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Acting on behalf of the Trunk Roads Network Management  
Directorate of Transport Scotland

**Halcrow** in association with  
**PricewaterhouseCoopers, Scott Wilson and TRL**

## **REPORT ON WINTER SERVICE PROVIDED BY BEAR ON M8 BETWEEN 5 AND 6 DECEMBER 2010.**

### **1. Executive Summary**

The purpose of this report is to investigate the winter service performance of BEAR from 5 to 6 December 2010 focussing on the M8 which was closed on 6 December 2010 and remained partially closed until 8 December 2010.

Overall, based on the forecast information available, BEAR's decision-making and actions throughout the period are considered to be acceptable. Planned treatments were in accordance with recently issued guidance advice being used across Scotland.

BEAR carried out additional treatments and patrols throughout the evening and early morning. The additional treatments were completed prior to the forecast heavy rain and the patrols were deployed to coincide with the heavy rain forecast.

The forecasts provided did not give any reason to suspect that the original low confidence of 2 – 4 cm snow forecast between 01:00hrs and 08:00hrs on 6 December 2010 would change.

The actual snowfall encountered was much heavier than the 2 – 4 cm forecast. It also arrived during the morning rush hour, hindering gritters deployed to clear the route.

There is nothing to suggest BEAR was not carrying out its winter service in accordance with the Contract requirements.

### **2. Introduction**

Following traffic disruption and motorway closures on the morning of 6 December 2010 PAGplus investigated the winter service performance of BEAR from 5 to 6 December 2010 focussing on the M8 which was closed on 6 December 2010 and remained partially closed until 8 December 2010.

BEAR is responsible for maintaining the M8/A8 commencing in approximate terms at M8/A8 Baillieston Interchange to M8 Newbridge roundabout and M8 Hermiston Gait roundabout both near Edinburgh.

### **3. Information reviewed**

BEAR's Winter Service Plan (WSP) sets out how it provides its winter service in the South East Unit.

Records of weather forecasts provided by MeteoGroup, planned and unplanned actions, Vaisala (provider of BEAR's computerised road weather information system) sensor records and Duty Officer Logs were reviewed for 5 and 6 December 2010.

Sensor information was reviewed at three sensors located on M8 west of Edinburgh at J3 Livingston, J4 Whitburn and Duntilland.

The M8 Whitburn weather forecast station Road Surface Temperature (RST) sensor did not appear to be functioning, although the station was recording all other relevant data. Vaisala was subsequently made aware of this fault in mid-December and is scheduled to repair this sensor within 28 days of notification.

The sections of **M8** reviewed near Edinburgh are within climatic **Domain 6** and relates most closely to the M8 Whitburn sensor.

There is no contractual requirement to patrol the M8.

Precautionary treatments for the sections of M8 maintained by BEAR are undertaken via gritter routes as follows:

Route no	Base depot	Route details
8	Bilston Glen	A720 Dreghorn to Gogar, M8 Hermiston Gait to J3 (Main Carriageway and Slip Roads)
9	Chryston	A8 Baillieston to M8 J3 Livingston (Main Carriageway Westbound and Slip Roads Eastbound)
10	Chryston	A8 Baillieston to M8 J3 Livingston (Slip Roads Westbound and Main Carriageway Eastbound)
14	Burghmuir	M9 from Pardovan to M8; M8 Jcn 3 to Hermiston Gait; M9 / A90 Link to Forth Bridge (Various Carriageway and Slip Roads)

There is an area of M8 at Harthill listed in BEAR's WSP as susceptible to frost.

## 4. PAGplus review

### 4.1 5 December 2010 12:00hrs to 6 December 2010 12:00hrs

#### 4.1.1 Weather forecast

Full details of the weather forecast information, which MeteoGroup provide to BEAR, are contained in Appendix A.

#### PAGplus comments on forecast

- For M8, the snow depth forecast, with low confidence, was 2-4cm for Domain 6 forecast between 01:00hrs and 08:00hrs on 6 December 2010.
- Rain forecast, with high confidence, between 07:00hrs and 08:00hrs (rush hour) on 6 December 2010 with potential to wash off any de-icing chemical on the road.

- Ice forecast, with high confidence, 12 noon to 12 noon 5 to 6 December 2010.
- Minimum RST minus 8.5°C.
- The headline on the evening update at 1925 hrs – *‘some of the snow timings have been changed, confidence is low on the timings and amounts though - RSTs well below zero - some snow later tonight’*.

Following the severe winter conditions in January 2010, guidance was developed, based on research undertaken by the Highways Agency and others on treatment levels which would ensure the most efficient use of salt stocks. This advice was issued to all Highways and Roads Authorities by the UK Roads Liaison Group (which was responsible for the 2009 salt review); similar advice was also issued by Transport Scotland and the Highways Agency to their respective contractors. The advice includes a treatment matrix which determines the amount of salt to be applied based on predicted conditions.

BEAR’s treatment followed this revised guidance.

#### **4.1.2 Treatment decisions**

Full details of BEAR’s planned and actual treatments for 5 to 6 December 2009 are provided in Appendix B. The Duty Officer log, contained in Appendix C, was also reviewed for the discussion below.

BEAR’s Daily Winter Action Plan (Planned), summarised from the forecast does not contain details either of the heavy rain forecast between 07:00hrs and 08:00hrs (high confidence) or the depth of snow forecast of 2 – 4 cm (low confidence).

#### **Treatment records**

BEAR completed its initial treatments as planned with the exception of route 8, which started two hours later than planned. This in itself did not present an issue.

In addition to its mid-day action plan, BEAR instructed additional treatments throughout the evening and early morning. It deployed gritters to treat part routes as required during the evening of 5 December 2010 and to undertake a T2 – 20g/m<sup>2</sup> between 03:00hrs and 05:00hrs on 6 December 2010. In addition, three patrols were deployed from 06:30hrs to 07:30hrs covering routes 8, 9 and 14. The additional treatments were completed prior to forecast heavy rain and the patrols were deployed to coincide with the heavy rain forecast between 07:00hrs and 08:00hrs.

#### **Duty Officer (DO) log extracts for 5 to 6 December 2010**

Relevant extracts for the M8 are given in Appendix C.

#### **PAGplus comments on DO Log**

The DO log records snow lying on M8 at 07:43hrs when back-up (additional) drivers were called out.

The log records at 08:14hrs M8 running ‘black’ i.e. free of ice and snow.

At 08:19hrs snow is again recorded as falling but not lying.

At 08:28hrs the DO log records a TRISS call reporting a tailback of traffic due to snow at M8 J4/Hermiston gate.

Thereafter, there are ongoing reports of vehicles and gritters stuck in traffic.

At 11:35hrs the log records a Police call to advise M8 at J2 Claylands eastbound was not passable and they were closing the road.

### **Vaisala sensor records for 5 to 6 December 2010**

Full details of the Vaisala sensor records are contained in Appendix D.

### **PAGplus comments on sensor records**

Vaisala's records show alarms at M8 J3 Livingston sensor at 09:00hrs for snow on the road surface.

M8 J4 Whitburn sensor shows no RSTs but there is a rain warning alarm at 08:20hrs and snow on the road surface from 09:40hrs.

At M8 Duntilland sensor at 08:40hrs there is a rain warning alarm indicating that the sensor has detected rain and the RST is at or close to zero with a high possibility of ice forming.

The sensors show snow on the road surface from approximately 09:00hrs. This may have been preceded by a shower of rain as evidenced by M8 J3 sensor. This would have the effect of washing off some or all of previous treatments.

The actual depth of snow is understood to have been in excess of the 2 – 4 cm predicted with low confidence by the weather forecaster, and it fell with high intensity.

## **5. Key Findings**

- BEAR's initial decision-making based on the information available to it from the forecaster at 12 noon was acceptable. Although BEAR omitted to carry forward the updated forecast information from 19:25hrs. However, this would not have changed the proposed treatments.
- BEAR completed its initial treatments as planned on the afternoon of 5 December 2010, with the exception of route 8 which started two hours later than planned.
- BEAR instructed additional treatments throughout the evening and early morning. It deployed gritters to treat part routes as required during the evening of 5 December 2010 and to undertake a T2 – 20g/m<sup>2</sup> between 03:00hrs and 05:00hrs on 6 December 2010. In addition, three patrols were deployed from 06:30hrs to 07:30hrs covering routes 8, 9 and 14. The additional treatments were completed prior to the forecast heavy rain and the patrols were deployed to coincide with the heavy rain forecast between 07:00hrs and 08:00hrs. Rain shown on the M8 Duntilland and M8 Whitburn sensors may have washed off or partially washed off previous treatments. However, there is no report of rain by any of the patrols.
- Back up gritters were then deployed when snow was reported.

- The evening update provided did not give any reason to suspect that the low confidence of 2 – 4 cm of snow forecast between 01:00hrs and 08:00hrs on 6 December 2010 would change. The later update in the DO log at 02:51hrs on 6 December 2010 stated that the snow would arrive slower than expected and would not hit the SE Network until approx 06:00hrs and last until 09:00hrs, affecting Domains 6, 7 and 4 possibly, not entering Domain 1 until 09:00 hrs. There is no mention of any change in the depth of snow expected.
- The actual snowfall encountered was much heavier than the 2 – 4 cm forecast. It also arrived during the morning rush hour, hindering gritters deployed to clear the route.

## 6. Conclusion

Overall, based on the forecast information available, BEAR's decision-making and actions throughout the period are considered to be acceptable. Planned treatments were in accordance with recently issued guidance advice being used across Scotland.

The weather station sensor at M8 J4 Whitburn shows no RSTs and should be repaired.

BEAR should ensure full details of the forecast are carried over to its Daily Winter Action Plan particularly when rain is forecast, so that it can be seen to have taken account of all of the forecast conditions in its decision- making process.

BEAR's weather forecaster should consider undertaking a review, as substantially more snow fell than was forecast.

Notwithstanding the above, and from the information reviewed, there is nothing to suggest BEAR was not carrying out its winter service in accordance with the Contract requirements.

PAGplus/AIJ/EJM/DCB/BDL  
31 January 2011

## Appendix A – Weather Forecast

The chart below taken from Vaisala's records show the weather forecast for 5 to 6 December 2010.

Received : 2010-12-05 19:25:25.0 GMT (+ 0.0 min)

### 24 HOUR SUMMARY FORECAST FOR BEAR SE UNIT

#### FORECAST FOR SUNDAY 05/12/2010 12:00 TO MONDAY 06/12/2010 12:00

Headline	EVENING UPDATE: Some of the snow timings have been changed, confidence is low on the timings and amounts though - RST's well below zero - some snow later tonight
Confidence	LOW

#### General Synopsis

This afternoon will be dry and sunny. RST's will stay below zero on many roads and where they do rise above zero they will drop back below from mid-afternoon. The first half of tonight will be dry and largely clear with RST's ending up well below zero. The second half of the night will see a band of snow move southwards across the region. Drier weather is likely to reach the far north by the end of the night and this will spread south during Monday morning.

#### Hazards and temperatures

	BEARSE WEST LOTHIAN DOMAIN 6	
Readiness Colour	RED	
Hoar Frost	18-09	HIGH
Ice	12-12	HIGH
Snow	01-08	LOW
Snow Level (m)	0	
Drifting	N	HIGH
Heavy Rain	07-08	HIGH
Fog	N	HIGH
Freezing Rain	N	HIGH
Minimum Air Temp	-7.5	
Min RST	-8.5	
RST period < 0	12-12	

#### Snow Summary

Total accumulations of 2-4cm are likely, with 7cm possible across the south of the A702.

## Appendix B – Treatment Records

### BEAR Scotland Daily Winter Action Plan (Planned)

#### Forecast Data

Domain	Min. Air °C	Min. RST °C	RST < 0°C	Hoar Frost	Ice	Heavy Rain	Fog	Freezing Rain	Snow	Snow Level	Drifting
6	-7	-9	12:00-12:00	22:00-09:00	12:00-12:00	-	-	-	01:00-07:00	-	-

#### Action Plan

Depot	Domain	Route		First Action & Time			Second Action & Time		
		No.	Description	Action	Start	End	Action	Start	End
Bilston Glen	6	8	A720 Dregghorn to Gogar, M8 Hermiston Gait to Jcn 3 (Main Cway and Slip Roads)	TF	15:00	12:00			
Chryston	6	9	A8 Ballieston to M8 Jcn 3 Livingston (Main Cway WB and Slip Roads EB)	TF	15:00	12:00			
Chryston	6	10	A8 Ballieston to M8 Jcn 3 Livingston (Slip Roads WB and Main Cway EB)	TF	15:00	12:00			
Burghmuir	6	14	M9 from Pardovan to M8; M8 Jcn 3 to Herm. Gait; M9 / A90 Link to Forth Bridge (Var Cway and Slips	TF	15:00	12:00			

Additional Comments	All routes will be treated with a top up T2 between 1200 - 1700 hours. Further treatment may be required after evening update. Control room to monitor route temperatures/conditions throughout the evening.
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**KEY TO PLANNED ACTION**

T1 - Pre-treatment 10g/m <sup>2</sup>	TE - Pre-treatment Ethylene Glycol	PO - Patrol
T2 - Pre-treatment 20g/m <sup>2</sup>	T*P - Pre-treatment Part route,*=1,2,3,4 or E	TF - Plough/Salt Whole Route
T3 - Pre-treatment 30g/m <sup>2</sup>	S - Standby in Depot	TP - Plough/Salt Part Route
T4 - Pre-treatment 40g/m <sup>2</sup>	NA - No Action	

**BEAR SCOTLAND Daily Winter Action Plan (Actual)**

Depot	Domain	Route		First Action & Time			Second Action & Time		
		No.	Description	Action	Start	End	Action	Start	End
Bilston Glen	6	8	A720 Dreghorn to Gogar, M8 Hermiston Gait to Jcn 3 (Main Cway and Slip Roads)	T1.5	17:00	17:30	T1.5	17:45	19:00
Chryston	6	9	A8 Ballieston to M8 Jcn 3 Livingston (Main Cway WB and Slip Roads EB)	T1.5	15:00	16:50	TP	18:30	02:30
Chryston	6	10	A8 Ballieston to M8 Jcn 3 Livingston (Slip Roads WB and Main Cway EB)	T1.5	15:00	16:50	TP	19:00	02:15
Burghmuir	6	14	M9 from Pardovan to M8; M8 Jcn 3 to Herm. Gait; M9 / A90 Link to Forth Bridge (Var Cway and Slips)	T1.5	14:45	16:35	TP	19:00	01:15

Depot	Domain	Route		Third Action & Time			Fourth Action & Time		
		No.	Description	Action	Start	End	Action	Start	End
Bilston Glen	6	8	A720 Dreghorn to Gogar, M8 Hermiston Gait to Jcn 3 (Main Cway and Slip Roads)	TP	20:00	02:00	T2	03:00	04:55
Chryston	6	9	A8 Ballieston to M8 Jcn 3 Livingston (Main Cway WB and Slip Roads EB)	T2	03:00	04:45	PO	07:30	



Chryston	6	10	A8 Ballieston to M8 Jcn 3 Livingston (Slip Roads WB and Main Cway EB)	T2	03:00	04:50	PO 07:20 18:05
Burghmuir	6	14	M9 from Pardovan to M8; M8 Jcn 3 to Herm. Gait; M9 / A90 Link to Forth Bridge (Var Cway and Slips)	T2	03:00	04:45	

Depot	Domain	Route		Fifth Action & Time			Sixth Action & Time		
		No.	Description	Action	Start	End	Action	Start	End
Bilston Glen	6	8	A720 Dreghorn to Gogar, M8 Hermiston Gait to Jcn 3 (Main Cway and Slip Roads)	PO	06:30	18:00	TP	07:00	10:00
Chryston	6	9	A8 Ballieston to M8 Jcn 3 Livingston (Main Cway WB and Slip Roads EB)	TP	08:00	10:05			
Chryston	6	10	A8 Ballieston to M8 Jcn 3 Livingston (Slip Roads WB and Main Cway EB)	N/A					
Burghmuir	6	14	M9 from Pardovan to M8; M8 Jcn 3 to Herm. Gait; M9 / A90 Link to Forth Bridge (Var Cway and Slips)						

**KEY TO ACTUAL ACTIONS**

T1 - Pre-treatment 10g/m <sup>2</sup>	TE - Pre-treatment Ethylene Glycol PL - Patrol in Loaded Gritter, Treat as Necessary
T2 - Pre-treatment 20g/m <sup>2</sup>	T*P - Pre-treatment Part route, PO - Patrol *=1,2,3,4 or E
T3 - Pre-treatment 30g/m <sup>2</sup>	S - Standby in Depot
T4 - Pre-treatment 40g/m <sup>2</sup>	NA - No Action
	TF - Plough/Salt Whole Route
	TP - Plough/Salt Part Route

## Appendix C – Duty Officer log extracts

### Duty Officer (DO) log extract for 6 December 2010

Relevant extracts for the M8 until 12 noon on 6 December 2010 are listed below

ID	Date	Caller	Route	Location	Call Type	Call Details	Action Details
32235	06/12/2010 02:51	Unknown			Winter	General Winter Update, snow is coming in slower than expected and will not hit SE Network until approx 0600 hrs and last until 0900 hrs, will affect Domains 6, 7 and 4 possible enter Domain 1 until 0900 hrs	Logged for information, T2 grit commencing at present and all gritter to be loaded for early shift
32239	06/12/2010 06:00	Unknown			General	Triss 1 commencing patrols of network	Logged for information
32240	06/12/2010 06:20	Unknown			General	Triss 2 commencing patrols of network	
32241	06/12/2010 06:58	Police	M8	M8 Livingston	TRISS	Bdv in lane 2	Burghmuir esu deployed and found no trace.
32243	06/12/2010 07:43	BEAR	M8	M8	Winter	Snowing on the M8	Called Mark Mitchell for back up drivers to be sent out.
32245	06/12/2010 08:14	BEAR	M8		Winter	Mark Mitchell called to report M8 running black.	
32246	06/12/2010 08:19	BEAR	8		Winter	Route 8 called to report snow, this is not lying at the moment.	
32247	06/12/2010 08:28	Unknown	M8	M8 jct 4/Hermistongait	Winter	Triss called to report tailback of traffic due to snow at this location.	
32250	06/12/2010 09:09	BEAR	M8		Winter	Called Mark Mithell for update on conditions, he advised drivers will be in tandem on the main	

						carriageway and backup gritter will do the slips.
32254	06/12/2010 09:35	Unknown	M8	M8 jct 2	TRISS	Bdv renault megane vrn NV52 FFG (spun on the road) Triss driver assited
32256	06/12/2010 10:22	Police	M8	M8 jct 3	Winter	Hgv stuck and need a gritter.
32257	06/12/2010 10:22	Police	M8	M8 w/b jct 3	Winter	hgv stuck in the snow. Called Mark Lister to assist with deploying the gritter drivers to this location.
32258	06/12/2010 10:48	Police	M8	M8 jct 2 underpass	Winter	Two cars and a lorry Mark stuck. Lister informed to deploy gritter to this location.
32260	06/12/2010 11:00	Police	M8	M8 slip road	Winter	Bdv tractor vrn EV07 Route 10 back EVH stuck in snow up driver will assist once he has dealt with back log of traffic on the M8 jct 3
32261	06/12/2010 11:35	Unknown	M8	M8 jct 2 Claylands e/b	Winter	Police called to advise Winter this road is still not manager/ passable and they are Scotland closing the road. Mark Lister informed
32266	06/12/2010 12:10	Police	M8	M8 w/b jct 3	Winter	Police called to advise Advised that artic lorry stuck in the snow. Pol.inc.no.175 and trying to get through, however due to the grid lock this may take sometime.
32268	06/12/2010 12:15	Police	M8	M8 Newhouse jct 5	Winter	Police asked for Advised police plough. Pol.inc.no.0770 we are innundated with calls and and will try and get to this incident as soon as possible.

## Appendix D – Vaisala sensor records

The graphs below show Vaisala records for the relevant sensors on M8.

Legend as follows:

**Graph colour legend:** Red = RSTs; Blue = Air temperature; Green = Dewpoint

Dewpoint – temperature to which air needs to be cooled to commence condensation. The temperature must fall below the dewpoint for condensation to take place. If the road temperature is above freezing the condensation will take place as dew and the road surface will become wet. If the road temperature is below freezing then the condensation takes place as hoar frost

### Surface States of Vaisala Road Sensors

State	Physical Meaning
<b>DRY</b>	The road surface is dry, no ice or snow either
<b>MOIST</b>	Little moisture in the road surface, no de-icing chemical
<b>WET</b>	Liquid water on the road surface, no de-icing chemical
<b>FROST</b>	Frost on the road surface
<b>ICE</b>	Ice on the road surface, not formed as frost, no snow
<b>SNOW</b>	Snow on the road surface
<b>WTRTD</b>	Liquid water containing de-icing chemical on the road surface, no ice
<b>TRACE</b>	Road surface moist and there is de-icing chemical

### Alarm states

**Green** - No alarm

**RAINW** – Rain Warning - The weather station has detected rainfall and the road surface temperature is at or close to zero. There is therefore a high possibility of ice forming.

**WARN** - Ice Warning - Surface is close to freezing or ice and or frost formation will occur within a given period if the current trend continues.

**ALARM** - Ice Alarm - Surface at or below freezing point; either there is ice / frost already or there will be very soon.



