DAVID GREEN

WRITTEN REPRESENTATION

HIGHWAYS ENGLAND'S RESPONSE

1. SUMMARY

1.1 I have 40 years experience in the fields of Highway and Transportation Engineering culminating in the position of Transportation Director with a leading consultancy. My work included responsibility for the development of a number of successful major projects through concept, justification and expert witness during inquiry stages and, consequently, I feel qualified to comment on various aspects of the M4 Smart motorway project as it currently stands. I recently retired and so my resources are limited but I have attended Highways England's (HE) exhibition and exchanged several Emails with the project team in an effort to appreciate better various aspects of the proposed scheme. I have taken the approach of drawing the Inspector's attention to what I consider to be the fundamental weaknesses with the project as it stands and hope that this proves useful to her in the assessment process.

1.2 In essence, whilst I would normally welcome capital investment in transport across Berkshire I remain totally unconvinced on several essential aspects of the present scheme:-

(a) The unproven safety of permanent hard shoulder running.

(b) The unreliability of the traffic forecasts used.

(c) The unproven ability of the local road network to accommodate the implied local traffic growth.

(d) The apparent lack of consideration of capacity improvements other than along the motorway main line.

(e) HE's stance regarding traffic noise.

(f) The impact of all the above on the scheme's business case.

These matters are discussed in depth below but I would urge that my comments are considered seriously before any decision is taken regarding the scheme's progress.

Highways England Comment

1.2.2 Highway's England's detailed response on each of the topics listed above is provided in the response below.

2. ROAD SAFETY

2.1 The development of Smart Motorways in the UK was based largely on the success of innovative trials on the M42 in the West Midlands. However, this trial differed markedly from that proposed on the M4 in a number of key ways. Firstly the emergency hard shoulder was used as a running lane only during heavy traffic times and when traffic was specifically directed to do so by closely spaced gantry signs. The M4 proposal however would subsume the hard shoulder as a continuously used fourth lane except when traffic was directed otherwise via less frequent gantry signs. Secondly, emergency refuge areas were provided more frequently on the M42 than the 2.5Km frequency proposed on the M4.

Highways England Comment

2.1.1 As suggested in the representation, there are considerable differences in the design of the M42 Pilot compared to the proposed M4 junctions 3 to 12 smart motorway scheme (the "Scheme"). It is correct that the M4 Scheme proposes the permanent conversion of the hard shoulder to a running lane (unless the lane needs to be closed via the gantry signs proposed as part of the Scheme, such as due to an incident), whilst the M42 Pilot is a dynamic hard shoulder running ("HSR") scheme. The proposals which comprise the M42 Pilot were not considered the optimal solution for the Scheme, the design evolution of which is explained in Chapter 3 of the Environmental Statement ("ES") (Application Document Reference 6-1). The M42 Pilot is more costly, visually intrusive, resource intensive and provides less journey time benefits than the design proposed for the Scheme.

2.1.2 The Managed Motorways All Lane Running Generic Safety report (Ref: 1039092-GSR-016, August 2013 source: http://assets.highways.gov.uk/specialist-information/knowledge-compendium/2011-13-knowledge-programme/MM-ALR%20generic%20safety%20report%20final.pdf provides further background information to explain why the all lane running ("ALR") design became Highways England policy as the preferred operating solution to address

congestion issues on the network and not the scheme design as seen on the M42 Pilot.

2.1.3 In relation to the spacing of emergency refuge areas ("ERAs"), during the design of the M42 Pilot, a decision was taken to provide refuge areas more frequently (than the spacing requirements for ALR schemes outlined within the smart motorways ALR design standard (Interim Advice Note ("IAN") 161/13 which was current at the time) due to the need to demonstrate to road users and broader stakeholders that the hard shoulder could be operated safely as a running lane in order to tackle congestion. However, analysis of the operation of M42 Pilot and subsequent HSR schemes, has led to the amendment of the guidance on the required spacing, resulting in the current 2.5km maximum spacing outlined within the smart motorways ALR design standard (IAN 161/13). IAN 161/13 – 'An Evaluation of the provision of refuge area' provides the evidence that many road users will still be able to drive to an ERA in an emergency, even when the distance is increased up towards 2.5km. (Ref: http://assets.highways.gov.uk/specialist-information/knowledge-compendium/2011-13-knowledge-programme/MM-ALR_Evaluation_of_the_Provision_of_Refuge_Areas.pdf).

2.1.4 This Scheme has an average spacing between refuges of 1.14 miles (1.85km), as detailed in section 2.2 of Annex E of the Engineering and Design Report ("EDR") (Application Document Reference Number 7-4), which although more widely spaced than the M42 Pilot will be significantly within the 2.5km maximum spacing outlined IAN 161/13.

2.2 I am aware that the M4 proposed arrangements have also been adopted for recently completed schemes on the M25 and are planned elsewhere. However, I have concerns that it may be too soon to draw conclusions regarding the inherent safety of the fundamentally changed approach. In a similar vein I am concerned that the country appears to be moving away from the longstanding, standard motorway hard shoulder approach of use only in emergency which matches common, long term international practice and is well understood by users of British roads. An apparently ad hoc mix of different approaches across the UK motorway network and the complexity of different signing and traffic management arrangements must result in an element of confusion/indecision for drivers. The UK motorway network is recognised internationally for excellent levels of safety which must surely be compromised by these changes on very busy strategically important traffic routes.

Highways England Comment

2.2.1 The representation suggests that it is too soon to draw conclusions regarding the inherent safety of the ALR design. Monitoring is currently underway on the first ALR scheme on the M25 J23-27 to measure actual safety performance and compare it with the safety levels before the introduction of ALR. The one year monitoring report will be published by the end of 2015. Whilst the results will give an indication of the actual safety level that can be achieved with ALR, it remains a very short timeframe upon which to assess the efficacy of the schemes - a scheme requires three years of validated accident data in order to be confident that it is meeting its safety objective. However, contrary to the suggestion in the representation, conclusions can be drawn on the inherent safety of the ALR design, as hazard log assessments have been undertaken, which accurately predict the safety of the ALR design. The assessment for the Scheme has concluded that the introduction of ALR should not compromise overall safety. The Hazard Log report, Annex E of the EDR (Application Document Reference Number 7-4), outlines the hazard analysis work undertaken and leads to the conclusion that the ALR design of the Scheme is likely to be no worse in terms of safety performance (than the baseline). Annex E concludes that the Scheme can expect *"A reduction in risk for 13 of the 17 highest scoring existing motorway hazards (i.e. those with a risk score of E08/S08 and above), due to a controlled environment being provided through a combination of regularly spaced [variable] mandatory speed signals, speed enforcement, and full CCTV coverage."*

2.2.2 With regard to the change in approach, the Managed Motorways ALR Generic Safety report provides further background information to explain why the ALR design became Highways England policy as the preferred operating solution to address congestion issues on the network. As noted in the Managed Motorways ALR Generic Safety report:

"In January 2009 the Government announced that hard shoulder running (HSR) would be extended to some of the busiest parts of the Highways Agency's major road network and this initiated the managed motorways (MM) programme. The MM concept built upon the success of the M42 Active Traffic Management Pilot (M42 MM) scheme. IAN 111/09 "Managed Motorways Implementation Guidance – Hard Shoulder Running (MM-HSR)" and IAN112/08 "Managed Motorways

Implementation Guidance – Through Junction Hard Shoulder Running" provide designers with guidance on the implementation of managed motorways with dynamic hard shoulder running and the option for including through junction hard shoulder running.

Further knowledge and experience of operating managed motorways schemes indicated that there was scope to further reduce capital and operating costs, whilst meeting congestion objectives and not reducing safety performance compared to the baseline.

Managed motorways all lane running (MM-ALR) has been developed by the Highways Agency to enable a reduction in the amount of infrastructure necessary for a managed motorway scheme, resulting in significant cost savings without a reduction in safety.

Permanent conversion of the hard shoulder to a running lane along with the ability to dynamically control mandatory speed limits is a key aspect of MM-ALR. This removes the complex operating regime of opening and closing a dynamic hard shoulder."

2.2.3 Highways England's experience of operating HSR has shown that it is resource intensive (to open and close the hard shoulder to traffic). It also has been found to have a number of technology points of failure, which means that the hard shoulder regularly cannot be opened.

2.2.4 For example, the opening of the hard shoulder as a running lane on an HSR scheme requires the operator to be able to view the full length of hard shoulder for safety reasons. When a camera develops a technology fault and a section of hard shoulder cannot be viewed by the operator, then the operator will not be able to open the hard shoulder to traffic.

2.2.5 Furthermore, this results in a high maintenance burden which creates greater risk exposure for Highways England's maintenance workforce. All of these factors impact on the financial and operational benefits of managed motorways. ALR reduces the risks of technology failure and the incumbent risks to the maintenance workforce. Optimising the smart motorways design, and subsequent operations, has enabled Highways England to find a balance between designing/operating efficient schemes that provide value for money, whilst

maintaining safety above baseline levels. These efficiencies have made it possible to deliver a far greater number of smart motorway carriageway miles and deliver significant benefits faster than would have been possible by replicating the heavily engineered M42 Pilot scheme.

2.2.6 Evidence (i.e. monitoring data on performance) built up from the M42 Pilot and more recent operational smart motorway schemes, e.g. hard shoulder running schemes on the M6 around Birmingham and M62 J25-30, has been used, as part of the hazard assessment methodology, to consider how drivers behave in a smart motorway environment. The smart motorway provides a controlled environment where driver information is provided through the effective operation of appropriate infrastructure and technology. Information, which is relevant, timely and accurate, is provided to the road user at the right location at the right time; thereby promoting appropriate driver behaviour. Drivers are expected to understand and react to the information presented to them and there is no evidence that drivers find smart motorway schemes confusing. Evidence has demonstrated that the use of the hard shoulder, as an additional lane, does not compromise overall safety.

2.2.7 The introduction of ALR on the M4 will be consistent with how Highways England operates the rest of the motorway network (i.e. a standard motorway). As noted above, the ALR operating regime is different to the HSR operating regime as it removes the need to open and close the hard shoulder to traffic. Therefore, an ALR operating regime is likely to be less confusing to motorists than the HSR operating regime - as lane one will always be open to traffic, (unless there is an incident and in that scenario appropriate information will be displayed on the signs and signals to clearly advise motorists which lanes are open and closed to traffic).

2.2.8 It is not correct that an ad hoc mixture of different approaches is being imposed across the strategic road network. Smart motorways have evolved into three separate operating solutions for application on the strategic road network: Controlled Motorways, HSR and ALR. The evolution of smart motorways has been through refinement and improvement of design and the need for scheme design to be considered on a case-by-case basis. Furthermore, Highways England policy now is that where it is identified that a smart motorway scheme is required,

the scheme will adopt the ALR operating regime as outlined in the smart motorways ALR design guidance (IAN 161/13).

2.2.9 Highways England does not consider that this approach results in confusion or indecision for drivers, as suggested in the representation. This is because the design of all Highways England schemes takes into account the optimum locations to provide information to motorists in order to achieve maximum driver understanding and compliant driver behaviour. The ALR design provides a stable and predictable road driving environment because it avoids potential confusion as to whether the hard shoulder is open or closed, in addition to reduced levels of infrastructure. The role of signs and lines along with electronic signals will communicate expectations to drivers and Highways England is engaged at a strategic level in further education work to support compliance. The Scheme is therefore not expected to compromise overall safety and the assessment of safety takes into account whether drivers will understand the information presented to them and how they will react.

2.3 I have been unable, to date, to find any evidence to support these fundamental changes to the M42 style motorway traffic management practice and it is my understanding that the emergency services remain concerned. Has the concept and operational detail of the M4 project been subjected to an objective, fully independent safety audit? Ideally, the audit process should be ongoing to make use of safety data from the recent M25 and any other schemes as well as full input by the emergency services to ensure that a rigorous approach has been taken to road safety.

Highways England Comment

2.3.1 As outlined above in the response to paragraph 2.2, the Managed Motorways ALR Generic Safety report provides further background information to explain why the ALR design became Highways England's policy as the preferred operating solution to address congestion issues on the network. Paragraph 2.2.3 above explains that Highways England's experience of operating HSR, such as on the M42 as referred to in the representation, has shown that it is resource intensive, and more dangerous, to open and close the hard shoulder and that there are a number of factors that impact on financial and operational benefits of providing an HSR scheme. ALR, where the hard shoulder is permanently open, reduces the risks of technology failure and risks to the maintenance workforce.

2.3.2 The emergency services initially had concerns regarding the smart motorways ALR concept. Highways England worked closely with the emergency service providers to ensure that the concerns that they had were properly addressed. Lessons learned from the M25 ALR schemes are being shared with the Scheme and it is intended that any best practice will be integrated into the Regional Operating Agreement ("ROA"), which is being developed with the emergency services on the M4. The ROA does not form part of this Examination. This agreement has been introduced to manage the partnership between Emergency Services and Highways England, and specifically, partnership working in relation to incident detection, incident verification, incident access and initial incident response. Highways England has had a number of meetings with the emergency services throughout the preliminary design stage where the design of the Scheme was discussed and any feedback from the emergency services was fed into the design process (e.g. meeting with Thames Valley Police July 2015 514451-MUH-00-ZZ-MI-OS-400122, attached as Appendix A to this response).

2.3.3 With regard to whether an independent safety audit has been undertaken, Highways England implements a safety management approach called project safety risk management for all its smart motorway schemes (GD04/12 - http://www.standardsforhighways.co.uk/dmrb/vol0/section2/gd0412.pdf and IAN 139 -http://www.standardsforhighways.co.uk/ians/pdfs/ian139.pdf). The Scheme has been designed in accordance with Highways England standards and processes. The Managed Motorways ALR Generic Safety report provides further detail on the processes and Highways England standards followed. It is also noted that a Stage 1 Road Safety Audit, in accordance with the Design Manual for Roads and Bridges ("DMRB") was carried out by an independent road safety audit team on the Preliminary Design and the resultant report is included as Annex C of the EDR (Application Document Reference 7-4).

2.3.4 Where appropriate, recommendations from the Road Safety Audit were discussed with the emergency services so that their views could be fed into the assessment process. For example, the review of the ERAs between M4 J3-4 and J4-4b included input from the Police. Ref: Project Safety Control Review Group ("PSCRG") minutes 514451-MUH-00-ZZ-MI-OS-300408 – Issue A – 5th February 2015, attached as Appendix B to this response.

2.3.5 With regards to the audit process making use of safety data from the recent M25 and any other schemes, as explained in paragraph 2.2.1, monitoring is currently being undertaken on the first ALR scheme on the M25 J23-27 to measure actual safety performance and compare it with the safety levels before the introduction of ALR. The results will give an indication of the actual safety level that can be achieved with ALR.

3. TRAFFIC ISSUES

3.1 The M4 between London and Junction 12 is currently already heavily trafficked for long periods of a typical weekday but particularly so during both peak hours and adjacent to peak hours. Drivers at these times typically experience slow or stationary motorway traffic, delays accessing or exiting overloaded junctions, delays on inadequate sections of local roads and regular incidents/accidents. I assume that this current situation would be accepted as fact by HE in view of the current proposal for extensive, costly works and a change of operational traffic management.

Highways England Comment

3.1.1 Highways England agrees that current traffic conditions on the M4 can give rise to congestion and delays. Table 2.2 in Chapter 2 of the ES (Application Document Reference 6-1) shows current (2013) and forecast ratios for each link along the Scheme. Table 2.2 demonstrates that at peak times, traffic flows on many links are close to, or exceed, the total flow that the link is designed to handle and traffic on the M4 therefore suffers from heavy congestion, which leads to unpredictable journey times and, on occasions, incidents and accidents. The Scheme, which is the subject of the Application for development consent, with its additional capacity and traffic control systems, is being proposed to address these issues.

3.1.2 With regard to drivers experiencing regular incidents/accidents, Appendix C of the M4 J3-12 Smart Motorway Consultation Report – 'the introduction of variable mandatory speed limits' (Appendix 33 of Application Document Reference Number 5-2) states *"the scheme section has a higher personal injury accident rate than the national average for motorways (England Motorway Data 2010), including a lower 'killed' but slightly higher 'seriously injured' rate, leading to a marginally higher (KSI) accident rate. It also has a higher 'slight accident' rate and therefore a higher 'total casualty' rate*". The Hazard Log

report, Annex E of the EDR, outlines the hazard analysis work undertaken and leads to the conclusion that, the All Lane Running design of the Scheme is likely to be no worse in terms of safety performance (than the baseline). In addition the hazard log report states that *"Calculations show that the total score for 'after' represents approximately a reduction of risk of 18% when compared with the safety baseline (no motorway incident detection and automatic signalling (MIDAS) queue protection)."* It is noted that when comparing the predicted reduction in risk with the actual M4 J3-12 motorway with MIDAS (10% safety benefit compared to the baseline) the Scheme would still expect to see a reduction in risk of approximately 8%.

3.2 *It is difficult to imagine any significant increase in traffic throughput at peak times on the motorway without some significant change to all of the above factors. However, (using traffic flows for the section J 10-11 provided by the project team by Email in March 2015) it appears that the traffic model forecasts an increase in two way peak hour flows of up to 13.7% between the base year of 2013 and the year of opening of 2022 and up to 18.2% between 2013 and 2037 even without the proposed scheme. Given that the motorway will be subjected to 5 or 6 years of construction/traffic management activity and the regular congestion experienced already these projections seem unlikely at best. At worst if these flows do materialise then they must surely represent periods of even worse operational conditions for drivers and massively worsening environmental conditions for local residents along the route.*

Highways England Comment

3.2.1 It is correct that the traffic model forecasts an increase in two way peak hour flows of up to 13.7% between the base year (2013) and 2022 (opening year) and up to 18.2% between 2013 and 2037 (design year) without the Scheme. The figures are calculated from data presented in Table A-15 of the Traffic Forecasting Report, which was provided at Appendix 1 to the Response to Relevant Representations submitted at Deadline I for the period 8am to 9am. Table 2 of the EDR (Application Document Reference 7-3) presents the forecast ratios of traffic flow to capacity and this highlights that with the forecast growth, the section between junctions 10 and 11 is expected to be at capacity in the eastbound direction in the morning peak period by 2022 with other sections nearing capacity. As such, there is a clear case for providing additional capacity to relieve these conditions.

3.2.1 During construction, traffic management in the form of three lanes of reduced width, together with a reduced speed limit will be in operation. To provide an assessment of the possible effect of the construction traffic management on users of the M4, the Highways England bespoke software program QUADRO (QUeues And Delays at ROadworks) was run with growth applied to the traffic flows to represent anticipated levels during construction. Analysis of the delays predicted by the program shows that during the majority of the day, traffic is able to pass through the roadworks without queueing. The additional time to travel through the first phase of works reached a maximum predicted journey time extension of 10 minutes in each of the Monday – Thursday peak periods. Only during the Friday PM peak in the westbound direction do journey extensions exceed 10 minutes and queues occur.

3.2.2 During phase 2 of the works, the capacity is exceeded during peak periods between junctions 3 and 4 and between junctions 5 and 6. At these times, there is the possibility of traffic taking an alternative route, although, as assessed by QUADRO, it is limited in number, totalling 106 vehicles per day, two-way Monday to Thursday between junctions 3 and 4 and a total of 296 vehicles per day, two-way Monday to Thursday between junctions 5 and 6.

3.2.3 The above conclusion that a limited amount of traffic diversion occurs during the construction of the Scheme is also reinforced by a comparison of traffic flow data during roadworks on the M4 during 2014. Two sets of works were undertaken – resurfacing between junctions 8/9 and 10 and bridge works between junctions 10 and 11, each using three narrow lanes of traffic management. Comparisons were made between traffic flows during these works and the previous year using data from Highways England's Traffic Data System, TRADS database. The comparisons showed that flows in 2014 were lower than the preceding year only during the peak periods, suggesting any traffic taking an alternative route was limited to those time periods.

3.2.4 In conclusion, Highways England recognises that the M4 will be operating at capacity on some stretches at certain times of the day during construction of the Scheme. However, Highways England considers that, with the traffic management regime in operation, there will not be significantly worse traffic conditions for drivers or consequent environmental impacts.

3.3 Off peak hours appear to fare similarly within the model with up to 16.9% and 26.6% flow increases forecast to the same two dates over a typical full day. If these flows were actually possible then in reality drivers may experience current levels of peak hour traffic conditions and all the attendant difficulties for much of the working day. Quite clearly, these sorts of unrealistic traffic forecasts do tend to some degree of scepticism about the model outputs overall.

Highways England Comment

3.3.1 It is correct to state that the forecast predicts the figures of 16.9% and 26.6% quoted above as the forecast growth in Annual Average Weekday Traffic ("AAWT") flows. These figures are derived by applying the factors set out in paragraph 6.7.4 of the Traffic Forecasting Report (Document 3, Appendix 1 to Highways England's Response to Relevant Representations at Deadline I) to the without-Scheme traffic flows for the section of M4 between junctions 10 and 11 in Tables A14-17 inclusive in the same report.

3.3.2 Between the peak periods there is more available capacity to accommodate growth in traffic levels. The capacities used in the traffic model in terms of the number of vehicles per hour that each lane can handle, are based on data obtained from existing motorways. As such, the assertion that the traffic forecasts are unrealistic and therefore questionable, is not accepted.

3.4 Turning now to the model traffic forecasts for the Smart Motorway scheme there is little experience of real operation of the type of scheme proposed and so it will be difficult to validate the model outputs. However, the model forecasts an increased flow over the 2013 base year of up to 31% during peak hours at year of opening and up to 43% at 2037. This represents an increase of over 3000 vehicles per morning peak hour at 2022 and 4350 vehicles in the same period at 2037. These forecasts also show that the scheme itself is only providing an additional 17% and 25% increased traffic in excess of the normal growth forecasts without the scheme as discussed above.

Highways England Comment

3.4.1 The traffic model developed to assess the Scheme has been validated in line with best practice against observed traffic flows and journey times. With the Scheme

in place, the M4 will operate as a 4-lane motorway, for which there is considerable experience to draw on.

3.4.2 It is correct that the traffic modelling for the Scheme forecasts an increased flow from the base year (2013) of up to 31% during peak hours at 2022 (the opening year) and up to 43% at 2037 (the design year) as being the forecast growth in AAWT flows. These forecasts are derived by applying the factors set out in paragraph 6.7.4 of the Traffic Forecasting Report to the with-Scheme traffic flows for the section of M4 between junctions 10 and 11 in Tables A14-17 inclusive in the same report.

3.4.3 It is also correct that the corresponding growth in vehicles is over 3,000 (3,145) vehicles during the 8am to 9am peak hour at year of opening and over 4,350 (4,355) vehicles in the same period in 2037. The equivalent figures for the without-Scheme scenario are 1,373 and 1,826 vehicles respectively. This demonstrates that without the Scheme, the lack of available capacity constrains the traffic flows and that with the additional capacity provided by the Scheme, the full demand can be accommodated in each year.

3.4.4 The additional capacity provided by the Scheme is not fully taken up in either the opening year of 2022 or later by 2037. Table 3 of the EDR presents the forecast ratios of traffic flow to capacity with the Scheme in place and this highlights that the section between junctions 10 and 11 is expected to be operating below capacity in both directions in the earlier 7am to 8am period, based on similar traffic flows to those occurring in the succeeding hour.

3.5 Similar percentage increases are forecast for the 18 hour day period for both dates which are difficult to comprehend albeit that there is more scope for increased flows during off peak and inherently less busy periods.

Highways England Comment

3.5.1 The figures for the 18-hour period are calculated directly from the 24-hour forecasts omitting the period between the hours of midnight and 6am from the daily total. Accordingly, the scope for increased flows during the inherently less busy periods between the peaks is the same for both the 18-hour and 24-hour periods.

3.6 *I am unaware of any tabulated practical flow capacities for this type of Smart Motorway and indeed data from the current schemes on the M25 would be useful. However, if the current peak hour throughputs on the M4 are taken as a practical capacity figure, given the daily congestion, then it is difficult to see how an additional fourth lane in each direction or an increase in practical traffic space of 33% could provide an increased throughput of 43% irrespective of the traffic management system deployed. Consequently, I must consider these projected flows unrealistic until evidence is provided to the contrary. Certainly, if such flows do materialise then they will inevitably be subject to slow, stop/start, close following and unpleasant full 4 lane driving conditions and it could be argued that little improvement would have been achieved from the overall scheme.*

Highways England Comment

3.6.1 It is normal practice to undertake studies for a period of three years before statistically reliable conclusions can be drawn. As three year studies of smart motorways have not been completed, no tabulated practical flow capacities for smart motorways with ALR are available yet. However, in the case of the M25 ALR scheme, which came into operation in November 2014, Highways England intends to publish initial results from the first 12 months of operation by the end of 2015.

3.6.2 Further to the Highways England's response at paragraph 3.4.2 above, the figure for growth of 43% comprises two elements: (i) the basic growth in two-way traffic without the Scheme from the 2013 flow of 9978 vehicles per hour to the design year (the first year of operation of the Scheme) flow of 11804 vehicles per hour (growth of 1826 vehicles per hour) and (ii) the additional traffic attracted to the Scheme following the provision of the extra capacity (2529 vehicles per hour), which takes the total flow to 14333 vehicles per hour and together make the identified total increased throughput of 43%.

3.6.3 Highways England disagrees that the projected flows are unrealistic because they are within the capacities observed for a 4-lane motorway.

3.6.4 Without the Scheme, the eastbound flow between junctions 11 and 10 during the morning peak in 2022 is forecast to have increased from its current level to 6,070 vehicles. With the Scheme in place, in 2037 the equivalent flow is forecast at 7,969 vehicles, an increase of 31% and just under the additional 33% of capacity provided. Table 3 of the EDR (Application Document Reference 7-3) shows that

the ratio of flow to capacity (based on capacities taken from observed flows on motorways) on this section reaches 97.7% in 2037 and whilst this is near to capacity, it is after 15 years of operation, during which time drivers will have benefitted from the improvements in travelling conditions that the Scheme will provide.

3.7 Traffic on the M4 should not be considered in isolation from the supporting local feeder network of roads and the forecast motorway flows do imply similar percentage increases on the local network. If not then where will the increased M4 traffic come from? From my local and professional knowledge of the local Berkshire road network and motorway junctions can I comment that I consider such increases on the local network to be impractical particularly at peak times. I have studied planned improvements by the local highway authorities and can see little in the pipeline which will change this opinion significantly. However, if such growth were to materialise on the local network then the only possible scenario would be heavily congested traffic for much of a typical day with all the associated environmental problems.

Highways England Comment

3.7.1 The traffic assessment for the Scheme has not considered the M4 in isolation from the local road network, and the impact of the Scheme on this road network has been assessed. This has been done, both in Chapter 13 of the ES 'Effect on All Travellers' and via supporting assessments of traffic management during construction.

3.7.2 Table A-5 within Appendix A of the Traffic Forecasting Report provides details of the total amount of trips forecast in the Do Minimum (without Scheme) and Do Something (with Scheme) highway matrices for each of the modelled time periods for the opening (2022) and design (2037) years split by light and heavy vehicles. The difference between the two sets of matrices represents the amount of 'induced' traffic arising from the implementation of the Scheme.

3.7.3 Using the data in Table A-5, over a 12 hour day, the level of induced traffic would equate to some 6,500 additional trips out of a total of 465,000 or 0.14%. Similarly, Tables A-31 and A-32 demonstrate that there is minimal impact on modal share arising from the Scheme.

3.7.4 Based on the above, as the increased volume of traffic is neither induced nor drawn from other modes (such as buses and trains), it follows that the majority of

"additional" traffic forecast to use the Scheme is already on the highway network and is reassigned from existing, less suitable roads. Consequently, contrary to the suggestion in the representation, it does not follow that there will be similar percentage increases in traffic on the local road network, leading to the claimed congested traffic conditions across the day and the associated impact on the environment. In fact, as the traffic is reassigned from existing, less suitable roads, the local road network should see a reduction in the volume of traffic (or, at the very least, an increase in traffic on the local traffic network will be less severe) as a result of the Scheme.

3.7.5 In respect of the point concerning the lack of planned improvements by local highway authorities, Appendix 1 to the Planning Statement (Application Document Reference 7-1) lists the plans and policies of the authorities across Berkshire to encourage economic growth, provide for increasing populations and bring forward the necessary supporting infrastructure to accommodate the growth in travel that follows. These development and infrastructure proposals have been taken into account in the traffic modelling and the consequent trips arising from future development account for much of the growth incorrectly attributed to the Scheme. It will be the responsibility of the local highway authorities to bring forward appropriate improvement proposals necessitated to accommodate traffic arising from local growth.

3.7.6 In summary, the smart motorway will provide additional capacity that will reduce congestion together with modern technology to inform drivers and smooth traffic flows on the Scheme. A substantial proportion of the increase in traffic forecast to use the Scheme is associated with national and local economic growth and is drawn to the Scheme from the existing network of roads to make use of the additional capacity and improved travel conditions provided.

3.8 Quite clearly, my fundamental comments on the key traffic flows used to support the scheme will call into question the validity of whatever business case has been used to support expenditure on this scale. However, if the traffic forecasts are taken as indicative of the probable demand for traffic growth then it is apparent that considerable additional funds will also be needed to improve the local feeder road network to accommodate this demand. Such essential further expenditure will affect the scheme business case.

Highways England Comment

3.8.1 The business case for the Scheme has been based on detailed appraisal covering a wide-range of potential impacts on the wider community. The assessment followed the guidelines for appraisal set out in Treasury guidance (The Green Book, Appraisal and Evaluation in Central Government) and as laid down for transport projects in the Department for Transport's Transport Analysis Guidance ("TAG") and the DMRB and supplementary advice in the form of IANs published by Highways England.

3.8.2 The forecasts for the Scheme that underpin the business case are derived from an application of the principles set out in the Department for Transport's TAG. The forecasts and the subsequent business case derived from them have been subject to due governance processes, both internally within Highways England and externally via the Department for Transport and Office for Government Commerce, all of whom accepted the validity of the case. As such, Highways England maintains that the business case for the Scheme is valid.

3.8.3 With regards to impacts on the local feeder road network, as set out by Highways England in the response to paragraph 3.7 above, the increased traffic using the Scheme is likely to have been reassigned from existing roads and accordingly, no additional funding for local roads is required as a direct consequence of the Scheme. Accordingly, such expenditure will have no impact on the business case for the Scheme.

3.9 The Inquiry will be interested to learn that a number of local Parish and Town Councils in Berkshire have already raised concern repeatedly with at least one local authority that traffic generation across central and west Berkshire from the extensive development already committed has been significantly underestimated and not adequately planned for. This factor may well cause even further traffic problems on the local road network during the assessment period of the M4 proposals.

3.10 There are other fundamental traffic issues which are dealt with below in the section on Traffic Noise to avoid duplication.

Highways England Comment

3.10.1 Highways England is not able to comment on representations that have not been made to the Examination, or seen by Highways England. The assessment of the Scheme has included a cumulative impact assessment that considered committed development in line with the requirements of DMRB, as explained and set out in Chapter 16 of the ES. The list of cumulative developments considered is presented in Table A16.2.1 within Appendix 16.2 of the ES (Application Document Reference 6-3). The list was compiled from details provided by local planning authorities and / or published local plans, that included West Berkshire, and represented the situation at the time the traffic forecasting model was under development. As such, it is not correct that the assessment significantly underestimated and not planned for committed development along the length of the Scheme, and in the West Berkshire area. As these developments have been accounted for in the assessment of the potential impacts of the Scheme, it is not correct to state that this will cause further traffic problems on the local road network. As noted above, the Scheme is predicted to have a neutral effect on the local road network.

4. TRAFFIC NOISE

4.1 I am a resident of Lower Earley and have experienced at first hand the extent of noise intrusion from the M4 for over 30 years. I was dismayed when I discovered at the HE scheme exhibition that very little was proposed to address this insidious blight on the lives of thousands of families living alongside the motorway. My comments may focus on Lower Earley but are equally applicable elsewhere along the route.

Highways England Comment

4.1.1 The impacts of the Scheme on the noise environment in the vicinity of Lower Earley have been assessed. The noise and vibration assessment, as reported in Chapter 12 of the ES, demonstrates that the magnitude of impact of noise resulting from the construction of the Scheme is minor beneficial in the short term and negligible in the long term at this location. The significance of effect during the operation of the Scheme is assessed as slight beneficial in the short term and neutral in the long term at this location (paragraphs 12.6.14 to 12.6.16 of Chapter 12 of the ES).

4.1.2 These noise reductions are shown in Drawing 12.4 for the short term and in Drawing 12.5 for the long term (Application Document Reference 6-2). Inspection of Sheet 4 of Figure 12.4, which is relevant to the Lower Earley area, shows the generally minor (1 to 3 dB) noise reductions across Lower Earley on Scheme opening. Inspection of Sheet 4 of Figure 12.5, which is relevant to the Lower Earley area, shows the generally negligible (< 3 dB) noise reductions across Lower Earley in the long term.

4.1.3 It is not correct to state that little is proposed by Highways England to mitigate the effects of noise from the Scheme. Noise mitigation measures are to be undertaken for the Scheme in the form of low noise surfacing across all lanes, a number of new noise barriers and the replacement of existing barriers on a like-for-like basis if in poor condition. No new barriers are proposed for Lower Earley as there is predicted to be a beneficial effect on the noise climate in this area with the Scheme in operation.

4.1.4 Further, whilst the representation focuses on the Lower Earley area, the assessment of the effect of Scheme as a whole between junction 3 and junction 12 has demonstrated that the noise impact of the Scheme is slight beneficial in the short term and neutral in the long term.

4.2 After much feedback on the subject, HE agreed to increase the use of low noise surfacing to all traffic lanes rather than just the 2 altered lanes as originally proposed. Apart from some limited new acoustic fencing the new surfacing alone is relied upon as the sole measure to tackle this major issue of traffic noise. In Email correspondence (17 March 2015) HE stated that

"Our assessment now shows a negligible/minor reduction in noise levels across the study area when compared with the Do Minimum 2022 scenario".

This rather counterintuitive conclusion, given the level of traffic growth predicted, led me to investigate the assessment process further leading to the following comments/questions about the standard noise assessment methodology and assumptions made.

Highways England Comment

4.2.1 It is correct that low noise surfacing is now proposed across all lanes along the entire extent of the Scheme, as secured by Requirement 5 of Schedule 2 to the

DCO. However, the provision of noise barriers to mitigate the effects of the Scheme cannot be described as limited. Instead, the provision is based on an assessment of the noise impacts of the Scheme to determine where such barriers are required in order to mitigate any adverse effects of the Scheme. Responses to the following comments and questions, regarding the standard noise assessment methodology and assumptions made, have been outlined below.

4.3 The level of noise reduction claimed by HE from low noise surfacing is 3.5dBA. The DfT standard Design Manual for Roads and Bridges (DMRB) document (Tables 3.1 and 3.2) suggests this reduction is perceived towards the Minor end of the Moderate range in the short term and towards the Negligible end of the Minor range in the long term (typically after 15 years). This concurs broadly with my rule of thumb approach discussed with staff at the HE exhibition that a 3dBA change is barely perceptible to the human ear. It must continue to be a moot point as to whether any residents would even be aware of any reduction in the magnitude of noise levels at day of opening from such a noisy source after a long scheme construction programme of disruption over 5 years.

Highways England Comment

4.3.1 It is not the case that a 3 dB change in noise level in the short term is the threshold of perception. A change of 1 dB in the short term is the smallest that is considered perceptible. The noise reductions on opening of the Scheme will be evident in many areas within the Scheme corridor.

4.3.2 DMRB defines a change in noise level of less than 3 dB as negligible in the long term. Much of the noise reduction achieved for Scheme opening (comparing "Do Minimum (i.e. without the Scheme) 2022" with "Do Something (i.e. with the Scheme) 2022") will be maintained in the long term (comparing "Do Minimum 2022" with "Do Something 2037").

4.4 However, the TRL Report PPR485: The Performance of Quieter Surfaces Over Time also suggests that

"the acoustic performance of low noise surfacing deteriorates at a rate of 4.5dBA over 10 years" with an assumed practical life of the surfacing of 10 years.

4.5 So it appears that any perceptible noise relief from low noise surfacing may be at best short lived and at worst imperceptible to residents. As a result, low noise surfacing, however

welcome, must be seen just as a normal house keeping exercise by HE rather than a strategic solution to long suffered motorway noise nuisance for local residents. It is a disappointing approach to promoting a major strategic transport infrastructure scheme taking 5 years to construct and estimated to cost over £0.8BN.

Highways England Comment

4.5.1 All road surface types degrade over time, with consequent increases in tyre/road noise. However, like any surfacing, low noise surfacing, is replaced periodically with the life expectancy determined by the specific constituents, quality of construction and amount of traffic and environmental conditions. The typical life expectancy is between 10 and 15 years (ref paragraph 6.20 of HD37/99 amendment 1). The pavement is regularly monitored following installation using a variety of tests (e.g. skid resistance) and will be maintained to a high standard and then replacement scheduled once its performance is no longer satisfactory, in accordance with Highways England's standard procedures. As such, it is not correct that the mitigation provided by low noise surfacing will be short lived. Nor will it be imperceptible, as explained above.

4.5.2 The provision of low-noise surfacing is not just a normal "house-keeping exercise" by Highways England. Further, low noise surfacing is not the only mitigation to be provided to address the effects of noise from the Scheme (which in any event are considered to result in a minor beneficial/negligible reduction in noise), as explained above.

4.6 As all long term residents adjacent to a major road will know traffic noise also varies noticeably as traffic flows rise and fall with time of day, day of the week, season of the year etc. In addition, noise varies with weather conditions, wind direction, overall temperatures etc. The standard assessment process deals with this variation by adopting the 18 hour L10 AAWT level as the key driver of noise level calculations and the apparent weaknesses to this approach are discussed further below.

4.7 In this case the 18 hour period runs from 06.00 to 24.00. L10 is the noise level not exceeded for 10 % of the time in any one hour and so represents the peak noise level in that hour. The L10 level for an 18 hour period is taken as the arithmetic average of all individual hourly L10 levels. It will be seen that merely taking an average of all 18 hours, including a mix of busy peak and quieter off peak periods will tend to water down the impact of peak period traffic levels on the final figure used in subsequent noise calculations.

4.8 *Annual Average Weekday Traffic (AAWT) is the average week day traffic flow taken across the year. Inevitably this will also tend to water down the impact of seasonal, often quite large variations in traffic flows in developing final flows used in subsequent noise calculations. By definition, the average will be exceeded for 50% of the year and often by a significant degree. Traffic Engineering practice would normally avoid flows measured in seasonally affected months for instance to avoid problems of under design.*

Highways England Comment

4.8.1 Highways England is required to carry out noise assessments in accordance with the procedures given in DMRB, Volume 11, Section 3, Part 7 (HD213/11 Revision 1). DMRB states that noise level calculations should be carried out in accordance with the procedures given in Calculation of Road Traffic Noise ("CRTN") (http://www.noiseni.co.uk/calculation_of_road_traffic_noise.pdf). Paragraph 9 of CRTN states that the traffic flows to be used in the calculation of noise levels are AAWT flows.

4.8.2 Paragraph A3.11 of DMRB, Volume 11, Section 3, Part 7 (HD213/11 Revision 1) states:

"…….The index adopted by the Government to assess traffic noise is LA10,18h which is the arithmetic mean of the noise levels exceeded for 10% of the time in each of the 18 one hour periods between 6AM and midnight……A reasonably good correlation has been demonstrated between this index and residents' expressed dissatisfaction with traffic noise over a wide range of exposures……."

4.8.3 Consequently, Highways England is of the view that it is an appropriate method to assess the noise effects of the Scheme and is representative of the noise levels actually experienced by receptors.

4.8.4 Regarding the effects of seasonal variations in traffic flows, two points are noted:

1) Traffic noise levels are not particularly sensitive to changes in road traffic flows. For example, an increase in traffic flow of 25% is required for there to be an increase of 1 dB in noise level (assuming speed and percentage heavy goods vehicles remain the same). Increases of less than 1 dB are considered

to be imperceptible. Doubling the traffic flow would only result in a 3 dB increase in noise level.

2) The noise assessment is predominantly based on noise level changes as a result of the Scheme. Any seasonal variations in traffic flows will affect the Do Minimum traffic flows (i.e. without the Scheme) as well as the Do Something traffic flows (i.e. with the Scheme). Thus, the changes in traffic flows (Do Minimum to Do Something) will not be significantly different from those using AAWT traffic flows. Hence, the changes in noise levels will not be significantly different from those calculated using AAWT traffic flows.

4.9 Weather conditions also have a major impact on traffic noise with, for instance, noise from a wet road surface being perceptibly greater than from the same traffic flow on a dry surface. However, this effect may not be fully accounted for in the methodology.

Highways England Comment

4.9.1 It is correct that the CRTN methodology does not account for changes in traffic noise levels as a result of a wet road surface, or other weather conditions. As is evident from observation near any road, traffic on a wet surface is noisier than on a dry surface. However, the effects of a wet road surface would be evident in the Do Minimum scenario (i.e. without the Scheme) as well as in the Do Something scenario (i.e. with the Scheme) and the changes in noise levels from Do Minimum to Do Something will be roughly comparable for a wet road surface and a dry road surface.

4.10 Similarly wind direction makes a significant difference to the impact of traffic noise. In my own property in Lower Earley a south or west air flow results in extremely intrusive noise levels whereas winds from the north make M4 traffic noise almost acceptable. Again, I do not feel that these impacts and the predominance of west winds are fully accounted for in the methodology.

Highways England Comment

4.10.1 The CRTN methodology assumes a reasonable worst case in that a moderate wind is assumed to be blowing from the noise source (i.e. any section of road) to

all receptors in the study area, wherever those receptors are located in relation to the noise source.

4.10.2 As for the effects of a wet road surface, the effects of wind direction would be evident in the Do Minimum scenario (i.e. without the Scheme) as well as in the Do Something scenario (i.e. with the Scheme) and therefore are incorporated into the assessment that looks at the change between the two scenarios.

4.11 The impact of warm air temperatures can lead to the phenomenon of temperature inversion which leads to more sound propagation sideways rather than upwards and leads to higher noise levels further away from the source than usual.

Highways England Comment

4.11.1 Temperature inversion is an infrequent and complex phenomenon which can affect the propagation of noise, resulting in elevated noise levels at relatively large distances from the noise source. The CRTN methodology does not take account of this phenomenon (nor do any other widely used methodologies for the calculation of road traffic noise). It is not best practice to base a road traffic noise assessment (or any other kind of assessment) on infrequent phenomena which may, or may not, happen.

4.11.2 However, as for the effects of a wet road surface, the effects of temperature inversion would be evident in the Do Minimum scenario (i.e. without the Scheme) as well as in the Do Something scenario (i.e. with the Scheme).

4.12 Any traffic growth on the M4 must be supported by similar growth on local roads leading to the motorway junctions. Has this contribution to the local noise environment caused by traffic growth directly associated with the proposed scheme been included in the M4 noise calculations?

Highways England Comment

4.12.1 Detailed computer models of the existing motorway and the Scheme, which included the M4 motorway, surrounding roads, ground elevation data and all buildings within 1 km of the Scheme, were developed in a commercial software package. Traffic data on the motorway and all the surrounding roads were input to the models for the following scenarios:

a) Do Minimum 2022 (i.e. the situation in 2022 if the Scheme was not taken forward)

b) Do Minimum 2037 (i.e. the situation in 2037 if the Scheme was not taken forward)

c) Do Something 2022 (i.e. the situation in 2022 if the Scheme was taken forward)

d) Do Something 2037 (i.e. the situation in 2037 if the Scheme was taken forward)

4.12.2 The traffic data included growth as a result of the Scheme and as a result of increasing traffic numbers between the years 2022 and 2037, both on the M4 and on the local roads.

4.12.3 The models were used to calculate noise levels within a corridor 600 metres either side of the motorway, between junctions 3 and 12. Thus, the calculated noise levels take into account the growth in traffic on the motorway and on the surrounding road network.

4.12.4 The calculated noise level at any location is the sum of all the significant noise level contributions from all roads in the study area (i.e. the motorway and all the surrounding local roads).

4.13 The methodology employed appears to compare noise calculated at year of opening with that after 15 years of use. However, this base level also assumes significant traffic growth from the true base of 2013. As discussed previously such growth is unlikely given existing traffic congestion, the length of the construction period and associated traffic management deployed. So, this perhaps underestimates the true level of traffic growth and hence traffic noise directly generated by the scheme.

Highways England Comment

4.13.1 The traffic model used for the assessment of the Scheme was originally fully validated in 2009 and confirmed to be forecasting against actual recorded flows to acceptable levels in 2013. The forecasts used for the assessment of the Scheme have been prepared in accordance with TAG guidance using factors derived from the National Trip End Model applied at a local level.

4.13.2 Whilst the traffic management arrangements proposed for the construction period, involving maintaining three lanes but with a speed limit of 50mph, are considered to provide adequate capacity for drivers not to have the need to divert to other routes, it is acknowledged that in practice some drivers could choose to use alternative routes. Should this prove to be the case, the Scheme would then appear to release, rather than generate, additional traffic. However, the appropriate comparison for Scheme assessment is between a Do-Minimum and a Do-something situation. Table 2 of the EDR shows that the existing three-lane M4 will be operating close to capacity, with two sections at capacity, in the proposed Scheme opening year of 2022. Accordingly, the noise assessment has been undertaken on the appropriate basis.

4.14 All of these issues taken together indicate why standard noise calculations used by HE perhaps can not adequately describe the degree of noise intrusion and blight already suffered on a daily basis by residents adjacent to the M4. This will only get worse with the levels of traffic growth outlined in support of the current proposals. The HE view that the proposals will produce a negligible/minor reduction in traffic noise from what is already a major intrusion into people's lives will be seen by many as a simply unacceptable consequence of an £0.8BN strategic route improvement scheme. I remain totally unconvinced by the HE stance on noise and would suggest that the only appropriate way forward would be to construct purpose built acoustic fences or bunds to provide meaningful protection for local residents.

Highways England Comment

4.14.1 For the reasons explained above, it is considered that an appropriate methodology, required by DMRB, has been used to assess the noise impacts of the Scheme. Contrary to the suggestion in the representation, the noise environment currently experienced by residents adjacent to the M4 will not worsen with the implementation of the Scheme, which is predicted to result in a negligible/minor reduction in noise overall. This is a wholly acceptable consequence of the Scheme as it has been shown not only to not have an adverse effect on noise, but to result in a beneficial effect, albeit one which is minor/negligible.

4.14.2 As explained above, noise mitigation is proposed as part of the Scheme in the form of low noise surfacing across all lanes for the entire extent of the Scheme, and the provision of additional noise barriers where these are deemed to be

required. Consequently, Highways England maintains that the noise impacts of the Scheme are acceptable and that meaningful protection for local residents is proposed as part of the Scheme's design.