

**CYNGOR SIR POWYS COUNTY COUNCIL.**

**CABINET EXECUTIVE  
8 October 2019**

**REPORT AUTHOR:** County Councillor Rosemarie Harris  
Leader

**SUBJECT:** Winter Service Review Phase 1

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**REPORT FOR:** Decision / Discussion / Information

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**1. Summary**

**1.1** This report will outline the review of the Powys County Council winter service programme for highway routes proposed for 2019/20 and will cover several related areas of service provision. Due to the number of questions raised in the course of the review, it has been approached as two separate phases:

**Phase 1:** A proposed reduction to the rates of salt currently used on county roads in line with new national guidance. A review has been undertaken to assess the potential for PCC to adopt its own matrix for use on county roads (See Table 2 of Appendix A). This would reflect improvements in modern distribution technology and salt quality and thereby increase the potential to reduce the quantity of salt being used on primary routes without a reduction in efficacy.

Also included within Phase 1 is a proposed discontinuation of the automatic retreatment undertaken on county roads when such actions are deemed necessary under trunk road guidance.

**Phase 2:** A review of the PCC winter service hierarchy of routes. The hierarchy currently in use has not had a major review for around 10-15 years, during which time many changes have taken place to the position of amenities, transport links and essential services. It is likely that some existing routes are no longer a priority or have increased in significance, while new routes may have become necessary. In view of these changes a review of the current routes is being undertaken to ensure that the most effective and comprehensive coverage of the target areas is being achieved. Following consultation and revision the proposed new hierarchy will be presented to Cabinet for approval.

This Cabinet report presents matters relating to Phase 1. A second report to address Phase 2 will be presented in due course.

## 1.2 Context

**1.2.1** Powys contains 5,500 km of roadway that comprises 431 km of trunk road, 238 km of County (category A) roads, 2,706 km of category B and C roads and 2,126 km of minor surfaced roads.<sup>1</sup>

Due to the reduction in revenue funding, winter service currently represents 35% of the overall highways budget in contrast to its historical 12%. It is proposed that through a review of our processes and the adoption of UK guidelines for use on the county roads, it should be possible to improve efficiencies and ensure a more appropriate use of existing resources without compromising safety.

**1.2.2** The Highways Act 1980 Section 41(1A) places a duty on the Authority to ensure; so far as is reasonably practicable, that safe passage along a highway is not endangered by snow or ice. (This amendment to the act was introduced under the Railways and Transport Safety Act 2003, Chapter 20 Part 6 Section 111).

Section 150 of the Highways Act 1980 Act places a duty upon Authorities to remove any obstruction of the highway resulting from accumulations of snow. The Authority believes the level of service meets the requirements on the current interpretation of “reasonably practicable” but will continue to keep service provision under review, particularly in respect of any legal judgements.

**1.2.3** In Wales, there are two primary guidance documents available to inform the development of a reasonably practicable winter service:

1. For trunk roads, the Welsh Government set out their policy and provide guidance in the Trunk Road Maintenance Manual (TRMM). The Welsh Minister has made the document available to local authorities across Wales to aid with the development of winter service plans.
2. Nationally the UK Roads Board publishes guidance in its document “Well-maintained Highways”. Revised winter service guidance is contained within Appendix H of Well-maintained Highways and was issued in September 2013<sup>1</sup>. This guidance was considerably more detailed and it was considered that it could take 10 years to implement if fully adopted. A further revision to the winter service guidance and intended to supersede that provided in Appendix H, has been provided through the National Winter Service Research Group (NWSRG) Practical Guide for Winter Service documentation, and most recently updated in March 2019.<sup>2</sup>

At present, PCC follows the winter service guidelines laid down by Welsh Government in TRMM, applying this standard to its county roads and on behalf of Welsh Government on their trunk routes.

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<sup>1</sup> Welsh Government, *Road Lengths and Conditions, 2015-16* (2017). Available online at <http://gov.wales/statistics-and-research/road-lengths-conditions/?lang=en>

<sup>2</sup> NWSRG Practical Guide for Winter Service [<http://www.nwsrg.org/publications/guidance>]

## 2. Proposal

**2.1** The adoption of a revised matrix that references both the TRMM guidance and the NWSRG guidance on county roads. It is proposed that this would provide a suitably robust position when informed by the experience and knowledge of the out of hours (OOH) duty officers in accordance with the current official guidance.

PCC would continue to administer salt spread rates in accordance with TRMM on behalf of the Welsh Government on trunk roads.

**2.2** A discontinuance of automatic retreatments on county roads.

## 3. Options Considered / Available

### 3.1 Adoption of a new salt spread rate matrix on county roads

The opportunity exists for PCC to adopt its own matrix, based on the available national guidance, for use on county roads. This would reflect improvements in modern distribution technology and salt quality and thereby have the potential to reduce the quantity of salt currently used on primary routes without a reduction in efficacy.

In representing the position of Welsh Government, NMWTRA require that PCC, in carrying out the winter service actions on its behalf on the trunk roads, act in strict accordance with the salt rate matrices published in TRMM (see **Appendix A, table 1**). On county roads, however, where no such imperative applies, it is necessary for PCC to make its own judgements regarding the salt rates utilised, based on the full range of national guidance available and with regard to the nature and condition of local roads. As stated in the NWSRG guidance:

As well as the content of national guidance documents such as this NWSRG Practical Guide, the development of these schedules or matrices should take into account all of the relevant important local climatic, geographic, network composition, resourcing and administrative factors, as well as their own experience of maintaining the road network in that area.<sup>3</sup>

The basis for decision is not one of financial expediency alone; initially it may appear desirable to maintain a risk-averse position through compliance with the highest recommended rates of salt usage (as represented by the Welsh Government trunk road matrix). The NWSRG guidance, however, states that 'In order to optimise salt usage, improve stock resilience and reduce the impact of salt on vehicles, infrastructure and the environment, it is important that precautionary salt spread rates are no higher than necessary'.<sup>4</sup> The NWSRG standard is used for both trunk and county roads in England and represents a robust, evidence-based position (see **Appendix A table 2**).

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<sup>3</sup> NWSRG Practical Guidance (2019), p.9

<sup>4</sup> Ibid., p.4

### **3.2 Removal of the retreatment link between trunk and other primary routes**

The TRMM guidance states that:

'Where weather forecasts and/or weather station data indicate that freezing conditions will exceed 12 hours in duration from the start time of the initial treatment or a change in weather such as precipitation, hoar frost or high winds are forecast during this period, a further treatment may be necessary and should be programmed accordingly.

The timing of any subsequent treatment should take account of the forecast weather event duration, residual salt levels, road conditions, traffic volumes and availability of resources/equipment."<sup>5</sup>

Powys County Council, in compliance with its contractual obligations to NMWTRA, carries out these retreatments within the required timeframe on trunk road routes.

Since 2008, PCC has also followed these measures on its primary (county) routes. It is proposed that PCC considers reducing the number of retreatments being carried out on county road through the adoption of the national standard rather than the guidelines set out in TRMM.

Some retreatments would still be required on county roads dependent on weather conditions, but the frequency of these would be based on the knowledge and experience of the OOH duty officer, in line with NWSRG guidance, rather than by being triggered automatically by the trunk road schedule.

### **3.3 Treatment with pre-wetted salt/brine**

Another area that was initially considered worth evaluation was that of spreading wet salt which can be a potential source of salt saving (See **Appendix B section 19.1** for a full description of pre-wetted salt distribution). Pre-wetting salt with brine can, in some circumstances, reduce salt usage by 25% but the majority of these savings would occur during extremely low temperatures that are rarely encountered locally (See **Appendix B section 19.2**); PCC currently does not pre-wet the salt before distribution as some trials have suggested that brine does not perform well in these extreme conditions and for reasons of safety it has been considered a priority to maintain resilience.

In order to benefit from the use of pre-wetted salt while complying with the authority's position on resilience, the vehicles used in winter service would need to be capable of switching between wet and dry salt spreading. This would maximise the potential of incorporating a varied response to predicted weather conditions but this flexibility would inevitably incur added equipment

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<sup>5</sup> WGTRMM, Part 2.2.22, Issue 2, Section 2.2.22.6.1, p.26

and fitting costs. The gritting vehicles currently hired by PCC do not have this capability although it is possible that the retrofitting of brine tanks might be undertaken.

The brine itself may be purchased ready-mixed or mixed on-site using a salt saturator. Irrespective of which approach is adopted, it would be necessary to install tanks at each of the 9 depots to allow the brine to be stored. If ready-mixed brine were to be used it may require larger storage tanks to be installed than would otherwise be the case but could prove to be a cheaper and more reliable option than installing salt saturation equipment at every depot. There would be significant financial investment required for either approach.

In view of these factors, using pre-wetted salt is not considered a recommended option but is included here to provide contextual information.

### **3.4 Continue with present arrangements**

While maintaining the present practices would avoid upheaval and may initially appear to represent a more robustly risk-averse position, this approach presents a number of disadvantages:

- a) Continuing to use salt spread rates that may not reflect modern improvements in salt quality and equipment efficiency.
- b) A failure to adapt in line with current national best-practice.
- c) Creating no potential for salt savings that might be used to maintain effective county route treatment in the face of a winter service budget that represents an increasingly and unsustainably large percentage of the overall budget available to cover all aspects of highway operations.
- d) An approach that relies, at all times, on operating at the maximum spread rates suggested, is failing to use a risk assessment approach as advised by the national guidance.

## **4. Financial Overview**

The following assessments show that a potential overall financial saving of around £71,000 (Appendix A Table 7) could be realised over the course of a winter such as 2018/19. The following sections discuss the potential savings for each measure in more detail.

### **4.1 Potential savings from the adoption of a new salt spread rate matrix**

As individual years show a large variation in terms of temperature range and weather conditions it is problematic to present the estimated savings that might occur as the result of adopting the proposed salt spread rate matrix. In light of this, the expected financial effects of the proposal are presented here in concrete terms that are based on the existing costs for the 2018/19 winter service season. Where very low temperatures or wet conditions prevailed the

rates have been left unchanged as in such situations the OOH duty officer would be responsible for making a decision based on current local and meteorological information and using their training and experience. In such cases it is likely that they would err on the side of caution and revert to a higher rate.

The comparison shown in **Appendix A figure 1** is between the actual costs for the winter season and the projected costs to HTR if the proposal were adopted for a comparable period. This option would allow PCC to continue to spread salt on trunk roads at the rate required by TRMM while reducing the rate of salt used for all county roads in line with the NWSRG guidance, including on routes that are shared between trunk and county roads. This option would allow us to further reduce our salt costs while still fulfilling our contract with Welsh Government and would avoid the necessity of re-optimising our existing routes to divide out trunk and county roads (with the attendant losses of efficiency this would entail).

This exercise indicates that the estimated saving would have been in the region of £41,000 for the season. During a winter season with longer periods of cold weather (especially within the 0° to -5°C range) but little snow there would be a greater potential for salt savings.

This option would, however, make salt distribution considerably more complicated for the gritting-vehicle drivers, who would be required to remember where and when to alter the spread rate calibration at multiple points during the route and this would inevitably increase the likelihood of mistakes occurring which could result in roads being salted at the wrong spread rate. This risk could be reduced by the introduction of on-board technology into the gritting vehicles to allow the automation of the process and to monitor the routes being covered. The estimated costs of installing vehicle technology are discussed below at section 4.3.

As illustrated in **Appendix A figure 2**, some potential remains for a lower rate of savings through the use of the NWSRG recommended salt rates when limited only to routes that are 100% county road with no trunk road sections. This would avoid the need to install vehicle technology and would also avoid the separation of the itineraries into trunk or county road specific routes.

At present routes are operated with trunk and county roads combined to maximise efficiency and reduce dead mileage. Some routes are already 100% county road routes but the majority are mixed. It is considered that some re-routing could be done to split out routes in to trunk only and county only which would assist the use of the different matrices. Some mixed routes will remain and it may be possible to re-structure these such that changing spread rates is more readily achievable through driver intervention.

This exercise indicates that the reduced estimated saving without vehicle technology would be in the region of £20,500 over the entire season.

## 4.2 Secondary financial benefits of digital vehicle technology

Digital vehicle technology offers the potential for further savings from improved management of salt usage through variable width distribution.

Road width data is available from an earlier project based on a desk-top analysis but has not been verified against actual measurements. Initial assessment suggests that a saving of around £20,000 could be achieved over a winter season such as that in 2018/2019.

Other benefits include: detailed monitoring and data collection; better informed decision making; compliance with standards; audit trail in the event of litigation or enquiry and reduction in administrative costs.

## 4.3 Potential savings from the removal of the retreatment link between trunk and other primary routes

During the 2018/19 winter season 8 retreatments were carried out on county roads because of the link with trunk road requirements. Breaking the link would give an estimated cost saving of around £43,000.

**Appendix A table 4** shows the key costs for an average retreatment of all 28 routes (at existing salt rates) excluding fixed costs such as vehicle hire, wear and tear, loading costs etc.

## 4.4 Estimated costs of installing vehicle technology

The estimated costs for vehicle salt management technology is around £2,610 per vehicle per year or £73,080 per year for the 32 vehicles currently in use. A breakdown of costs is included at **Appendix A table 5**.

Costs for the existing vehicle tracking system are included at **Appendix A table 6**).

## 5. Preferred Choice and Reasons

**5.1** The preferred option for salt spread rates is to adopt a hybrid matrix that incorporates elements of both the NWSRG and TRMM matrices for use on all sections of county road which could realise further reductions through the use of vehicle technology in future. This option would allow the maximum percentage of salt savings while ensuring a robustly supported position for the authority in the discharge of its duties.

**5.2** The preferred option for route retreatments would be to reduce the potential number carried out on county roads by separating out trunk and county road treatment decisions to recognise the best practice offered by TRMM and NWSRG guidance.

**5.3** In summary, following deductions for the costs of the vehicle technology, the total financial savings for this option would be in the region of £71,000 (see **Appendix A table 7**) over a relatively mild winter service season such

as 2018/19, with that amount anticipated to rise during winters with longer periods of temperatures below freezing.

## **6. Impact Assessment**

**6.1** Is an impact assessment required? Yes/No

**6.2** If yes is it attached? Yes/No

## **7. Corporate Improvement Plan**

### **7.1 Vision 2025**

**7.1.1** Developing proposals to improve our transport infrastructure and connectivity to help support the local economy.

**7.1.2** Making best use of our resources and working in new, innovative ways to deliver our priorities for the benefit of the county's residents and communities.

**7.1.3** Making evidence-based decisions underpinned by accurate information.

**7.1.4** Being an organisation that demonstrates good practice

### **7.2 Strategic Vision**

**7.2.1** Residents and Communities: This project will support residents by ensuring that we are delivering the most cost efficient and effective winter service possible.

### **7.3 Well-being Plan**

**7.3.1** A prosperous Wales: An effective winter service helps to maintain transport routes for goods, services and residents.

**7.3.2** A resilient Wales: An efficient winter service reduces use of resources and lessens the impact of treatments on the environment.

**7.3.3** A Wales of cohesive communities: An effective winter service helps to maintain transport routes for communities.

## **8. Local Member(s)**

**8.1** The changes proposed in this report would apply to the county roads in all areas of Powys.



**9. Other Front Line Services**

Does the recommendation impact on other services run by the Council or on behalf of the Council? Yes/No

If so please provide their comments

**10. Communications**

Have Communications seen a copy of this report? Yes/No

Communication comment: The report is of public interest and requires use of news release and social media to publicise the recommendation/decision.

**11. Support Services (Legal, Finance, Corporate Property, HR, ICT, Business Services)**

**11.1** Legal – The recommendations can be supported from a legal point of view.

**11.2** Finance – Finance: The Finance Manager notes the contents of the report, finance have been involved in the estimation of the saving. The levels of salt used vary year on year which make estimation of savings difficult.

**11.3** Business Services – Note the content of the report and ask to be kept informed of service changes so that they can provide appropriate responses to customer enquiries.

**12. Scrutiny**

Has this report been scrutinised? Yes / No?

**12.1** The plan has been scrutinised by a Working Group of the Economy, Residents, Communities and Governance Scrutiny Committee. Their findings and recommendations are included at Appendix C to this report.

**13. Data Protection**

If the proposal involves the processing of personal data then the Data Protection Officer must be consulted and their comments set out below.

N/A

**14. Statutory Officers**

**14.1** The Head of Finance (Section 151 Officer) notes the comments of the Finance Manager.

14.2 The Head of Legal and Democratic Services (Monitoring Officer) commented as follows: “I note the legal comments and have nothing to add to the report.”

**15. Members’ Interests**

The Monitoring Officer is not aware of any specific interests that may arise in relation to this report. If Members have an interest they should declare it at the start of the meeting and complete the relevant notification form.

<b>Recommendation:</b>	<b>Reason for Recommendation:</b>
<b>1. That PCC adopts the proposed matrix for use on Powys county roads as set out in Table 2 of Appendix A to the report.</b>	<b>1. Provision of financial and material efficiency while retaining a desirable level of resilience.</b>
<b>2. That PCC discontinues automatic retreatments on county roads.</b>	<b>2. To base retreatment decisions on the experience and local knowledge of PCC officers, in compliance with national guidance.</b>
<b>3. Investigate vehicle technology and implement if supported by the business case.</b>	<b>3. To realise maximum efficiency while retaining resilience, compliance and accountability to NMWTRA.</b>
<b>4. In the interim, implement the proposed PCC matrix on only those routes comprised of 100% county roads.</b>	<b>4. To realise all viable efficiencies at the earliest opportunity, prior to the availability of enhanced methods.</b>
<b>5. To review existing treatment network and return to cabinet to agree proposed amendments (phase 2).</b>	<b>5. To ensure that the routes receiving treatment reflect the optimum coverage attainable in the current financial climate.</b>

<b>Relevant Policy (ies):</b>	
<b>Within Policy:</b>	<b>Y / N</b>
<b>Within Budget:</b>	<b>Y / N</b>

<b>Relevant Local Member(s):</b>	<b>All</b>
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<b>Person(s) To Implement Decision:</b>	<b>Head of Highways, Transport and Recycling</b>
<b>Date By When Decision To Be Implemented:</b>	<b>Phased introduction from October 2019</b>

<b>Is a review of the impact of the decision required?</b>	<b>Y / N</b>
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**Background Papers used to prepare Report:**

*Well Maintained Highway Infrastructure*

*WG TRMM*

*NWSRG Practical Guide For Winter Service*

*Powys creates a single highways data set (Ordinance Surveys Business and Government Case Studies)*

## 17. Appendix A

### 17.1 Table 1 Comparison of TRMM and NWSRG matrices

*Comparison of Current TRMM matrix and 2019 NWSRG guidance*

Road Surface Temperature (RST)	TRMM				NWSRG Practical Guide for Winter Service (2019)			
	Fair*		Poor*		Good*		Fair*	
	Dry/Damp	Wet	Dry/Damp	Wet	Dry/Damp	Wet	Dry/Damp	Wet
At or above -1.0°C	10	10	10	10	8	8	8	8
-1.1°C to -2.0°C	10	10	10	10	8	8	8	11
-2.1°C to -3°C	15	15	15	20	8	13	9	17
-3.1°C to -4.0°C	15	20	15	20	9	17	12	23
-4.1°C to -5.0°C	15	20	15	20	11	21	14	28
-5.1°C to -7.0°C	20	2 x 15	20	2 x 15	15	30	20	39
-7.1°C to -10.0°C	20	2 x 15	20	2 x 15	20	40	27	54
-10.1°C to -15.0°C	-	-	-	-	28	56	38	75

\* Good, Fair and Poor relate to the standard of equipment, method of calibration and testing regimes in place. See relevant guidance for detail.

17.2 Table 2 Proposed PCC matrix

*Proposed new PCC matrix for county roads based on TRMM and NWSRG salt rates (g/sqm)*

<i>Road Surface Temperature (RST)</i>	<b>Dry/Damp</b>		<b>Wet</b>	
	<b>Good*</b>	<b>Fair*</b>	<b>Good*</b>	<b>Fair*</b>
<i>At or above -1.0°C</i>	8	8	8	8
<i>-1.1°C to -2.0°C</i>	8	8	8	10***
<i>-2.1°C to -3°C</i>	8	9	13	17
<i>-3.1°C to -4.0°C</i>	9	12	17	20***
<i>-4.1°C to -5.0°C</i>	11	14	20***	20
<i>-5.1°C to -7.0°C</i>	15	20	30**	30**
<i>-7.1°C to -10.0°C</i>	20	20	30**	30**
<i>-10.1°C to -15.0°C</i>	28**	38**	56**	75**

\* Good, Fair and Poor relate to the standard of equipment, method of calibration and testing regimes in place. See relevant guidance for detail.

\*\* Treatment rates up to 20g/sqm can typically be achieved in a single treatment having regard in particular to: weather window; treatment policy timings; vehicle capacity and working/driving hours. Spread rates above this will normally require the operation to be undertaken in two or more passes and will need to be planned having regard to the prevailing conditions.

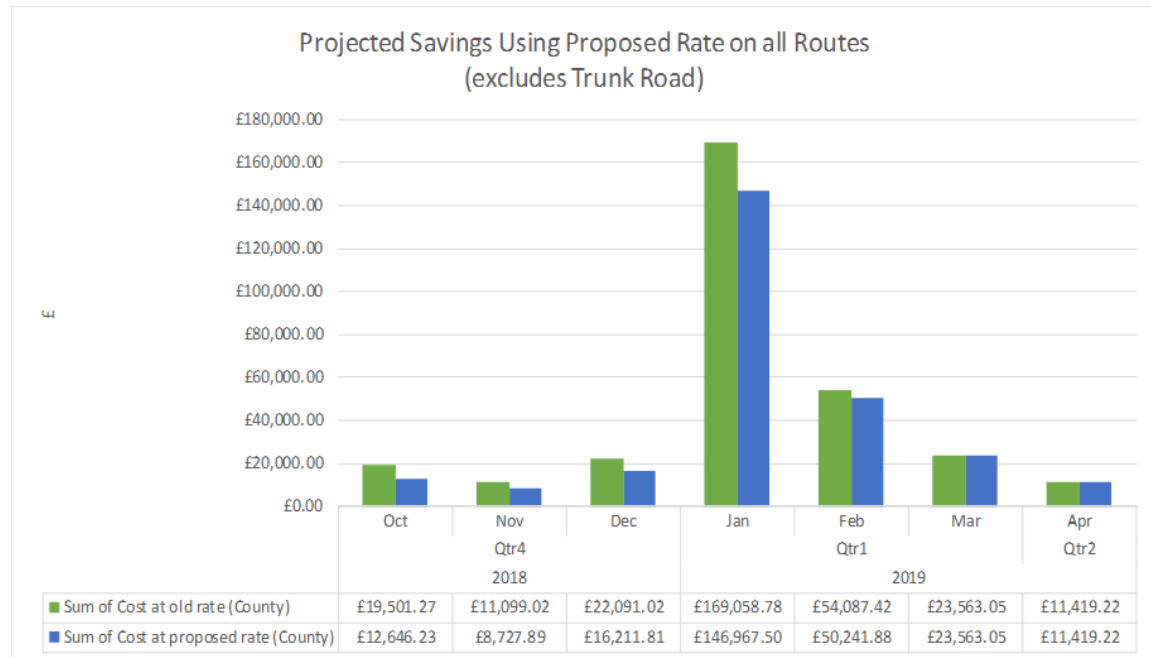
\*\*\* Although the NWSRG guidance recommends a higher salt rate [11, 23 or 28 g/m<sup>2</sup>], as PCC is currently using a lower spread rate [10 or 20 g/m<sup>2</sup>] under TRMM guidelines, it is anticipated that this rate would be maintained for this range of temperatures under wet conditions but subject to individual case decisions informed by the experience of the OOH officer. This would be in line with the NWSRG guidance as the officer would be relying on 'their experience and expertise in dealing with the conditions and circumstances prevailing in their local areas, so as to ensure that risks and resources are appropriately managed'.<sup>6</sup>

<sup>6</sup> NWSRG., p. 10.

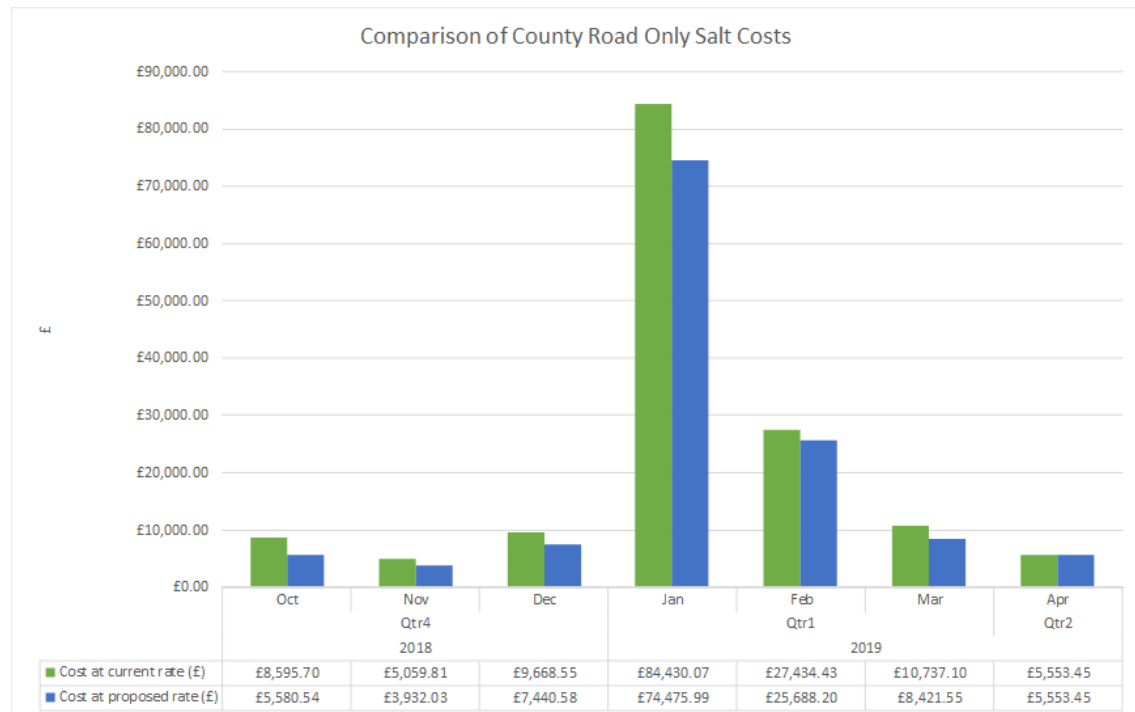
### 17.3 Table 3 Estimated savings from variable width salt distribution

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### 17.4 Figure 1 Projected savings for all routes



### 17.5 Figure 2 Projected savings for county-only routes



<b>17.6 Table 4, cost of an average treatment for all routes (County)</b>						
	<b>Item</b>	<b>Quantity</b>	<b>Unit</b>	<b>Unit Rate</b>	<b>Average cost per retreatment</b>	
	Salt = 167 Tonnes @ £43/Tonne	105	tonnes	£43.00	£4,524	
	Fuel = 973.25 km (8mpg = 2.8 km per ltr)	348	km	£0.58	£ 202	
	Salary				£1,407	
				Total	£6,133	
<b>17.7 Table 5 Installation and hire cost of salt management vehicle technology</b>						
(Annual cost based on 5 year contract)						
	<b>Item</b>			<b>Cost per vehicle</b>	<b>Estimated total Costs</b>	
	On-Board Weighing			£1,290	£36,120	
	Programmable salting management system			£ 500	£14,000	
	Active GPS tracking system			£ 820	£22,960	
			Total	£2,610	£73,080	
			County element		£48,964	
<b>17.8 Table 6 Existing vehicle tracking costs (GPS tracker with mobile comms)</b>						
(For winter season of 7 months/26 weeks)						
	<b>Item</b>	<b>Quantity</b>	<b>Unit</b>	<b>Unit Rate</b>	<b>Total</b>	
	Installation (One-off costs when vehicle comes into service)	32	Vehicle	£ 65.00	£ 2,080	
	Annual Operating Cost	32	Vehicle	£ 465.00	£14,880	
				Total	£16,960	
			County element		£11,363	
<b>Annual equivalent based on 1 installation over 5 year period</b>						
	<b>Item</b>	<b>Quantity</b>	<b>Unit</b>	<b>Unit Rate</b>	<b>Total</b>	<b>Total Annual Cost over 5 year period</b>
	Installation (One-off costs when vehicle comes into service)	32	Vehicle	£ 65.00	£ 2,080	£ 416
	Annual Operating Cost	32	Vehicle	£465.00	£14,880	£14,880
				Total	£16,960	£15,296
			County element			£10,248

<b>17.9 Table 7 Estimated overall savings/costs of preferred option</b>				
	(Based on 2018/2019 winter season)			
<b>Item</b>	<b>Cost</b>	<b>Saving £</b>	<b>Annual Net Saving / Cost (-)</b>	
Salt Management Vehicle Technology	£48,964	£10,248	<b>-£38,715</b>	
Adoption of new matrix (Table 2) for County Roads (where routing practicalities permit)	Establishment cost in amending documents, systems and staff training	£41,042	£41,042	
Changes to re-treatments (establish separate Trunk Road only routes for follow-up treatments)	Establishment cost in establishing new routing plan and schedules	£42,928	£42,928	
Salt saving from computer managed spread rate adjustment	Establishment cost in programming system and staff training	£ 6,000	£ 6,000	
Salt saving from computer managed width management	Establishment cost in programming system and staff training	£20,000	£ 20,000	
			<b>Total</b>	<b>£71,255</b>



## 19. Appendix B

### 19.1 Pre-wetted salt distribution

The following excerpt is taken from the *Highways Agency Network Management Manual*.

Pre-wetted salt is accomplished by wetting dry salt (at its natural moisture content) at some point between the vehicle hopper and before application to the road surface. The liquid used as a pre-wetting agent can be water or a suitable chemical solution of brine using either Sodium Chloride (NaCl) or Calcium Chloride (CaCl<sub>2</sub>). A ratio of 30% pre-wetting agent to 70% dry salt is commonly used.

It is considered that pre-wetted salt enters into solution much more effectively than dry granular salt, thus enabling the anti-icing action to begin more quickly.

One of the main advantages of pre-wetted salt is that, because it has a higher moisture content than naturally occurring rock salt, it sticks to the road more readily, even to a dry road. The anti-icing action is therefore able to begin more quickly and with greater certainty. Pre-wetting can achieve a 25% reduction in the usage of rock salt.

Pre-wetted salt and brine are effective over a similar temperature range to rock salt but adhere to the road better than dry salt and can be spread more uniformly with less wastage. The anti-icing/de-icing action is more immediate. However brine is more readily dispersed by rain.

The salt component of pre-wetted salt is stored as dry salt with the water or brine being added at the point of application to the road surface. Brine may also be stored as dry salt (although it should be noted that salt of a high purity (>98.5% NaCl) is normally used), with a saturator in the compound producing the brine that would then be held in an appropriate tank. Alternatively brine may be obtained and delivered pre-mixed from suppliers and stored in an appropriate tank.

The most commonly used pre-wetting technique requires specialist equipment. A saturator or salt station is required to produce the brine solution (wetting agent), which is simply a semi-automated tank where the brining salt is manually added to the circulated water supply. The concentrated brine then runs into a separate vessel within the tank to be drawn off as required. A weir within the tank collects any undissolved solids and foreign matter, which is then collected and disposed of periodically. A controlled and consistent quality of brine is assured.

Salting vehicles specifically designed to undertake pre-wetted salting operations are readily obtainable. In addition, hybrid vehicles have been

developed that will run both dry and pre-wetted operations. Recent developments have also led to the production of combi-spreaders that spread both dry and pre-wetted salt, in addition to brine only. All vehicles require a hopper for the dry anti-icing agent and integral tanks for the storage of brine. Associated pipe work is also required to pass the brine from its tanks to the spreader. In most cases, existing salting vehicles fitted for traditional dry salting can be retrofitted with brine tanks etc. to enable them to carry out pre-wetted operations.<sup>7</sup>

## 19.2 NWSRG recommended spread rates for pre-wetted salt

*Recommended Spread Rates – Pre-Wetted Salting (g/m<sup>2</sup>)*

<i>Road Surface Temperature (RST) when frost/ice is predicted</i>	Spreader Capability			
	Fair		Good	
	Dry/Damp Road	Wet Road	Dry/Damp Road	Wet Road
<i>At or above -1.0°C</i>	8	8	8	8
<i>-1.1°C to -2.0°C</i>	8	10	8	8
<i>-2.1°C to -3.0°C</i>	8	16	8	12
<i>-3.1°C to -4.0°C</i>	11	21	9	17
<i>-4.1°C to -5.0°C</i>	14	27	11	21
<i>-5.1°C to -7.0°C</i>	19	37	15	30
<i>-7.1°C to -10°C</i>	27	53	21	42
<i>-10.1°C to -15°C</i>	n/a	n/a	n/a	n/a

<sup>7</sup> *Highways Agency Network Management Manual, Section 5.5.3*  
[[http://www.standardsforhighways.co.uk/ha/standards/nmm\\_rwsc/docs/nmm\\_part\\_5.pdf](http://www.standardsforhighways.co.uk/ha/standards/nmm_rwsc/docs/nmm_part_5.pdf)]