

Winter Maintenance Report 2020/21 season



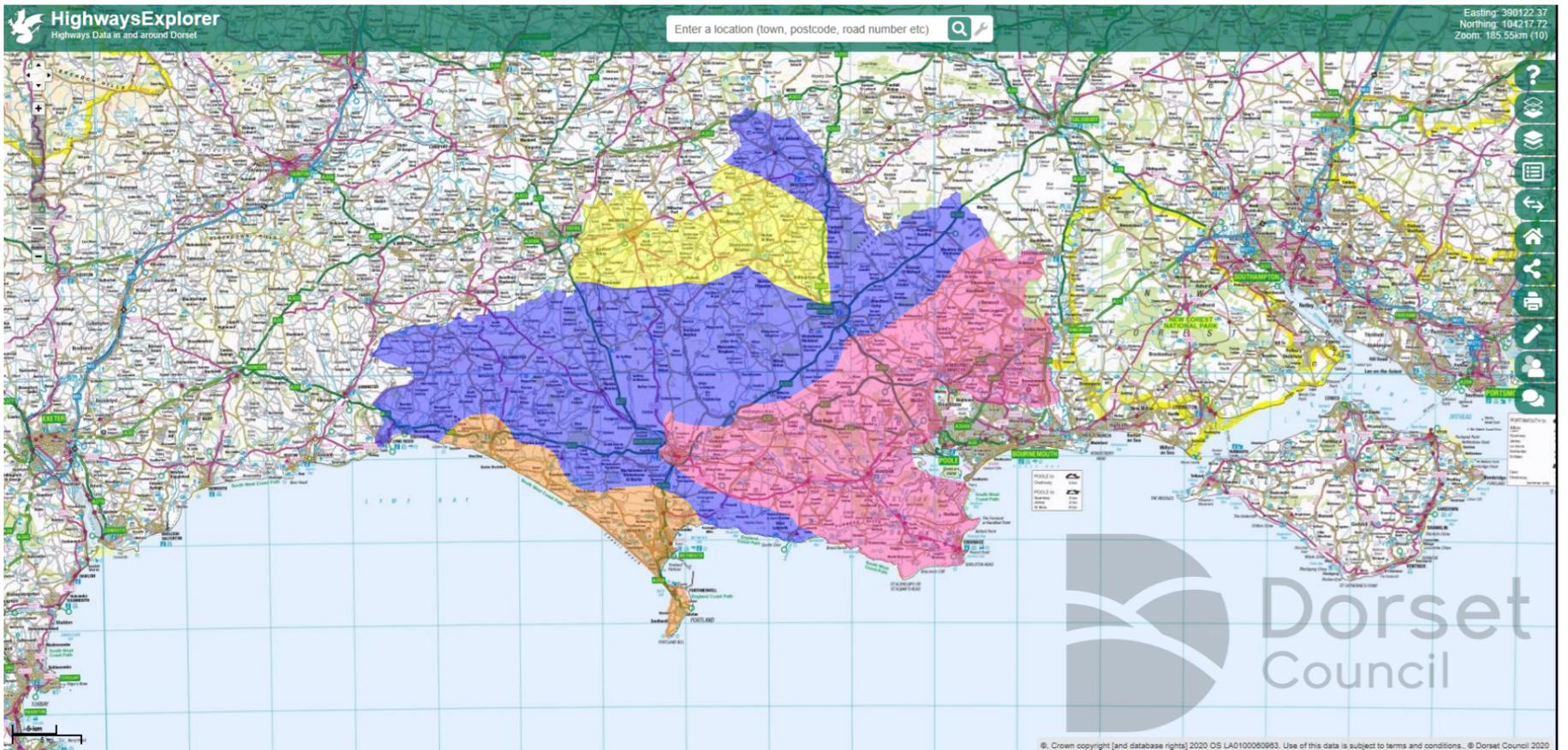
Officer	Michael Westwood – Community Highways Manager
Subject of Report	Report to show comparison between Route Based Forecasting (RBF) and Domain Based Forecasting (DBF). The forecasting is used in the decision-making process regarding the salting/gritting of the highway.
Executive Summary	To inform senior managers and members of the research that has been carried out into potential financial and environmental savings that a transition to RBF could bring. We currently make decisions regarding salting on a forecast for each of the 4 weather domains in the Dorset Council area. RBF gives a forecast for each of our 22 salting routes. This allows for a more targeted approach, only treating the parts of the network that are likely to see frost or ice forming on them.
	<p>Budget Implications of recommendation:</p> <p>During the 2019-20 winter season RBF was monitored offline to compare the number of routes that would have been treated compared to our current domain based system. Decisions were still made on the domain based forecast in line with our current policy. The results of this comparison can be found in Appendix 1. Using DBF a total of 676 routes were treated, in comparison to the 566 routes that would have been treated under a RBF system. A saving of 110 routes.</p> <p>The routes cost between £371 and £434 each time they are done (calculation for this cost are shown in Appendix 2 and vary due to salt spread rate). At the lower end of these cost it would be a saving of £40810 (110 x £371). The extra cost of having RBF is £18,825 annually. This would have brought a net saving of £21985.</p> <p>The cost for RBF is fixed (other than inflation changes) for the next two years.</p> <p>There are also savings to be made on environmental grounds (saline content of bordering water bodies), reduction in emissions from fewer lorry movements and reduced salt usage. Information relating to environmental saving are shown in Appendix 3.</p>

Change from domain-based forecasting to route-based forecasting

	<p>Risk Assessment:</p> <p>Having considered the risks associated with the current situation using the Dorset Council's risk management methodology, the level of risk has been identified as:</p> <p>Current Risk: LOW</p> <p>Residual Risk: LOW</p> <p>The overall risk to changing to RBF would be low. We would still be relying on an accurate forecast to help make the decision around salting in any part of Dorset. The accuracy of the forecast has been very good in previous years.</p> <p>The financial risk I would judge to be medium. At the lower end of the cost per route we would have to reduce the number of routes treated by 51. Last winter we would have seen a reduction of about 110 routes, but it was a very mild winter leading to a lot of moderate nights. I would not expect to see this kind of number in a normal winter.</p>
Recommendation	My recommendation would be to move to RBF.
Reason for Recommendation	Route based forecasting potentially brings both financial and environmental saving. This step will also keep us up-to date with the changing technology and moves to a the more targeted treatment of roads.
Officer Contact	Name: Michael Westwood Tel: 01305 228167 Email: michael.westwood@dorsetcouncil.gov.uk

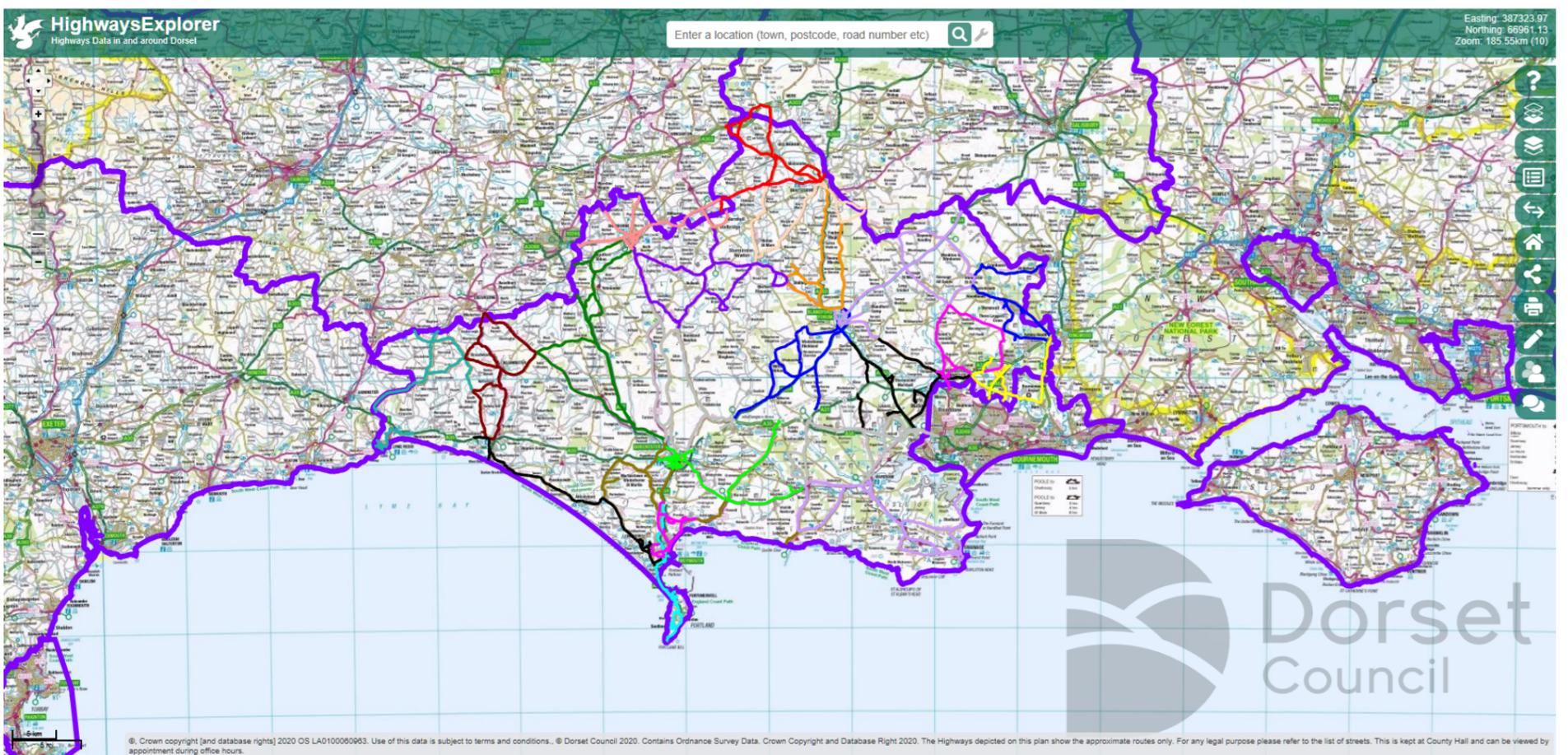
What is Route based Forecasting

Currently we receive forecasts for the 4 weather domains in Dorset – Toller, Wimborne, Weymouth and Sherborne.



This forecast is produced using current data from our weather stations and historical data. The forecast gives us the lowest expected road surface temperature for that domain.

Route based forecasting would give us a forecast for each of our 22 routes.



Change from domain-based forecasting to route-based forecasting

These forecasts would be produced using historical data along with current data from our weather stations. A “sky view affect” is included to produce a more accurate forecast. This takes into account the impact of shading on the road caused by trees, banks, buildings etc. The amount of sun that reaches the road surface during the day affects what heat is built up in the road surface which affects the predicted minimum road surface temperature at night. The existence of bridges on the route is also factored in as these can become cooler at night. This gives us a more accurate forecast and allows us to target routes rather than whole domains.

The main justifications for Dorset Council to move to RBF are:

- Facilitate more targeted, surgical treatments on marginal nights:
- Better use of resources:
- Conserve salt
- Reduction in drivers' hours and the risks to the Fleet Operators Licence in managing them
- Reduce fuel consumption
- Reduced operational costs
- Reduce environmental impact:
- Prevent unnecessary salt application
- Reduction in CO2 emissions from operational activity
- Prepares the organisation for future moves to dynamic spreading (variable spread rates on the same route) and fully autonomous gritters
- Scientific, data-led decision making which support a more robust defence against litigation
- Negates the (costly) need for thermal mapping (re)surveys

Options for consideration

Do nothing – continue with DBF

Do something – In recognition that the 2019-20 season was unseasonably marginal, the trial could be continued for the 2020-21 season

Officer recommendation – Move to an RBF system for the 2020-21 season

Change from domain-based forecasting to route-based forecasting

Appendix 1- comparison of route based forecasting v Domain based forecasting

The table below shows a comparison between the runs completed over the 2019-20 season based on DBF and those that would have been completed under a RBF system based on the daily 12pm forecast for any routes going below +1c.

Route based v domain based number of runs								
Sherborne =1								
Toller=11								
Wimborne=7								
Weymouth=3								
All=22								
	Date	Domain runs	Route based runs	difference	routes saved	routes saved with officer discretion		
	07-Nov	12	4	8		8		
	08-Nov	19	20	-1				
	11-Nov	11	12	-1				
	14-Nov	0	0	0			forecast wrong	
	16-Nov	19	17	2		2		
	18-Nov	19	18	1		1		
	29-Nov	11	3	8		8		
	30-Nov	22	22	0				
	01-Dec	22	22	0				
	02-Dec	33	33	0				
	03-Dec	12	18	-6				
	04-Dec	19	20	-1				
	09-Dec	19	18	1		1		
	10-Dec	11	3	8		8		
	11-Dec	19	18	1		1		
	17-Dec	12	15	-3				
	24-Dec	19	20	-1				
	25-Dec	11	2	9		9		
	17-Jan	22	22	0				
	18-Jan	22	22	0				
	19-Jan	22	22	0				
	20-Jan	22	22	0				
	21-Jan	19	22	-3				
	27-Jan	11	7	4		4		
	28-Jan	19	20	-1				
	03-Feb	11	3	8		8		

Change from domain-based forecasting to route-based forecasting

	04-Feb	11	3	8		8		
	05-Feb	11	1	10		10		
	06-Feb	19	19	0				
	10-Feb	11	8	3		3		
	11-Feb	19	16	3		3		
	17-Feb	11	0	11		11		
	20-Feb	11	11	0				
	25-Feb	22	22	0				
	29-Feb	11	2	9		9		
	02-Mar	19	16	3		3		
	05-Mar	19	19	0				
	06-Mar	11	3	8		8		
	15-Mar	11	12	-1				
	25-Mar	19	19	0				
	26-Mar	11	20	-9				
	29-Mar	11	6	5		5		
	31-Mar	11	19	-8				
	Totals	676	601	75	75	110		

Notes

The 2019 – 2020 season was particularly marginal. We had a lot of nights that were very close to freezing. It was not a typical season when we only experience marginal night at the beginning and end of the season.

Using route-based forecasting would have saved us somewhere between 73 and 110 routes over the season.

The spread of numbers is due to a level of officer discretion that would have been used. I have used the trigger point, +1c (as per the policy) for the lower number but on some nights, we will not go out on that trigger point.

This would be due to road conditions - very dry, residue salt or temperatures only dipping for a very short period close to freezing but not going below with road surface temperatures staying above +0.5c.

Further savings are also possible on salt usage, where we have gone out in a whole domain at a rate higher than 8g which may have only been required on a few of the routes within that domain.

Using less salt during the season will also help with our stocks and resilience should we experience more harsh conditions.

There will also be advantages regarding the workforce including less disruption to working day, more resilience in drivers' hours etc.

Change from domain-based forecasting to route-based forecasting

Appendix 2- Calculation for cost per route

Cost per run

Salt	£38.00 per tonne
Red Diesel	£0.40 per litre
White diesel	£0.88 per litre
Average salt run at 12g equates to between 4 and 5 tonnes used on two average routes	£171
Average salt run at 8g	£113
Labour cost for one driver at time and a half (£57.19)	£229.00

*I have not included stand by payment at £162 per week, supervisor cost (Duty Engineer or Duty Supervisor) or supporting services such as Fleet Maintenance.

Total for a 8g salt run = £371

Total for a 12g salt run = £434

Change from domain-based forecasting to route-based forecasting

Appendix 3 – Environmental considerations

Average carbon dioxide emissions for example vehicles (driving at a particular speed);

Vehicle type	Co2 emissions in grams per kilometre at a speed of 40mph	Co2 emissions in grams per kilometre at a speed of 50mph
Euro cat 6 engine rigid 32 tonne GVW lorry	812	843
Euro Cat 6 engine rigid 14 to 20 tonne GVW lorry	540	560
Euro Cat 6 engine rigid 12 to 14 tonne GVW lorry	455	469

There are a lot of variables such as driver behaviour and the age of the vehicle but the above provides indicative examples.

Co2 savings if we did not grit on marginal shouts would soon start to add up over a season and for multiple vehicles.

Environmental impacts of salt;

Aquatic life – some fish are sensitive to salt and others are fairly tolerant, so it is species specific, but salt does not bio-accumulate.

Soil – salt is naturally occurring however there is a risk of increased salt levels from leaching off roads which is a problem for ground water receptors and particularly where this leads to drinking water supplies.

Corrosion – salt is well known to causes problems for vehicles and metal structures.

Plant life – de-icing activity damage tends to be localised around immediate verges to roadsides, depending on the intensity it can cause damage through osmosis leading to root and leaf 'burn'.

Links below to useful articles;

<https://www.saltassociation.co.uk/de-icing-roads/de-icing-environment/>

<https://www.theyworkforyou.com/wrans/?id=2013-03-01a.144740.h>