

## **M4 Smart Motorway : Representations by D J Green**

### **Summary**

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.

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:-

- The unproven safety of permanent hard shoulder running.
- The unreliability of the traffic forecasts used.
- The unproven ability of the local road network to accommodate the implied local traffic growth.
- The apparent lack of consideration of capacity improvements other than along the motorway main line.
- HE's stance regarding traffic noise.
- 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.

**Road Safety.** 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.

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.

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.

**Traffic Issues.** 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.

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.

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.

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.

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.

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.

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.

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. 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.

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

**Traffic Noise.** 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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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?

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.

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.

D J Green

10/9/2015