



Rail Accident Investigation Branch

# Rail Accident Report



**Dispatch of a train with an unsecured load,  
Basford Hall Yard, Crewe  
21 February 2006**

This investigation was carried out in accordance with:

- the Railway Safety Directive 2004/49/EC;
- the Railways and Transport Safety Act 2003; and
- the Railways (Accident Investigation and Reporting) Regulations 2005.

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# Dispatch of a train with an unsecured load, Basford Hall Yard, Crewe 21 February 2006

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## Introduction

- 1 The sole purpose of a Rail Accident Investigation Branch (RAIB) investigation is to prevent future accidents and incidents and improve railway safety.
- 2 The RAIB does not establish blame, liability or carry out prosecutions.
- 3 For the purpose of this investigation, access was freely given by Freightliner, EWS, TMA and Network Rail to their staff, data and records.
- 4 Appendices at the rear of this report contain glossaries explaining the following:
  - acronyms and abbreviations are explained in Appendix A; and
  - certain technical terms (shown in *italics* the first time they appear in the report) are explained in Appendix B.

## Summary of the report

### Key facts

- 5 On its journey from Crewe to Toton (near Nottingham) on 21 February 2006 train 6D51, hauled by two *class 67 locomotives*, incorrectly contained 14 *Salmon wagons* with unsecured loads of redundant *track panels*.

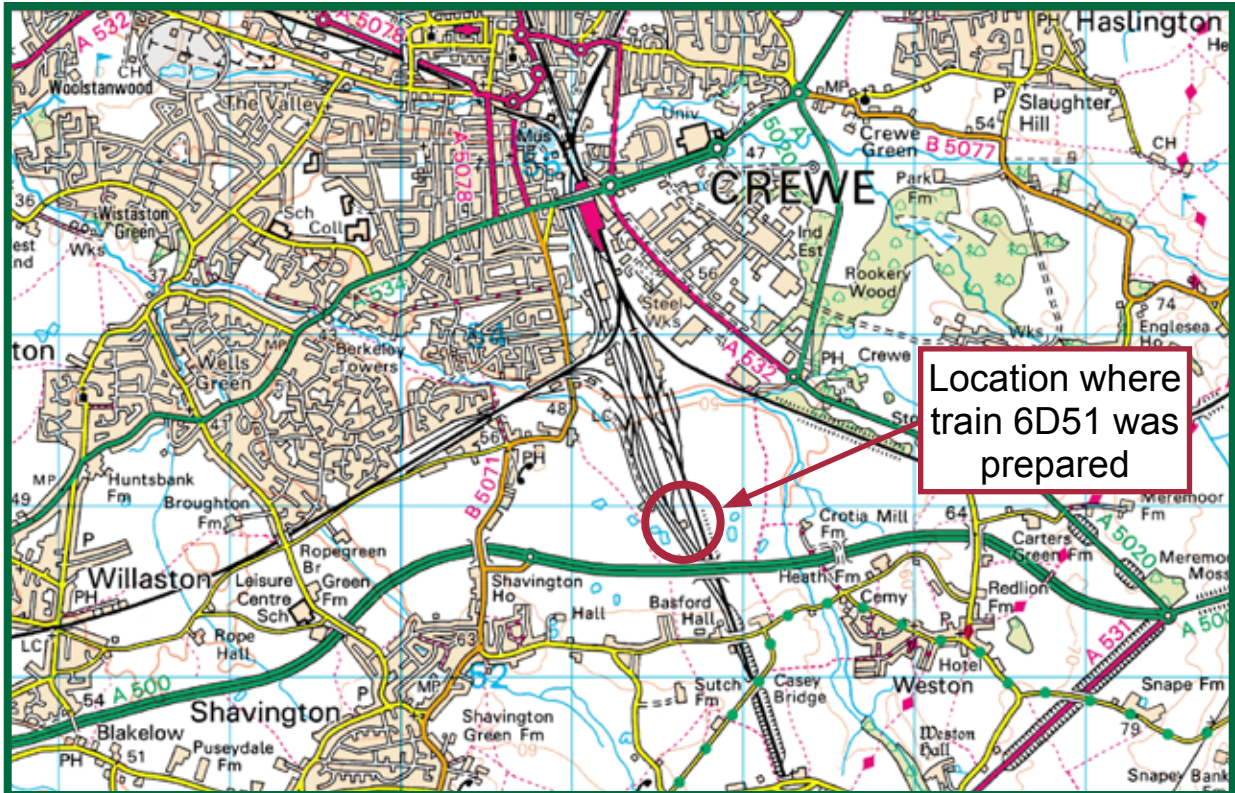


Figure 1: Extract from Ordnance Survey map showing the location where train 6D51 was prepared.

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### Immediate cause, causal and contributory factors, underlying causes

- 6 The immediate cause of the incident was that train 6D51 was dispatched onto the railway with incorrect wagons, carrying an unsecured load.
- 7 Causal factors were:
  - there was a breakdown in communication between the *team leader* and a *shunter* in Basford Hall Yard over which wagons were to be placed in train 6D51; and
  - the shunter did not follow the correct process to check the train prior to departure and in particular he did not check the vehicle numbers or the security of the load of train 6D51.

- 8 The following factors were contributory:
- the shifts that the shunter had previously worked, together with his off duty activities, may have increased his levels of susceptibility to fatigue and to error;
  - the shunter may have been placed under time pressure;
  - the method of work for siding MO13 (see Figure 2 & Paragraph 34) did not include sufficient controls to prevent vehicles being taken from the siding in error;
  - the process for issuing and briefing local working instructions to *shunting* staff members was inadequate.
- 9 The underlying cause was:
- Shunting staff at Basford Hall Yard did not always comply with the rules and regulations associated with the preparation of trains. The regime for ensuring the quality and safety of shunting work at Basford Hall did not prevent such non-compliances.

### **Severity of consequences**

- 10 Although the unsecured load remained in place throughout the journey there was potential for it to move or be shed, which could have resulted in a serious incident.

### **Recommendations**

- 11 Recommendations can be found at Paragraph 147. They relate to the following areas:
- ensuring the quality and safety of shunting work;
  - the writing, checking, authorising, briefing and issuing of methods of work at Basford Hall.

## The Incident

### Summary of the incident

- 12 On its journey from Crewe to Toton on 21 February 2006, train 6D51, hauled by two class 67 locomotives, contained 14 Salmon wagons with unsecured loads of redundant track panels. These wagons should not have been included in this train, and had not been prepared for dispatch from Basford Hall Yard.

### The parties involved

- 13 Freightliner Group Limited is the parent company of Freightliner Limited and Freightliner Heavy Haul Limited. Freightliner Heavy Haul Limited operates Basford Hall Yard and employs the shunters, team leaders and other members of staff working there; it also is responsible for the maintenance of the infrastructure in Basford Hall Yard.
- 14 English Welsh & Scottish Railway Limited (EWS) provided the locomotives for, and employed the driver of, train 6D51.
- 15 Track Material Agency (TMA), which is contracted to Network Rail, unloaded and dismantled redundant track panels at Basford Hall Yard.
- 16 The train was operated on behalf of Network Rail and operated on its infrastructure from Crewe to Toton.

### Location

- 17 Train 6D51 was *marshalled* and prepared in Basford Hall Yard, Crewe. This is a large marshalling yard 1.5 km south of Crewe station, Cheshire (see Figure 1).
- 18 This incident involved sidings MO9 to MO13. These are located towards the south end of the yard on the eastern side. The sidings were constructed in 2003 (see Figure 2).
- 19 Basford Hall Yard has two cabins for shunting staff. The north cabin is towards the north end of the yard; the middle cabin is towards the south end of the yard (see Figures 2 & 3).

### Staffing of Basford Hall Yard

- 20 Members of Freightliner shunting staff are present on shift 24 hours a day, seven days a week to carry out shunting and train preparation duties; these members of staff work from both the north and middle cabins.
- 21 Freightliner team leaders are the first level of supervision; one is located at the north cabin and one at the middle cabin. The team leaders' shift pattern covers 24 hours excluding part of the weekend.
- 22 Freightliner shift managers are the next, and highest, level of supervision and are located at the north cabin; one is on duty per shift. The shift managers' shift pattern covers 24 hours 7 days.



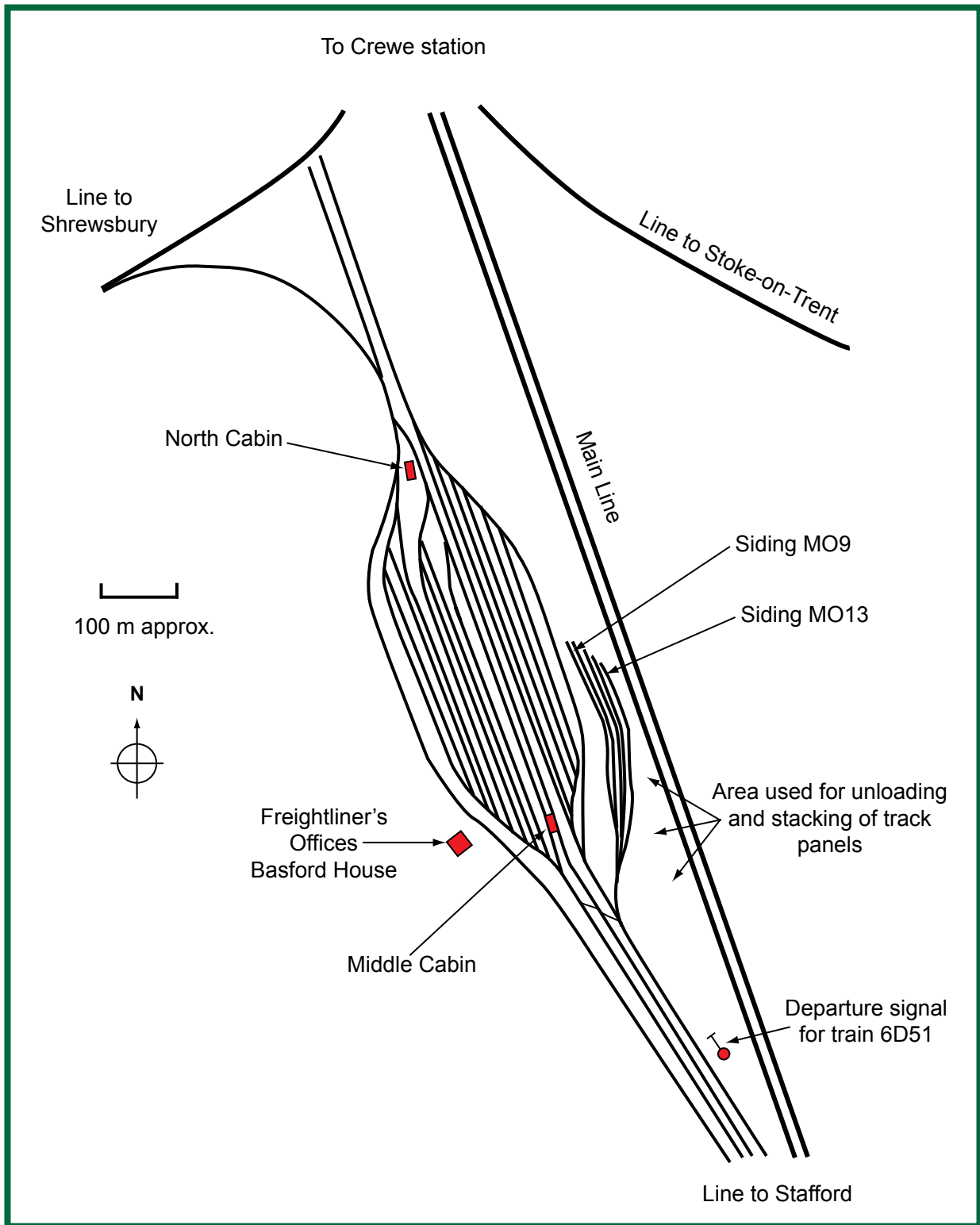


Figure 2: Diagram of Basford Hall Yard



Figure 3: The middle cabin

- 23 The shift manager decides on the work that is to be carried out during his shift. In respect of the work to be carried out from the middle cabin, he will communicate his instructions to staff based at the middle cabin. These instructions include:
- which siding the various vehicles from an incoming train are to be placed into;
  - other shunt movements; and
  - the formation of trains for departure.
- 24 The team leader at the middle cabin receives instructions from the shift manager and instructs the shunters working from the middle cabin in respect of the shunting activities to be carried out.

### **Documentation at Basford Hall Yard**

- 25 Two types of paperwork are provided for shunting the yard; *shunt lists* and *train lists*.
- 26 The locations of wagons in the yard are recorded in the *TOPS System* and on *mimic boards* by the shift manager. The team leader at the middle cabin also keeps a version of a mimic board for sidings in the locality of the middle cabin.
- 27 The shift manager provides shunt lists to each team leader for the movement of wagons within the sidings, and for incoming trains that are to be divided and stored on sidings he specifies.
- 28 For a shunt from the middle cabin, the shift manager marks up the shunt list by hand with the locations to which the vehicles are to be moved. He then faxes the shunt list to the middle cabin. The team leader receives the shunt list and provides a copy to the shunter who is to execute the move.

- 29 Train lists are received from the TOPS system at a printer in the relevant cabin. These show the locomotive(s) and the wagons that need to be formed into a train for dispatch including the order in which they are to be placed in the train, the length, the weight and the brake force of the train. Train lists also have a section for the *train preparer* to sign and give to the train driver, stating 'The provisions of the *Rule Book* module TW1<sup>1</sup> have been carried out. The train is in good order to proceed'. There is a further part which is known as the *Driver's Slip* that contains a summary of the information shown on the train list. This should also be signed by a representative of the dispatching depot. Train lists do not show on which siding the wagons are located.
- 30 At Basford Hall Yard train preparation is carried out by shunters.
- 31 In accordance with Freightliner's 'Basford Hall Yard Manual', Issue 14, shunting moves should be carried out with the aid of radios, one with the driver and one with the shunter both being tuned to the same channel. The team leader also has a radio to communicate with the radios of both the driver and the shunter.

### **Basford Hall Yard – Use of siding MO13**

- 32 Track Materials Agency (TMA) has a facility, linked to the Basford Hall site which includes sidings for the off-loading of track materials from wagons. The facility was taken out of use for re-surfacing from November 2005. Initially this was anticipated to be for a period of about six weeks but on the day of the incident the facility had not been re-commissioned.
- 33 During the resurfacing, TMA was unloading wagons on siding MO13. This was a temporary arrangement that had been agreed with Freightliner. Wagons were placed on siding MO13 by Freightliner's shunting staff and then TMA staff unloaded redundant track panels from the wagons and stored the panels on adjacent land.
- 34 Freightliner had written, with input from TMA, a 'Method of Work' for the temporary use of siding MO13 while it was being used for track unloading and dismantling. This included the method of use of the siding, safety issues and the walking route.
- 35 The method of work stated that when a train was placed on siding MO13 for off-loading by TMA, the shunter in charge of the movement was required to set and clamp the points so that any vehicles approaching the points could not enter siding MO13. The method of work did not require the clamp to be locked, or for there to be any 'Not to be moved' signs or lights placed on or near the vehicles in the siding. Siding MO13 was also used for storage of other wagons (not used by TMA) during this period.

### **The train**

- 36 Train 6D51 conveys vehicles associated with the upkeep of the railway infrastructure as required by Network Rail; it runs most days, between Basford Hall Yard and Toton. Its composition, length and weight vary from day to day depending on the wagons that are to be conveyed.

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<sup>1</sup> Module TW1 - (Preparation and Movement of Trains, General)

- 37 Network Rail instructed that on 21 February 2006 train 6D51 was to be formed of:
- 4 no. FJA ‘*Super Tench*’ Wagons;
  - 20 no. MRA ‘*Sidetipper*’ Wagons.
- 38 On 21 February 2006 train 6D51 was actually formed of:
- 4 no. FJA ‘*Super Tench*’ Wagons;
  - 14 no.’ Salmon’ Wagons of types YSA and YWA loaded with redundant track panels.
- 39 The train was hauled by two Class 67 diesel locomotives operated by EWS.



Figure 4: Class 67 locomotive

- 40 FJA ‘*Super Tench*’ Wagons are flat wagons with two bogies incorporating four-part droppable sides. They are 21 m in length.



Figure 5: FJA wagon

- 41 YSA and YWA ‘Salmon’ wagons are flat wagons with two bogies and without sides. They are 20 m in length.



*Figure 6: YSA or YWA wagon*

- 42 MRA ‘Sidetipper’ wagons incorporate hoppers that can be tipped to the side to discharge its load. They have two bogies and are 17 m in length.



*Figure 7: MRA wagon*

## **The staff involved**

- 43 Shunter A was involved in the shunting of the Salmon wagons some time prior to the incident. He had been working for Freightliner for about two years at Basford Hall and commenced shunting work in June 2005.
- 44 Shunter B prepared train 6D51 for dispatch on 21 February 2006. He had worked at Basford Hall for Freightliner as a shunter for about two years.
- 45 Freightliner had last assessed the competence of shunter B as a shunter in accordance with its company procedures on 17 January 2006. This assessment determined that shunter B was competent in his duties.

- 46 The team leader on duty when train 6D51 was dispatched had been working as a team leader at Basford Hall Yard for two years; previously he had been a shunter at Basford Hall Yard since 1992. He worked at both the north and middle cabins.
- 47 The shift manager who was on duty at the time that train 6D51 was prepared and departed, had worked on the railway for 16 years, most of which was as a shunter. He took up his current position in 2005.
- 48 The local distribution centre/yard manager at Basford Hall had worked in the rail industry in the field of train operations since 1978. He took up his current position in 2000.
- 49 The TMA member of staff who usually unloads track panels from wagons oversaw the partial unloading of the wagons incorrectly dispatched on train 6D51 on 21 February 2006.
- 50 The EWS Train Driver who drove train 6D51 from Basford Hall on 21 February 2006 had worked in the rail industry since 1978. Since 1990 he has been a train driver; prior to that he was a guard.

### **Events preceding the incident**

- 51 On the weekend of 18/19 February 2006 track works were being undertaken near Oxford and at Coombs near Buxton. At both of these locations track panels were being removed. The removed panels were loaded onto Salmon wagons, up to six panels high, secured by 6 to 8 straps (see Figures 10 and 11). Each train had its load examined by an authorised *load examiner* to ensure that the wagons had been loaded safely and were fit to travel.
- 52 Four loaded Salmon wagons from Oxford and ten from Coombs were sent to Basford Hall Yard for off-loading by TMA (see Paragraphs 32 - 35).
- 53 On 21 February 2006 shunter A was instructed by a team leader at the middle cabin to shunt the 14 loaded Salmon wagons into siding MO13 from another part of the yard. This move was carried out at about 12:00 hrs.
- 54 Shunter A did not apply the clamp to the points as required by the method of work for use of siding MO13.
- 55 Freightliner advised the TMA staff member that the wagons were in place on siding MO13, and were ready for unloading.
- 56 During the afternoon of 21 February the TMA staff member walked to siding MO13; he unfastened all the straps securing the track panels to the wagons except one, which was too tight to release. He did not remove all the straps he had unfastened. It was his intention to return the following day to remove the straps and complete the unloading. Because the straps had been unfastened, the load on the wagons was no longer in a secure state for transit.

### **Events during the incident**

- 57 On 21 February 2006 train 6K05 arrived from Carlisle at about 17:30 hrs; it contained 4 Super Tench wagons that were required to form part of train 6D51.

- 58 At the start of his shift shunter B had a brief meeting with the local distribution centre/yard manager and then arrived at the middle cabin at 18:05 hrs to commence his 12-hour turn of duty. He reported to the team leader. There is evidence that shunter B was informed that there was a lot of work to be done on the shift.
- 59 Shunter B was asked by the team leader to temporarily place the four Super Tench wagons from train 6K05 that were for train 6D51 on to siding MO11 until the locomotives for train 6D51 arrived. There was a shunt list for the disposal of the wagons from train 6K05 (see Figure 8); the handwritten note alongside the first four wagons 'Put toward MO11' refers to this move. The larger handwritten note '6D51 + MO12' refers to the fact that these four wagons were to be added to the wagons in MO12 to make up train 6D51. These handwritten notes are enlarged in Figure 8 for clarity.

SHIFT MANAGER PAGE 02/

21/02/06 16.00.23 07153  
SHUNT LIST AT 1800 ON 21/02/06

GR05 GR05 GR05  
WAGON LIST 096K050M *Extract for 606*

SQ	WGN	NUMBER	L	TRB	LS	DESIN	COMDITY	C	UNCODES
1		621914	E	FUR	69	56590			NHL*
2		621902	E	FUR	69	56590			NHL*
3		621916	E	FUR	69	56590			NHL*
4		621913	E	FUR	69	56590			NHL*
<hr/>									
5	DB	996667	E	YVA	65	42159			<i>6906 + 17 A...</i>
6	DB	996310	E	YSA	66	42159			
7	DB	996929	E	YSA	66	42159			
8	DB	996385	E	YVA	65	42159			
9	DB	996355	E	YSA	66	42159			
10	DB	996864	E	YSA	66	42159			
11	DB	996452	E	YVA	65	42159			
12	DB	996441	E	YVA	65	42159			
13	DB	996655	E	YVA	65	42159			
14	DB	996308	E	YVA	65	42159			
15	DB	996897	E	YSA	66	42159			
16	DB	996452	E	YVA	65	42159			
17	DB	996422	E	YVA	65	42159			
18	DB	996137	E	YSA	66	42159			
19	DB	996323	E	YVA	65	42159			

SHUNTING COMPLETED TIME

*6D51 + MO12*

*6L10 20 SDG.*

*6D51 + MO12*

SHUNT LIST FROM SSM

Figure 8: The shunt list for the move of four wagons onto siding MO11 - area circled red is enlarged for clarity

- 60 The shift manager instructed the team leader that the Super Trench wagons were to be initially placed in siding MO11 because the shift manager thought that the combined train would be too long for siding MO12.
- 61 Shortly before 19:00 hrs the team leader asked shunter B to form train 6D51.
- 62 There is conflicting evidence as to the conversation between the team leader and shunter B. However, shunter B understood the instruction to mean that he was to take the wagons that he had previously placed on siding MO11 and couple them to the wagons on siding MO13 to form train 6D51.
- 63 Shunter B received the train list for train 6D51 from the team leader. He signed the train list in the middle cabin and then commenced the move. In accordance with normal Freightliner practice there was no shunt list for this activity.
- 64 Shunter B instructed the driver of the two coupled Class 67 locomotives in the necessary moves to form train 6D51.
- 65 Shunter B and the driver coupled the locomotives to the four Super Trench wagons in siding MO11. Shunter B gave the signed train list to the driver at this time.
- 66 Shunter B instructed the driver to pull the train forward, clear of the points connecting to the sidings; he would then direct him onto the rest of the train.
- 67 The driver pulled the train forward. Shunter B stopped the train by raising his hands as he did not have either a radio or a handlamp with him. The use of handsignals without a lamp is specified within the Rule Book module SS2 as a permissible option during daylight.
- 68 Shunter B pulled the points lever to give access to siding MO13, where the Salmon wagons were standing, then used hand signals to call the train back.
- 69 The driver set back by driving from the southern cab of the locomotives but stopped after about 20 m because he lost sight of shunter B. The EWS train driver applied the brake, alighted and went to find shunter B. He explained to shunter B that he could not see him.
- 70 Shunter B climbed onto a parked excavator to put himself in a better position so that the driver could see him. The move was resumed and the train was coupled to the Salmon wagons in siding MO13, not those that should have been attached.
- 71 Shunter B checked the handbrake was released on the first of the Salmon wagons and then walked to the locomotives.
- 72 He told the driver to pull the train forward to the departure signal, and that he would then carry out a *brake continuity test*, after which the EWS train driver could contact the signaller to arrange for departure.
- 73 As the driver pulled the train forward shunter B stated that he walked towards the rear of the train observing the wheels, couplings, the security of the load and that no handbrakes were applied. He noted nothing untoward.
- 74 Shunter B did not check that the wagon numbers were consistent with the train formation documentation nor did he determine that the load was secure on the wagons.
- 75 The driver stopped the train on the approach to the departure signal.
- 76 When the train stopped shunter B placed the *tail lamp* on the train and carried out a brake continuity test.



- 77 The driver and the team leader contacted the signaller to arrange for departure of the train.
- 78 At 19:33 hrs train 6D51 departed Basford Hall Yard, 19 minutes early, with the incorrect wagons attached.
- 79 At 21:45 hrs train 6D51 arrived at Toton, 17 minutes early (see Figure 9). There were no reports of any problems with the train during its journey.

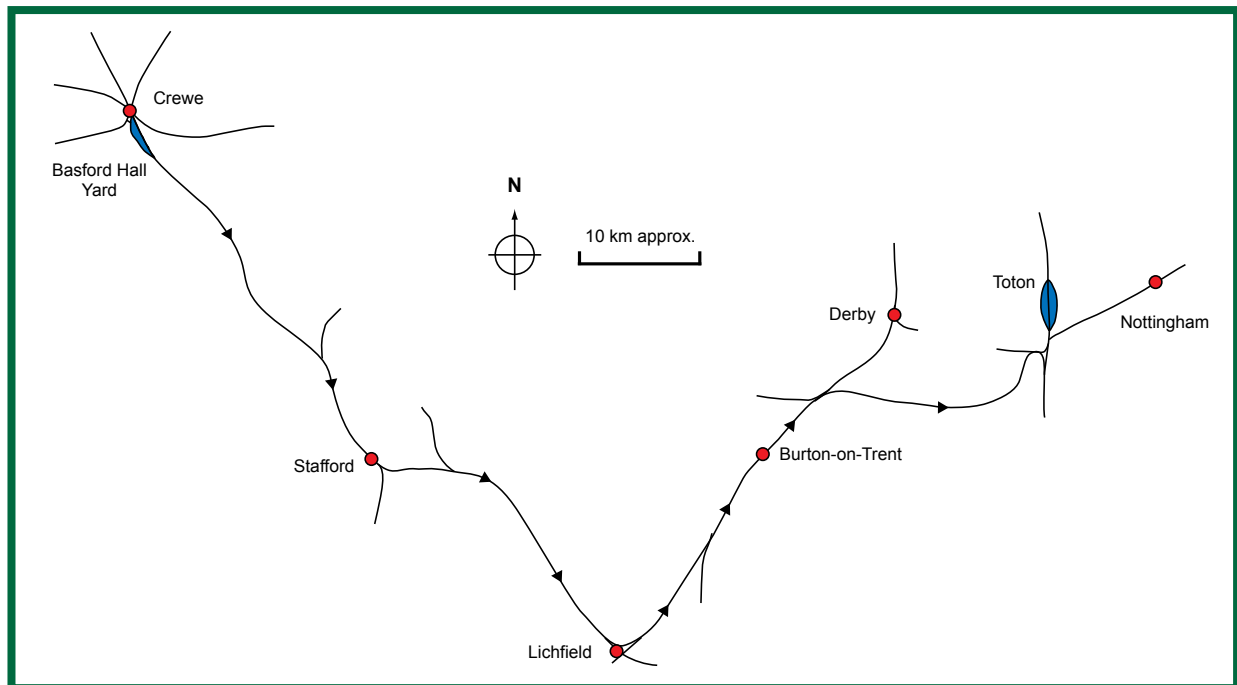


Figure 9: Railway map showing the route taken by train 6D51

## Consequences of the incident

- 80 Although the unsecured load remained in place throughout the journey there was potential for it to move or be shed, which could have resulted in a serious incident.

## Events following the incident

- 81 The following morning, 22 February 2006, EWS staff at Toton found that the load on the wagons was not secure and reported the incident to their management, who in turn notified Freightliner.
- 82 Freightliner formally notified the RAIB of the incident on the morning of 22 February 2006.

## The Investigation

### Sources of evidence

- 83 Interviews were conducted with staff from Freightliner, EWS and TMA.
- 84 Documents were provided by Freightliner, EWS and Network Rail.
- 85 Train data recorder information was provided by EWS.
- 86 Information regarding the yard was gathered through site visits.

### Key evidence

#### Train 6D51

- 87 Train 6D51 was viewed and photographed at Toton on 22 February 2006 in the condition it arrived from Basford Hall. Only one strap was in place over the track panels on one of the wagons. A number of other straps were found loose on the load. It was not possible to determine how many straps had been removed by TMA at Basford Hall, and how many fell from the wagons during the journey.



*Figure 10: Part of the train after arrival at Toton*



Figure 11: Wagon with one strap attached.

### Management systems in Basford Hall Yard

88 Freight train preparation is specified in the ‘Working Manual for Rail Staff Freight Operations – Railway Group Standard GO/RM3056’. Section C, ‘Principles of safe freight train operation’, includes at C4.1, the requirement that before departure a physical examination of the the train should be made, including checking:

- the vehicle numbers;
- that the vehicles are coupled correctly
- that unused couplings are correctly stowed;
- that brake equipment is correctly coupled;
- that handbrakes are released;
- that goods/passenger and empty/loaded levers are correctly positioned;
- that load securing equipment is correctly tensioned; and
- a number of other elements.

89 Freightliner’s Rail Operations Standard PSD/0300 Issue 1 states that regular monitoring of train preparation is to be undertaken. As a minimum this must be 20 per cent of the train services from each Freightliner site.

90 Witness evidence was that in Basford Hall Yard:

- The training of shunters includes that under normal circumstances shunting moves should be carried out with radios.
- The training of shunters includes instruction that the practice of allowing a train to pull down to the signal is not allowed.
- The training of shunters includes instruction that correct train preparation requires examination of both sides of the train and the carrying out of a brake continuity test.
- The training of shunters includes instruction that it is not acceptable to examine the train as it moves past the shunter.
- All shunters are issued with a hand lamp, without one it would not be possible to read the train list.
- New shunters are given a *Personal Track Safety* course and a medical examination. They are then given an induction course which includes a series of classroom sessions on rules and regulations. The new shunter is then placed with an experienced 'mentor' shunter for familiarisation with the yard. This is followed by further classroom learning and then by further mentoring in the yard. Once the shunter is confident about the requirements of the job, knowledge of the rules and regulations and of the operation of the yard is tested, followed by an assessment by the local distribution centre/yard manager.
- Monitoring of train preparation by team leaders and supervisors, including out of normal working hours, is far less than the 20 per cent of train services required by PSD/0300 Issue 1. The evidence presented during the investigation suggests the figure at Basford Hall Yard to be less than 5 per cent.

91 The competence of established shunters is assessed through five elements;

- personal preparation for duty;
- attach/detach rail vehicles and prepare/control shunting;
- train preparation and dispatch from site;
- respond to out of course situations; and
- assessment applicable to local site working.

Each of the five elements is assessed over a two year rolling programme.

92 Both shunters A and B were mentored during their training periods. There were no irregularities recorded in shunter B's competence records.

93 Evidence was given that there were not enough radios available on the night of 21 February 2006 and the team leader told shunter B to use hand signals as there were only four wagons to couple. This was during the hours of darkness; however Basford Hall Yard is floodlit.

94 Shunter B told the train driver that there was a shortage of radios and that he would use hand signals. He did not have a hand lamp (Paragraph 67). This was the first time that the driver had not used a radio to do such a shunt.

95 Rule Book Module SS2, section 4.2 (Shunting) states that handsignals without a lamp can only be used to control movements during daylight. During darkness movements must be controlled by handsignals with a lamp, by radio or by audible signals.

- 96 Freightliner's 'Basford Hall Yard Working Manual', Issue 14, states that 'Under normal circumstances shunting operations will be undertaken by use of radio', but does not specify what should be done under abnormal circumstances.
- 97 There is evidence that on other occasions at Basford Hall Yard the shunters had told the driver to pull their train forward to the departure signal, the shunter then doing the train preparation as the train passed, and had carried out the brake continuity test when the train stopped at the signal. There is also evidence of other occurrences of shunters carrying out a brake continuity test at the rear of the train and then not returning to the driver once train preparation has been completed. The RAIB could not establish the frequency of these events.
- 98 There is also evidence that at Basford Hall Yard shunters had been signing train lists in the shunting cabin and providing the document to the driver before carrying out the train preparation. This signing should confirm that 'The provisions of the Rule Book module TW1 have been carried out. The train is in good order to proceed'. Such confirmation cannot be given until the train preparation has been completed successfully. The RAIB could not establish the extent of this practice.

#### Preparation of train 6D51 for dispatch

- 99 There is conflicting evidence regarding the instruction given by the team leader to shunter B as to whether shunter B was to couple the wagons from siding MO11 onto those in siding MO12 or siding MO13. However, shunter B believed the instruction was to couple them onto the wagons in siding MO13.
- 100 Shunter B did not repeat the instruction to the team leader to confirm understanding.
- 101 Shunter B did not correctly shunt or prepare train 6D51, although he was aware of the various correct procedures.

#### Securing of siding MO13

- 102 Evidence was given that the instruction (Paragraph 35) detailing the use of siding MO13 had been pinned in the team leader's office in the middle cabin, and that all the shunting staff knew about it.
- 103 The members of shunting staff were not individually briefed nor was there the requirement for the members of shunting staff to sign a document to the effect that they were aware of the procedure and would work in accordance with it.
- 104 Shunter A stated that at the time of the incident he was not aware of the existence of the method of work for siding MO13 and that he had been neither briefed about, nor issued with it.
- 105 Evidence from others is that the clamp for siding MO13 was not always used to secure the siding when wagons were being unloaded.

### **Other previous similar incidents**

- 106 Freightliner are not aware of any event involving the dispatch of incorrect vehicles in any of their operations in at least six years.

## Analysis

### Identification of the immediate cause

107 The immediate cause of this incident was the dispatch of train 6D51 onto the railway network with incorrect wagons, which had unsecured loads.

### Identification of causal and contributory factors

#### Train dispatch instruction

- 108 Paragraphs 25 to 31 explain the documentation that controls shunting within Basford Hall Yard. Shunt lists are prepared for incoming trains and shunt moves, and train lists for trains to be dispatched. Train lists are generated by the TOPS system, and do not include the sidings where the wagons for the train are to be found.
- 109 At Basford Hall a further list of the vehicle numbers, in the order in which they are to be placed in the train, is also printed. It is intended that the shunter uses this latter list for checking the vehicle numbers and the vehicle order.
- 110 On 21 February 2006 there was a shunt list for temporarily placing the four Super Tench wagons on siding MO11 (Figure 8 and Paragraph 59) although accounts vary as to whether shunter B was given this list or was only instructed verbally about this move.
- 111 The paperwork for the dispatch of train 6D51 was the train list together with the shunter's list of vehicle numbers, in accordance with the process outlined in Paragraph 105.
- 112 The instruction to complete the formation and dispatch train 6D51 was given verbally by the team leader to shunter B.
- 113 There is contradictory evidence over the verbal instructions given to shunter B as to whether the wagons to which the Super Tenches were to be attached were in siding MO12 or MO13.
- 114 Either shunter B misheard or misunderstood the instruction, or the team leader did not state the correct locations of the wagons to form train 6D51.
- 115 Whichever scenario applies, the instruction was not repeated back to the team leader to confirm a mutual understanding. This is contrary to the requirements of the Rule Book, module G1, section 11, 'Giving and receiving safety messages'.
- 116 The verbal instruction concerning the current location of the wagons is related to the movement of trains, and in part prevents a wrong train dispatch, and thus is a safety message.
- 117 The communication breakdown between the team leader and shunter B, which was caused by not complying with the Rule Book requirements for safety messages, was a causal factor in the incorrect dispatch of the train.

### Train preparation procedures

118 Shunter B did not comply with the Working Manual train preparation procedures (Paragraph 89), in that:

- He signed the train list and gave the train list to the EWS train driver before the train preparation was completed.
- He did not check the vehicle numbers nor did he ascertain that the load securing equipment was properly in place.
- He checked the train as it was being pulled past him as he walked to where the rear of the train would stop. It was not possible for shunter B to carry out the required elements of train preparation in this manner. In addition, it was dark and he did not have a hand lamp to assist with train preparation.
- He viewed only one side of the train during train preparation.

119 Of the above issues, not checking the vehicle numbers and the load securing equipment was causal to the incorrect dispatch of the train.

### Ensuring the quality and safety of train preparation and shunting work

120 Several of the non-compliant practices identified by witnesses, such as issuing the signed train list prior to train preparation, examining the train from one side only while it was being drawn forward, and carrying out a brake test when the train was at the starting signal, were stated to be commonplace at Basford Hall.

121 This indicates that there was an ineffective regime for ensuring the quality and safety of the shunting work at Basford Hall. This is the underlying cause of the incident.

### Fatigue and risk

122 Shunting operations at Basford Hall Yard require the shunters to work shifts. Shift workers, because of the pattern of hours that they work, can be more susceptible to fatigue; there is also a possible increased risk of an accident or incident occurring.

123 Freightliner's systems are designed to ensure the hours that shunters worked comply with Railway Group Standard GH/RT 4004 'Changes in Working Hours – Safety Critical Work'.

124 High fatigue levels can compromise safety. In discharging duties under the Health and Safety at work Act 1974, employers are required to ensure, so far as is reasonably practicable, the safety of employees and that persons not in their employment who may be affected thereby are not exposed to risks to their health or safety. In such cases employers should implement effective control measures. These are likely to include shift work education and a shift system that conforms, so far as is reasonably practicable, to good practice guidelines, such as the Office of Rail Regulation's guidance on 'Managing Fatigue in Safety Critical Work' dated July 2006. Such control measures might include, for example:

- restricting the number of consecutive night shifts to no more than four if possible;
- allowing no additional overtime if 12-hour shifts are worked;
- planning a minimum of 12 hours between shifts;
- using forward rotation (morning/afternoon/night);
- taking travelling time into account.

125 The RAIB assessed the hours that five shunting staff, including shunter B, and a team leader worked over the preceding weeks using the newly developed HSE Fatigue and Risk Index (FRI) (This is made up of two separate Risk and Fatigue indices, as detailed in Appendix C).

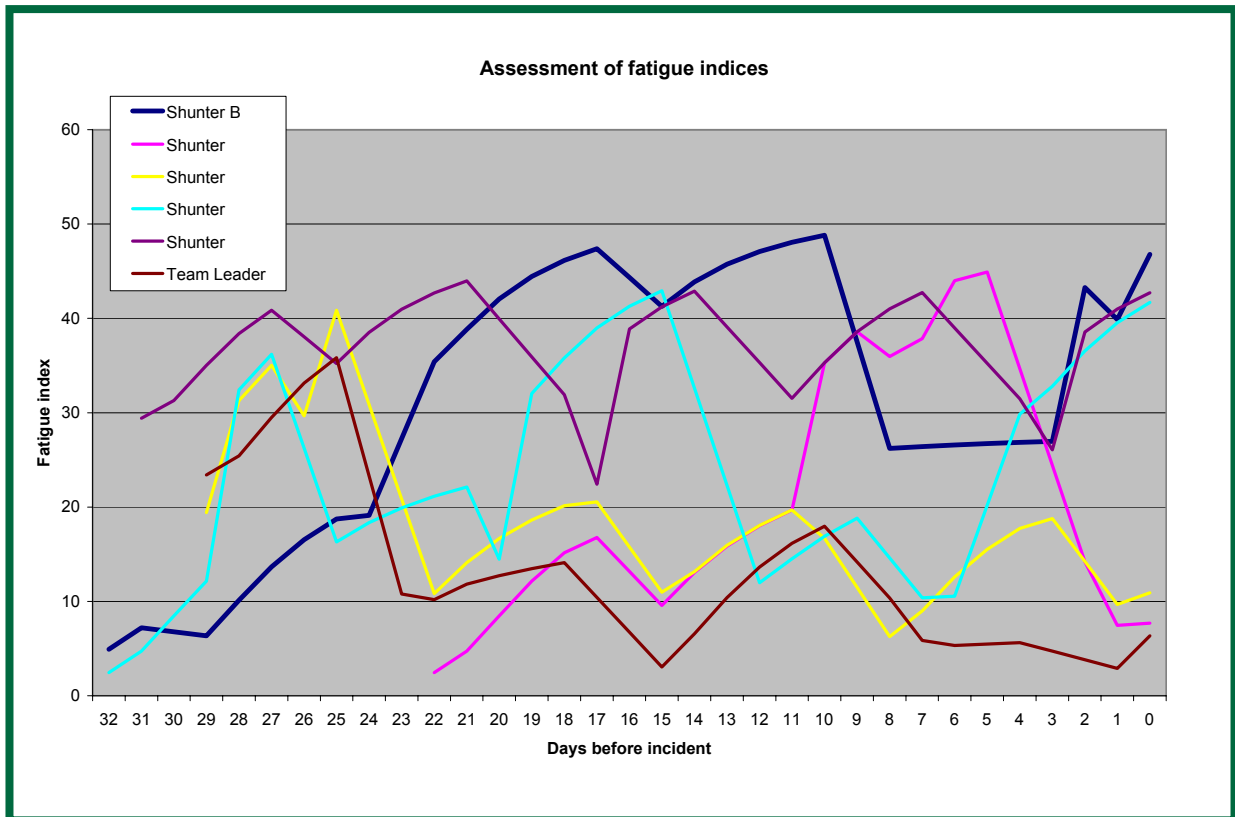


Figure 12. Chart showing the fatigue indices of a sample of the Freightliner staff

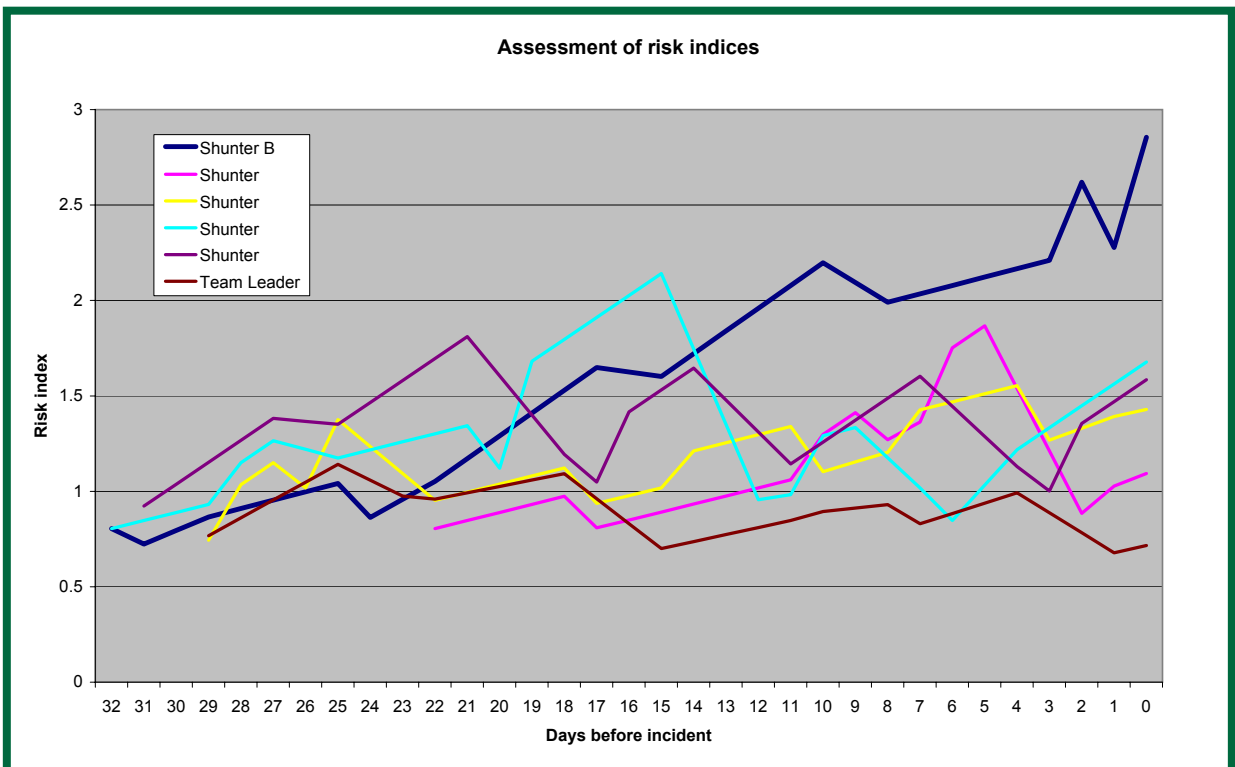


Figure 13. Chart showing the risk indices of a sample of the Freightliner staff



- 126 Shunter B's contracted week was 37 hours, normally rostered over five shifts. His overtime was worked voluntarily, and he agreed with Freightliner what he would work when the roster was prepared.
- 127 In the 30 days up to and including the date of the incident, shunter B worked 27 shifts. This included 24 twelve-hour shifts, 13 of which were at night. During the 30 days his fatigue index peaked at 48.8, and for his shift on 21 February 2006 it was 46.8, indicating an increased propensity for sleepiness. Looking at a sample of other Basford Hall shunters (Figure 12), some also had very high levels of fatigue index (in excess of 40) whereas others had low levels (about 10 or less).
- 128 Shunter B's off-duty activities were likely to have increased his fatigue. He stated that he did generally experience fatigue.
- 129 During the 30 days leading up to the accident, shunter B's risk index increased from below 1 to 2.86, indicating an increasing risk of an accident or incident occurring. In comparison to the sample of other shunters (Figure 13) this level was much higher; typical figures for the sample of shunters were between 0.7 and 1.7.
- 130 On 21 February 2006 shunter B had a high fatigue index and a very high risk index. The shifts that shunter B had worked in the weeks prior to the incident coupled with the activities affecting his non working hours, made him more susceptible to fatigue and to having an accident at work. The shifts that shunter B worked, combined with his off duty activities, were potentially a contributory factor to the incident.

#### Procedure for use of siding MO13

- 131 The method of work for siding MO13 is explained in Paragraph 35. If applied correctly, it would have caused shunter B, in forming train 6D51 with vehicles from siding MO13, to have needed to remove the clamp and as such he may have questioned whether he was forming the train with the correct vehicles. Since the clamp was not applied this control was not in place
- 132 The method of work did not require the point clamp to be locked and the key given to the TMA staff member while the unloading operation was happening, nor did it require any visible signs or lamps to be placed onto the train placed in siding MO13, such as a 'Not to be moved' board. The provision of such additional controls, similar to those in Module T10 of the Rule Book, is good practice on the railway.
- 133 The lack of a clamp on siding MO13 was a contributory factor to the train being incorrectly despatched. A more rigorous procedure, as described in Paragraph 132, would have reduced the likelihood of this incident, and provided better protection to those unloading the wagons.

#### Local working instructions

- 134 There are no records of the Freightliner Local Work Instruction of the method of work for siding MO13 being briefed to appropriate staff members, nor were signatures taken from members of staff to confirm that they had received and understood the method of work.
- 135 Freightliner's Rail Operations Standard PSD/0300 does not include a process for the authorising, issuing and briefing of Local Work Instructions.
- 136 The absence of a process for the authorising, issuing and briefing of Local Work Instructions allowed an unsatisfactory instruction to be written, and for it to be issued with no way of ensuring that those affected were aware of it. The absence of this process was a contributory factor to the incorrect despatch of the train.

### Time pressure

137 From the conversation that shunter B had with the team leader at the commencement of his shift, shunter B believed that there was a high level of work to be done on that shift; this may have contributed, along with local practices, to him taking the short cuts in the train preparation procedures detailed in this report. This may have been a contributory factor.

### **Severity of consequences**

138 Train 6D51 travelled from Basford Hall Yard to Toton with an unsecured load. This is a distance of 116 km, 75 per cent of which is on routes regularly and frequently used by passenger trains. The train travelled up to speeds of 60 mph (96 km/h).

139 The train did not shed its load nor did the load become displaced. If the load had been shed or displaced then there would have been potential for a serious accident.

## Conclusions

### Immediate cause

140 Train 6D51 was dispatched onto the railway network with incorrect wagons, carrying an unsecured load.

### Causal and contributory factors

141 Causal factors were:

- there was a breakdown in communication over which wagons were to be placed in train 6D51 between the team leader and a shunter in Basford Hall Yard (Paragraph 117); and
- the shunter did not correctly follow the specified processes to check the train prior to departure and in particular he did not check the vehicle numbers or the security of the load of train 6D51 (Paragraph 118).

142 The following factors were considered to be contributory;

- the shifts that the shunter had previously worked, together with his off duty activities may have increased his susceptibility to fatigue, and to having an accident or incident (Paragraph 130);
- the shunter may have been placed under time pressure (Paragraph 137);
- the method of work for siding MO13 did not include sufficient controls to prevent vehicles being taken from the siding in error (Paragraph 133);
- the process for writing, checking, authorising, issuing and briefing of local working instructions to shunting staff members was insufficient (Paragraphs 136); and
- the reduced level of team leaders' and supervisors' monitoring of train preparation, compared with the requirements of Freightliner's own standard (Paragraphs 89 and 90).

### The underlying cause

143 The members of shunting staff at Basford Hall Yard did not always comply with the rules and regulations associated with the preparation of trains. The regime for ensuring the quality and safety of shunting work at Basford Hall Yard did not prevent such non-compliances and was therefore ineffective.

### Additional observations

144 The loaded Salmon wagons had originated from two work sites. It was observed that wagons from both work sites had examples of poor loading including, two unsupported sleepers and one partially rotted sleeper end, any of which may have fallen from the train.

145 Although neither causal nor contributory shunter B controlled the preparation of train 6D51 without either a handlamp or a radio. He positioned himself in places where he was personally at risk to achieve this, particularly by climbing onto an excavator to improve the driver's view of him (Paragraphs 70, 93 & 94).

## **Actions reported as already taken or in progress that affect this report**

146 Freightliner has investigated this incident. Following their investigation a number of recommendations were made. Freightliner has taken steps to implement the following recommendations at Basford Hall Yard:

- Introduction of a confidential daily log of out of course events, maintained by the local distribution centre/yard manager.
- Introduction of documented records of staff performance issues.
- Revised briefing of staff on new and amended procedures.
- Review of depot protection to TMA's siding(s). Since the report the sidings have been relocated to their original position, and there is a controlled gate across the access to the new sidings.

## Recommendations

147 Evidence has been collected in relation to Basford Hall Yard only, therefore the recommendations are specific to that site but Freightliner should review the risks of shunting and train preparation at their other locations.

148 The following safety recommendations are made<sup>1</sup>:

### Recommendations arising from the conclusions

- 1 Freightliner to ensure that instructions to marshal trains are treated as being safety critical and appropriate working methods concerning effective communication of such safety critical instructions are adopted (Paragraph 141).
- 2 Freightliner to review and amend its methods of shunting and train preparation to minimise the likelihood of any train not being shunted or prepared in accordance with the requirements of the Rule Book and the Working Manual for Rail Staff Freight Operation. This should include reviewing its procedures, training methods and supervision, and should ensure that the specific responsibilities for shunting and train preparation are clearly defined for each level of the line management structure (Paragraph 141).
- 3 Freightliner to put in place a company process for the initiating, checking, authorising, issuing, briefing periodically review of Local Work Instructions to ensure that risks are effectively controlled, and are properly understood by the relevant persons (Paragraph 142).
- 4 Freightliner to put in place a company process to assess and take account of fatigue arising from the shifts that members of staff work together with any disclosed off-duty factors so as to reduce the likelihood of staff making errors due to fatigue. Action should include consideration of amending staffing levels and roster patterns where appropriate (Paragraph 142).

### Recommendation arising from the observations

- 5 Freightliner should review the issue of radios and hand lamps at Basford Hall Yard to ensure that all shunters are properly equipped for their duties (Paragraph 143).

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<sup>1</sup> Responsibilities in respect of these recommendations are set out in the Railways (Accident Investigation and Reporting) Regulations 2005 and the accompanying guidance notes, which can be found on RAIB's web site at [www.raib.gov.uk](http://www.raib.gov.uk)

## **Appendices**

### **Glossary of abbreviations and acronyms**

### **Appendix A**

EWS	English Welsh and Scottish Railway Limited
FRI	Fatigue and Risk Index
TMA	Track Material Agency

## Glossary of terms

## Appendix B

Brake continuity test	A test to ensure that the brakes work on the train.
Class 67 locomotive	Modern locomotives operated by English, Welsh and Scottish Railways powered by a diesel engine and having two bogies.
Driver's slip	A document providing information to the train driver about the train. It is signed by the person who prepares the train.
Load Examiner	Certain loads that are to be conveyed by wagon require examination to ensure that the load is safe for this conveyance. In these cases the examination is carried out by an authorised load examiner.
Marshalled	(see 'Shunting').
Mimic Boards	A manually updated diagram of the yard showing what wagons within it are in which sidings
Personal Track Safety	A course to provide persons with the necessary knowledge and certification to work on or about the railway.
Rule Book	Railway Group Standard GE/RT 8000.
Salmon wagon	Flat wagons with two bogies and without sides, 20 m in length.
Shunter	In respect of this report a person who is employed by Freightliner to carry out shunting and train preparation activities.
Shunt list	A document containing the vehicle numbers, in the physical order that they are on a specific siding; it is printed from the TOPS System.
Shunting (or marshalling)	Low speed movement of rail vehicles generally within a set of sidings.
Sidetipper wagon	Wagons incorporating hoppers that can be tipped to the side to discharge the load. They have two bogies and are 17 m in length.
Super Tench wagon	Flat wagons with two bogies incorporating four part droppable sides, 21 m in length.
Tail lamp	A red flashing lamp that is placed on the rearmost vehicle of a train.
Team Leader	In respect of this report, a person who is employed by Freightliner to manage, instruct and coordinate the activities of a number of shunters.
TOPS System	A computer system that records the operation of trains.
Track panel	A length of railway track, typically 18 m in length, including rails and sleepers.
Train list	A document providing information about a train which incorporates the driver's slip.
Train preparer	A person who prepares a train for operation on the main line. At Basford Hall yard shunters carry out this task.

- 1 The Fatigue Index (FI) was developed by the Centre for Human Sciences at the Defence Evaluation and Research Agency (now known as QinetiQ) in a research project commissioned by HSE. The objective of this was to provide a means to assess the short-term, daily fatigue and cumulative fatigue risks associated with shift work.
- 2 The FI is based on the five main factors known to have an impact on fatigue: time of day, shift duration, rest periods, breaks within a shift, and cumulative fatigue. For each component a scoring system operates.
- 3 The FI takes account of day, night and early shifts and can be used to compare different shift patterns. It can also be used to identify peaks of fatigue within a shift pattern so that suitable control measures can be put in place. For day or evening shifts, an FI value exceeding 30 is likely to indicate that fatigue was too high, whereas the comparable figure for night shifts is an FI value of 35 or more.
- 4 However, the FI has some shortcomings in that it takes no account of individual factors such as age, and fitness etc. Significantly, it also takes no account of an individual's lifestyle outside work, including the amount of sleep obtained preceding a shift. The FI does enable effective comparisons to be made between different shift roster patterns.
- 5 The FI has been further developed under work commissioned by HSE and undertaken by QinetiQ in collaboration with Simon Folkard Associates (research report 446, available from [www.hse.gov.uk](http://www.hse.gov.uk)). This considers issues such as cumulative fatigue, time of day, shift length, the effect of breaks and the recovery from a sequence of shifts. A review was also undertaken of the trends in risk associated with shift work. This resulted in the Fatigue and Risk Index (FRI) containing two separate indices; one relating to fatigue and the other relating to risk. The risk index is made up by multiplying factors relating to:
  - cumulative fatigue over successive shifts;
  - duty timing derived from time of day and length of shift; and
  - job type (how demanding) combined with the timing and duration of breaks.
- 6 The main difference between the two indices relates to the time of day: the peak in risk occurs close to midnight whereas the peak in fatigue occurs about five hours later.
- 7 Values of the FRI sufficiently high to cause concern are still under evaluation by HSE.



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