

DEPARTMENT OF TRANSPORT

RAILWAY ACCIDENT

Report on the Collision that
occurred on 19th July 1976
between Merkland Street and
Govan Cross

ON THE
UNDERGROUND RAILWAY
OF THE
GREATER GLASGOW PASSENGER
TRANSPORT EXECUTIVE

LONDON: HER MAJESTY'S STATIONERY OFFICE

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RAILWAY INSPECTORATE,
DEPARTMENT OF TRANSPORT,
2 MARSHAM STREET,
LONDON, SW1.
18th April 1977.

SIR,

I have the honour to report for the information of the Secretary of State, in accordance with the Order dated 23rd July 1976, the results of my Inquiry into the collision that occurred at about 12.08 on Monday 19th July 1976 between a passenger train and an empty train between Merkland Street and Govan Cross Stations on the Underground Railway of the Greater Glasgow Passenger Transport Executive.

At approximately 11.48 Train Route No. 12 developed a fault whilst ascending the 1 in 20 gradient to Govan Cross and came to rest near the mid section signal. The Conductor went forward to Govan Cross to summon assistance and he also telephoned the station master at Merkland Street Station and instructed him to hold the following train, Route No. 13, at that station.

Workshop staff quickly arrived on the scene. It was decided to run the train back down the 1 in 20 gradient to the lowest point of the line between Merkland Street and Govan Cross Stations and then to attempt to climb up to Govan Cross.

In the meantime, the passengers were detrained from the following train, Route No. 13, at Merkland Street Station and, on the instructions of the Chief Line Inspector who was visiting the station at the time, the train was prepared for pushing Train Route No. 12 up the gradient into Govan Cross Station. The Inspector then drove the train without authority past the Starting Signal at Danger, into the section towards Govan Cross, travelling at a slow speed down the steep gradients to the lowest point on the line between the two stations. As Train Route No. 13 rounded a curve, Train Route No. 12 was seen to be reversing towards it. Despite an emergency application of the brakes of Train Route No. 13 by the Inspector, the two trains collided, being telescoped by about four feet: there was no derailment.

The emergency services were promptly alerted and were quickly on the scene. Five of the passengers in Train Route No. 12 were taken to hospital but were released the same day. Four of the staff of the two trains also suffered minor injuries, one of whom was detained in hospital overnight.

DESCRIPTION

The Line

1. The Glasgow Underground consists of Inner and Outer Circles of railway, some $6\frac{1}{2}$ miles in circumference, of four foot gauge in separate tunnels. The lines are electrified on the third rail system at 600 volts DC. The maximum permitted speed of the trains is 20 mile/h. The 15 stations on the line are as shown on the Location Diagram at the end of the Report. Each station has a 10 ft wide island platform approached down steps from street level at one end, except Kelvinbridge where the platform is 15 ft wide. At the other end of the platform there is a signalling cabin operated by the station master. Govan Cross Station is 888 yards south of Merkland Street Station and the line passes underneath the River Clyde approximately in mid section.

2. The Inner Circle Line on leaving Merkland Street falls sharply at approximately 1 in 20; the line is straight until it approaches the north bank of the Clyde where there is a left-hand bend of 470 yards radius for a distance of 443 yards. The line then straightens as it proceeds up the top half of the rising gradient of about 1 in 20 into Govan Cross Station. There is a pump room in between the Inner and Outer Circle Tunnels at the lowest point under the Clyde with access from both tunnels. The pump room door in each tunnel is illuminated by three bare white lights. The point of collision was some 475 yards from the Merkland Street Station headwall and about 11 yards past the pump room door.

3. A plan showing the location of the tunnels under the Clyde, the place where the two trains came to rest, and the estimated positions of the trains when the crew of Train Route No. 13 first sighted the rear lamp of Train Route No. 12 are shown at Figure No. I at the end of this Report, while a vertical elevation of the tunnel, showing the gradients in the area of the collision and both approaches to it, together with positions of the trains and their sighting positions, is given at Figure No. II. A further plan showing the Merkland Street-Govan Cross section together with the location of the collision is given at Figure No. III.

Signalling and Telecommunications

4. Automatic colour-light signalling is installed throughout the system. Station signals are mounted on the right-hand side of the tunnels just beyond the ends of the platforms. That on the Inner Circle at Merkland Street is a three-aspect signal with Green over Yellow over Red aspects. A mid section two-aspect signal is also provided 78 yards short of Govan Cross Station. The signalling is controlled by current taken through the two 'T irons' used for train lighting, the upper 'iron' being energised at 250 volt 50 hertz from station domestic supplies and the lower being neutral. The depression of a treadle on one rail a few feet in advance of each signal replaces that signal to Danger. At least a full overlap ahead of each treadle the 'T irons' are sectioned for a length of approximately 90 ft. When a train takes lighting current from this 'Clearing Section' the signal at the station two in rear will clear to a green aspect.

5. There is an electrically operated train stop on the right hand side of the line at each signal. It is held in the raised position by a spring and is normally lowered only when the signal displays a Yellow or Green aspect. In addition, however, the station master has a sealed push button on the indicator panel in the station master's cabin which enables him to lower the train stop if it is necessary for a train to pass the signal at Danger. The signal next in rear will remain at Red until the train has passed the clearance section beyond the train stop being lowered.

6. Tunnel wires for communication are provided between stations on the right hand tunnel wall. Each train is equipped with an emery board to clean the wires, and a short circuiting bar, the application of which to the wires cuts off the electric traction supply and also causes a klaxon horn to sound at the station in rear to warn the station master that a train crew wishes to communicate with him. The train crew can connect a portable telephone to the two wires and can then talk to the station master who uses a plug-in instrument. It is not possible for the train crew to ring the station master using the telephone however and thus it is most important that the latter makes every effort to make contact with the former on hearing the klaxon.

The Trains

7. All trains on the Glasgow Underground consist of a power car leading and one trailer car vestibuled together. Each train has four sliding doors or folding gates on its right-hand (platform) side. The conductor can open and close all four doors or gates on the train. With the doors open, the driver's door buttons are inhibited, while with the three non-cab doors closed the driver can open and close the cab door, but with the cab door open the conductor's door control buttons are inhibited. The driving controls are on the left side of the cab which extends the full width of the car. The cab also has a transverse sliding door at the back to prevent passengers obtaining access to it when the train is between stations. The side doors are interlocked with the driver's controller, but there is no bell communication between the conductor and the driver. The trains are 81½ ft long overall.

8. Trains pick up lighting current from the two 'T iron' conductors mounted on the left hand tunnel wall. Each coach carries lighting skids on its left side and the ones at the rear of the trailer car are normally used. Each car also has emergency lights in series circuit fed from the 600 volt DC traction supply. There are three tail lights at the rear of the train. Two are built in just above cantrail level, one on either side of the rear door, that on the left being powered from the 'T iron' supply and that on the right from the traction supply. In addition there is a portable battery-fed lamp at the lower right-hand side.

9. All trains are fitted with the Westinghouse two pipe continuous automatic air brake. In addition to the driver's application valve, which is located adjacent to the other controls, there is a 'guard's' emergency brake cock at the rear end of the power car for the use of the conductor and another valve at the rear end of the trailer car.

10. The trains involved in the collision were Route No. 12, composed of Motor Car No. 55 leading and Trailer Car No. 42 in rear, and Route No. 13, composed of Motor Car No. 2 leading and Trailer Car No. 10 in rear. Each motor car is powered by four 600 volt DC series wound, nose suspended, axle hung, electric motors, each motor developing approximately 60 b.h.p. The motors are permanently coupled in parallel pairs, each pair working first in series and then in parallel.

Damage to Trains

11. Motor Car No. 55 did not sustain any damage, but Trailer Car No. 42 was extensively damaged. The rear-end body framing was completely smashed, as were the 'T iron' skids and mountings. The rear 5 ft of the underframe crushed and dropped some 7½ ins. The rear vestibule bulkhead and the sliding doors were seriously damaged and the hand brake wheel smashed. The body sides 'bellied' at the rear of the trailer and the seat risers were damaged. The damage to Train Route No. 13 was confined to Motor Car No. 2 where the front body framing, severed from the roof, was displaced backwards and extensively damaged. The bulkhead between the cab and the passenger compartment was displaced backwards some 7 ins. while the half doors at the front of the car were smashed: the front buffer beam was also distorted. Other damage included the smashing of the 'T iron' skids, and the displacement of the compressor switch box.

RULES AND REGULATIONS

12. The following Greater Glasgow Passenger Transport Executive (formerly Glasgow Corporation Transport) Underground Section Rules and Regulations, 1961, are relevant to this collision:—

83. When the normal working of the line is disturbed, because of a disabled train, a signalling defect, men working in tunnel, or for any other reason the necessary movement of trains will be authorised by the issue of Caution Orders by the Station Master on duty at the place where the delay occurs.

84. Station Masters are responsible for the issue of Caution Orders in the circumstances calling for their use. It will be their duty to see that Caution Orders are completed in the manner prescribed, and that a legible duplicate is made for reference purposes.

86. When trains are sent forward by a Station Master under a Caution Order with the station starting signal at Danger, the seal on the trainstop release should be broken and the trip arm lowered. Also, on occasions when two trains coupled together have to pass through a station, the same procedure must be observed. In cases of this kind the trip arm must not be lowered unless the section ahead is known to be clear, or when a propelling train is being sent forward.

Occurrences of this kind must be reported immediately to Electrical Workshops (397) so that the seal may be replaced at the earliest possible moment.

139. A Driver shall not allow any unauthorised person to drive for him, nor shall he permit anyone other than an authorised person to interfere with the train or its equipment.

165. Except on account of signals or in an emergency, stopping on a heavy gradient should be avoided if at all possible. When a stop is unavoidable, the Driver must remain constantly on the alert to check instantly any tendency to run back. If, for any reason, the train has to run back, the Station Master at the station in the rear must first be notified. Any such run-back must not proceed beyond the point when the Driver's cabin is at the sump light at the bottom of the gradient.

179. If the signal controlling the entrance to the section ahead is maintained at Danger by a defect of any kind, Drivers must not proceed until they have received a Caution Order from the Station Master authorising them to go forward. The Station Master will then lower the trainstop trip arm by means of a sealed plunger on indicator panel. Should the Station Master be unable to do so, owing to failure of power supply or defective trainstop, the Driver may be authorised to isolate the trip cock. An interval of five minutes must be allowed to elapse from the time of departure of previous train before acting on this instruction. When proceeding on the authorisation of a Caution Order, the conditions attached thereto must be carefully observed. (see Rule 86).

199. If assistance required to be given to a train which has broken down on a heavy rising gradient, the disabled train shall remain on the face of the hill until the following train has been brought forward to its assistance. On no account should the disabled train be allowed to run back to the level.

On gradients where, for purposes of acceleration, it may be necessary to run back, this should only be done after the trains have been coupled, and then never further than the point where the driving end of the disabled train is at the bottom of the gradient.

200. When a Driver receives instructions to go forward to assist a disabled train, the passengers on board should be asked to leave. He must then proceed cautiously, keeping a sharp look-out and prepared to stop at a moment's notice.

Before moving forward for coupling up, he must bring his train to a standstill not less than 2 ft from the rear of the disabled train, and in the process of closing up the utmost care must be taken to avoid undue impact between the vehicles.

On no account should the trip cock on the propelling train be isolated or the lighting skids on either train be removed from the tee-irons.

On heavy gradients, coupled trains may be allowed to run back until the driving end of the disabled train is at the foot of the gradient, so that the necessary starting acceleration is obtained. To avoid derailment of the skids, the run-back speed must not be allowed to exceed 5 miles per hour, and it should be remembered that trains will not run back by gravity if the reversers are set in the forward direction. At all times the reversers must be set in the position corresponding to the direction of movement, otherwise severe damage will ensue.

Before commencing a run-back, Driver should ensure that the Conductor of the propelling train is stationed at the rear of his trailer coach.

215. Emergency Fitters and Electricians, having been called to a defective train, may take over control of train if they deem it necessary, whether passengers are still on train or not. They will then be responsible for giving all necessary orders for any movement of the train to the driver and conductor and for ensuring that these orders are carried out safely.

244. If a train is brought to a stop on a rising gradient, the Conductor shall stand by the hand brake on the rear coach, and be prepared to apply same immediately any rearward movement is noticed.

EVIDENCE

13. *Driver C. Whittingham*, the Driver of Train Route No. 12 on the day of the accident, had been a Driver on the Glasgow Underground for some 19 years. He said that on leaving Merkland Street he coasted down the falling gradient to the lowest point of the railway under the River Clyde and then, having applied power to climb the rising gradient up to Govan Cross, a fault developed in one of the motors which caused the circuit breaker at Merkland Street to open and the train came to a stand about three train lengths from Govan Cross Station. When power was restored, Whittingham found that the motored wheels spun and he was unable to start the train. He sent his conductor forward to Govan Cross to request the Station Master to summon assistance.

14. In due course *Shift Fitter J. Munro* and two electricians arrived at Govan Cross and made their way down the tunnel to the disabled train. Whittingham said that the electricians examined the traction motors and that Munro took over the controls of the train from him. I questioned Whittingham as to why he handed over the driving of his train to Munro and whether he had been certain that the latter was qualified to drive passenger trains. As far as he was aware, Munro was qualified and he saw nothing unusual in handing over the driving of the train. From further questioning it became clear that the normal procedure during the

breakdown of trains was for the Shift Fitter or another member of the Car Sheds' staff to take over the controls from the rostered Driver of the train and to drive it until such time as the train was repaired or reached the Car Sheds when the necessary action could be taken to repair it.

15. Whittingham said that Munro attempted to move the train up the gradient to Govan Cross, but again the wheels spun so that Munro and the electricians decided to run the train back to the bottom of the incline, the former in charge of the controls throughout the movement. While the train was being reversed Whittingham stood by Munro in the driver's cab but no longer considered he had any responsibility for the operation of the train. In particular, he did not consider that it was his responsibility to telephone the Station Master at Merkland Street, in accordance with Rule 165, and inform him that the train was about to be reversed to the bottom of the gradient. Nor did he consider it was his duty to remind Munro of this requirement when it was clear that the latter was not going to carry it out.

16. Whittingham said that his conductor was standing with him in the driver's cab during the reversal down to the sump. He was aware that, in accordance with Rule 244, the conductor is required to stand by the hand brake on the rear coach if a train comes to a stand on a rising grade to prevent any rearward movement of the train, but failed to appreciate that the conductor's presence at the rear of the train was even more vital during the reversing movement, both to control the train when necessary and to act as a lookout man. On further questioning, Whittingham admitted that he had never positioned his conductor at the rear end of the trailer car when carrying out similar reversing movements in the past.

17. The reversing movement proceeded at first without incident, until suddenly Whittingham became aware of an impact at the rear of the train but he did not immediately appreciate that a collision had occurred. He subsequently helped with the passengers and then tried to free the driver of the train in the rear who was trapped in his cab.

18. The Conductor of Train Route No. 12 was *Conductor L. Nicol*. He confirmed the evidence of his Driver as to the initial failure some three train lengths from Govan Cross Station and his walk up the tunnel to get the station master to call out the breakdown gang from the Car Sheds. He then walked back to the train as "the passengers were a bit shaky". Soon after the breakdown gang arrived he was instructed to arrange for all the passengers to move into the rear coach and to close the doors between the two coaches. He then returned to the front coach and sat down on a seat near the entrance to the driver's cab.

19. I pointed out to Nicol that by positioning himself at the front of the power car no-one was in the rear vestibule of the trailer car manning the hand brake and keeping a lookout during the propelling movement down to the sump. Nicol agreed that this was the case, but said "As far as I knew, once the workshop staff took over the train, I took orders from them. I did what I was told to do." It is clear from his whole attitude that he firmly believed that in these circumstances the workshop staff were in charge of the train and that the normal operating rules did not apply.

20. *Inspector J. Cullen* had worked on the Glasgow Underground for about five years prior to the accident, the last three of which had been in the rank of line inspector. On the morning of the accident he had arrived at Govan Cross at 11.52 and had gone down onto the platform where he was informed by the station master that Train Route No. 12 was immobilised in the tunnel. Cullen said that he walked down the tunnel and boarded the train, asking the driver what the trouble was. The driver explained that the circuit breaker had opened and that the train had come to a halt on the steeply rising grade. Power had been restored but he had been unable to move the train due to slipping wheels and so he had requested the assistance of the breakdown gang from the Car Sheds.

21. Cullen then saw the fitters approaching the train; they boarded it and started to check the electric motors as soon as the passengers had been transferred to the rear coach. Cullen said that one motor was found to be defective and that Fitter Munro took over the controls of the train to reverse it down the gradient. He told Munro that they should disconnect the 'T Irons', but the latter said that this was unnecessary as they would only be travelling very slowly. Cullen stood in the driver's cab during the reversing movement and, when the collision occurred, he was thrown back against the partition wall of the cab. He immediately made his way to the rear of the train and, finding all the lights in the coaches were extinguished, he shouted for a light to be brought. He then returned to the front of the train, told the fitters that he was returning to Govan Cross Station to obtain help and instructed Nicol to obtain the names and addresses of any injured passengers. On arrival at the station he informed the Duty Officer by telephone of the accident and also requested further assistance from the electrical workshops. He took no action to summon the emergency services.

22. I questioned Cullen at some length as to what authority Munro had to take over the controls of the train from the official driver and whether he, as an inspector in the Operating Department, saw nothing odd in a member of the workshop staff taking over as the driver of a passenger train. Cullen stated "No, nothing at all. He can take over the controls if the train is in difficulty. We just follow their instructions; they are in charge." He presumed that Munro had been passed to drive passenger trains, but was not certain.

23. After quoting Rule 165, I asked Cullen whether the station master at Merkland Street was informed of the intended reversing movement and his permission obtained before the movement commenced. To the best of his knowledge no permission was obtained and he was quite certain that no use was made of the tunnel telephone to contact the station master. Cullen agreed that had one of his drivers been at the controls he would have insisted that he obeyed Rule 165 and obtained permission before reversing down the slope, but he considered that, even though he was a line inspector in the Operating Department, it was in no way his duty to question any irregular action on the part of Munro when in control of the train.

24. Cullen was also asked whether he was aware of where the conductor was during the reversing movement. He said that he assumed that he was in the rear coach, but he had not checked to ensure that this was so, even though he knew that a requirement to this effect was laid down in the Rules (Rule 200).

25. *Relief Station Master J. Aitkin* was on duty at Govan Cross; he had been forty one years on the railway, of which some twenty years had been as a station master. On the morning of the accident he saw Train Route No. 12 come to a stand some 40 yards inside the tunnel. After a short while it started very slowly and it appeared that the wheels were slipping, as it again came to a stand with smoke being given off from underneath the motor coach. Aitkin said he telephoned to the Car Sheds and informed Fitter Munro that the train had stopped on the rising gradient from Merkland Street. The conductor then arrived from the train and stated that although traction had been restored the driver was unable to move the train, and Aitkin passed this information on to Munro. Shortly afterwards Munro, together with two electricians, arrived at the station and proceeded down the tunnel to the train. They made some remarks to Aitkin as they passed, but he could not recall what they were.

26. Aitkin said that he then telephoned the station master at Merkland Street and informed him that the fitters had entered the tunnel at Govan Cross to go to the assistance of Train Route No. 12 and that Train Route No. 13 was to be held at Merkland Street. Aitkin said that he received a definite assurance from the station master that the train would be held at Merkland Street: in his view there was no possibility of any misunderstanding.

27. Aitkin said that in the course of his twenty years as a station master he had been in charge of both Govan Cross and Merkland Street and I questioned him at some length about his experience at previous breakdowns between these two stations. He said that the most normal procedure when an Inner Circle train broke down on the rising gradient was for the driver to open the circuit breaker at Merkland Street and to inform the station master there that he required the assistance of a train to push him out. The assisting train always remained at Merkland Street until the fitters and electricians arrived from the Car Sheds, whereupon it then entered the section, was connected to the rear of the failed train, and pushed it out.

28. Aitkin agreed that he had been on duty on occasions when the failed Inner Circle train had not required to be pushed out of the section. In these cases the train had reversed to the bottom of the incline and had then managed to ascend the gradient successfully. On no occasion when this had occurred while he was on duty at Merkland Street had he been informed that the train was going to reverse, nor did he seem to think that there was any necessity for him to be informed, despite the clear instruction in Rule 165. It was clear from Aitkin's evidence that the rule was largely, if not totally, disregarded by both operating and workshop staff when breakdowns occurred between Merkland Street and Govan Cross.

29. *Shift Fitter J. Munro* told me that he had been working on the Glasgow Underground as a fitter for twenty-eight years and that he had been a shift fitter in the breakdown gang for eighteen years. On the morning of the accident he had been informed that Train Route No. 12 had broken down in the Merkland Street-Govan Cross section and so he collected Electricians J. Campbell and A. Irvine and they walked through the direct tunnel from the Car Sheds to Govan Cross. Munro said that on arriving there he asked the station master if there was any train coming on the Inner Circle and was told that Train Route No. 13 was being held at Merkland Street. He then proceeded with the electricians down to Train Route No. 12 where, on examination, the electricians discovered that No. 4 motor was defective. After the brushes had been removed from the defective motor, Munro said that the electricians asked him to reverse the train to the sump at the bottom of the incline. He reversed the train downhill slowly, keeping the brakes partially applied so that he had full control of the train.

30. Munro said that they had almost reached the sump when there was a severe bump and they knew that they had collided with another train. He walked through to the rear of the train and found that there was considerable damage. Leaving one electrician to reassure the passengers, he walked up to Govan Cross to report the accident to Mr. R. Howie, the Underground Engineering Superintendent, but was unable to make contact with him by telephone, so he walked to the Car Sheds where he reported to him personally. He then returned to the scene of the accident and assisted, together with members of the emergency services, in bringing the passengers and train crews up to Govan Cross.

31. On being asked why he had taken over driving the train from Driver Whittingham, Munro said that this was the normal procedure and that the breakdown gang always took over the controls of a train in such circumstances. Munro considered he was qualified to drive a passenger train but admitted that he had never been passed out as a driver by the traffic department. He was not familiar with Rule 215 and, on reminding him that this specifically stated that "Emergency fitters and electricians . . . will then be responsible for giving all necessary orders for any movement of the train to the driver and conductor . . .", he reiterated that the procedure had always been for him to drive the train if there was an electrical fault and for one of the electricians to drive if there was a mechanical fault. This practice, according to Munro, had been going on throughout the whole time that he had been in the breakdown gang.

32. I also asked Munro whether he informed the Merkland Street station master before starting to reverse the train down to the sump and was told that the normal procedure at a breakdown of this nature was never to inform the station master at the station in front or in rear. Munro admitted that he knew Rule 165 and there were various ways he could have informed the station master at Merkland Street that he was going to reverse Train Route No. 12 down to the sump, but it was clear that, despite the rule, it was the practice of the members of the breakdown gang to reverse trains towards the station in rear without notifying either station master.

33. Munro was not sure where the conductor was during the reversing movement, but thought he was in the centre of the train. I pointed out that Rule 244 clearly stated that when the train stopped on a rising gradient the conductor must at once go to the hand brake in the rear coach and that it was obviously even more important for him to be at the rear of the train during a reversing movement, even if the visibility from the rear was not good. Munro agreed that it might possibly have helped, but it was clear he did not consider it was part of his duties when handling the train to ensure that the conductor was carrying out his duties correctly.

34. Munro stated that during the few years prior to the accident he had reversed passenger trains down to the sump between Merkland Street and Govan Cross on dozens of occasions in a similar manner to that adopted at the time of the accident. It was very rarely that a failed train had to be propelled out of the section, probably not more than once in ten stoppages.

35. Finally, Munro agreed that he carried out the training of the traffic staff on how to deal with breakdowns, including the use of an assisting train to push out one that had failed. He admitted that on these occasions the assisting train was driven by its regular driver and that he stood beside him to observe his actions and, if satisfactory, to pass him out.

36. *Shift Electrician J. Campbell* had also been employed on the Glasgow Underground for twenty eight years and for no less than twenty six years had been working with the breakdown gang. He confirmed the evidence of Munro concerning the events leading up to the accident and was also able to elaborate certain aspects. He said that on arrival at Govan Cross he had spoken to Station Master Aitkin who had told him that he had instructed the station master at Merkland Street to hold Train Route No. 13 at that station. On arrival at Train Route No. 12 he found out from the driver that when the circuit breaker at Merkland Street had opened he had noted smoke coming from under the front coach and, in order to examine the traction motors, he asked the conductor to transfer all the passengers to the rear coach. He found No. 4 motor to be defective, cut it out of the circuit and Munro then started to reverse the train. As the train approached the sump it stopped suddenly with a severe bump. The 'T iron' lights went out in both coaches, as did the emergency lights in the rear coach powered by the traction current.

37. Campbell said that he walked through to the rear of the train with Munro and discovered that they had collided with Train Route No. 13. The latter train was manned by a driver, a conductor, and Line Inspector L. Connolly, both the driver and conductor being injured. He then accompanied Munro to Govan Cross to summon the emergency services, to obtain the assistance of the signal electrician and to collect as many 'T iron' hand lamps as possible to provide temporary lighting at the scene of the accident. He returned to the train with two ambulance men who rendered first aid to those passengers and staff who needed it prior to their evacuation to Govan Cross station.

38. Campbell, like Munro, stated that he had attended very many similar breakdowns between Merkland Street and Govan Cross, most of which had involved the reversal of the failed train to the bottom of the incline. The driver on some occasions had been an electrician, on others a fitter, and on a few others the normal driver of the train. In Campbell's opinion the reason for the electrician or fitter driving was that they were more experienced than the driver of a normal service train, particularly when the electric motors or the power car as a whole needed very careful handling. Campbell was unable to tell me on what authority Munro had taken over the train from the official driver, but confirmed that this had always been the procedure in the past. The only times that he could recall the train driver remaining at the controls was when the breakdown team had been split up due to several emergencies having occurred simultaneously and thus only one fitter or electrician had been available to attend to the train.

39. Despite Rule 215, Campbell considered that the fitters and electricians were fully entitled to take over the controls of a disabled train, even though it was carrying passengers. He said "On a great many occasions we are starting and moving while working on the motors that are live and we prefer someone at the controls who knows exactly what we are doing to drive the train. . . ." Campbell admitted, however, that none of the fitters or electricians had ever been tested by the Traffic Department as to their efficiency to drive a passenger train.

40. I again questioned Campbell concerning the non-observance of Rule 165 in that the station master at the station in rear was not notified before they started to reverse the train down towards the sump. He said he did not consider it was necessary to inform the station master in rear, that he had carried out similar movements on hundreds of occasions in the past, and never had informed the station master.

41. *Station Master D. Boyle* was on duty at Merkland Street station on the morning of the accident. He had been a station master for about 15 months and prior to that a driver for some six months. Boyle said that Train Route No. 12 entered and left his station in the normal way. A short time later the circuit breaker opened, he reclosed it and it did not open again. He then received a telephone call from Station Master Aitkin at Govan Cross telling him that Train Route No. 12 was disabled in section and that Train Route No. 13 was to be held at Merkland Street. Shortly after Aitkin telephoned him again to tell him that the shift fitters and electricians were joining the disabled train from Govan Cross and at the same time repeating the instruction to hold Train Route No. 13 at Merkland Street.

42. Boyle admitted that soon after receiving the first telephone call he had issued a Caution Order to Driver Ashraf of Train Route No. 13, despite Aitkin's instructions that the train was definitely to be held at Merkland Street. Boyle said that he told Ashraf to prepare the train for pushing out the disabled one but that he was to wait in the station and that he was on no account to move the train until he received a positive

order to do so. At the time he issued the Caution Order and was giving these instructions to Ashraf, Line Inspector Connolly was standing on the platform nearby and, in Boyle's opinion, heard the instructions he gave the driver about not moving the train.

43. Boyle said that Line Inspector Connolly helped Ashraf to prepare the train for the pushing out operation and then both men entered the driver's cab. Boyle was adamant that at this time he instructed Line Inspector Connolly personally that he must wait and that the train was not to be moved. Although Connolly did not reply, Boyle said that he was certain that he had heard him. A few minutes after giving these instructions Train Route No. 13, with Connolly driving, started to move. It passed the Station signal at Danger and the brakes were applied by the operation of the trainstop which was in the raised position. Boyle, who had returned to his station master's box immediately after instructing Connolly, presumed that the trip cock was then isolated as, after a brief delay, the train restarted and disappeared into the tunnel.

44. I questioned Boyle at length on why he issued the Caution Order to Ashraf immediately after he had been instructed by Aitkin to hold the train at Merkland Street, but he failed to give any satisfactory reason. In addition, he appeared unable to appreciate that a Caution Order itself is an order to "Proceed under Caution Instructions", and that its unnecessary issue could easily lead to a misunderstanding with the driver of a train as to whether he should proceed or not.

45. Boyle said he received no communication from Train Route No. 12 or Govan Cross informing him that the train was reversing down to the sump. On being reminded of the contents of Rule 165, Boyle stated that he would have expected to be informed prior to the train reversing. It was clear from his evidence however that he was unfamiliar with the rule and thus was not expecting to be told beforehand in the event of the train being reversed.

46. Finally, I asked Boyle why he had taken no emergency action to stop Train Route No. 13 from entering the Merkland Street-Govan Cross section. Despite the train being brought to a halt when the brakes were tripped, he made no attempt to contact any member of the train crew to prevent the train being driven further into the section, even though one member of the crew obviously leaned out of the train to isolate the trip cock. Boyle admitted that it was an extremely serious thing for a second train to enter a section that was already occupied but he said that he could see no point in attempting to stop the train, particularly while it was stationary having been tripped, by switching off the 600 v traction supply. Boyle's attitude regarding any attempts to stop the train was clear from his answer about not turning off the traction current. He said "... there is a defective train there and you are going to take the power off a train that is all ready—it is going to assist the disabled train. I did not see the point there."

47. *Driver N. Ashraf*, the driver of Train Route No. 13, had been a driver since April 1975 and had previously been a conductor since September 1974. He was a most unreliable witness, possibly due to his nervousness, and several main items of his evidence conflicted with the corroborated evidence of others. In particular, he denied being handed a Caution Order by Station Master Boyle and signing it. The Order, clearly signed by Ashraf, was produced at my Inquiry and Inspector Connolly confirmed that he saw Ashraf sign the order (see paragraph 53). He also denied that Boyle told him that he was to wait in the station and not move the train (see paragraph 42). When Inspector Connolly joined him in the cab of the train he admitted to being nearer to Boyle on the platform than Connolly, but was quite unable to recollect any of the vital discussion which took place between them except Connolly saying "We are getting late." Finally, he asserted that Boyle isolated the trip cock while the train was standing in the platform. That this was not so was proved by the fact that the train was tripped as it passed the station signal at Danger but, in fairness to Ashraf, Boyle admitted to attempting to isolate the cock as part of the preparation for the train to push Train Route No. 12 out of the tunnel to Govan Cross. He was unable to do so, however, due to the lack of clearance between the cock and the platform edge.

48. In describing the events leading up to the collision, Ashraf said that when he arrived at Merkland Street the Station signal was at Danger. Station Master Boyle informed him that the train in front had broken down and told him to prepare his train for a 'push out'. He started to take off the doors at the front of the train and Line Inspector Connolly then came and helped him to prepare the train. Connolly then took up the driver's position and he stood beside him. After the discussion between Connolly and Boyle referred to in paragraph 47, Connolly drove the train past the Station signal at Danger and then isolated the trip cock to release the brakes and enable the train to proceed. Connolly drove the train very slowly down the severe gradient towards the sump. When they were near the sump lights, Ashraf said he saw, from a distance he estimated as about 50 yards, the rear of the train in front approaching them and he shouted to Connolly "This train is coming back." Almost immediately afterwards the collision occurred and he was thrown to the floor. Connolly helped him to his feet and in due course he was taken first to the other train and then evacuated from the scene of the accident.

49. *Conductor F. Beg*, the conductor of Train Route No. 13 on the morning of the accident, said that his train arrived at Merkland Street just before 12.00. He opened the doors and noted that the Station signal was at Danger. Station Master Boyle came over to him, explained that the train in front had broken down and that it might be necessary to push the train out. Boyle then asked him to get all the passengers out of the train. Beg said he generally helped Ashraf and Connolly prepare the train for the 'push out' and confirmed that Boyle tried unsuccessfully to isolate the trip cock.

50. During the movement from Merkland Street, Beg was seated in the leading coach; he estimated that the train travelled at about 6 mile/h. When the collision occurred he was thrown off the seat onto the floor and became unconscious. He was subsequently removed to hospital where he was detained.

51. *Line Inspector L. Connolly* told me that he had been with the Glasgow Underground for 21 years and that at the time of the accident he was the most senior line inspector, responsible, amongst other things, for the training of the traffic staff. On the morning of the accident he had travelled from Govan Cross to Merkland Street on Train Route No. 1, arriving at the latter station at 11.48. He heard the station circuit-breaker klaxon sound and saw Boyle walking towards the station control box to reclose the breaker. Boyle informed him that Train Route No. 12 had caused the breaker to open and that the station master at Govan Cross had informed him that the train had come to a stand near the mid section signal.

52. Connolly said that he then telephoned the station master at Govan Cross who confirmed where Train Route No. 12 was stalled. He informed him that he would prepare Train Route No. 13 to push the failed train out of the section and he was subsequently informed by Boyle that the shift fitters and electricians were making their way direct from Govan Cross to the failed train. Connolly then stated, "At approximately 12.00 hours, the driver having been issued with a Caution Order authorising him to proceed under caution, I decided to go to the assistance of Train Route No. 12 and took over the controls of Train Route No. 13 and proceeded under caution, travelling at approximately 5 mile/h. As I neared the sump, I could see that the track was clear but, as I got closer to it, my vision of it was obscured due to a bend and, as I approached the sump, the lights there slightly dazzled my eyes. Driver Ashraf shouted "There's a train running back." By this time the driver's cab was just behind the sump and I told Ashraf to get out and I then applied the brake, hoping that Route 12 would also apply the brake. At that position in the section there was no action that I could take because of the steep gradient to avoid colliding with Route 12."

53. Inspector Connolly, in answer to my questions, confirmed that he had seen Ashraf sign the Caution Order issued by Boyle: he could see no reason at all why Ashraf should deny signing it. He had helped Ashraf prepare the train for pushing Train Route No. 12 out because he did not wish to waste time and it was for the same reason that he took over the driving of the train. Connolly admitted that he had been instructed by Boyle that the train was not to depart from Merkland Street until he received a definite order to do so and that permission to depart had not been given at the time that he drove the train past the Station signal at Danger into the Merkland Street-Govan Cross section.

54. Connolly said he could not understand why he had disobeyed Boyle's instructions, except that it was his main concern to get Train Route No. 12 moved as quickly as possible and to clear the Inner Circle. The tripping of the brakes by the train stop at the station signal did not alert him to the serious error he had committed because there was no way to isolate the trip cock while they were standing in the platform at Merkland Street due to the lack of clearance, and the trip cock had to be isolated for a pushing out operation such as he proposed to carry out.

55. Connolly agreed that he was well aware of the notice in the station master's cabin at Merkland Street which states:

"TO ALL STATION MASTERS AND ACTING STATION MASTERS

When train becomes disabled between here and Govan Cross on Inner Circle, tell Car Sheds you are holding propelling train until they arrive and board it.

Important—Under no circumstances must propelling train be allowed to leave Merkland Street without the breakdown squad aboard."

I again asked him whether this had not alerted him to the folly of his actions, but he said that he completely forgot about the notice.

56. Connolly confirmed that prior to proceeding into the section he had not received any request for the pushing out of Train Route No. 12 from either the train crew or the shift fitters from Govan Cross or using the tunnel telephone. I asked him whether he would not have expected them to send a message if assistance was required, to which he replied, "No, not really. I should have known myself personally that they would try to get the train out. . . ." Connolly admitted that the procedure frequently adopted by the fitters and electricians when going to a disabled train at the Govan Cross end of the section was, having located and, if possible, rectified the trouble, to set the train back almost to the sump in order to get a good run up the steep gradient to Govan Cross. Unfortunately he had failed to pay any attention to the possibility that the other train might reverse when he drove Train Route No. 13 into the section.

57. Finally, Line Inspector Connolly, in answer to my questions, agreed that he, having taken over Train Route No. 13 from a laudable but misguided wish to try to speed things up, was responsible for the accident that followed.

58. *Mr. W. Rodger, the Underground Training Co-ordinator of the Traffic Department*, explained to me the detailed training of the Traffic Department drivers. He explained that each driver was selected for training from a list of conductors and that the full training syllabus lasted for 40 days, during 9 of which the learner driver was driving a passenger train with a qualified driver at his side, while for up to a further 30 days he would drive the train but with a qualified driver acting as conductor who was available to assist him if required. Recently, due to severe staff shortages, the 30 day period had been reduced to 7 days, but a trainee was only formally tested after 40 days, the final test including a two hour written test and a two hour examination in rules and regulations. At various times during the training a trainee's progress was checked by the special line inspector or the duty line inspector to ensure that it was satisfactory. If it was not, the trainee might be put back in his training or even reverted, at least temporarily, to the grade of conductor.

59. All trainee drivers at the end of their first 10 days training were given what was termed a 'breakdown practice' between Govan Cross and Merkland Street. This was conducted by a line inspector, the shift fitter,

and Mr. R. Howie, the Underground Engineering Superintendent. The purpose of this training was to ensure that drivers were fully conversant with the action they should take in the event of a breakdown, including the action of pushing a disabled train out of the Govan Cross-Merkland Street section. In the event of a driver failing to pass this part of his training, he would either be put back and given additional training before carrying out his breakdown test a second time, or revert to being a conductor. In the latter case he would be reconsidered for training as a driver, if he so wished, along with other conductors when more were required.

60. In answer to my questions, Mr. Rodger told me that the Traffic Department did not undertake any training of workshops staff, such as the shift fitters and electricians who form the breakdown gangs, in the driving of passenger trains. Nor did the Department take any action to ensure that the workshops staff were fully conversant with the parts of the Rule Book that they considered essential that their own drivers should know and in which they examined their drivers at regular intervals.

61. Mr. Rodger explained that station masters were selected from the drivers' seniority list, but that a considerable number of drivers did not want to become station masters, with the result that comparatively junior men could find themselves selected to become station masters. Under the present conditions it is possible for a man to become a station master in little over a year and, on account of this, the station masters' training course had been extended from one to two weeks. The actual training was carried out by a fully trained station master, but the trainee was 'passed out' by the Engineering Department signals foreman, an electrician by trade, as he was the man most suitably qualified to test a station master in the technical side of his duties such as the replacing of circuit breakers and the lowering of train stops. They were tested in the Rules and their normal traffic duties by the special line inspector and periodically thereafter they were tested by the duty line inspector who noted any shortcomings and instructed them what action they were to take to rectify them.

62. Mr. R. Howie, the Underground Engineering Superintendent, explained that the Engineering Department ran a five week training period to teach various tradesmen of the Car Sheds section to drive trains. The majority of training was carried out after the normal passenger services had ceased at 23.00 and, in Mr. Howie's opinion, the training included more driving in reverse and other intricate moves than was included in the training of a normal Traffic Department driver. He pointed out that Munro and Campbell were both very experienced and competent people and Munro was the fitter who trained the Traffic Department trainee drivers on breakdown procedures.

63. Mr. Howie confirmed that all the fitters and electricians were provided with a Rule Book when they joined the railway, but that the Workshops Department had never examined any of their staff trained to drive trains in any of the rules or regulations relevant to drivers in the same manner as the Traffic Department examined their drivers.

CONCLUSIONS

64. The direct cause of the collision was the driving of Train Route No. 13 without authority past Merkland Street Inner Circle Station signal at Danger into the Merkland Street-Govan Cross section. The collision was made more serious by the fact that Train Route No. 12 was being reversed, again without authority, down the slope from Govan Cross towards the sump under the River Clyde as Train Route No. 13 was travelling towards it. The sharp vertical and horizontal curves in the tunnel in this area, coupled with the fact that there was no person at the rear of Train Route No. 12 to act as a lookoutman, made it impossible for the driver of Train Route No. 13 to prevent the collision when the rear of the other train came into sight, even though both trains were travelling slowly.

65. There is no doubt that Line Inspector Connolly must bear the major part of the responsibility for this accident, for he took over the controls of Train Route No. 13 and, in direct contravention of the instructions given him by Station Master Boyle that the train was to remain at Merkland Street, he drove past the Station signal and into the section once he had isolated the trip cock. The fact that Connolly's reason for driving into the section was to assist the other train, which he understood was disabled, in no way lessens his responsibility. As the most senior line inspector on the railway he was well aware of the special notice displayed in the Merkland Street station master's cabin (see paragraph 55) which specifically lays down that under no circumstances must any propelling train be allowed to leave Merkland Street without the breakdown gang aboard, and should have been more conscious of the importance of obeying rules and regulations during times of emergency working than any other member of the Traffic Department.

66. I do not consider that either Driver Ashraf or Station Master Boyle displayed any initiative in trying to rectify Connolly's mistaken action. Ashraf, who had also been instructed to keep the train at Merkland Street until ordered to proceed to Govan Cross by Boyle, should have reminded Connolly of the instructions as soon as the latter started to move the train. Boyle, who should not have issued the Caution Order until told to do so by the Station master at Govan Cross, should, in the first instance, have made determined efforts to attract the attention of Connolly or one of the train crew while the train was stationary, having been tripped on passing the Station signal at Danger. If his initial efforts had failed, he should have cut off the power between Merkland Street and Govan Cross, thus probably bringing both trains to a halt and averting the accident.

67. As I have already stated in paragraph 64, the accident was made considerably more serious by the fact that Train Route No. 12 was reversing down the slope towards the foot of the incline at the sump. The train was being driven by Fitter Munro, one of the breakdown gang and a very experienced driver, but one who had never been 'passed out' in rules and regulations by the Traffic Department. Thus he professed complete ignorance of Rule 165 which requires any driver to notify the station master at the station in rear if for any

reason any train has to reverse in section, and indeed stated that to reverse down to the sump was the normal method of dealing with failures in this section, but that when he was carrying this out he had never first informed the station master in rear. Had Munro observed this rule, it is likely that the accident would have been averted as Boyle would almost certainly have been informed prior to Connolly's departure and would have warned him of the movement of the other train, thus emphasising the importance of his remaining at Merkland Street with Train Route No. 13. If Connolly had departed with the train prior to Boyle receiving the request for the train to run back, the latter would never have acceded to the request and in addition, would have warned Munro that the train in rear was approaching his train without authority. With the disabled train in the original position where it came to rest adjacent to the mid section signal 232 ft short of Govan Cross, its rear lights and profile would have been seen by Connolly from a considerable distance. He already knew roughly the location where it had broken down, and he was proceeding through the section at Caution to go to the assistance of the other train. It is my firm opinion, therefore, that Connolly would have brought his train to a stand on the steeply rising gradient short of the disabled train and the accident would have been averted if the latter train had not reversed down the slope.

68. The failure to obey Rule 244 also resulted in neither the conductor, Nicol nor any other member of the crew of Train Route No. 12 being at the rear of the train as lookout and brake man while the train was stationary on the steep gradient or during the reversing movement. The fact that Fitter Munro had taken over driving the train and was reversing it contrary to Rule 165 in no way absolved Nicol from positioning himself correctly nor can Line Inspector Cullen, who had boarded the train soon after it became disabled, escape part responsibility for not checking that one of the train crew was at the rear.

REMARKS AND RECOMMENDATIONS

69. Although the direct cause of this accident was quite clearly the action of Line Inspector Connolly in proceeding into the section occupied by the disabled train without authority, which in itself is inexplicable in view of Connolly's knowledge of the rules, the many contributing factors to which I have referred in my Conclusions are nearly all connected with the lack of knowledge or non-observance of the Rules. Repeatedly during the course of my public Inquiry witnesses either professed ignorance of the Rules or stated that they had acted contrary to them because 'this had always been the procedure', or words to that effect. This revealed, in my opinion, a poor standard of discipline, although it may partly be due to a lack of clarity of a number of important Rules in the 1961 edition of the Glasgow Corporation Transport (now G.G.P.T.E.) Underground Section Rules and Regulations. The Rules themselves however, if properly observed, were adequate to prevent the occurrence of an accident of this kind.

70. The most serious feature revealed at my Inquiry, however, was the fact that for many years, when passenger trains have broken down in traffic, Car Sheds staff not 'passed out' as drivers by the Traffic Department or examined in the Rules have taken over complete control of the trains from the train crews. While I have no doubt that the members of the Car Sheds staff who have driven passenger trains in these circumstances are technically highly competent, having been taught to drive by the Engineering Department, this in no way alters the fact that they are not qualified to drive a passenger train. That this state of affairs has existed for many years is, in my opinion, a clear indication of the shortcomings in the management of the Underground Traffic and Underground Engineering Departments, the more so when one takes into account that there were 22 recorded breakdowns between Merkland Street and Govan Cross between 1972 and 1975, out of which the Car Sheds staff took over control no less than 15 times including at least 3 times when they reversed down to the sump, thus it was by no means an unusual situation.

71. The present management of the Greater Glasgow Passenger Transport Executive is fully aware of the shortcomings revealed by my Inquiry and I am glad to report that the Executive's Officers have already carried out a major review of the Rule Book and have arranged for the Car Sheds staff who may drive passenger trains during breakdowns to be tested by the Traffic Department on the relevant rules and regulations for drivers, on their proficiency as drivers, and particularly in the procedures to be adopted to recover a stalled train on the steep under-river gradients. I am also glad to be assured that it is the declared policy of the Executive not to allow Engineering Department staff to drive trains on the operational railway after the modernisation of the Underground.

72. Finally, the Executive fully accepts that the existing Rule Book is totally unsuitable for the modernised railway and I am told that the new Rule Book is in the latter stages of drafting. In addition to this I consider it essential that the responsibility for the safety of operations of the railway should be firmly vested in the Traffic Department.

I have the honour to be,

Sir,

Your obedient Servant,

P. M. OLVER,
Major.

The Permanent Secretary,
Department of Transport.

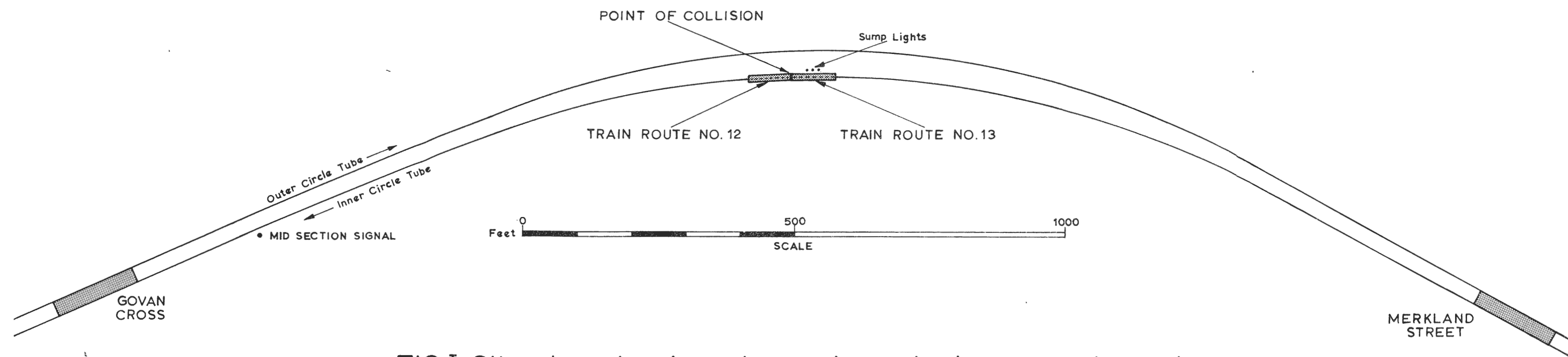


FIG.I Site plan showing place where trains came to rest.

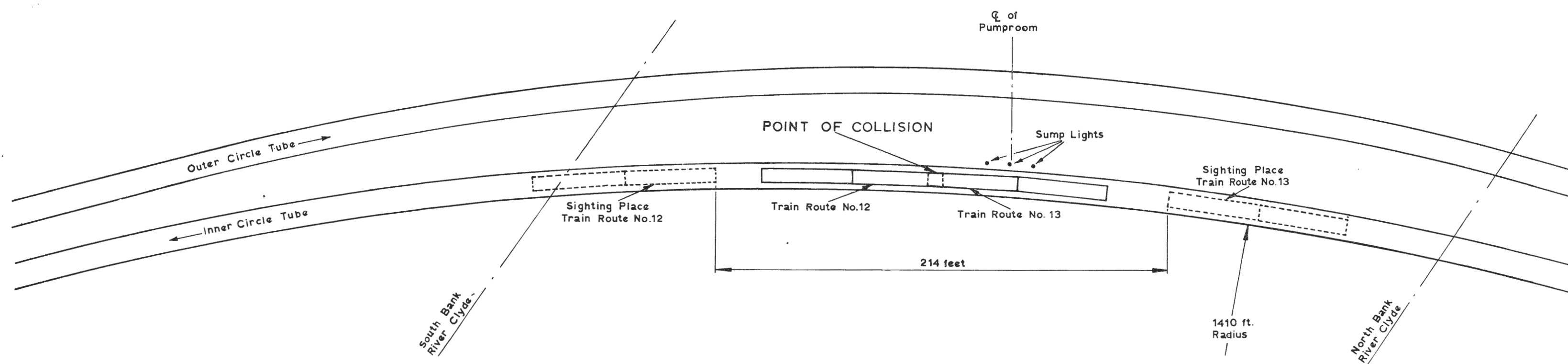
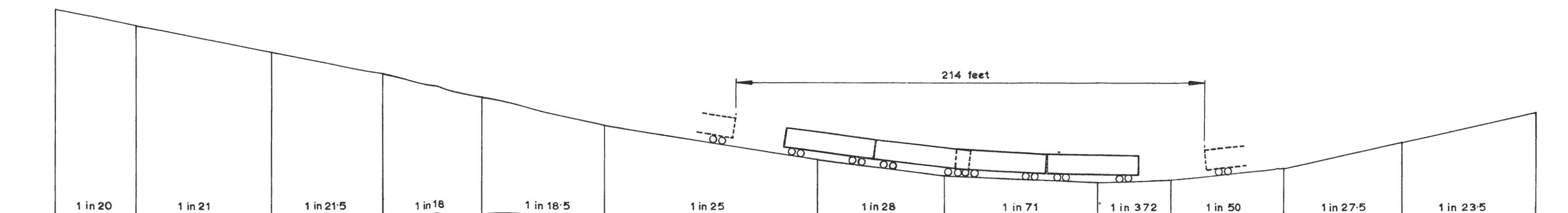
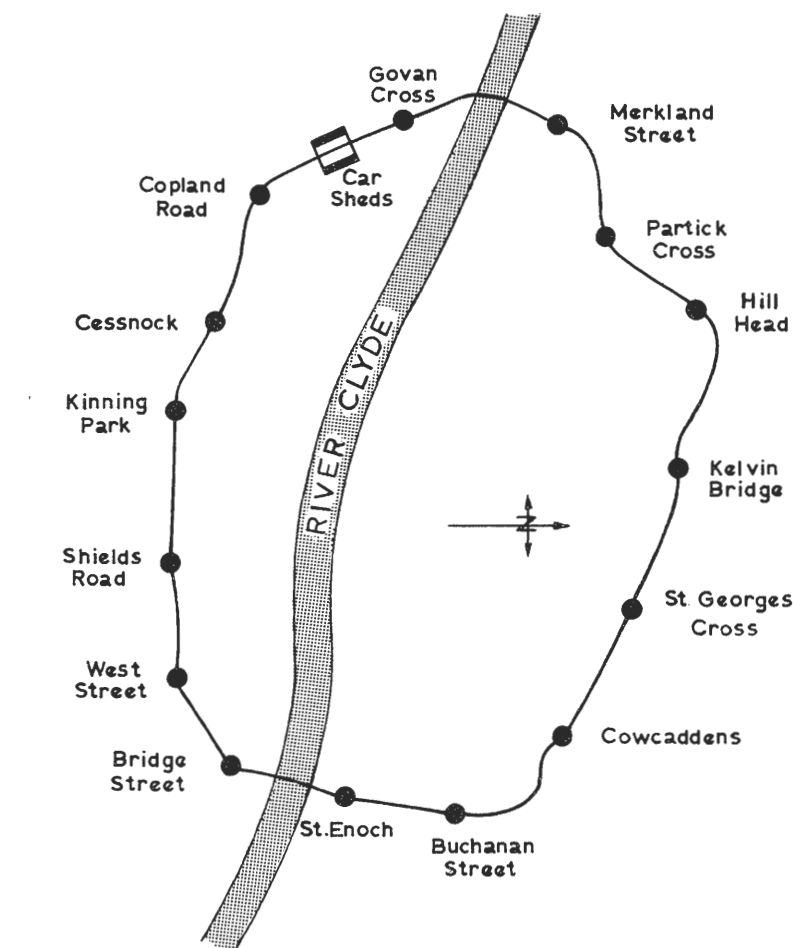


FIG.II Plan showing position of trains at first sighting and after collision.



ains at first sighting and after collision.



The Underground Railway System
of the
Greater Glasgow Passenger Transport Executive.

COLLISION BETWEEN
MERKLAND STREET
AND
GOVAN CROSS
ON
19th JULY 1976