Responsibility for the regulation of health and safety on the railways was transferred from the Health and Safety Commission (HSC) and Health and Safety Executive (HSE) to the Office of Rail Regulation (ORR) on 1 April 2006.

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TRAIN COLLISION AT GREAT HECK NEAR SELBY, 28 FEBRUARY 2001

HSE interim report

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Summary

The HSE investigation into the collision at Great Heck near Selby on 28 February is continuing. However, the initiating cause of the collision was a Land Rover vehicle and trailer (itself carrying another vehicle) which left the carriageway of the M62 and continued along a steep road embankment and subsequently down a railway embankment onto the track and into the path of an express passenger train bound for London. The impact with the Land Rover caused the train to derail. The momentum of the train carried it forward, staying substantially in line and upright, until it hit a set of points which further deflected the train into the path of a north bound freight train which at that instant was travelling on the other track.

There is no evidence at this stage to suggest that there were any errors by the railway staff or faults with the signalling, rolling stock or track involved in this collision. Accordingly HSE has not found it necessary to take any immediate enforcement action.

The immediate cause of the collision is quite clear - the Land Rover fouled the track. The circumstances that led to the Land Rover ending up on the railway track and the subsequent catastrophic events were not easily foreseeable (the time span from the Land Rover coming onto the line and final impact between the two trains was around 60 seconds). HSE considers, on the basis of the evidence to date, that there was nothing that the railway industry could reasonably have done to prevent the collisions.

Investigations into matters relating to road design and construction, crash barrier protection, road conditions at the time and the state of the road vehicle and its driver are being taken forward by the relevant authorities.

Introduction

The Health and Safety Executive (HSE) is conducting its own investigation into the railway aspects of the collision at Great Heck near Selby on 28 February. In addition, the Deputy Prime Minister requested that HSE co-ordinate an interim report of the investigation and subsequently announced this to Parliament. In view of the relatively short period of time elapsed since the collision, this report only records a factual account of progress to date (15.00 on 5 March) and details of current lines of inquiry. It also contains information provided by the other agencies involved in investigating the circumstances surrounding the collision.

Sequence of events

On Wednesday 28 February 2001, the 04h45 Great North Eastern Railway (GNER) passenger train left Newcastle on route to London Kings Cross. At approximately 06h12, while it was still dark, a Land Rover pulling a trailer loaded with a Renault car left the west bound carriageway of the M62 motorway at Great Heck, between junctions 34 and 35. The Land Rover and trailer continued along the steep road embankment and subsequently down a railway embankment and came to rest, fouling the Up mainline, on the south side of the M62 over-rail bridge at a point located at about 170 miles from London up the East Coast Main line (ECML).

The road vehicle driver survived the incident and made a telephone call to the emergency services. As he was talking to the emergency services (at about 06h14), the south bound GNER express passenger train struck the Land Rover. The train, which was travelling at around the line speed of 125mph, was an Intercity 225 propelled by a Class 91 locomotive and consisted of a leading Driving Van Trailer (DVT), eight Mark IV passenger carriages, and a buffet car. The DVT became derailed at a point approximately 15 metres to the south of the impact and then travelled in a derailed condition, staying substantially in line and upright, for approximately 700 metres until it reached a set of points associated with sidings.

Evidence suggests that these points further deflected the DVT towards the opposite track. At this point, in the vicinity of road bridge ECM 2/7, it was hit by a northbound freight train. The freight train, operated by Freightliner, carrying over 1000 tonnes of coal and hauled by a Class 66 locomotive, was the 05h00 from Immingham to Ferrybridge which had departed early at approximately 04h17 and was around 20 minutes early at the point of collision. It was travelling close to the maximum permitted line speed for freight of 60 mph. As a result of the second impact, the GNER train became virtually completely derailed and descended the embankment into an adjacent field to the south side of overbridge ECM 2/7. The Class 66 locomotive of the Freightliner train also became derailed into the garden of a railside property north of that overbridge on the down side.

The line at the location of the collision is straight, without significant gradients, and has a maximum line speed of 125 mph for passenger trains. No speed restrictions were in place at the time of the collision. The lines are electrified by a 25KV overhead lines system and there are signals in the vicinity of the crash site though these would have played no part in the collision sequence. Whilst the coal train had in fact departed early, this early departure was permitted under the operating rules. A schematic diagram of the collision site is attached at Annex 2 as are photographs taken of the site.

Consequences

GNER have informed HSE that 147 passengers had seat reservations. As yet, the exact number of passengers on the train has not been confirmed. There were seven staff on the passenger train and two drivers on the coal train.

Latest information is that six passengers and four railway staff died but it is possible that these figures will need to be revised following clearance of the remaining wreckage. The fatalities included the Driver, Customer Operation Leader and Chef of the passenger train and one of the two freight train drivers. 76 people were taken to hospital from the site including 4 GNER staff.

HSE investigation of the collision

HSE is carrying out the investigation using its powers under the Health and Safety at Work etc Act 1974. The investigation team has drawn on a wide range of available HSE and external expertise including support from HSE's Health and Safety Laboratory (HSL).
The aim of the investigation is to:

- clarify what happened - and its relevance to health and safety legislation;
- consider any factors which may have contributed to causation or reduced effectiveness of mitigation of the event;
- learn any lessons for railway safety;
- learn any lessons for crashworthiness of the rolling stock;
- ensure that all this is done efficiently in relation to recovery of the site to enable disruption to the travelling public to be kept to a minimum.

This interim report sets out the initial findings from the first five days of HSE's investigation. As significant findings from HSE's investigation come to light, HSE will make them available as appropriate.

HSE investigation - progress to date

Immediately on being informed of the collision HMRI sent four inspectors to the site, the first one arriving at 09h24. They were subsequently backed up by a further four inspectors.

HMRI inspectors commenced their initial on-site investigation on arrival on 28 February. This investigation continued until dusk when work ceased due to poor light. The investigation resumed at first light on 1 March. The investigation is being co-ordinated by the various agencies concerned - the local constabulary (both South and North Yorkshire police), the British Transport Police (BTP), the Highways Agency, GNER, Freightliner and Railtrack. There is full and excellent co-operation with and between them.

HMRI is liaising with the Office of the Rail Regulator (ORR) and the Strategic Rail Authority (SRA) to ensure that they are kept informed of the matters which affect the national rail network.

HMRI has called upon HSE's Health and Safety Laboratory (HSL) who are working with GNER and HSBC (the vehicle owners) to create a photographic record of the site which will be used later in studying the crashworthiness of the train vehicles.

The data recorder of the Class 66 locomotive has been recovered and shows that the freight train was travelling at 56 mph on its approach to the site of the collision - well within the permitted line speed (60 mph) for this stretch of line - and that the brake was applied 7 seconds before impact. The speed on impact was 54.2 mph,.

In accordance with the requirements of Railway Standards and HSE policy, GNER is in the process of fitting data recorders to its fleet of Class 91 locomotives under a rolling programme of fitment, with one locomotive currently having been fitted. However this is not the locomotive involved in this incident.

Work is also in progress to identify the exact position of impact of the two trains but the evidence so far suggests that this took place south of overbridge ECM 2/7.

Two carriages and a number of coal wagons remain to be removed. HSE is monitoring site safety issues, including examination of the crane lift method statements.

Other agencies' investigations to date

In accordance with their various roles and responsibilities, the agencies listed in paragraph 12 are co-operating closely with each other in investigating the complex sequence of events which led to this catastrophic collision. The BTP are in the lead in the investigation of the road related aspects of these events, supported by the North Yorkshire police and are also investigating the events on Railtrack's infrastructure. The Highways Agency are involved as the government agency responsible for the design and maintenance of major highways. The results to date are summarised below.

Police investigations

Early findings are that the Land Rover left the M62 hard shoulder some distance (yet to be confirmed) before the crash barrier near the bridge. The BTP and North Yorkshire police are carrying out an investigation into the manner in which the vehicle was driven, the health and condition of the driver, the condition of the vehicle and the extent to which the weather may have been a contributory factor to the Land Rover leaving the M62 carriageway.

The police have examined the scene in detail to try to identify the reason for the vehicle leaving the road in the first instance. At this stage of their investigation they are unable to release any specific details of their findings.

Road design and construction including crash protection

The Highways Agency is investigating the road design and construction, including crash protection, with technical support from the Transport Research Laboratory. We are informed by the Highways Agency that this section of the M62 was built in 1974 and was based on the technical design standards published by the then Department of Transport. These required the provision of a safety barrier as a means of protecting motorists from collision with the bridge parapet itself while also acting as a barrier capable of containing light vehicles which leave the carriageway and which might otherwise encroach onto the railway below or any other hazard that exists.

In response to the Selby collision, the Highways Agency has commissioned the Transport Research Laboratory to collect data in order to prepare a factual report of road features and conditions which might have had a bearing on the incident. Additionally, in the circumstances of that particular site, the Transport Research Laboratory have been asked to give a view, if they feel able to do so, about the adequacy of the safety barrier.

The findings will be reported to the Highways Agency.

Road conditions at the time

This is under investigation by the North Yorkshire constabulary. The Highways Agency and the Transport Research Laboratory are providing supporting information for this inquiry. They are inquiring into the extent to which the weather may have been a contributory factor in the vehicle initially leaving the road.

Condition of the vehicle

The police are also leading the investigation into the condition of the vehicle. The Vehicle Inspectorate (a DETR Agency) has a role in inspecting vehicles involved in serious collisions, amongst other duties, and is involved at Great Heck.

The vehicle driver

BTP, supported by the North Yorkshire constabulary, is additionally investigating the actions of the driver of the Land Rover who was on his way to work in Wigan, carrying a vehicle for delivery to a friend.

HSE's findings to date

The immediate cause of the collisions was the obstruction of the Up line by the Land Rover vehicle which was pulling a trailer (itself carrying another vehicle). This resulted from it leaving the M62 carriageway some distance before the motorway barriers and continuing along the steep road

embankment and subsequently down a railway embankment before coming to rest fouling the up mainline.

The circumstances that led to the Land Rover ending up on the railway track, and the subsequent catastrophic events, were the result of a number of different events coinciding within a very short space of time (around 60 seconds from the time the Land Rover came onto the line and final impact between the two trains). HSE considers that the chain of events - a vehicle travelling so far off the highway, fouling the track just before the approach of an express train, closely followed by a freight train travelling in the opposite direction - was not easily foreseeable, and that there was nothing that the railway industry could reasonably have done to prevent the collisions.

Other findings to date are:

- HSE consider that the possibility of a chain of events of this nature coming together at a point in time is highly unlikely and unpredictable;
- there is no evidence of any operating errors by railway staff or of failure of railway infrastructure or systems;
- there is no evidence of a failure of rolling stock;
- the signalling system played no part whatsoever in the collision;
- on the crashworthiness of the carriages - many carriages stood up well in a crash involving a closing speed of around 140mph;
- the driver of the passenger train would have had no time to react on seeing the obstruction (the emergency stopping distance for an express passenger train travelling at 125mph is approximately 1760 metres). The estimated elapsed time between the emergency call from the Land Rover driver and the collision between the two trains was approximately 60 seconds;
- similarly the driver of the freight train would have had no time to take any action that would have reduced the consequences; and

HSE has concluded that no immediate enforcement action is needed in relation to the Railways.

Action notified by Railtrack, GNER and Freightliner

Railtrack has not imposed any operational restrictions on specific rolling stock. GNER and Freightliner have imposed no restrictions on their services as a result of the collision beyond what is necessary to deal with the consequences of the ECM line being blocked at this location.

Restoration of site

HSE expects to have completed its preliminary examination within the next day or so. The investigation will continue at other locations when the tracks have been cleared.

The lifting of the carriages began at 15.00 on Friday 2 March and is expected to be completed today. HSE do not see any regulatory reason why Railtrack could not start track repairs once the site has been cleared. It will only be possible for Railtrack to complete its estimate of the level of damage and the time necessary for repairs once the carriages have been removed.

Vehicle/train issues

Obstruction of railway track by road vehicles leading to collision occurs 2-3 times a year on average, whether through misadventure or (more often) through vandalism. The catastrophic consequences of this road traffic incident - which result from this unusual series of events - are wholly exceptional.

Annex 1 table 1 shows the incidents of road vehicles obstructing the line (not at a level crossing) reported to HSE since 1998\99 and table 2 shows those incidents in which a train subsequently struck the vehicle.

Since 1998\99, there have been 31 incidents involving motorists losing control of their vehicles and landing on the railway and obstructing the line. There have been a further four incidents involving vehicles coming from road over rail bridges. In this period, 4 vehicles have been struck by trains after motorists have lost control and a further 6 trains have struck vehicles obstructing the line as a result of vandalism or criminal intent. These figures include the recent incident at Great Heck.

Embankment/bridges

The immediate cause of this collision was a road traffic incident that resulted in horrific consequences. As mentioned above, the police are investigating the cause of the vehicle leaving the road.

Railtrack PLC has responsibility for providing safe passage for trains and for making an assessment of risk. In this case, the road vehicle travelled a considerable distance on the road embankment before crossing on to the railway embankment.

The Highways Agency has responsibility in relation to the construction and maintenance of roads and road bridges.

Rail vehicle crashworthiness

The GNER carriages are damaged to varying degrees. Some suffered extensive damage including extreme penetration of the passenger compartments. Examination of vehicles, particularly the DVT vehicle leading the passenger train, will continue on site to the extent necessary and,

subsequently, after vehicles and debris have been removed off-site. Detailed investigation will, however, take some time to complete after site clearance.

The express passenger train consisted of Mark IV coaches which were built in the late 1980s. They are 23.4 metres long and constructed of steel in the form of a monocoque tube. This form of integral body construction results in the body itself becoming the load bearing structure, rather than a more rigid underframe to which the body is fabricated (a feature of earlier designs e.g. Mark 1 vehicles). The coaches are mounted on bogies of welded 'H' frame construction, with primary suspension of rubber mounted coil spring and with air-bag secondary suspension. The Mark IV's are equipped with 'Tightlock' couplers, a design which contributes to vehicles remaining coupled, thus upright and generally in line, when derailed.

The monocoque design is considered a significant benefit regarding the survivability of passengers in collisions and was a development of earlier similar designs, the first in Britain being the Mark 2 design built from the 1960s. The bodies thus remain relatively intact after a collision, though later designs incorporate a greater ability to absorb energy, typically at vehicle ends (which are normally relatively free of passengers). This should result in less severe injuries to passengers through being thrown about less violently in given collision scenarios.

However, at collision speeds in excess of around 60 mph, it is likely that significant structural damage will occur. The amount of damage will also depend on the nature of a collision, that is whether it is head-on or of a 'side-swiping' type. The latter scenario has the potential for significant damage to occur at lower speeds, particularly if the bodyside becomes penetrated. It is estimated that the combined speed involved in this collision was approximately 140 mph which greatly exceeds the design base figure. Early indications are that, generally, the carriages stood up to the collision remarkably well as evidenced by the number of passengers who survived : however, the DVT leading the passenger train was extensively damaged. A detailed analysis of the course of the collision will enable a proper assessment of how well the Mark IV coaches involved performed and consider the configuration of the trains.

There will also be a need to correlate passenger injuries with their location on the train to discover what can be learned about design of vehicle interiors and their performance in incidents like this.

Railway emergency arrangements

As part of the follow-up to the collision, the experiences of the passengers involved in the incident will be taken into account in the investigation of the effectiveness of emergency arrangements on the train itself.

As is normal after such incidents, the agencies and operators involved at the scene will undertake a de-briefing exercise to review what was done and to

what effect, and discover what can be learned to increase preparedness for any similar incident in the future.

Conclusions

The immediate cause of the train collision was the Land Rover fouling the track in front of the passenger express train.

The chain of events - a vehicle travelling so far off the highway, fouling the track just before the approach of an express train, closely followed by a freight train travelling in the opposite direction, and causing catastrophic damage - all occurring within approximately 60 seconds was not easily foreseeable.

HSE considers, on the basis of the evidence to date, that there was nothing that the railway industry could reasonably have done to prevent the collisions.

There is no evidence at this stage to suggest that there were any errors by the railway staff or faults with the signalling, rolling stock or track involved in this collision. Accordingly HSE has not found it necessary to take any immediate enforcement action.

Future actions in the investigations

HSE's plans for further action are as follows:

- HMRI will continue to investigate in conjunction and co-operation with the other agencies and assist as necessary in the detailed search of the scene;
- further examination of train and track will be carried out after the carriages are lifted from the site;
- HMRI will expect railway industry dutyholders to review their risk assessments in the light of this incident;
- HSE anticipates that its on-site inspection work will be completed by midweek. However, completion of the work will be determined by the need for BTP to complete the search, and recovery, of bodies and personal possessions and subject to Railtrack's ability to facilitate these searches.

The Highways Agency and police investigations are also continuing.

Annex 1

Table 1 Incidents of road vehicles obstructing the line not at a level crossing

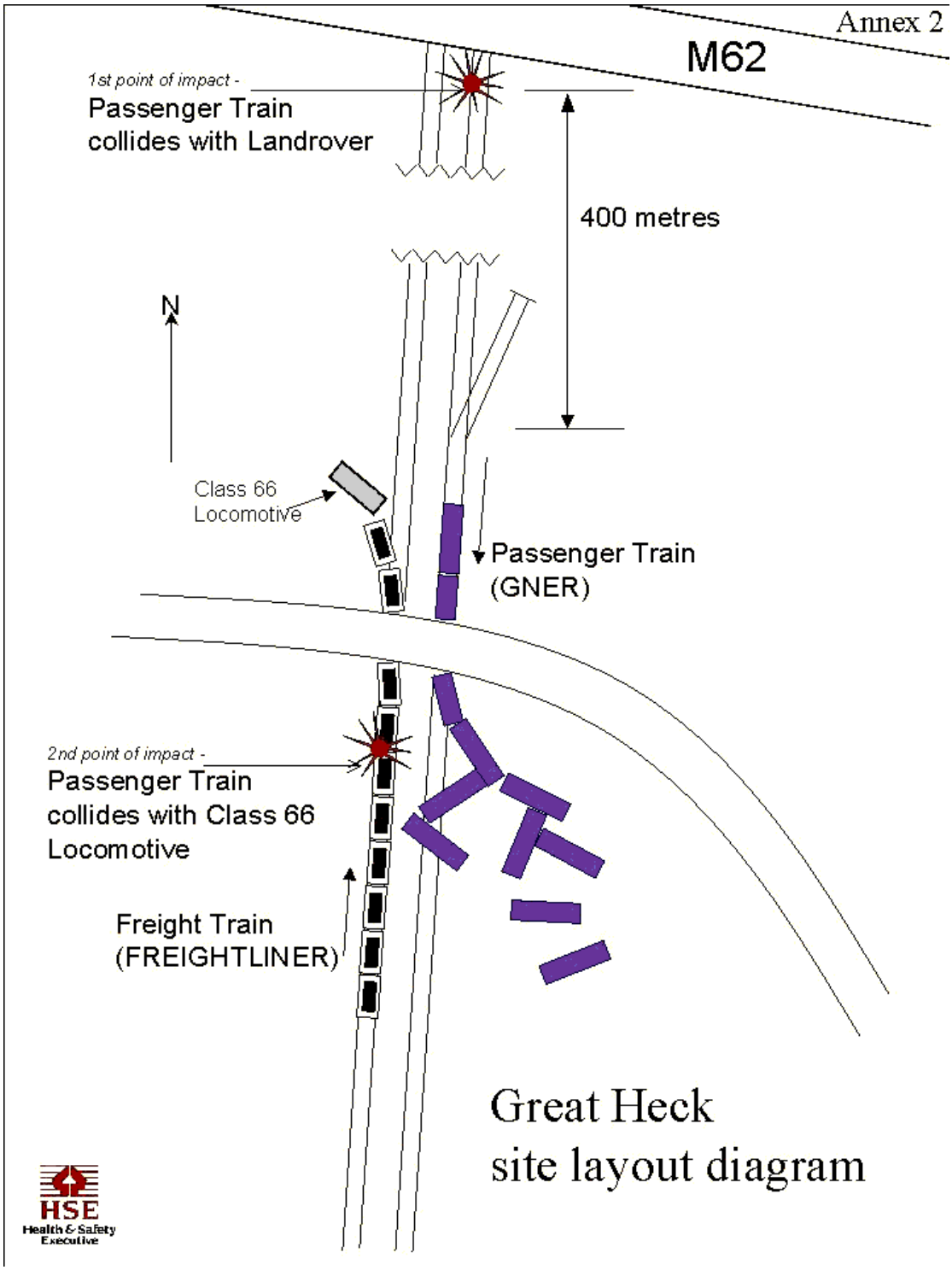
	Motorist losing control of vehicle	Loss of control from road over rail bridge	Criminal intent/ vandalism	Other	Total
1998/99	12	0	14	5	31
1999/00	8	1	9	5	23
2000/01	11	3	7	4	25
Total	**31**	**4**	**30**	**14**	**79**

Table 2 Incidents of road vehicles obstructing the line not at a level crossing and struck by a train (train running into obstruction)

	Motorist losing control of vehicle	Loss of control from road over rail bridge	Criminal intent/ vandalism	Other	Total
1998/99	1	0	2	0	3
1999/00	2	0	3*	0	5
2000/01	**1	0	1	0	2
Total	**4**	0	6	**0**	**10**

* Includes passenger train derailment 14 09 1999 Aberdeen
** 2000/01 figures include the recent incident at Great Heck

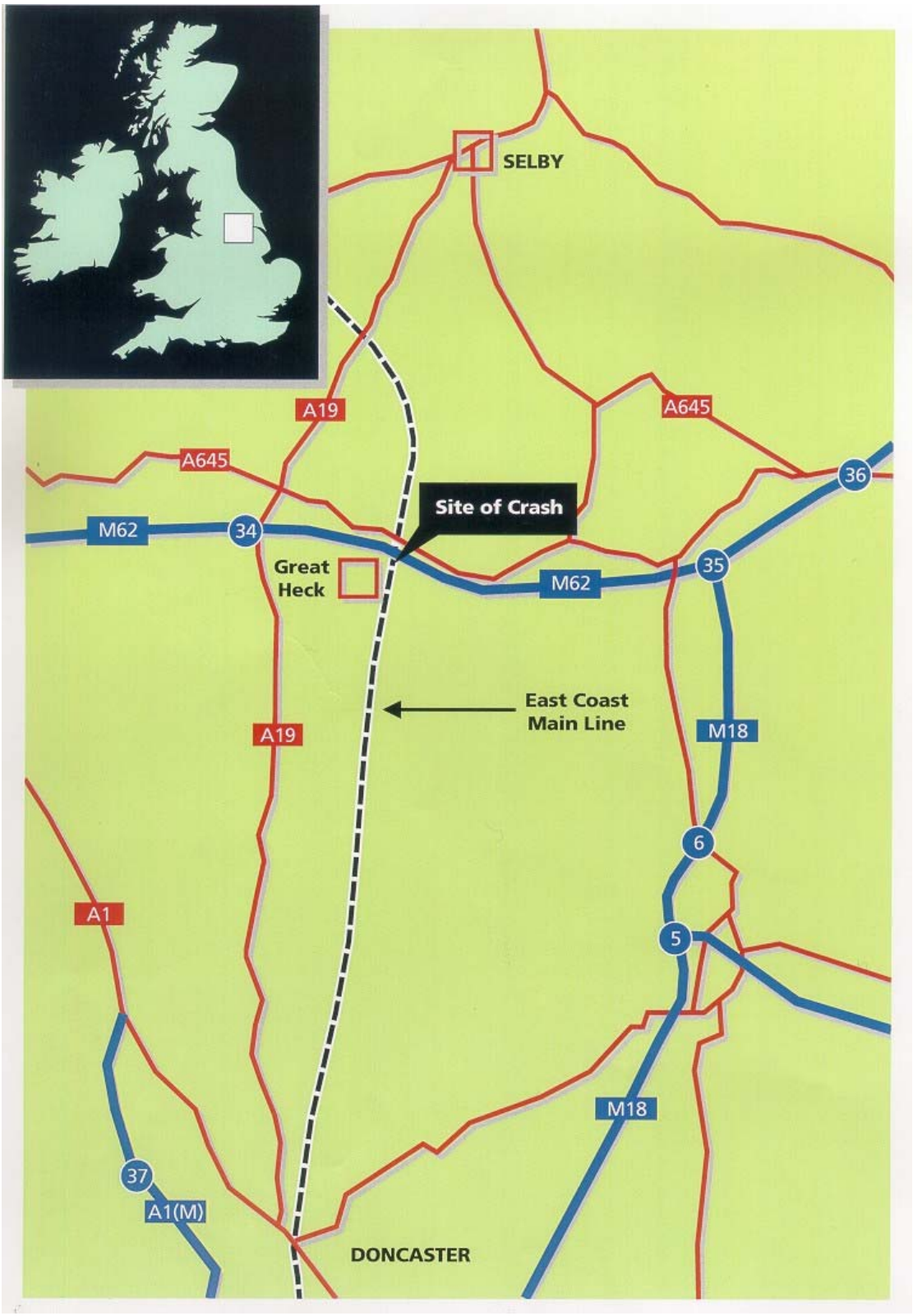
Annex 2


Annex 2
M62
1st point of impact -
Passenger Train
collides with Landrover
400 metres
N
Class 66
Locomotive
Passenger Train
(GNER)
2nd point of impact -
Passenger Train
collides with Class 66
Locomotive
Freight Train
(FREIGHTLINER)
Great Heck
site layout diagram
HSE
Health & Safety
Executive

Photos


Freightliner

Areaplan


SELBY
A19
A645
A645
M62
34
Site of Crash
Great
Heck
M62
36
35
East Coast
Main Line
A19
M18
6
A1
5
M18
37
A1(M)
DONCASTER