Ploughing On

A review of highway resilience in Winter 2013

Brian Smith
May 2013

RAC Foundation

The Royal Automobile Club Foundation for Motoring is a transport policy and research organisation which explores the economic, mobility, safety and environmental issues relating to roads and their users. The Foundation publishes independent and authoritative research with which it promotes informed debate and advocates policy in the interest of the responsible motorist.

RAC Foundation
89–91 Pall Mall
London
SW1Y 5HS

Tel no: 020 7747 3445
www.racfoundation.org

Registered Charity No. 1002705

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About the Author

Brian Smith retired from Cambridgeshire County Council in 2010 and is now a management and transport consultant.

Following a history degree at Cambridge University, he worked in local government till his retirement, with over 20 years as a chief officer in Cambridgeshire. He took on the role of director of the newly formed Department of Environment and Transport in 1996, and under his leadership it established a strong national reputation across the breadth of its responsibilities.

Brian chaired the National TravelWise Association for three years until 2002, and played a leading role in regional planning as Chairman of its Technical Advisory Group. He chaired the County Surveyors' Society (CSS) Transport and Environment Committee for three years until 2007, and in June 2008 became president of the CSS (now ADEPT, the Association of Directors of Environment, Economy, Planning & Transport), a position held for one year. In July 2009, he received a Lifetime Contribution to Local Transport award at the National Transport Awards.

Following retirement, he was a member of the panel chaired by David Quarmby, CBE, which undertook the review of winter resilience, following the severe winters of 2008/09 and 2009/10.

Acknowledgements

This review relied on many people who provided information through telephone conversations and email responses. Thanks are due to all who helped in this way, from representatives of both English and Welsh governments, the Highways Agency, and over 30 councils (listed in Appendix B) to the Freight Transport Association, ASDA, Boots and Royal Mail.

Information was also secured from surveys of RAC patrols and the network of motoring clubs in Europe; RAC Motoring Services are particularly thanked for their assistance in facilitating this.

The support and input of Philip Gomm, Ivo Wengraf and Luca Lytton at the RAC Foundation is also gratefully acknowledged.

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Foreword

For generations of Britons the weather has been a great source of conversation, in recent years seemingly more so than ever. The one predictable thing about the weather is its growing unpredictability. That is not to say we don't know what's coming over the next few weeks – overall the Met Office has greatly improved its shorter term forecasting – but rather the conditions we encounter are more extreme and 'unseasonal' than in times gone by.

Planning and resourcing our response to these circumstances – not least periods of intense snow and ice - to keep our transport systems running is a major challenge. Balancing the requirement to spend money on equipment, materials, staff training, and general readiness with the likelihood of all this actually being necessary in a particular winter is not easy, especially in an economic downturn.

For nearly a decade up to 2008 Britain experienced mild winters with little or no snow or ice. However, things were different in 2008-09 and 2009-10 when conditions were much more severe. The nation's transport systems did not stand up well to the onslaught. In particular there was a critical shortage of road salt.

In the wake of this I was asked by government to review the winter resilience of England's transport networks – road, rail and aviation. With me on the panel were Brian Smith (former Executive Director of Cambridgeshire County Council) and Chris Green (Non-Executive Director of Network Rail). The recommendations we made in the interim and final reports were adopted by central and local government, and the railway industry. In December 2010 after an unexpectedly early and harsh bout of winter weather I carried out a further audit to ensure the authorities' response was adequate.

During a two-week period at the end of January 2013 Britain was again hit by freezing temperatures, strong icy winds and significant snowfall. We at the RAC Foundation thought it would be a good idea to once again assess how those charged with keeping the road network moving fared. We were also keen to compare the 'official' line with the experience of road users. We were delighted that Brian Smith agreed to conduct the project.

Overall, the picture he paints is a positive one. It was notable that, without exception, local authorities are maintaining their level of spending on winter resilience despite general budget cuts. There was also evidence of cooperation between adjacent and intertwined county, district and parish councils. This activity was underpinned by improved consultation with local communities and better communications with the media and the public.

The perception of road users – as represented by RAC Breakdown patrols and some of the UK's biggest businesses – generally matched this assessment.

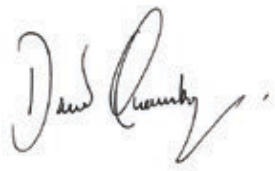
Brian Smith also offered some reassurance that things are not – as we often believe – necessarily rosier on the continent. In those countries with similar climates to ours extreme weather can cause as much or even greater disruption.

Which is not to say everything is perfect. The weather is increasingly conspiring against us. We should not see snow or ice or wind or rain as isolated events. The impact of one weather phenomenon can be compounded by another. The experience of drivers in Kent and Sussex (which Brian manages to consider in an addendum to this report) on 11 and 12 March, and more generally across the country in the run up to Easter (which Brian was unable to include) shows that despite the best efforts we can be overwhelmed by nature.

The question is whether the relevant highway authorities can reasonably be expected to do more with their current winter resilience funding. Brian's report suggests that most authorities do a pretty good job today in dealing with the usual 'moderate' winters (when they come), and we accept that. Is there an argument for more funding to made available if, as seems the case, extremes of weather are going to occur more often? This is a question worth investigating – but until more is understood about the patterns of weather we seem to be moving into, we would not wish to make the case for additional resources now.

If there is a conclusion to be drawn from this work it is that there comes a point where expectations have to be modified; a time when conditions are so severe that we have to amend our travel expectations and reconsider what, in the face of a changing climate, is normal.

David Quarmby



Chairman, RAC Foundation

Executive Summary

Background

There was an intense two-week period of cold weather and snow during the latter part of January 2013, which provided a good test of the readiness and performance of the authorities responsible for winter services on the road network. The RAC Foundation therefore commissioned this review, to assess progress made since the Quarmby Review (and subsequent Audit) in 2010, both of which were commissioned by government in the wake of the severe winters between 2008 and 2010. This review covers both England and Wales.

As this review was about to go to print, the South East of England was hit by heavy snow on Monday 11 March 2013, with significant disruption on the roads. This episode has therefore been considered in an addendum at the back of the report, and some of those points reflected in this summary.

Given the tight timescale, much of the evidence was gathered by telephone conversations with relevant organisations, including a sample of over 15% of the local highway authorities (LHAs). Information was also sought from key logistics operators, and surveys were used to gather feedback from RAC patrols and the network of motoring clubs in Europe, to help put experience here in a Continental context. The author would like to express his gratitude to all who provided input to this review.

A key focus of the recommendations from the 2010 Review was to develop greater resilience in salt stocks, in order to ensure that in periods of extreme weather the relevant authorities are not constrained in its use. This was to be complemented by the establishment of a data collection system, so that an overview of salt availability exists. Other recommendations related to improved coordination and dissemination of research, and specifically a review of technical standards and guidance, which would lead to more effective and efficient salt use.

Further recommendations were applicable to LHAs. These included the need to review winter service plans, and ensure links with wider resilience planning; consultation on and improving information about these plans; further work to improve communications during periods of bad weather; and working with other councils and the community to improve responses to snow events.

The weather

Snow and cold weather, forecast several days in advance, reached the country over the weekend of 12–13 January 2013. Much of the country had periods of

snow – or snow showers – over the following two weeks, although the London area and the South East escaped much of this. Everywhere remained very cold, so there was lying snow in many areas throughout the period.

The weather forecasts during the two weeks were very accurate, which meant that road users were alerted in advance to expected snow through the Met Office weather warning system. The snow which arrived from the South West on Friday 18 January was preceded by the unusual red alert for the higher parts of South Wales.

There was also heavy snow which spread northwards through central and eastern and northern England on 20 and 21 January, and some very heavy snow in parts of the Midlands and northern England on the evening of Friday 25 January, ahead of the warm weather which led to a rapid thaw over that weekend.

In summary, it was a difficult period of weather, because it stayed cold throughout the two weeks and there were some very cold nights too. There were also several snow periods – always the most challenging weather from the point of view of the highway authorities.

Performance of the highway authorities

In England, the 'strategic' network of major national routes – the vast majority of motorways and trunk roads – is the responsibility of the Highways Agency. This network, 4,500 miles in length, is maintained by contractors overseen by Highways Agency teams; their responsibilities include the delivery of winter services. In Wales, the strategic network of 1,100 miles of motorway and trunk roads is maintained for the government by agents utilising service providers. These are many of the councils.

Since it is the *strategic* network, carrying heavy traffic flows including many heavy goods vehicles (HGVs), both countries place great emphasis on keeping these roads in a serviceable condition in all but the most extreme weather. This aim was achieved during the two-week period, the only significant problem being on a section of the M6 close to Manchester during the evening of Friday 25 January, when exceptionally heavy snow fell for several hours, vehicles became stuck, and the road had to be closed to allow recovery and clearance.

Maintaining these roads in serviceable condition requires good planning and preparation, including training, and an understanding of likely trouble spots where there might be a need for more intensive treatment. Both the Highways Agency and the Welsh Government stressed the importance of good information being made available to drivers, and the dissemination of messages about the preparation needed before driving when snow is forecast. On the day of the red alert for South Wales, it is interesting to hear that traffic

was much lighter than normal, as drivers appear to have taken account of the warnings about heavy snow.

All other roads, in both England and Wales, are the responsibility of the LHA – from busy A roads to rural roads, and all the residential streets. There are 150 authorities in England, a mix of all-purpose (unitary) and shire counties, and 22 (all unitary) in Wales.

Feedback from all those authorities contacted suggests that the Quarmby Review, and the follow-up Audit, were important in shaping today's winter service. Of course, there was already good practice – and this has continued, and has been developed – but it is apparent that they served as a prompt to review many aspects of the service, and to stimulate improved practice and innovation. As confirmation of this, every LHA pointed to areas of review and improvement since 2010.

The issue at the heart of the 2010 Review was salt stock levels, which had run low in the two preceding winters. This review revealed that more salt is now stocked, giving much greater resilience, and that various arrangements have been put in place to reinforce this resilience, such as joint additional storage arrangements with other councils. In addition, many authorities have reviewed their salt spread rates in conjunction with the new national guidance, and/or improved their fleet.

This resilience was clearly demonstrated during the two-week period. Salt use was very heavy, but no authority reached a point where there was any risk of running out; indeed, both England and Wales had, in overall terms, significant reserves which could have been used.

Many of the authorities reported how plans had been strengthened or developed to work with community groups, as well as lower-tier councils, for instance parish or community councils where these exist. Other councils pointed to arrangements for groups of LHAs to work together; this is particularly a feature of the large metropolitan areas, and the winter service in Wales.

Much attention has also been paid to improving information about winter services, and especially communications at times of snow. All the authorities contacted were now using Twitter.

A more mixed picture emerged from the LHAs when it came to consulting on their winter plans. There is more engagement with those stakeholders with direct interests – transport operators and distribution centres, for example – but a concern was expressed by some LHAs that more general engagement will simply lead to demands for more of the network to be treated, when this cannot be afforded.

All LHAs reported that they were well prepared for the severe weather in

January. They were helped during this period by accurate weather forecasts, which provide decision-makers with confidence and enable the most effective pre-treatment ahead of snow. All LHAs also reported that they regarded performance on the priority roads as satisfactory during the snow events. There were some areas where one or more of the snow periods coincided with a rush hour, and there was disruption for a few hours until snow ploughs and gritters were able to operate effectively, but the consistent message was that performance was according to plan.

Inevitably, there were the expected problems, at least initially, on the non-priority roads. The approach to these roads varies from one authority to another, but the majority of them reported that a combination of their own resources and supplementary community resources led to many of these roads being passable with care.

One complication for many authorities was the saturated ground that resulted from the heavy rain in the autumn, and in some places fields were still under water when the snow came. Not only did the continued run-off cause problems to some authorities during the cold period, causing dangerous ice on the roads, but the saturated ground also contributed to widespread flooding when the lying snow thawed rapidly.

One indicator of good performance is positive feedback. Every authority reported that they have never before received so much thanks and praise from a range of sources. Some pointed to Twitter feedback as a contributory factor, but it does seem that improved communication and a high standard of performance generated much positive feedback.

Given the spending pressures on local government, the opportunity was also taken during the conversations to ask whether budget cuts (as distinct from efficiency savings) had been made to the winter service, or whether any were proposed, to get an indication of whether the improvements of recent years are likely to be maintained. The response was identical from every authority: no cuts have been made to the winter service in the last two years, and none are scheduled. This gives confidence that the improvements of recent years should be maintained.

Other evidence

The views of some freight operators and the Freight Transport Association (FTA) were sought, to test whether this positive picture of performance was shared by them. The help of ASDA, Boots, Royal Mail and the FTA is gratefully acknowledged.

The overall message, certainly in respect of the strategic and main roads (all of which are pre-treated and are prioritised for clearing), is that there were few

problems, with an acknowledgement that they had been treated well – better than the roads in the problem years considered by the 2010 Review.

The FTA observed that it had not received as many complaints about non-treatment by the local authorities as it had during the bad winters of 2008/9 and 2009/10. It believed that it was the general preparation of equipment and salt stocks, in conjunction with the warnings that were given, that helped to keep roads open (or enabled them to be reopened promptly if initially shut). Side roads were an issue, but the main routes were, for the most part, kept clear.

Some problems were reported by the freight operators, such as the M6 incident already referred to, while the Pharmacy Delivery and Collection Service (PDC), which delivers to patients at home and to care homes, reported that its service was affected because of untreated roads.

All bodies who were consulted highlighted the importance of the weather warnings, and increasing confidence in their accuracy. However, if distribution arrangements are to be adjusted, the warnings must come early enough in the day to influence scheduling.

A different perspective was provided by feedback from RAC patrols, which are called out more often when the weather is bad. With the help of RAC Motoring Services, information was sought from the patrols on the conditions, and about the issue of driver preparation, by means of an online survey – completed by more than 20% of the patrols.

The patrols reinforce the view of the freight operators that the roads were treated as well as or better than expected, and estimate that more than half of callouts attributable to icy or slippery conditions were on untreated roads. Half of the patrols considered they had been moderately or severely hindered by ice and snow in trying to help people.

Within the interesting free text comments, there were several observations that drivers appeared not to have heeded weather warnings and had been caught out, or unprepared, and that many of the stranded vehicles were not suitable for driving in the conditions. There were also concerns about poor driving and lack of experience/skills for the conditions. There were a large number of comments about the number of potholes in all types of road, and the observation that they are particularly dangerous when it has snowed, because they cannot be seen.

Feedback was also gained from 13 European motoring clubs relating to the same two-week period and, together with press reports, gave a Continental perspective. The picture that emerged is not dissimilar to that in the UK. In particular, snow is initially disruptive, and the focus is on clearing the main networks. Where snow is more frequent, this is matched by investment in snow-clearing equipment to ensure that disruption is kept to a minimum. Some of

these countries also place restrictions on HGVs during periods of snow, and/or have requirements for the fitting of winter tyres – or, in some cases, snow chains.

This feedback also highlighted how governments and the relevant authorities seek to manage driver expectations at times of snow, and also their expectations of drivers being prepared for bad weather. This has also been a feature of the approach across the UK in recent years.

In the UK, the system of weather warnings provides notice to road users to be prepared. These warnings, and the associated more detailed local weather forecasts, are certainly used by the highway authorities to mobilise for snow, and are also invaluable to logistics operators. The issue of their drivers being prepared seems to be of increasing importance.

Highway authorities across England and Wales have stressed the responsibilities of all road users to be prepared if adverse conditions are forecast. This has been reinforced during times of snow with communications which alert drivers to potential difficulties and give advice about precautions that can be taken if snow is forecast (taking warm clothes, drink, a shovel and so on in the car). There is some evidence of drivers responding, as measured by reduced traffic volumes in many areas when snow was forecast, but there is also evidence, including that from the RAC patrols, that many drivers are ignoring the warnings, and are not prepared for bad weather.

Heavy snow in the South East of England, March 2013

In early March there was a dramatic but localised return of snowfall concentrated on the southern part of the South East. The weather conditions were extreme and, although all the highway authorities had completed full precautionary treatment, this was one of those snow events where disruption was almost inevitable given the unfavourable combination of factors – specifically: there was less warning than there had been in January; temperatures were very low, which impacted on the effectiveness of salt; and driving winds blew both salt off the roads and more snow onto them. Unfortunately, because road users had less notice than in January of the likely disruption, there was less opportunity to change journey plans, but this only reinforces the point that when there is a forecast of potential snow and consequent travel disruption, the wise road user will take heed of the messages to be prepared.

Conclusions and lessons

Overall, the conclusions from this review, based predominantly on the January 2013 weather and the way in which the country coped with it, are encouraging:

- The recommendations from the 2010 Review and subsequent Audit have been followed through in both England and Wales, and consequently there is now, in 2013, much greater resilience in the winter service provided by the highways authorities. The key concern from 2010, insufficient salt stocks, has been addressed.
- There was good preparation for the winter of 2012/13. This reflects the follow-through of recommendations from the 2010 Review, and in particular the existence of good plans, arrangements with local communities and other councils, strong communications, and continued development of equipment and materials.
- The forecasting from the Met Office was to a high standard, allowing – in the majority of places, and most of the time – highways authorities, drivers and businesses to make appropriate arrangements.
- The operational response during the two-week period of cold weather and snow was generally good. After the initial disruption as snow fell, which will always occur, the main roads were quickly restored to operational use, although there were some inevitable problems in untreated areas. This assessment is reflected by the large and unprecedented numbers of positive comments received.
- The feedback gathered for this review suggests that the experience of most road users matched this assessment.
- There is evidence that more road users are taking notice of the adverse weather warnings, and being prepared.
- There is no clear evidence that the impact of severe weather is particularly bad in this country by comparison with our closer European neighbours. Where, as in the UK and some parts of Europe, snow is not a regular occurrence, there is always some initial disruption and frustration for road users.

However there are still some matters of concern and areas where lessons can be learned, particularly in the light of the March 2013 weather:

- The poor state of the road network – something reinforced by the latest ALARM (Annual Local Authority Road Maintenance) survey,[1] which states that a fifth of the English local road network is in poor condition – is a cause for concern, as the snow and ice not only exacerbates damage but also hides potholes, through which road users then unwittingly drive or ride.

1 www.asphaltindustryalliance.com/images/library/files/Alarm%20Survey%202013/ALARM_Survey_2013.pdfPoor condition is defined as “having less than five years’ remaining life in the view of the relevant local authority.”

- Road users need to recognise that there comes an intensity of cold weather where the standard pre-treatment is increasingly ineffective: the effectiveness of salt is greatly reduced at temperatures of –7°C or less. At this point, the policy emphasis alters to one of coping with the conditions rather than trying to change them. There is a case for more widespread understanding of the need for good tread depth on tyres, and the benefits of both winter tyres and 'add-ons' such as snow chains (in extreme conditions) and snow socks.
- One of the issues for highway authorities to consider is whether anything can be done to avoid the problem of salt spreaders getting stuck in traffic queues, an issue which has affected the Highways Agency with barriers along the central reservation. As part of its own review of the snow episode in the South East in March 2013, there appears to be a case for the Highways Agency to consider whether it would be appropriate to install more removable sections of barrier to help in such snow events.
- Snow and ice should not be regarded as isolated problems. For example, as we seem to be experiencing increasingly frequent extreme weather events, their combined impacts must be assessed. This review heard how surface water and field run-off caused by months of heavy rain quickly froze when temperatures fell. Then, when temperatures rose and the snow melted, there was flooding as a result of the ground already being saturated.
- Highways authorities must keep under review the extent of the priority network they will treat during periods of severe weather, and should consult with key stakeholders and local residents so that there is full understanding of what will be treated.
- Councils have made a point of not cutting back on winter resilience despite the current period of austerity. The risk is that a run of two or three mild winters may result in a lessening of the priority given to the winter service, thus potentially leading to a dilution of the state of readiness.
- Although there is welcome evidence that many drivers change their travel plans in the light of snow and ice warnings, there are some people who still expect their journeys to be normal. They may feel that we have the technological resources to deal with whatever nature might throw at us – but the experience is that we do not.
- Evidence given to this review revealed the logistical and financial problems resulting from employees being unable to reach their places of work. Most firms have suitable business continuity plans in place to take account of disruption caused by bad weather (as well as other problems), and clearly these need to be kept under constant review, but employers may also wish to consider whether they can do anything more to support the preparedness of both their employees who drive in the course of their work and employees who drive to get *to* work.
- The public and the authorities should not confuse 'extreme' with 'rare'. Over recent years at least, there has been a propensity for severe weather events to become increasingly frequent. We all have a duty to be prepared.

In summary, the main lessons are for all highway authorities to maintain their present state of readiness and resilience, and to avoid complacency, especially if there is a succession of winters when extreme conditions are not experienced.

The progress with community engagement, communications and information, and partnership working is greatly welcomed and needs to be maintained; such mechanisms are of wide value for other emergencies, and for resilience planning in general.

However, the key lesson for everyone is to be prepared. The highway authorities must maintain robust plans to deal with extreme weather whenever it comes, and these will show their worth when roads are salted to keep us moving safely in freezing temperatures, and to get us moving again as soon as possible should there be snow that hinders us. But there is also a personal dimension: we must each accept our own responsibility to take note of warnings, to be prepared, and to adjust our driving to suit the conditions on the roads.

1. Introduction

This review was commissioned by the RAC Foundation following an intense two-week period of cold weather between 13 and 26 January 2013, with periods of snow which was at times heavy.

The brief was to take stock of the state of readiness of the highway authorities and assess how they performed, with regard to the Winter Resilience Review and Audit commissioned by the government in 2010. The Foundation also requested that the review examine the experiences of road users and their preparation for the weather; address the perception that severe weather appears to cause less disruption in other countries than here; and consider what lessons could be learned for the years ahead.

The formal terms of reference are set out in Appendix A. These call for enquiry into the experience in Wales as well as England; this recognises that the 2010 Review focused exclusively on England, although the strong interdependencies as regards salt supply, and the wide applicability of the recommendations, meant that the recommendations were taken up across the UK.

The 2010 Review entitled *The Resilience of England's Transport Systems in Winter*[1] had been commissioned by the Secretary of State for Transport in England, following the severe winters of 2008/9 and 2009/10, during which there were major salt shortages. The Review, with outputs of an Interim Report in July and a Final Report in October, was carried out by a panel led by David Quarmby CBE, of which the present author was also a member; David Quarmby was subsequently asked, on 1 December 2010, to undertake an urgent audit of progress against the Review recommendations[2], when the next winter commenced with more severe weather. The 2010 Review and Audit considered roads, rail and aviation; but this present review is focused only on the road network.

The recommendations from the 2010 Review are addressed in Section 2. As a member of the Review Panel, the author is well positioned to assess progress against the Review recommendations.

1 Quarmby, D., Smith, B. & Green, S. (2010). *The Resilience of England's Transport Systems in Winter: An independent review*. Report commissioned by the Department for Transport. Retrieved 18 March 2013 from http://webarchive.nationalarchives.gov.uk/20111014014059/http://transportwinterresilience.independent.gov.uk/docs/final-report/wrr-final-report-2010-10-22.PDF.

2 Quarmby, D. (2010). *The Resilience of England's Transport Systems in December 2010: An independent audit.* Commissioned by the Department for Transport. Retrieved 18 March 2013 from http://webarchive.nationalarchives.gov.uk/20111014014059/http://transportwinterresilience.independent.gov.uk/docs/audit/index.php.

1.1 The approach

In view of the tight timescale, the following approach to gathering evidence was adopted.

a. Telephone conversations were held with 22 English local authorities and five Welsh local authorities, on a non-attributable basis to encourage frankness. This included the council where the chair of the Engineering Board of the Association of Directors of Environment, Economy, Planning & Transport (ADEPT) works, to obtain a wider perspective; ADEPT is the professional association of many of the directors whose responsibilities include the winter service. These conversations concentrated on the areas where most snow fell, and were with a mix of type of authority, both rural and predominately urban; in England, they included two-tier and unitary authorities. A list of the authorities is provided as Appendix B.
b. There was a telephone conversation with the Highways Agency, which is responsible for the strategic road network of motorways and trunk roads in England.
c. A telephone conversation was had with the Department for Transport (DfT) lead for winter service, and with the equivalent official for the Welsh Government.
d. Invitations were given to key logistics operators and the Freight Transport Association (FTA) to contribute evidence, in order to provide direct user input to the review.
e. A survey was completed by RAC Patrols.
f. A survey was also used to gather information from the Fédération Internationale de l'Automobile (FIA) network of motoring clubs in Europe.

Websites were a further useful source of information. This was particularly the case with the Met Office, which provided an overview of the weather and weather warnings in that period; the Highways Agency; the local authorities (both those directly contacted, and others); and the FTA.

The author would like to express his gratitude to all who provided input to this review, and to the staff of the RAC Foundation for their support.

2. Recommendations from Previous Reviews

The Interim and Final Reports on Winter Resilience were published in July and October 2010 respectively, and were then followed in December 2010 by the audit of progress. A full list of those recommendations which relate to the road network is given in Appendix C.

Some of the recommendations in the Interim Report were updated or overtaken by the Final Report, while others required short-term action, and were completed – for example, the establishment, in England, of a strategic salt reserve, using the Highways Agency, and the development of a 'Snow Code'[3] – the advice given to property owners about clearing footpaths, pavements and other public spaces.

3 Met Office (2013). *The Snow Code*. Advice issued by the Department for Transport. Retrieved 18 March 2013 from http://www.metoffice.gov.uk/learning/get-ready-for-winter/out-and-about/the-snow-code.

The ongoing recommendations, which are the focus of this review, can be summarised as follows:

For government(s):

- the DfT, in liaison with governments of Wales and Scotland, should establish and maintain a data collection system on the salt stocks held by individual authorities across the UK, so that the overall situation is known;
- the National Winter Service Research Group (NWSRG) should be brought under the wing of the UK Roads Liaison Group (UKRLG), a coordinating body – chaired by the DfT – of government and local authority representatives; its research should be made available to the whole highways community;
- there should be a review of technical standards and guidance, led by UKRLG.

For the Highways Agency:

- continue to research and share knowledge / best practice.

For local highway authorities (LHAs) – a term applicable to England and Wales:

- review winter service plans, and ensure links with wider resilience planning;
- consult on plans; ensure that there is good understanding of, and ongoing information about, treated networks;
- ensure sufficient resilience with salt stocks; support the collection of salt data by the DfT and review salt utilisation / different treatment methods;
- collaborate with, and provide support for, lower-tier authorities and community groups;
- review the extent of treatment of footways, especially in key locations / transport interchanges.

In addition, there was a recommendation that the professional bodies and the Local Government Association (LGA) should encourage more dissemination of best practice in the preparation and delivery of winter plans. In Wales, the equivalent body is the Welsh Local Government Association (WLGA).

Good practice was also highlighted in David Quarmby's Audit, which identified four key elements: planning; community engagement; information; and operations. These are considered further in Section 5, which covers local authority progress since the 2010 Review, the state of readiness for the January cold snap, and the performance of local authorities.

As a result of the severe weather in December 2010, the Transport Select Committee at Westminster also focused on the issue of resilience and preparation. Much of its focus was rail and aviation, but in respect of roads, it recommended in its report issued in May 2011 that:[4]

- the Highways Agency and police should make more use of roadside and in-car information systems to warn motorists of problems ahead;
- the government should launch a high-profile campaign to increase the proportion of motorists taking precautions for driving in winter weather;
- the government should develop clearer travel warnings relating to snow and ice risk for freight vehicles.

Sections 4 and 5 consider how the highway authorities have responded to the recommendations. At this stage, it should be noted that the DfT, linking to counterparts in Wales, has followed through the recommendations for which it is responsible – in particular to put in place the data collection and stock monitoring mechanism, to ensure that there is an overview of salt use and stocks.

A large strategic salt reserve was in place in England at the beginning of this season, and a *Strategic Salt Protocol* document issued to every LHA. This document highlighted how a number of the issues from the Review had been carried through, the need for each LHA to commence the winter season with sufficient stocks, and the arrangements for drawing from the reserve should that be required. It also pointed to the work on salt spread rates and the continuing research of the NWSRG.

The Parliamentary under Secretary for Transport also wrote to every council leader in England, highlighting key points and the information resources available to local authorities, and stressing the importance of each local authority's role in ensuring an effective response to winter conditions.

4 Transport Select Committee (2011). *Keeping the UK moving: The impact on transport of the winter weather in December 2010*. Fifth report. Retrieved 18 March 2013 from http://www.publications.parliament.uk/pa/cm201012/cmselect/cmtran/794/79402.htm.

The LGA, following up the recommendation to encourage the sharing of best practice, has established a community forum in which authorities can exchange information and best practice related to winter resilience issues.

The government in Wales also followed through the recommendations, modified where appropriate for the country. There has been close working between the government, WLGA and all 22 councils on winter resilience, and regular meetings are held by officials. It has also been a key topic discussed in the meetings between the Transport Minister and the leaders of the councils.

3. The Weather in the Two-Week Period

There had been cold weather and some extensive frost at the beginning of winter, but no significant snow. The Christmas period had been relatively mild, and this weather continued into the first part of January. However, there were indications from the beginning of the month that the weather would turn much colder.

The snow and cold weather which reached the country over the weekend of 12–13 January 2013 was forecast several days in advance. Several bands of snow moved from west to east. Weather warnings were provided by the Met Office and reported by the media, highway authorities had plenty of notice, and road users were alerted to likely problems on the network.

Much of the country had snowfall, and because it remained very cold there was lying snow in many areas until the end of the cold period. There was drifting in the more exposed areas, because of the wind and the relative dryness of the snow. The London area and the South East escaped much of the snow in the period, although there was enough snow to cause problems at Heathrow on 18 and 20 January, partly because there is no slack in the schedule, and also because flights were cancelled in anticipation of heavier snow than actually arrived. The weather throughout the period was very cold across the whole country, and there was a continuing problem of ice and slippery roads.

Parts of the country, particularly those bordering the North Sea, were subject to snow showers throughout the two-week period, as the wind came from the north or east. Showers are difficult to predict, and some, such as those that hit Norfolk on 14 January, were quite intense.

More snow arrived from the South West on Friday 18 January, and once again it was as forecast; the heaviest snow was in parts of the South West, Wales and the Midlands. This snow came with the unusual red snow alert for the higher parts of South Wales.

Snow then spread northwards from the Continent on Sunday 20 January through central and eastern England, into northern England, and then into Scotland the next day. With strong winds in the North, there was significant drifting. Again the snow was well forecast, so the authorities were prepared and warnings given to travellers.

There was further snow in parts of the South West, the Midlands and South Wales on 22 January. The threat of rain or snow had been forecast, and indeed it did rain in places, but there were also some places which received significant snowfall, even though it began as rain.

The last snow event of the period was on the evening of Friday 25 January and overnight, as a weather front spread from the west. This heralded warmer air,

and a rapid thaw over the weekend, but first it met the very cold air across the country. The threat of snow spreading east was accurately forecast, as was the fact that it would turn to rain with rising temperatures; the balance between snow and rain, however, varied across the country, as did the volume of precipitation. In particular, there was heavy snowfall in parts of the North West, with the area to the north-west of Manchester having between 20 and 30 cm of snow in a few hours. This led to the closing of the M6 near Wigan, as vehicles became stuck in the wintry conditions.

In summary, it was a difficult period of weather, because it stayed cold throughout the two weeks and there were some very cold nights too. There were also several snow periods – always the most challenging weather for the highway authorities. The conditions overall were not as severe as those in 2008/9 or 2009/10. Nonetheless, it provided a good test of the progress made by highway authorities since the 2010 Review, both in terms of salt resilience – as they were required to salt throughout the period – and of their preparation and operations.

Periods such as this see very heavy demand for salt supplies: highway authorities would pre-treat every day (usually twice a day), and snow events will see more intense activity, with significant use of salt. The scale of salt required was highlighted in the 2010 Review: in an *average* winter, salt use across the whole of Britain is about 1.5 million tonnes; in a *moderately severe* winter (such as that of 2008/9), this rises to 2.8 million tonnes; whilst in a *nationally severe* winter (such as that of 2009/10), this rises to 3.3 million tonnes.

These figures would be slightly different now, as authorities have reviewed spread rates, although they report that the consequent reductions have been offset in part by salt allocated to parish councils and the community.

If the figures are brought down to individual authority level, a typical usage figure for one of the larger Shire counties is 200 tonnes for one run on all its routes, with an average winter figure of 12,000 tonnes. This would rise to some 22,000 tonnes in a moderately severe winter, and some 26,000 tonnes in a nationally severe winter.

Information obtained during this review highlights how much salt can be used in a short period. Several of the authorities which typically spread about 200 tonnes per complete run used around 6,000 tonnes of salt in this two-week period. A couple of authorities, where the problems were particularly acute, used more than 10,000 tonnes in this period alone. Overall salt use to the end of January was typically equivalent to a moderately severe winter.

One aspect of salt spreading which sometimes causes confusion is that the vehicles are generally called ‘gritters’. It is, however, salt that is spread (sometimes with a brine or sugar additive), and references to spread rates refer to the different volume of salt spread expressed in weight per surface

area – for example, 10 g or 20 g per m^2. Salt can be mixed with some sand or grit, particularly for hand spreading, but the downside is the mess that remains once the snow has melted, and that the material gets washed into the drains.

4. The Strategic Road Network

In England, the 'strategic road network' of major national routes – the vast majority of motorways and trunk roads – is the responsibility of the Highways Agency. This network of some 4,500 miles is maintained by contractors, overseen by Highways Agency teams, whose areas of responsibility include winter services.

In Wales, the strategic road network of motorways and trunk roads, covering some 1,100 miles, is maintained for the government by agents utilising service providers. These are many of the councils, and again winter services are in the remit.

4.1 The network in England

All the Highways Agency network is pre-treated, and there are clear requirements and a detailed specification for its contractors. Salt is purchased by the contractor, but the Highways Agency maintains an overview of the total stock available to its network.

The recommendations of the 2010 Review acknowledged that the Highways Agency and its contractors had performed well through the winters of 2008/09 and 2009/10. The report also recognised the steps taken by the Highways Agency to reduce its salt use by the adoption of pre-wetting across its network. (Pre–wetting, which requires specialist vehicles, is the addition of a saline solution to salt, so that the salt sticks to the road surface when spread rather than 'bouncing', thereby reducing salt requirements.)

Specifically, the Review proposed that the Highways Agency should organise a strategic salt stock for England, a recommendation accepted by the Secretary of State and followed through by the Highways Agency. The Highways Agency was also commended for its research programme, and encouraged to continue this and to share the results widely. It has continued to do this.

The Highways Agency was well prepared for winter, and in conversation it reported that operational performance was good throughout the two-week period. It also highlighted its work prior to the start of the season, and its work with others, to ensure that the messages about driver preparation would be widely disseminated, and especially at times of severe weather warnings, where there was the threat of snow.

The Highways Agency, working with the police, and the local authority where relevant, has also identified a number of places where heavy goods vehicles (HGVs), which tend to lose traction before other vehicles, can get into difficulty. A good example of this is the A38 Haldon Hill and A380 Telegraph Hill in Devon, just south of Exeter. Additional treatments are used in some places,

while in other places measures – such as holding back HGVs until conditions ease, or until they can be helped – have been developed. Linked to this is better coordination between its winter fleet, its traffic officers, and vehicle recovery services.

Despite all these preparations, there were difficulties with falling snow on the M6 on the evening of Friday 25 January, in the area north-west of Manchester. This was the last band of snow, ahead of the thaw, and weather warnings had been issued the previous day. These were based on a weather forecast of snow accumulations of 2–5 cm in the area, with up to 10–15 cm across higher ground in the east of the region (the Pennines area).

The Highways Agency consequently warned that "heavy snow and most disruption is currently expected to be on the highest parts of the A66, A69, M62 and A628, where more than 10 cm is likely", and further advised that "travel in these areas is likely to be extended, or even disrupted".

As it happened, the heaviest snow fell further west than expected during the evening period. Police reports, reinforced by local authorities in the area and other evidence, indicated that up to 30 cm of snow had fallen in a four-hour period. This exceptionally heavy snowfall led to the M6 between junctions 25 and 27 becoming blocked by numerous HGVs jackknifing or being unable to gain traction, with traffic becoming stationary on both carriageways, and the hard shoulder blocked by vehicles in places.

This meant that snow ploughs were unable to access and clear the carriageways, and the situation had to be managed by the Highways Agency's North West Regional Control Centre, which coordinated the efforts of the Highways Agency's Traffic Officer Service, the winter service contractor, the police, and vehicle recovery contractors. Additional equipment was moved to the area, some from the areas where the heavier snow had been expected, and it took several hours for the combined efforts to clear the problems and get everyone underway.

The Highways Agency indicated that the full precautionary salt treatments had been undertaken on all routes on the network three times since the morning of the 25 January, in accordance with the Highways Agency's treatment guidance, fully in accordance with forecast conditions. It highlighted the fact that the significant amount of snow which fell over a short period was very unusual, and would have been likely to cause disruption to travel regardless of the precautions that had been taken.

It is interesting that, although there is some mention of these problems by users of the network, the majority acknowledged the exceptional snow and difficulties – indeed, there were specific positive comments from some who were rescued about the way it was handled.

In advance of this snow event – and indeed all forecast snow events – all road users should be aware of the prospect of adverse weather, as the Highways Agency makes full use of its overhead messaging signs with relevant warnings. Information is also provided on its website, and working with the Met Office, it now feeds this information to many road users around the country. The aim is to ensure that all road users are alerted and prepared.

This links to the Agency's 'Make Time for Winter' partnership marketing campaign.[5] Its aim is to make drivers consider their responsibilities and actions carefully throughout the winter period, especially during periods of severe weather. Its key messages to drivers and passengers are: to be prepared and informed, and to plan accordingly for their journey. The messages are disseminated through the media, through the Highways Agency's own information road signs and other information points, and via the social media.

The Highways Agency provided clear evidence of the impact of this campaign. Its toolkit of resources has been distributed to 330 organisations, and it is currently working with over a hundred partner organisations to promote the campaign via their websites, newsletters and poster sites, both to their staff and customers. Its own website had over 36,000 web hits, from the launch of the campaign in mid October 2012 up to the beginning of February 2013, with over 20,000 of these in the period after 7 January. Its Twitter account has around 5,400 followers, and was also recommended by Number 10's Twitter account to its 2.2 million followers; this recommendation was then retweeted a further 86 times to an estimated 40,000 more people.

This issue – driver preparedness for the weather conditions – has been stressed by government since the Review and Audit of 2010. Whilst the Highways Agency has led with its campaign, it is also a key message promoted by LHAs, and by industry bodies such as the FTA. This review has therefore attempted to assess whether the messages are influencing road user behaviour.

4.2 The network in Wales

In Wales, the pre-treating of all the strategic network, in accordance with a detailed specification, is also undertaken. Pre-wetting is used, as it has been for many years. Wales makes its own decisions on all these matters, but in practice, there are many similarities in approach between Wales and England.

There is sharing of research and information through participation in the NWSRG, and consequently, involvement in the guidance published by the UKRLG.

5 Highways Agency (2013). *Make Time for Winter*. Retrieved 18 March 2013 from www.highways.gov.uk/traffic-information/seasonal-advice/make-time-for-winter.

The government in Wales is also active in seeking to influence driver preparedness and behaviour, and at times of snow, providing information through similar channels used in England to help road users.

What is distinctive in Wales is strong partnership working, involving government, the 22 councils and the WLGA. This is seen in: regular planning meetings between officials; arrangements to coordinate activities during periods of adverse weather, including cross boundary working if this is required; and in plans which have established robust resilience on salt stocks, with a specific user group. In the first stage of this work, ahead of the establishment of additional strategic reserves, it was agreed that all councils should hold a minimum of one and a half times their average salt use in recent years, and a number of joint stores were established.

Through the two-week period, there were no major problems on the strategic network. All the roads were treated as planned, and even on the day of the red snow alert, the network was kept open. It was reported that traffic levels were significantly lower on that day, as drivers responded to the weather warnings, so helping snow ploughs which were not held up by heavy traffic. The volume of traffic was also eased by the advance closure of schools, as well as many deciding to work from home.

5. The Local Highway Authority Network

All other roads, in both England and Wales, are the responsibility of the LHA. These range from busy A roads to the lightly trafficked single-carriageway roads in upland areas, and many are residential streets.

In England, there are 150 LHAs, a mix of all-purpose (unitary) authorities, and the upper-tier authorities in those areas where the pattern of local government is shire county and district councils.

In Wales, the responsibility rests with the 22 all-purpose authorities.

The following material does not distinguish between the Welsh and English authorities, since in practice, the feedback was almost identical. The only difference, already highlighted in Section 4, is the extent of partnership working and mutual support between the authorities in Wales.

Many of the recommendations in the 2010 reports were directed to the LHAs, hence the first issue to be addressed is the way they have been followed through, before the question of preparation and performance during January's severe weather is considered.

Feedback from all those authorities contacted suggests that the Quarmby Review, and the follow-up Audit, were important in shaping today's winter service. Of course, there was already good practice – and this has continued and been developed – but it is apparent that the report served as a prompt to review many aspects of the service, and to stimulate improved practice and innovation. As confirmation of this, every LHA pointed to areas of review and improvement since 2010

5.1 Salt stocks

The issue at the heart of the 2010 Review was salt stock levels, prompted by the shortages of the previous two winters. Most LHAs reported in 2013 that they had increased their start-of-season stockholding, either by holding more in available storage, or by improving their storage capacity. All were confident of their resilience regarding the volume of salt they held. Some authorities also pointed to arrangements with other councils: either joint storage, or arrangements to 'borrow' salt, should the need arise.

Many have reviewed salt spread rates, following the issue of the revised guidance from the UKRLG, leading to savings in the volumes of salt

used, as well as now applying salt at rates that are appropriate to varying circumstances. In practice, some of the salt saved has been redirected into salt bins or salt bags, to support community efforts (see below). However, there was awareness amongst those interviewed, and the DfT, of a few authorities where the revised guidance has yet to be implemented; a common reason is the limitations of the gritting fleet.

Many of the councils had improved their fleet in recent years, with vehicles purchased either by the council or as part of new contracts, and gritting fleets are now generally of recent age and high calibre. This has allowed more precise spreading, with differential spread rates according to the conditions. In many cases this has been linked to other improvements such as pre-wetting, described above, or the use of other proprietary additives – all these steps being aimed at improving the effectiveness of salt use, and in many cases reducing the volumes spread.

There is every prospect of further improvements as technological advances are made. A number of authorities are testing the use of liquid de-icers, already used in parts of Europe and North America, and research continues into many aspects of the service. All authorities can look forward to a complete update of Appendix H (dealing with spread rates) of the *Well-maintained Highways* document, developed by the NWSRG and about to be published by the UKRLG.

As highlighted in Section 3, salt use in the January two-week period was heavy. However, going on the information provided for this review, and indeed reinforced by the DfT's salt-monitoring system, no LHA reached a point where there was any risk of running out, and there remained adequate stocks, demonstrating that there is now much greater salt resilience in England.

Salt supply was not reported as a problem by the majority of LHAs. Most of the salt comes through two main suppliers: Salt Union in Winsford, Cheshire, and Cleveland Potash in Loftus, Cleveland; some also comes from Irish Salt Mining near Carrickfergus on the coast of Northern Ireland. However, a few authorities observed that once the severe weather hit, and many orders were being placed to replenish stocks, the deliveries did not match what had been ordered, and that when it came it arrived somewhat piecemeal. This perhaps suggests that, as identified by the 2010 Review, there may be capacity constraints on the main producers affecting the delivery of orders at times of high demand.

This aspect of the supply chain is something to which LHAs might wish to give further consideration. There appear to be some issues concerning the flow of salt stock data between customer and supplier, and a better understanding of the limits of the supply chain, and some assessment of whether different contract models might be worth exploring, would seem useful.

5.2 Other councils and community engagement

One aspect in which many LHAs have made positive changes since 2010 is the level of community engagement, to support their plans at times of snow. There are many approaches to this, reflecting varying local situations and local decisions. In areas where there are parish and town councils, (community councils in Wales), there is diversity in the measures in place. Some are formal, others more informal, but all have been introduced in recognition of the additional capacity and local engagement that follow.

Some parish councils are used to oversee the use of grit bins. Others have been provided with salt bags, to spread salt in high-priority areas. Some have been part-funded to purchase equipment such as hand gritters, whilst others have to purchase such equipment but are then given technical advice and support in its use. Many of these initiatives are supported by some form of 'snow warden' arrangement.

Such arrangements have also been developed in areas where there are no parish or town councils. A number of LHAs described arrangements with local shopping centres, such as salt delivered for the centre to spread, or with local community groups.

In rural areas, the use of the farming community to assist in clearing roads has been developed, or extended, by LHAs. This now seems to be more widely practised than in 2010. A variation on this is arrangements with local contractors.

All the unitary (all-purpose) LHAs highlighted the good practice of deploying other council staff or contractors, for example from street cleaning and parks and gardens, to support snow clearing, with a number emphasising how these arrangements have now become more formalised. Two–tier areas do not have the range of functions needed to do this, but many of them reported arrangements developed with district councils in their areas. This leaves some that have no such arrangements, or only partial ones, depending on the degree of cooperation.

The large urban areas have developed strong local support networks. The 2010 Review highlighted this from its consideration of the London area, and the conversations for this review picked up that such networks exist in the West Midlands, Manchester and Newcastle areas.

It was pleasing to note that many of the initiatives described throughout this section are also described on websites, which increases public awareness and reinforces the messages about preparation and resilience.

5.3 Information and communication

Concerning information and communication, there was a consistent message from all LHAs: this element of the winter service has been much strengthened in the last few years. Information about plans is now widely disseminated, by means of printed material, websites, social media and other digital communications. Each authority contacted is now using Twitter to advise gritting plans, and some include details such as spread rates. Clearly, #grittertwitter has been well-used this winter season. The nature of Twitter means that feedback is also being received; this in turn has meant that consideration has had to be given to how to manage this information, which is needed when the feedback is reporting problem spots or similar, rather than conveying thanks.

Alongside this, vigorous efforts are being made to engage with the local media, especially local radio and television, to ensure that it has been briefed ahead of the winter season. This helps enormously when snow events occur, and it is vital to work with the local media to disseminate messages and ensure that all road users are well informed.

5.4 Consultation on winter plans

A more mixed picture emerged from the LHAs when it came to consulting on their winter plans. This was one of the recommendations of the 2010 Review and the 2010 Audit identified the ideal as “review and consult with stakeholders widely on the treated networks, including adjacent highway authorities, major installations, transport operators, health and educational facilities”.

Measured against this, most authorities reported they had strengthened or improved their consultation with those named in the above list, but the approach to general consultation is quite varied. Many LHAs take the view that there is limited value in consultation, because there is no additional money to support more of the network being treated – although they do engage with stakeholders who have specific issues: if, for example, there is a local distribution centre. Nevertheless, information about plans is widely promoted, as indicated above.

The downside of limiting consultation, from a concern that it will simply lead to additional requests, is that the opportunity to engage with stakeholders on the issue which generates most concerns and complaints – those parts of the network which are not treated – is missed. Residents understand that resources are limited, and provided that this is the context for any consultation (which might take a variety of forms), there are potential advantages in setting out the criteria underpinning the decisions and the proposals in a consultation.

5.5 State of preparation

All LHAs reported that they were well prepared for the severe weather in January. It is also worth noting that many highlighted how the winter plans were now linked to wider resilience planning, such as that for flooding problems; they also said that in the event of a snow event, coordination arrangements are put in place, to ensure good media liaison and the necessary coordination of arrangements for vulnerable members of the community.

Moreover, this extended weather event did not take place at the beginning of winter. All authorities had been pre-treating according to conditions for many weeks, and snow had fallen in some areas. There had been quite significant use of salt in some areas, but in spite of this all LHAs commenced this January period with good stocks.

5.6 Operational performance

If LHAs are to respond effectively, it is vital that there are good weather forecasts, which provide decision-makers with confidence. All agreed that the forecasts were accurate in this period, both as to the timing of events and the predicted volumes of snow. The exceptions were the snow/rain which fell in the South West on 22 January, which fell more as snow (and less as rain) than predicted, and the volume of snow which fell in the North West of England on 25 January, as described above.

Whilst some LHAs use private contractors for their forecasts, it is the Met Office which provides the forecasts and associated weather warnings of which most people are aware. These warnings were conveyed not only as part of

the weather forecasts, but by the media, and – as indicated above – by the Highways Agency and the Welsh government; all agreed that this is important as a means of alerting drivers to reflect on the need to travel and to be prepared for poor conditions and possible disruption.

All authorities reported that they regarded performance as satisfactory during the snow events. There were some areas where one or more of the snow periods coincided with a rush hour, and there was disruption for a few hours until snow ploughs and gritters were able to operate effectively, but the consistent message was that performance was according to plan. This takes into account that, even with the priority network, there may be some initial disruption, depending on the amount and type of snow and on the traffic volumes at the time. However, the expectation is that any disruption is short-lived, and that within a few hours this network is restored to serviceable use.

There were no reported problems with snow ploughing, or using snow blowers in the more rural areas (although the dry snow and strong winds meant that there was a lot of drifting in some parts). A number of authorities were trialling a new blade, demonstrating continuing willingness to innovate, and they reported good performance in clearing the snow 'down to black', i.e. to the road surface.

The situation across the rest of the network, i.e. other than within the priority network, was much more varied, and it is very difficult to draw firm conclusions. Between one local authority area and another, very different percentages of the total network are defined as priority (this report sample had a range of 20% to 64%), the decision reflecting the urban/rural mix, the geography and topography of an area, the type of roads, and local priorities. Some authorities' main aim is to keep the priority network in a serviceable condition during severe weather periods, which means that, ahead of forecast snow, all efforts are directed to getting a layer of salt onto the surface of the road, and then clearing and maintaining this network in good condition. Others have a defined secondary network, and as soon as the priority network has been restored, resources are applied to this. Some reported that they were also able to pre-treat this ahead of forecast snow. Others do not define such a secondary network, but apply resources following snow to additional roads and problem areas.

Many LHAs reported that there were the anticipated problems, at least initially, on the non-priority roads. The continuing cold weather meant that in many places the snow continued to lie on the most rural and less-used roads, but the majority of authorities reported that a mix of their own resources and supplementary community resources led to many of these roads being passable with care.

One interesting point was made by several authorities: there were particular problems this year as water continued to run off fields – the result of last year's

very wet weather. This meant that even on days when there was no snow, there was the hazard of ice, as the water from the run-off froze in the low temperatures, as well as the problem of the water washing away salt in some places. One of the lessons from this experience is that conditions are rarely the same from year to year.

Indeed, there were some parts of the country where there were still flooded fields when the snow came, and the ground was generally very wet, the result of the heavy rain in the autumn. The eventual rapid thaw then led to flooding in many areas, with further problems, not only for those directly affected but for the highway authorities. There is not universal agreement about climate change and the greater frequency of more extreme weather events, but those dealing with the impacts are very clear that they seem more frequent.

This feedback on overall performance from the LHAs sounds very positive, and indeed encouraging, but some might ask: was the situation really under control, as they suggest? That performance was indeed good was strongly indicated by unsolicited comments from *every* authority that they have never before received so much thanks and praise from a range of sources. Some pointed to Twitter feedback as a contributory factor in this, but it does seem that improved communication and a high standard of performance generated much positive feedback.

This is not to say there were not some issues and some complaints, most of the latter relating to those roads which are not scheduled for treatment. However, these were far outweighed by the positives, and it was revealing to hear some of the experienced winter service managers expressing their surprise, and pleasure, at the positive feedback that had been received.

Given the spending pressures on local government, the opportunity was also taken during the conversations to ask whether budget cuts had been made to the winter service, or whether any were proposed, to get an indication of whether the improvements of recent years are likely to be maintained. Budget cuts are to be distinguished from efficiency savings, which are being achieved by many authorities in providing this service.

The response was identical from every authority. It is a high-priority service, and its importance widely recognised. No cuts have been made to the winter service in the last two years, and none are scheduled. This clearly gives confidence that the improvements of recent years should be maintained.

6. Other Evidence

Whilst it is clear that there has been good follow-through of the recommendations from the 2010 Review, and the Highways Agency, the Welsh government and the LHAs are indicating that they performed well during the difficult weather in January – a view reinforced by the positive feedback they have received – this review has sought to test that assessment by obtaining views from those whose operations are highly road dependent.

The assistance of ASDA, Boots and Royal Mail in providing input to this work is gratefully acknowledged. This also applies to the FTA, the trade body for freight operators.

To provide a different perspective, help was also sought from RAC Motoring Services, and the opportunity provided to its RAC Patrols to complete a short survey on their experience during the two-week period; the author is grateful for their time and cooperation.

Information was also sought from Europe, through the FIA network of motoring clubs, to obtain some comparative information about the impacts of snow conditions in Europe. The 13 countries from which clubs responded are listed in Appendix D.

None of these are fully scientific surveys. They do, however, provide useful observations to relate to the comments from the highway authorities, and also furnish comments and material on the issue of driver responsibility and preparation, which is also considered in this section.

6.1 The freight operators

The overall message, certainly in respect of the strategic and main roads (all of which are pre-treated and are priority for clearing), is that there were few problems and an acknowledgment that they had been well treated. There was also recognition of the signs warning of expected adverse weather, although the major operators also have central systems in place, linked to the Met Office, to ensure that the best information is always available.

However, there were specific problems, namely the difficulties on the M6 – and the linked roads – on 25 January, and those in the South Wales area on 18 January, when there was the red snow alert. ASDA highlighted that the former had an impact on about a hundred stores, with late arrival of fresh deliveries, and hence reduced product availability for customers, whilst clothing deliveries in the South Wales area were postponed.

ASDA also highlighted that for expected adverse snow conditions, it has a

process to track Met Office weather alerts, so that appropriate action is taken. This includes the clearance and gritting of its depots, store yards and car parks, and it reported no problems with these. For other weather-related issues (such as high winds and flooding) it uses the FTA red/amber warning system to support its depots.

Additionally, ASDA pointed to some of the indirect impacts of snow, such as staff being unable to get into depots. Overall, it estimated that, in addition to the cost of gritting and ploughing its own sites, it incurred a cost of some £100,000 for additional labour and resources to minimise the service impacts caused by the poor weather, a reminder that poor weather has a significant economic impact on the country.

Boots was able to secure feedback from logistics company DHL, which operates the retail transport operation to its 2,600 shops; from the Alliance Healthcare Pharmacy wholesale network; and from the Pharmacy Delivery and Collection Service (PDC), which has over 1,500 drivers, and which delivers to patients at home and to care homes.

Both DHL and the Alliance Healthcare Pharmacy network reported that they had few problems, since the main routes were well treated, and certainly in a better state than three or four years earlier. Comment was specifically made about the value of advance warnings of bad weather, and the importance of these in allowing plans to be adjusted – particularly as drivers would leave earlier, if possible, during the bad conditions.

There were some issues with minor roads, but "experienced drivers would expect that, and make alternate arrangements". This clearly links to driver preparation, part of which involves the issue to every driver of a Winter Kit, to assist them in getting through any particularly bad areas. This includes bags of salt, a shovel, gloves, an insulation blanket, an emergency food pack and a mobile phone charger.

The PDC encountered more difficulties, mainly because of its need to use minor roads. It reports that its service was impacted, as medication deliveries were delayed, or at least delivered later than planned, to both patients at home and to care homes. Many of these deliveries are dynamic and time sensitive, and cannot be rescheduled, such as controlled drugs for end of life care.

It reported:

> "Most PDC driving takes place on A roads and side roads. General feedback was that most A roads were cleared fairly quickly; however, the majority of side roads / housing estates had little or no gritting/clearing. This resulted in hazardous driving conditions for PDC drivers, resulting in delivery delays and some deliveries having to be made on foot. We also experienced an increase in

collisions/accidents related to weather/road conditions, as well as an increase in driver slips/trips due to snow and ice."

These difficulties are not surprising, since many, if not most, side and estate roads are not part of the treated network, and subsequent clearance and treatment practice varies considerably. Some LHAs highlighted that places such as care homes were specifically included in their treatment plans, or that they would try to help if requested, but the reality of limited resources is that many of the locations needing to be accessed by PDC drivers will not be treated. Organisations making such deliveries need to take account of this, both in respect of the vehicles and their equipment, but also when it comes to drivers and their equipment, such as footwear.

Royal Mail also highlighted that, apart from some short-term problems as snow fell, preparation and performance were generally good, and that it received no reports of any untreated major roads. Several drivers were caught up in the M6 problem on 26 January, and whilst advance notice on the matrix signs alerts drivers, options are limited by the types of vehicles being used.

Royal Mail also stressed the importance of the warnings provided by the Met Office, Highways Agency and BBC Travel of adverse weather and likely disruption, particularly since weather can vary significantly across the UK. It mentioned that the BBC travel cameras offer a really good view of what the major trunk roads are like in real time.

Driver preparation is an important issue for Royal Mail. Road Safety Week, ahead of the winter weather, is fully supported and used to link to the wider aspects of winter travel.

The FTA also observed that it had not received as many complaints about non-treatment by the local authorities that it had within the bad winters of 2008/09 and 2009/10. It believed that it was the general preparation of equipment and salt stocks, in conjunction with the warnings that were given, which helped to keep roads open – or reopen them. Side roads were an issue, but the main routes were for the most part kept clear.

The FTA stressed not only the usefulness of the snow warnings issued by the Met Office, and others, but the growing confidence that operators had in the warnings. Such confidence is important as they consider changes to their operations, and, moreover, customers understand that the warnings might indicate a change to normal distribution patterns.

It also highlighted that the timeliness of the warnings is important. If they are firmed up around midday as regards conditions that night and the next day, this allows distribution patterns to be adjusted if necessary. If the warnings come later in the evening, it may be too late with loads already scheduled for that night and the following early morning. Timely information can also be important for the supply chain – for example, warnings of severe snow and ice can prompt an increase in bread demand by a factor of 25%, to which the industry needs time to respond.

6.2 RAC Motoring Services

It will come as no surprise to hear that in extreme weather conditions, particularly snow and very cold weather, there are more callouts to breakdowns and incidents. Figures provided by RAC Motoring Services show that through this cold period, there were over 20% more calls per day for more than half the days in this period than there were the previous year, and that through this period the RAC attended well over 100,000 calls for assistance. Monday 21 January, the day that heavy snow hit eastern and northern England, was also the busiest day for the RAC since 2007, with their patrols being called out to more than 12,000 breakdowns across the UK.

With the help of RAC Motoring Services, the opportunity was taken to seek the views of RAC Patrols on the conditions, and the issue of driver preparation, by means of an online survey. This was a self-selecting survey, completed by 381 drivers (more than 20% of the total), which provides some interesting points for this review.

The main headlines are:

- 46% considered that more than half the faults were related to the cold conditions;
- 90% considered that less than half of callouts were attributable specifically to icy or slippery conditions;

- 76% considered that more than half of callouts attributable to icy or slippery conditions were on untreated roads;
- 42% considered that more than half of the accidents which they attended were caused by the cold weather;
- about half considered that they had been moderately or severely hindered by ice and snow in trying to help people;
- nearly 80% considered that the roads were as well or better treated than expected;
- 90% estimated that fewer than one in ten of vehicles they attended had winter tyres;
- 74% considered that more people deliberately chose not to drive during the periods of snow and icy conditions this year than in previous years.

Patrols were also given the opportunity to comment in free text. Some of the main points which emerged were:

- concerns about the number of potholes, in all types of road, and the observation that these are particularly dangerous when it has snowed, because they cannot be seen;
- a recognition that local authorities did much better in the recent bad weather than they have in the last few years;
- the observation that drivers appear not to have heeded weather warnings, and that many had been caught out or unprepared; moreover, that many of the stranded vehicles were not suitable for driving in the conditions;
- concerns about poor driving, or driving in a manner inappropriate to the conditions, and a lack of experience/skills for the conditions;
- the observation that many of the problems with snow and ice occurred on the untreated side and estate roads;
- several observations about the difficulties with rear-wheel-drive cars, and also the benefits of winter tyres; and some surprise that more motorists in areas subject to frequent snow and ice problems do not fit them.

6.3 European feedback

Comments were received from 13 European motoring clubs (the equivalent to the RAC and AA), and various press reports have also been accessed describing the impact of snow in parts of Europe during the same two-week period.

Snow fell in many parts of Europe during this period, and the press reports highlight the resulting disruption during the times of snow stretching from France and the Netherlands to Poland and Germany.

The motoring clubs report that the media in France and Germany tend to be particularly critical of the authorities and the disruption caused by snow. Despite this, all concluded that the public in the 13 countries covered are

either satisfied or well satisfied with the performance of the authorities, and are satisfied with their preparation for snow. They stress that snow inevitably disrupts, and therefore what matters most is recovery from the problems, so that travel is able to resume. They also highlight that the focus is clearing main networks, and that this can leave other routes difficult to use.

In many European countries, snow is relatively frequent, and this is matched by investment in snow-clearing equipment, to ensure that disruption is kept to a minimum. Other measures adopted include bans or restrictions on HGVs in some countries during periods of snow (this applies in nine of the twelve countries which answered this question).

All report that their government tries to manage expectations, and to get out messages about avoiding unnecessary journeys, being prepared, and driving in a manner appropriate to the conditions.

It is somewhat anecdotal, but when there is criticism of the authorities following snow in Britain, the claim is often heard that other countries manage better. Yet the above snapshot would seem to suggest that this is probably not true, and certainly it is not a like-for-like comparison. Where is disruption abroad, there is focus on getting the main roads clear first, and minor roads are frequently difficult to use. It is also important to note that some of these countries have requirements for winter tyres.

It was also noticeable from the press reports that much of their focus was on the airports and whether these remained operational. The same focus is also found in Britain. But keeping an airport open is not the same as keeping local roads passable, and two of the reports mentioned that whilst the airport did remain open, there was major disruption on surrounding roads because of snow and ice.

It is also important to recognise that disruption builds quickly where traffic is heavy. It takes only a small incident to cause significant delays, and consequently, snow can cause major problems in busy areas. We know this from experience in the UK, where the greatest disruption arises when snow causes problems in urban areas. If this is then taken together with the fact that the UK has the greatest traffic density of any country in the European Union when measured in passenger miles per mile of road[6], perhaps we should not be very surprised that snow events do sometime bring disruption.

6.4 Driver responsibility and preparation

Whilst highway authorities will always try to keep the roads clear and safe to use (as required by law), there has been increasing emphasis in recent years on the responsibilities of road users, and the need to be prepared if adverse conditions are forecast. This has been made easier by the improvement in weather forecasts, and the system of weather warnings, which usually provide advance notice of likely disruption and so allow better targeting of problem areas.

The Highways Agency winter campaign, mentioned above, and similar by the Welsh government, are very important in getting messages across, but this is complemented by local reinforcement, whether by printed material on winter travelling, websites, or day-to-day messages, or through the media. The FTA also has a helpful and informative webpage[7] that gives good advice for those moving freight on the roads. This highlights the need for vehicles to be in the best possible condition, which includes having the recommended minimum tread depth of 4 mm (it highlights that winter tyres might be used as an operational decision), and for drivers to be equipped so they are best able to handle any disruption caused by snow.

But are the messages getting through, and is there any evidence that road users are more prepared?

Some local authorities reported no change in traffic volumes when significant snow was forecast. Others reported that traffic was noticeably lighter when

6 Gomm, P. (2012). *Keeping the Nation Moving*. RAC Foundation presentation given to the Road Users' Alliance at the Institution of Civil Engineers, 3 May. Retrieved 18 March 2013 from www.racfoundation.org/assets/rac_foundation/content/downloadables/gomm%20rua%20030512.pdf.

7 www.fta.co.uk/policy_and_compliance/road/drivers/driving_safety_advice/operating_in_snow_and_ice.html

significant snow had been forecast, but there is no direct evidence to draw the conclusion that this is because people are heeding the advice to undertake essential journeys only. Indeed, there are those who question whether this advice is really understood, and also point to the irony that clearing roads of snow needs vehicle tyre action to work with the salt. However, the advice reinforces the warnings about bad weather and should make people think before they make a journey.

If they think about the journey, then there is a greater likelihood that they will also take the appropriate preparations. But it is concerning to hear from the Highways Agency that its research last year suggested that 24% of drivers take none of the recommended additional items in their vehicle. This also seems to be borne out by the RAC Patrol comments, which suggest that many drivers were not equipped to drive in difficult weather conditions. It seems that the message about being properly prepared for difficult conditions needs continuing emphasis by governments, the highway authorities, the Met Office and the media.

The evidence from the freight operators is more encouraging. It does seem that the message about drivers being prepared is taken seriously, at least by some, and perhaps that is less of a surprise because of health and safety concerns on the part of drivers. The challenge is to ensure that this attitude is widely adopted, especially since it is HGVs and other freight vehicles which usually become stranded first in snow and ice, as they lose traction.

Given the importance of timing to so many deliveries, with so much emphasis today on ‘just in time’, it might be unrealistic to expect many deliveries to be rescheduled when adverse weather is forecast. It is noted that careful attention is given to the Met Office forecasts, but perhaps a better approach would be to consider delaying at least some deliveries, if at all possible, until better conditions are forecast.

And if deliveries have to be made – or, equally, if there are unavoidable journeys for whatever reason – there remains the option of fitting winter tyres, or if this is deemed too expensive, ensuring that the vehicles are using tyres with the recommended 4 mm of tread (as opposed to merely the legal minimum 1.6 mm). It is accepted there are additional costs involved, but these need to be weighed against the costs of delay, or potential damage to vehicles to the operators, quite apart from those affecting society at large.

7. Conclusions and Lessons

7.1 Conclusions

The conclusions from this review are clear and encouraging:

- The recommendations from the 2010 Review and subsequent Audit have been followed through in both England and Wales, and consequently there is now, in 2013, much greater resilience in the winter service. Whilst this conclusion is based on a sample of 15% of highway authorities, it is known that key concerns from 2010, such as ensuring the adequacy of salt stocks, have been widely addressed within this sample.

- There was good preparation for the winter of 2012/13. This reflects the follow-through of recommendations as detailed in sections 4 and 5 and in particular the existence of good plans, arrangements with local communities and other councils, strong communications, and continued development of equipment and materials.
- The operational response during the two-week period of cold weather and snow was good. After the initial disruption as snow fell, which will always occur, the main roads were quickly restored to operational use. There were some problems with untreated areas, which are inevitable given limited resources, but affected areas seemed to cope well overall. This is assessment is reflected by the large and unprecedented numbers of positive comments received.
- The feedback gathered for this review suggests that the experience of most road users matched this assessment.
- There is evidence that more road users are taking notice of the adverse weather warnings, and being prepared; nevertheless, there remain many who are not heeding this advice.
- There is no clear evidence that the impact of severe weather is particularly bad in this country by comparison with our European neighbours. Some countries have so much snow that they and their residents can gear up accordingly, with good habits being reinforced by regulations applying to road users. Where snow is less predictable, there is always disruption, and consequent frustration for road users. It is when it falls in areas that suffer only occasional snow – particularly if that area is densely populated – that most problems arise. The equipment available may have limitations, and certainly does not match what is used in areas in which more extreme conditions are relatively common, because it makes no economic sense to invest in equipment that is rarely used; and road users, unused to driving in such conditions, get caught out.

7.2 Lessons from 2013, and future resilience

The severe weather of January 2013 saw an effective response from the highway authorities, and difficulties appear to have been kept to a minimum. However, there must be no complacency. Many improvements have been made to winter services, but not necessarily by all authorities. Expectations are higher, and it is important that all highway authorities continue to respond to the challenge, even though resources are tight.

It is clear that there is now much stronger underlying resilience in both England and Wales, particularly when it comes to salt stocks, and all those involved in achieving this should take credit. But this needs to be maintained, even if there is a succession of relatively mild winters with little snowfall. The difficulty for the UK is the unpredictability of its weather, caused by the competing weather systems from the warm Atlantic, and the cold (in winter) landmass of Europe and Asia.

Periods of cold and snow can therefore come at any time in the winter months. They may be brief, with the snow thawing (a pattern frequently experienced), but there could be an extended period of freezing temperatures and heavy falls of snow. The unpredictability of such weather makes it more challenging to prepare for, and respond to. This report has already noted that heavy snow in southern Britain, and particularly London and the South East, tends to cause more disruption than a similar event elsewhere in the UK because of the numbers of people affected, the high density of vehicles, and the lack of experience of such conditions on the part of road users.

Many areas have developed, and indeed are continuing to develop, arrangements with other parts of the community to support their efforts. This has been given impetus by the recent relative frequency of snow events, which have highlighted the need for such mechanisms and encouraged volunteers for roles such as snow wardens. However, memories can be short, and the enthusiasm of individuals wane – and key individuals can move away from an area. The challenge will thus be to maintain effective arrangements, even if there are winters with little or no snow. It should help that many of these arrangements are linked to wider community resilience work, such as that relating to flooding.

Communications and information have undoubtedly become much stronger in recent years, and they, too, need to be maintained, but there should be fewer problems in doing this because of their wider applicability, and links to emergencies and resilience. The Highways Agency variable message signs are a good example of this, as they provide messages for a range of purposes, from warning of incidents and delays ahead to displaying road safety advice. Communication using social media will clearly continue to develop – perhaps the challenge here is to persuade non-users, such as the author, that it can provide valuable information.

The increasing evidence that organisations are working together is encouraging. There are both informal and formal arrangements amongst groups of authorities. There is also evidence of good work between them and the emergency services, and of engagement with other key stakeholders. All these arrangements, and other similar ones besides, help to ensure that good plans are made and so lead to effective responses.

Another significant finding is that despite the pressure on budgets, the winter service remains a very high political priority, and an area in which spending is not at present being reduced. The question for the future, especially if there is a succession of mild winters, is whether this will continue to be the position, and whether there might be the temptation to cut corners. It will be a brave politician who can anticipate what the British weather will be!

Another area of budget pressure for the highway authorities is highway maintenance: for many authorities, maintaining resources for the winter service will place pressure on the wider highways budget. One of the difficulties with very cold weather, especially when it is accompanied by precipitation, is the damage that it inflicts on road surfaces, leading to more potholes in them and ultimately causing them to fail. This is not a problem associated exclusively with cold and snow – any extreme weather can and does cause damage. It was noticeable that RAC Patrols referred to the problems of potholes, and it is inevitable there will be many more requiring repair as a result of this winter.

Given the pressure on budgets, there is unlikely to be much change to how much of the network is pre-treated, or any expansion of the number of priority routes in times of snow. Authorities certainly do review such decisions, and small changes are made as networks change, but the untreated parts of the network will often prove difficult for road users. The lesson from this is that users need to be aware. Residents living in these areas should be particularly aware of the difficulties, and take precautions accordingly. In hilly residential areas, several authorities highlighted that when snow is forecast, such behaviour is on occasion evident in that some people park on treated roads and walk to their house. In more rural parts, the difficulties with snow will sometimes influence the choice of vehicle and/or the fitting of winter tyres.

As fed back to the review, there will also tend to be difficulties for those making deliveries and those in other public service roles. A particular problem area for local authorities is the need for refuse and recycling vehicles to reach all properties; indeed, problems with non-collection in severe weather are a frequent source of complaints. Where this function is undertaken by the same authority that is responsible for winter maintenance (in unitary authorities), several of the conversations pointed to arrangements where a gritter would go ahead of a refuse vehicle. For others, the answer would seem to lie in the issue of being prepared and considering the case for winter tyres on key vehicles.

All this highlights the key question for everyone: are we prepared? The Met Office has its role – and has developed a robust system of weather warnings, which we ignore at our peril. The highway authorities have their role – and it is clear that most, if not all, have sound plans in place, which will show their worth when roads are salted to keep us moving safely in freezing temperatures, and to get us moving as soon as possible should there be snow that hinders us. But there is also a personal dimension: we must each accept our own responsibility to take note of warnings, to be prepared, and to adjust our driving to suit the conditions on the roads.

Appendices

Appendix A: Terms of reference

The Review entitled *The Resilience of England's Transport Systems in Winter* was completed in 2010 following the severe winters of 2008/9 and 2009/10, during which there were major salt shortages. There was also an audit during December of that year, the result of more severe weather at the beginning of the next winter (2010/11), to review progress against Review recommendations.

Prompted by the cold weather and significant snowfall in January 2013, the RAC Foundation has commissioned a review building on those recommendations of the 2010 Review and Audit which relate to the road network in England, to address the questions:

1. Have the recommendations been carried through?
2. How well prepared were the relevant authorities for the severe weather, and was the operational response satisfactory?
3. Overall, how did the affected areas cope?
4. Did the experience of road users / business match the perception of highway authorities on how they coped?
5. Are road users themselves sufficiently prepared for severe weather episodes?
6. What was the experience in Wales?
7. Is the impact of severe weather particularly bad in this country?
8. What are the lessons to be learned from 2013 and what are the prospects for Winter Resilience in the years ahead?

Whilst this report follows on the heels of the previous Winter Review (and subsequent Audit), its emphasis will be wider, looking as it does at those issues raised in bullet points 4–8.

Appendix B: Authorities providing information for this review

England

Brighton and Hove City Council

Bristol City Council

Cambridgeshire County Council

Cheshire East Council

Cheshire West and Chester Council

Devon County Council

Durham County Council

East Sussex County Council

Gateshead Council

Gloucestershire County Council

Kent County Council

Kirklees Council

Lancashire County Council

Lincolnshire County Council

Norfolk County Council

North Somerset Council

North Yorkshire County Council

Northumberland Council

Oxfordshire County Council

Peterborough City Council

Sheffield City Council

Somerset County Council

Staffordshire County Council

Stockport Council

West Sussex County Council

Wolverhampton City Council

Wales

Cardiff Council

Caerphilly County Borough Council

Denbighshire County Council

Gwynedd Council

Rhondda Cynon Taf County Borough Council

Appendix C: Recommendations from the 2010 Review

Interim Report, July 2010

Action	Status
For 2010/11, establish a strategic reserve stock of salt, using the Highways Agency.	Action completed
Collect data and monitor overall salt stock position – DfT action.	Action completed
Targeted intervention of salt supply chain.	In main report
The DfT should consult with Scotland and Wales re salt supply chain.	Action completed
Every local highway authority (LHA) should have a robust winter service plan, and should regularly review the key elements of it, including network coverage, operational procedures and standards and appropriate stockholding to meet defined resilience standards, all in line with best practice.	
Consultation on treated networks should be broadly drawn to include business representatives, passenger and freight transport operators and local communities, as well as health and education service providers; and to help manage public expectations should be followed by clear and comprehensive communications of winter service plans, supported by good real-time communications through media and online when winter conditions arrive.	
As many LHAs already do, authorities should collaborate with and support lower-tier authorities to help ensure that maximum practical winter support can be given in areas and communities beyond the treated networks, including possibly the treatment of key footways and pedestrianised areas.	
While recognising that research and technical information in this area is relatively fragmented, and uncoordinated, and that available evidence needs to be presented more authoritatively, LHAs should be aware of the opportunities to improve salt utilisation through adopting lower spread rates and alternative treatment methods, both to reduce cost and to reduce demands on a potentially vulnerable salt supply chain.	

Action	Status
Professional bodies and the Local Government Association (LGA) should encourage the more widespread dissemination and adoption of best practice in the preparation and delivery of winter service plans.	
While recognising that the resilience of salt supply is being addressed as a nationwide issue, LHAs can support this and should: All participate fully in the year-round systematic information collection and monitoring of salt stocks and movements which we are recommending should be adopted by the DfT; Ensure their own planning of salt stocks and supply is sound and carried out in accordance with best practice, and supported by practical measures to improve salt utilisation; Put in place (or confirm where existing) mutual aid with neighbouring authorities to help address localised shortages.	
LHAs should treat their winter service planning as an integral part of wider general resilience planning for civil contingencies, bringing to the development of winter service plans the benefits of processes and disciplines associated with resilience planning, together with the culture of constructive challenge and validation.	
The Highways Agency should be commended for the research-based measures it has put in place to improve its salt utilisation. It should: continue to research and monitor the efficiency of its practices and strive to improve the cost-effectiveness of its winter service operation; share best practice, research and knowledge with other highway authorities.	
There should be a comprehensive, authoritative review of technical standards and guidance relating to both the treatment and spread rates of salt, based on research and evidence as necessary, leading to the production of practical guidance for practitioners as well as at a policy and planning level. This should be led by the UK Roads Liaison Group (UKLRG).	

Action	Status
The valuable initiative and work of the National Winter Service Research Group (NWSRG) should be brought under the wing of the UKRLG.	Action completed
The DfT should develop a Snow Code.	Action completed
Weather forecasting recommendation.	Outside terms of reference (ToR)
Winter resilience planning – and the securing of greater resilience in the supply of salt – should continue on the basis of dealing with winters of a severity similar to that of 2009/10.	

Final Report, October 2010

Action	Status
Rail recommendation	Outside ToR
Rail recommendation	Outside ToR
Rail recommendation	Outside ToR
Rail recommendation	Outside ToR
Aviation recommendation	Outside ToR
The review of best practice and technical standards recommended in the Interim Report as a task for the UKRLG should be given added urgency, focusing on research which would underpin recommendations for the adoption of lower salt spread rates as a strategic initiative to improve resilience of the salt supply chain; together with a timescale for adoption in early 2011.	
The two main UK suppliers should be encouraged to continue their current initiatives to increase their throughputs – Cleveland Potash with its exploration of imports to meet high demand from its customers and to replenish its own mine stocks; Salt Union with its plans to increase throughput of the underground crushing and grading plant – as a means of increasing total mine output rates.	

Action	Status
A new resilience benchmark of 12 days / 48 runs should be adopted for pre-season stockholding for English LHAs; they should then review their history of usage and mutual aid or other arrangements to consider: Whether there is a case for increasing capacity towards 48 runs if it is currently less than this, in addition to filling the capacity they have; or At what level to stock – at or above the 48 runs level – where the capacity exists to do so.	
To ensure optimum resilience of the supply chain through a nationally severe winter, achieving benchmark resilience levels across Britain by the beginning of November should be treated as the key priority, facilitated where necessary by imports. The year-round monitoring system being put in place will analyse and overview this process and enable any future shortfall to be addressed.	
Building on the UKRLG Report of July 2009, that the *Well-maintained Highways* code of practice continues to be regarded as best practice by LHAs for winter service policy and planning, as modified by the specific recommendations of this review.	
LHA should in their winter planning and consultation consider the extent of treatment of footways, especially in relation to bus stops, railway stations and other public transport interchanges as well as to town centres, business premises, schools and health facilities.	

Appendix D: Countries with motoring clubs which responded to the survey

Austria

Belgium

Bosnia and Herzegovina

Croatia

Denmark

Finland

France

Germany

Italy

Luxembourg

Norway

Serbia

Slovenia

Addendum

This addendum considers the snow episode which hit the South East of England on the afternoon and evening of Monday 11 March 2013 and caused significant disruption to road users. It has been prepared following the completion of the main report, which was about to be printed when the snow fell.

The author is very grateful to the Highways Agency, Brighton & Hove City Council, East Sussex County Council, Kent County Council and West Sussex County Council, each of which responded quickly to his request for information and for a telephone conversation about the problems, at a particularly busy period following the snow event.

The snow followed the onset of strong easterly winds on Sunday 10 March, which had brought snow showers to parts of eastern England, which in turn had led to a Met Office yellow snow alert being put in place. This yellow warning was updated at 11.45 on Monday 11 March to a forecast of 2–5 cm (with a risk of 5–10 cm in southern parts of Kent and Sussex), with a strong north-easterly wind which would cause lying snow to drift. Snow showers affected the area all day.

At 18.14 that afternoon, the Met Office issued an amber warning for Kent and Sussex, forecasting up to 10 cm of snow. This was linked to a small weather system – which had tracked east across northern France during the day, dropping heavy snow in the Channel Islands and northern France – taking a slightly more northerly track, resulting in the continuous snowfall in the more southerly parts of Kent and Sussex.

All of the highway authorities were aware of the forecasts, and each undertook full precautionary salting. However, there was undoubtedly more snow – and conditions were more difficult – than forecast. The Highways Agency reported that full precautionary treatments took place during the evening of Sunday 10 March and the afternoon of Monday 11 March to suit the forecast in place at the time, in accordance with its treatment guidance. The afternoon treatment on 11 March was timed to be completed before the evening rush hour. Light snow showers were falling throughout the day, and after snow began to fall more continuously in the south of the region, all routes were treated again and ploughed where necessary between 17.00 and 03.00. A further full treatment was carried out from 03.00 onwards on Tuesday 12 March.

The local highway authorities reported similar precautionary treatment, beginning on the Sunday and continuing on the Monday, and once the heavier snow arrived, salt-spreading vehicles were out continuously. Large amounts of salt were used; for instance, East Sussex, where a complete run at standard spread rates applies 150 tonnes, reported that it applied 1,000 tonnes on the Monday night alone, and nearly 2,000 tonnes on the Monday and Tuesday combined.

However, despite all the salt which had been spread, there were difficulties across the area. The wind was undoubtedly a contributory factor: strong winds, gusting at times up to 50 mph, caused snow drifts which in places reached 1–2 metres in depth, something which seems to have been accentuated by the dryness of the snow.

Another impact of the wind was that much of the salt appears to have been blown off the carriageways. In any case, the very low humidity and low temperature also appear to have contributed to the limited effectiveness of the salt which had been applied, the impact of salt being greatly reduced when temperatures drop to –7°C and below. Once this point is reached, the reality is that road users will think that roads have not been treated, and they are likely to struggle for grip unless they have good tread depth on their tyres, or they are using winter tyres or some 'add-on', such as snow chains or snow socks.

The Highways Agency, commenting on the conditions, observed how the wind caused drifting – up to 2 metres high in places, and in many cases blowing granular snow back onto the carriageways as soon as they had been cleared. It also highlighted how low humidity, combined with strong wind, resulted in a very low chill factor temperature approaching –10°C, and this meant that the salt had difficulty dissolving into solution, despite the use of pre-wet salt.

In these conditions, disruption was almost inevitable, particularly given the hilly nature of parts of the area, and the density of the traffic. The South East has some of the busiest roads in the UK, if not Europe, and has a particularly high proportion of HGV traffic heading to and from the ports. The situation was made worse by the timing of the snow, turning heavy for the evening rush hour.

It is noteworthy that road users had less warning of potential disruption to travel than during the January snow events. A yellow warning was issued by the Met Office at 11.45 on Monday 11 March, and the amber warning issued at 18.14 the same day warned of the potential for significant disruption. By that time severe conditions were already being encountered on many routes.

Clearly, many drivers would have been committed to their travel plans, and it seems unlikely many would have avoided travelling. Certainly there was severe congestion in many of the main population centres, as vehicles all tried to leave at the same time, but there were also problems on many of the strategic routes.

The Highways Agency reported a large number of incidents, particularly HGVs losing traction on uphill gradients, causing congestion at several locations, and long queues. This had the knock–on effect that a number of salt spreaders and recovery vehicles were delayed by inability to progress through the standing traffic, and later in trying to pass abandoned vehicles.

Its worst affected roads were the A2 (at Coldred Hill / Lydden, 4 miles north-west of Dover), the A23 south of Crawley and the M20 near the Channel Tunnel

terminal. In addition, severe weather in northern France caused delays of six hours through the Channel Tunnel and the Port of Dover was effectively closed. These additional impacts caused further queueing traffic on the M20, A20 and A2.

A significant number of motorists were caught in stationary traffic for a number of hours on the A23, A2, A20 and M20, and the Highways Agency worked throughout the night with the police, other emergency services, vehicle recovery companies and the Red Cross to ensure the welfare of those trapped.

The Highways Agency also reported that subsequent clearance was hindered by a number of abandoned vehicles. Once traffic was running again, safety considerations meant that the remaining vehicles were removed, but recovery charges were waived for vehicles collected within 24 hours.

The local highway authorities also had problems with vehicles losing traction, causing blockages and leading some drivers to abandon them. These difficulties were compounded by inconsiderate driving (in part caused, no doubt, by frustration), blocking roundabouts and exits and adding to the difficulties of gritters already stuck in traffic queues. One authority reported that one of its gritters became caught in traffic and took over eight hours to return to its depot.

Despite these problems, all available resources were applied to clear roads as soon as possible. In particular, the county authorities used their networks of local farmers and contractors to support the efforts.

Reference has already been made to the severe weather in France, as it suffered from the same weather system. Indeed, another part of the UK, the Channel Islands, was also hit hard, with the worst snow for 25 years, causing disruption to road and air travel. Northern France was also badly affected, as was Belgium. Many flights were cancelled at the two main Paris airports (Roissy-Charles de Gaulle and the more domestic Orly), there was major disruption to the road network, and Belgium suffered huge traffic jams. France implemented a temporary ban on the movement of HGVs over 3.5 tonnes, something which contributed to the problems in the South East of the UK, as HGVs travelling to Europe were forced to wait for the ban to be lifted.

So, given the very difficult weather conditions, could anything else have been done to keep traffic moving? It is clear that full precautionary treatments had been undertaken, and indeed the firm message back from the LHAs is that given the forecast and their experience, the approach would be the same if a similar set of circumstances arises again.

Similarly, the Highways Agency was well prepared. It had 24 winter fleet vehicles treating the network in Sussex and Kent prior to and during the spell of severe weather. In addition, it had taken the precautionary measures of deploying two tractors, with ploughs, to both the A23 Handcross Hill and

the A27 Devil's Dyke near Brighton, both at 06.00 on the Monday morning, and a further two to the A20 at the Courtwood (B2011) interchange between Folkestone and Dover at 08.30 that morning. It had also deployed recovery vehicles to five locations within the region: two locations on the M25, two on the M20 and one on the M23.

As problems developed, Highways Agency traffic officers were also deployed onto the A20, A2 and the A23. These are routes not normally patrolled by Highways Agency traffic officers, but using their 4x4 capability, they assisted in moving smaller vehicles and unblocking carriageways.

One difficulty was undoubtedly the problem of salt spreaders getting stuck in traffic, and therefore being rendered unable to apply additional salt and/or clear snow with their ploughs, and the question has been asked: would this situation be mitigated helped if there were more demountable barriers in the central reservations on the Highways Agency network? There are already a number of such gates on the strategic roads in the South East, designed primarily for incident management, but it is not clear (leaving to one side the issue of construction cost of providing more) how much they would help in snow events.

They are relatively quick to open (though this is a task which requires the Highways Agency contractors), but the other considerations would be: the choice of locations for them; the need to stop traffic on the opposite carriageway if it is still moving (implying significant traffic management and safety considerations); and, particularly, the challenge of getting the resources (both traffic management and contractors) to the gate location when there is already poor weather / major congestion.

The Highways Agency has already indicated that it will be conducting a full review of all aspects of this severe weather event through its usual debriefing process. Clearly there are practical considerations, as outlined above, but there appears to be a case for considering whether it would be appropriate to install more removable sections of barrier, to help in such snow events.

The importance of reviewing this snow episode and applying any lessons learnt was something highlighted by all of the highway authorities. This process had only just commenced when the telephone conversations took place, so this addendum cannot reflect any of their conclusions. It was, however, particularly pleasing to hear that this review process will involve not only the highway authorities but also other agencies, including the police. One point that will undoubtedly be considered is communication between the different agencies as roads become impassable or blocked, as this can have a significant impact on other parts of the road network.

In conclusion, it is clear that all the authorities were prepared for the snow, having undertaken full precautionary salting. However, the weather conditions were extreme, and this was one of those snow events where disruption was

inevitable. Unfortunately, road users had less notice of the likely disruption than in the January snow events, and less opportunity to change journey plans; this, however, only reinforces the point that when there is a forecast of potential snow and consequent travel disruption, the wise road user will take heed of the messages to be prepared.

The Royal Automobile Club Foundation for Motoring is a transport policy and research organisation which explores the economic, mobility, safety and environmental issues relating to roads and their users. The Foundation publishes independent and authoritative research with which it promotes informed debate and advocates policy in the interest of the responsible motorist.

RAC Foundation
89–91 Pall Mall
London
SW1Y 5HS

Tel no: 020 7747 3445
www.racfoundation.org

Registered Charity No. 1002705

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The Javelin Partnership Ltd.
Tel: 0118 907 3494

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