultation expressed a preference for the Orange Option (45%) followed by Blue (35%) and Red (20%).

The concepts have been developed and assessed against engineering, environmental and value for money criteria.

All of the options would provide satisfactory traffic capacity, by the use of signal controlled junctions between the slip roads and the A5120 Harlington Road.

The Red Option was located sufficiently far to the north of J12 to enable the existing bridge to be maintained, and this would make a good improvement in weaving length from 365m to 1070m northbound and from 517m to 1090m southbound. It would be necessary to reconfigure the road across the bridge to improve facilities for pedestrians. The Red Option would be the most expensive to construct, as the embankments at the slip roads would require more fill material, at £43.8m to £70.6m, using the estimates shown at Public Consultation.

The Blue Option would be located similarly to the Red Option but the slip road embankments would be lower. This would reduce costs but it would not be possible to maintain access routes through underpasses for agricultural traffic, and alternative routes would be provided. It would be necessary to divert public footpaths by approximately 500m. The existing bridge would be retained, with the road over it reconfigured similarly to the Red Option. This option would be less expensive than the Red Option, at £32.1m to £50.5m, using the estimates shown at Public Consultation.

The Orange Option is more compact, being located closer to the existing A5120 crossing. The improvement in weaving length would be less than for the Red or Blue Options, but would still be good, from 365m to 865m northbound and from 517m to 985m southbound. It would be necessary to construct a new bridge to replace the existing bridge, to allow the slip roads to pass under the spans. However, this would also permit more efficient layout of the traffic signals junction and provision of a pedestrian/cyclist route over the bridge. Existing bridges under the motorway would be extended and new structures constructed to maintain agricultural accesses and public footpaths. This is the least expensive option at £32.4m to £47.9m, using the estimates shown at Public Consultation.

11.4 Changes since the Public Consultation

Changes made to the design of Junction 11 and 12 since the Public Consultation have been described above. Updated estimates taking into account these changes have been used in preparing the economic assessment of the scheme. Using these higher estimates the scheme including the Orange Option for Junction 12 offers good value for money with a benefit - cost ratio of at least 2.4.

11.5 Summary

The single proposal for improvement at Junction 11 would address the scheme objectives and received support during the Public Consultation.

Three options were presented at the Public Consultation for Junction 12 and all received some support. It is necessary to strike a balance between the engineering, environmental and other issues relating to each option when assessing the scheme.

On balance the Orange Option offers advantages over the Red and Blue Options for the following reasons:

- There would be a good improvement in weaving length and road safety would be improved.
- The land required and environmental impacts would be less than for the other options.
- It would be feasible to maintain agricultural and public footpath routes without major diversions.
- The facilities provided for pedestrians and cyclists would be enhanced by construction of the new bridge.
- The traffic signals layout is more efficient with the additional carriageway width available on the new bridge.
- This Option was favoured at the Public Consultation.
- This Option offers the best value for money.

This proposal is shown on drawing D123846/GD/DEV/25.045 in Appendix 7.

12. THE RECOMMENDED ROUTE (In Confidence)

- 12.1 The recommended solution for the improvement of Junction 11 is a signalised enlarged roundabout as shown on drawing no.: D123846/GD/DEV/00.038.
- 12.2 The recommended solution for the improvement of Junction 12 is the half cloverleaf junction referred to as the Orange Option. This is shown on drawing no.: D123845/GD/DEV/25.045.