A review into the causes of passenger disruption affecting King's Cross and Paddington station services on 27 December 2014

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Foreword by Mark Carne

On 27 December thousands of passengers using King's Cross and Paddington services, many of whom were travelling home after visiting friends and family over the holiday period, experienced significant disruption. They suffered both inconvenience and discomfort and I want to unreservedly apologise to everyone who was affected.

But being sorry is not enough. We have to learn from what happened to ensure that we can further reduce the risk of such incidents in the future. I therefore instructed that there should be a full and speedy investigation into the root causes of the problems. I also committed to making the findings public, which I am now doing.

To protect the safety of the network, improve its reliability and enhance its capabilities, Network Rail aims to execute extensive engineering works efficiently, in very short periods of time and with high levels of reliability. The vast programme of works across the country over Christmas involved thousands of dedicated people working on 300 different projects across 2,000 work sites, and 99% of these projects were delivered safely and back into service on schedule. Of course that is scant comfort for those passengers who were left standing on a cold platform, or queuing outside a station, waiting for a train. That is why this report is important and why we want to get to the bottom of the issues we faced.

The explanation is complex at some levels, but also simple. In very complex projects sometimes simple things go wrong and these can snowball in short periods of time to become major issues. Our contingency plans should address these issues and protect passengers from our problems as far as possible. And our industry service recovery plans should minimise the impact of any disruption once it has occurred. On these occasions we simply did not do these things well enough.

The report describes a number of improvements that must be made. I would highlight three that deserve special prominence.

- Improve the effectiveness of our project and operational contingency plans so that we put minimising passenger disruption at the very heart of our planning.
- Improve our management of the performance of critical contractors and, in the case of one specific contractor, do a better job of working with them to improve their signalling commissioning process.
- Work with industry colleagues to improve service recovery and to provide better information to passengers.

As well as apologising, I would also like to thank those railway staff at the front line, on stations and trains, who helped us deal with a difficult situation as well as Transport for London and British Transport Police who provided additional resources at short notice at Finsbury Park.

The timing of these events, over the Christmas holidays, has also made us question traditional thinking. While our industry has historically seen the 'quieter times' of railway use as the natural time to carry out essential project works, I believe that it is appropriate to challenge some of this thinking. Passengers who use the railway during holidays to connect with friends and family also

deserve reliable and predictable services. That is the thought behind a second review that we have already announced, following discussions with the Secretary of State. This will be independently led and will report through the industry's Rail Delivery Group.

Our railway has seen unprecedented growth in the last two decades as passenger numbers have more than doubled to a level of 4.5 million per day. To meet this demand we are investing at record levels to improve passenger services, increase capacity and to continue to improve the safety and reliability of the whole railway. We have to make these investments on the very same railways that passengers rely on, every day. Managing this balancing act is what we are here to do, and the events of the last weeks highlight that we are still not meeting our customers' expectations and we must get better.

I am committed to making the improvements necessary, not just in the delivery of projects, such as those described in this report, but also to the underlying reliability of our infrastructure. The travelling public deserve to be treated with respect and we must do everything reasonably practicable to ensure this kind of disruption and inconvenience does not happen again.

Mark Carne
Chief Executive, Network Rail

12 January 2015

Executive Summary

On 27 December, many train passengers on the East Coast main line and the Great Western main line experienced significant delays and disruptions. While some passengers were delayed at mainline stations, others were diverted to smaller stations and experienced overcrowding and, in the case of Finsbury Park, some had to queue outside for at least two hours. The disruptions followed the overruns of two very significant pieces of engineering works, at Holloway, north of King's Cross station, and at Old Oak Common, west of Paddington station. The nature of the issues meant that the train operating companies (TOCs) were given around 14 hours advance notice on Boxing Day of the overrun affecting King's Cross station, but no warning at Paddington. These were two very different incidents, with different types of passenger impact. The report therefore addresses each in turn.

Network Rail recognises that it needs to improve both project and operational contingency management, so that better identification of delivery problems results in better operation of recovery services. It may also be necessary in some circumstances to change the threshold for project contingency although this will have cost consequences and add to disruption for other sets of passengers.

King's Cross / Holloway Junction

What was the work?

Holloway Junction is approximately 1½ miles north of King's Cross Station and is part of the East Coast Mainline. Two of the junctions and 500m of the two railway lines between them were being replaced between Christmas Day and Monday 29 December 2014. Although this type of renewal is a relatively routine operation on the Network, it was large in scale, involving the replacement of 6,000 tonnes of ballast and so was a significant logistics operation. Two other adjacent railway lines were needed for the large engineering (freight) trains which supported the work.

The work was being undertaken by an Alliance of Network Rail and Amey Rail.

What went wrong?

Due primarily to issues with the removal of the old ballast, scrap rails and sleepers, resulting from failed new equipment, the project had slipped to six hours behind plan by the evening of Christmas Day. The equipment failures were unexpected, due to the provision of new hardware that had been bought specifically to reduce the risk of breakdown. However this new hardware had not been tested in the railway environment before deployment, and was not reliable when put to use. Despite this, it was still believed that two of the four railway lines could be opened on the morning of Saturday 27 December for the reduced passenger service that had been agreed previously because there was still some contingency time in the plan. In any event the project had long passed the point of no return by this time – the full works were committed. Overnight, the physical project works then fell out of sync with the logistics plan for the engineering trains and crews. Progress suddenly fell to a crawl as train drivers reached maximum shift length limits and trains were left out of position to support the work.

By late the following morning (Boxing Day), the project had fallen to 15 hours behind plan and an overrun was declared.

During a conference call on the evening of the 26 December, involving Network Rail, TOCs and British Transport Police, the decision was made by Network Rail to run as much of the scheduled train service on the 27 December as possible, but for trains to start and terminate north of King's Cross, mainly at Finsbury Park. This decision was made after balancing the disruption that would be caused by running services terminating at Finsbury Park, against the even greater disruption that would probably have been caused by cancelling services altogether or inconveniencing passengers further by directing them to destinations more remote from King's Cross.

In this decision making, Network Rail was accountable for deciding if it was safe to run trains and for preparing the route plans. They acted on advice given by the TOCs regarding passenger handling and the capacity of the stations that they manage, along with advice from the British Transport Police (BTP) and other stakeholders.

What was the impact on passengers?

Once the decision to run a contingency service was made on the evening of Friday 26 December, all available passenger information channels as well as the national media announced that the following day, East Coast, Grand Central, Hull Trains and GTR passengers would need to start or end their journey at Finsbury Park rather than King's Cross. Where possible, passengers were asked to defer their journey to another date.

There were mutual failings in the communications between Network Rail and Govia Thameslink Railway (GTR), who manage Finsbury Park station, around the implementation of the contingency plan. Failure to operate a revised platform usage pattern, as agreed the previous evening, was a significant contributor to the subsequent overcrowding, and was only corrected after three long distance trains had cycled through the station.

Around 100 trains had already arrived, departed or passed through the station with little incident by 10:00 when the first long distance train arrived. By about 10:30 it became clear that passenger flows were extremely difficult, with crowded platforms meaning that passengers on incoming trains were even unable to alight. As a result, at approximately 11:00, GTR closed the station for about 30 minutes due to overcrowding and the safety risk to passengers (supported by the British Transport Police (BTP)). The overcrowding led to several hundred passengers having to queue outside the station, in some cases for 2-3 hours. GTR and BTP implemented a one way system at the station and, by 14:00, the crowd were organised and being managed. By 17:00 the queues had largely disappeared.

Although the vast majority of passengers were able to board a train to their destination, a reduced service meant that trains were cramped with many passengers forced to stand for some or their entire journey.

Passenger services to and from King's Cross were resumed on Sunday 28 December on two railway lines and all four lines were opened, as originally planned, for services on Monday 29 December.

In summary, what caused the passenger disruptions?

- A succession of equipment failures ultimately put the track renewal activities out of sync with their supporting engineering trains, stalling progress.
- Insufficient contingency existed in the project plan once the full scope of the works was committed early on Christmas Day to assure hand back on Saturday 27 December.
- Given it was Boxing Day, one of only two days in the year when the railway is closed, there were delays in being able to put together a service recovery plan with the train operating companies as well as devise and communicate a revised timetable.
- Not enough was done in both the planning and the implementation to ensure appropriately managed passenger flow at Finsbury Park; in particular a failure to implement an agreed platform strategy that would have separated alighting and boarding passengers.

What will we do?

The major lessons from this passenger disruption are:

1. The overall structure and content of project and operational contingency plans will be improved to ensure that minimising passenger disruption is at the very heart of our planning.
2. Contractors will be required to test any new equipment in an off-the-railway environment before it is used on live railway work.
3. Recognising the risks that are introduced at times of peak project delivery, such as Christmas and Easter, consideration will be given to moving more work away from these peak times.
4. A review will be undertaken of Network Rail processes for communicating operational train service contingency plans to our own and other staff at short notice.
5. Engineering train crew and contingency at times of peak work will be treated with the same level of nationwide cross-project scrutiny and planning as other resources in short supply, such as signal testers and overhead line engineers.
6. Network Rail will work with industry colleagues to improve service recovery and to provide better information to passengers.

Old Oak Common

What was the work?

Between 24 December 2014 and 2 January 2015, Network Rail undertook major project works along the 25 mile stretch of railway between Paddington and Maidenhead to replace ageing infrastructure and to upgrade the railway for future services.

The work included the introduction of a brand new 1,750m long flyover and junction to enhance connections to Heathrow Airport; and major track layout, overhead line and signalling changes at Old Oak Common depot to allow this complex depot to be used by new trains – this was the item which overran on 27 December.

What went wrong?

Signalling testing for Old Oak Common and the main lines was reported as complete at 03:30 on Saturday 27 December by Signalling Solutions Limited (SSL), who are one of Network Rail's appointed signalling framework suppliers. At this point, the project appeared to be on time to open the railway lines as planned at 07:00 to allow passenger services to commence. As it turned out, this reporting was inaccurate.

SSL would use the time between 03:30 and 06:00 to complete their final paperwork checks and testing verifications. This activity is routinely planned to last one to two hours since the testing paperwork is maintained and updated constantly throughout a major signalling commissioning. However, it emerged that the amount of work that needed to be done at this stage was greater than they expected. The cause of this was a combination of physical testing work needing to be redone or rechecked and inconsistencies in the paperwork needing to be resolved. Additional site checks/tests on the Main Lines were required to be undertaken prior to the Safety Certification being issued.

At 06:30 the safety certificate for the main lines had not been presented. Dialogue between the Network Rail and SSL Project Teams continued to be very regular (every 15-20 minutes) but, despite this, the SSL team were unable to confirm when the Safety Certification for the main lines would be issued.

At approximately 08:30, the Network Rail Project Team stopped the SSL Tester In Charge and asked him for a candid view of the issues and confirmation of what the revised timescales would be. The Tester In Charge then stated that the document for Old Oak Common would be issued at 11:15. Route Control and the Operations teams therefore planned on this basis. Ultimately, the documentation was finally issued to enable the signalling and thus the railway lines to be handed back into use at 13:14.

What was the impact on passengers?

Several thousand passengers expecting to travel on services to and from Paddington on 27 December were affected by cancelled and severely delayed services, with many passengers experiencing overcrowding as well as having to change trains and/or use alternative routes to reach their destinations. The disruption continued throughout the day, with some further impacts on Sunday 28 December as trains and staff were then not in the correct locations to deliver the planned services.

Services did run throughout the day but many passengers had to change trains to continue their journeys. Passengers to London were generally diverted to Waterloo once they reached Reading. Passengers from Paddington were advised to use the Underground to Waterloo and join services to Reading, although this led to some overcrowding as there was a rugby match at Twickenham. Passengers between Oxford and London were diverted via Banbury and services to/from Marylebone and this generally worked well.

In summary, what caused the passenger disruptions?

- The necessary construction works to the infrastructure were complete in time to allow passenger services to commence as planned on Saturday 27 December. All was on plan at 03:30 on 27 December for the planned service from 07:00.
- The Network Rail appointed signalling contractor then took nearly ten hours to complete the planned two hour safety validation, testing and sign-off of the new signalling system due to some of their testing work needing to be redone or rechecked.
- A lack of warning that this work was delayed and frequent changes to the forecast completion time made it difficult to plan an effective train service.

What will we do?

The major lessons from this passenger disruption are:

1. SSL are a key supplier to Network Rail on a number of contracts, so their work management processes that led to the incorrect conclusion that the signalling testing of the main lines was complete will be thoroughly reviewed by SSL and Network Rail staff.

2. Consideration will be given to providing additional contingency time for the validation process where major signalling works or multi-disciplined works are being undertaken.

Main Report

Introduction

Like all infrastructure, railways wear out over time and the rail, ballast and sleepers (foundations) have to be renewed. The timing depends on the rate of deterioration, which is a function of the speed, weight and frequency of trains. Also, the rail infrastructure is being enhanced, extended and upgraded to cope with increasing passenger growth.

To do this type of renewal and enhancement work, the railway needs to be shut. There are very few opportunities to shut the railway completely for any extended period of time on urban routes and, therefore, the Christmas period, when passenger numbers are about 50% lower than at other times of the year, has traditionally been considered a suitable time to deliver these types of projects.

The engineering works at Holloway Junction and at Old Oak Common were complex and very extensive. The plans of the project teams to undertake the works had been reviewed using the standard processes that were introduced by Network Rail to improve the delivering of project work following engineering overruns in 2007.

Both projects had also been assessed using an industry standard risk assessment tool and both passed with a greater than 95% likelihood of handing back the railway into service on time. This exceeded the threshold level of confidence generally deemed appropriate for this type of critical operation and is consistent with the regulatory funding available to Network Rail. Given the limitations of service recovery options, it is reasonable to question whether a higher level of delivery confidence might have been appropriate in this case.

There were shortfalls in the delivery of the project plans, in the management of the project contingency plans during the work and in the service recovery plans after an overruns were recognised.

The issues causing the engineering activities to overrun at Holloway Junction, affecting King's Cross Station, and at Old Oak Common, affecting Paddington Station, were of a very different nature. When the issues arose, they were escalated within Network Rail's and the respective contractors' management teams. The nature of the issues meant that the Train Operating Companies (TOCs) were given around 14 hours advance warning of the overrun affecting King's Cross Station, but no warning at Paddington Station.

Holloway Junction

What work was being undertaken and why was it necessary?

Holloway Junction is approximately 1½ miles north of King's Cross Station and is part of the East Coast Mainline *(fig 1)*. There are four railway lines at Holloway interconnected by four junctions to allow trains to pass from one line to another. The junctions are approaching the end of their service life as is the 300mm of ballast (stone) which sits beneath the junctions and which provides the foundations for the railway. If the junctions and ballast were not renewed then the likelihood of points and signalling failures would increase, leading to significant disruption to train services and the passenger ride quality would deteriorate.

Two of these junctions and 500m of the two railway lines between them were being replaced over Christmas 2014. The other two railway lines were needed for the large engineering (freight) trains which supported the work *(fig 2).* The two junctions (referred to as Site A and Site B), the 500m of railway line and around 6,000 tonnes of old ballast had to be removed and transported away.

Around 6,000 tonnes of new ballast then had to be installed and levelled and eighty-two pre-assembled track panels *(fig 4)* laid on top like jigsaw pieces. Some 180 welds were then required to join everything together followed by alignment checks on the 25,000 volt overhead cables. In total about 8,000 hours of work was undertaken by the "Northern S&C Alliance". S&C stands for switches and crossings, commonly known as points and crossings. The Northern S&C Alliance is one of two contractual alliances recently set up by Network Rail and comprises Network Rail and Amey Rail, the contractual obligations of Amey Rail being discharged by the AmeySersa Joint Venture.

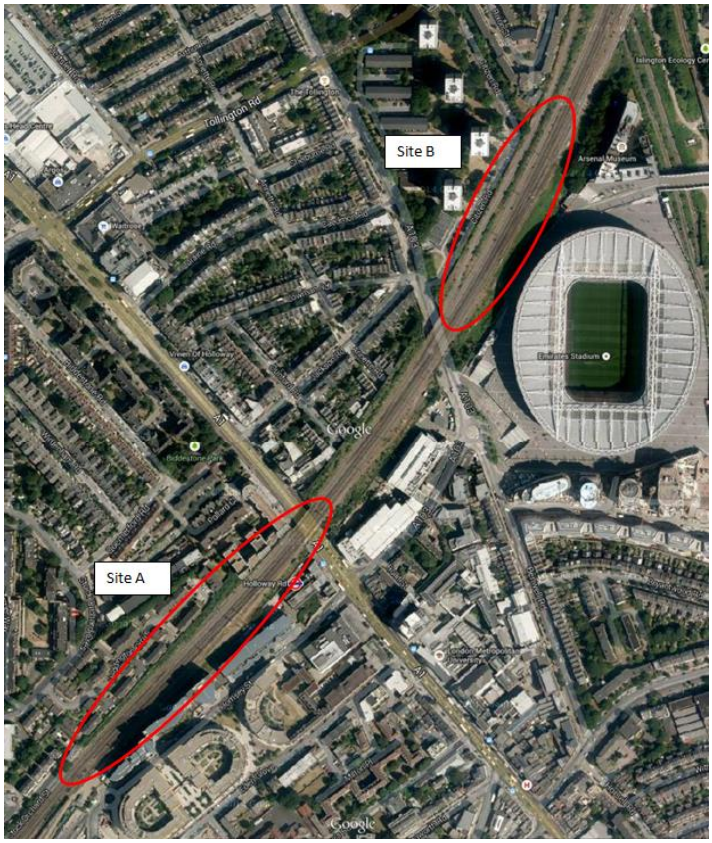


Figure 1. Site A and Site B

Figure 2. Typical Engineering Train

Figure 3. Above: Track panel being installed at Holloway Junction.

Figure 4. S&C panels ready to be lowered.

The Alliance was set up in July 2014 as a ten year design and build contract with built in efficiency targets. The contract has risk/reward mechanisms to incentivise performance and the continuous improvement necessary to achieve the 2014-2019 Control Period 5 (CP5) financial targets.

The Alliance Management Team is made up from members of all three organisations on a “best for role” basis and the Alliance provides all of the necessary supervision on the worksites. In the case of the works at Holloway, the Alliance reported progress to the Network Rail Infrastructure Projects (IP) Tactical Control Room in Peterborough, which was coordinating feedback from all sites in the region, and disseminated the collated information through Network Rail.

The overall cost of the work undertaken by the Alliance at Holloway was around £4 million.

In parallel, there were a significant number of other engineering works being undertaken between King’s Cross and Peterborough which closed the East Coast Mainline in multiple locations. As a result, it was not possible to bring the engineering trains straight to site from their depots. In total, 14 engineering trains were required to support the project at Holloway and they had to be delivered to site ahead of the work and parked up. The large number and size of these engineering trains made the total worksite *(fig 5*) around 9 miles long in order to accommodate them safely and to allow them the space to move in and out of the construction area in a carefully choreographed sequence.

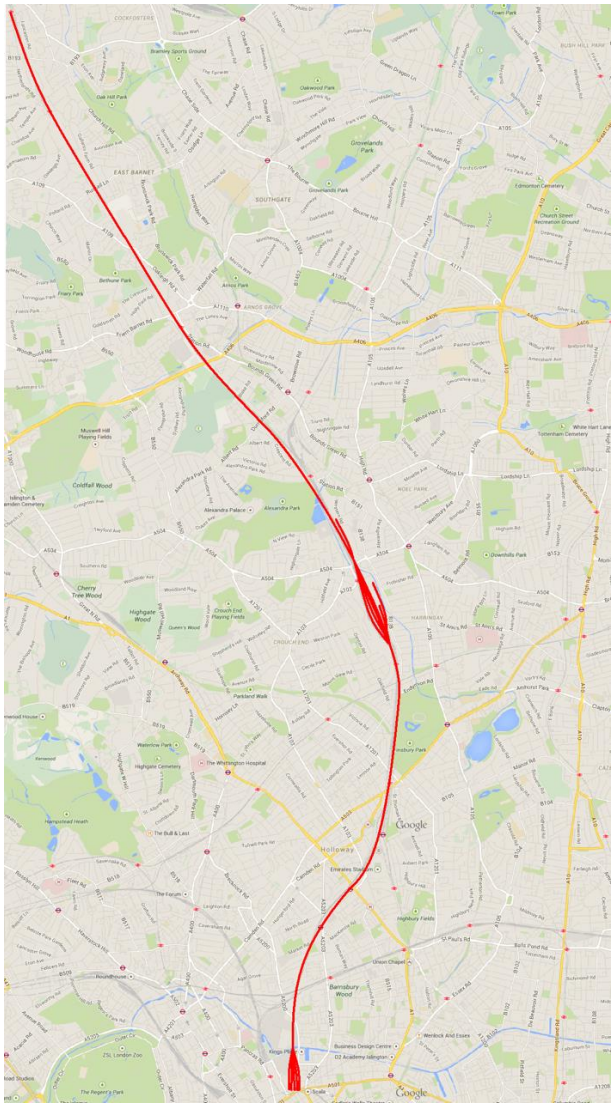


Figure 5.
Extent of possession

Was the initial plan adequate?

The optimum engineering plan would have required the closure of all four railway lines at Holloway in a seven day blockade and to renew all four junctions and all four stretches of track in one activity. This would have been cheaper, gained the operational benefits and maintenance savings more quickly and would have had inherently more flexibility in the engineering plan and thus lower risk of overrun. However, because of the significant disruption to passengers resulting from a seven day blockade, this strategy was not supported.

The next best plan was to have two -four day blockades and to undertake the renewal in two halves, one at Christmas 2014 and one at Christmas 2015. However the main junction at Watford on the West Coast Mainline was being also being renewed over Christmas 2014. This would have left two of the key North/South routes closed at the same time, which would again cause significant disruption to passengers. In discussion with the TOCs it was agreed to keep an Anglo-Scots route open to a London Terminal Station and therefore the plan at Holloway was staged in such a way that two of the four lines could be opened on Saturday 27 December to enable reduced passenger services to run.

The plan was reworked in June 2014 in such a way that this could be achieved with four lines blocked for two days over Christmas Day and Boxing Day and with two lines open over the following two days, 27th and 28th (Saturday and Sunday).

To be able to execute this plan, various parts of the project had to be undertaken in parallel rather than in series reducing flexibility. Whilst the risk of an overrun on Saturday 27 December was now higher with the final plan, the project was risk assessed using the standard industry risk assessment tools and passed the risk assessment with a 95% likelihood of completing on time. The 95% probability threshold is used by the industry and agreed with the regulator, as criteria to balance the competing pressures of cost and the passenger inconvenience associated with possessions. Higher probabilities of success can be achieved, but either at increased cost or through longer possessions. Given the limitations of service recovery options, it is reasonable to question whether a higher level of delivery confidence might have been appropriate in this case.

The plan for the work at Holloway, and for the work at the other 58 high risk worksites over Christmas, followed Network Rail's Delivering Work Within Possessions (DWWP) process (described in the appendix). Formal deliverability reviews were held twelve weeks, eight weeks, four weeks and two weeks and one week prior to the works being undertaken. The site status, action log and an extensive pack of supporting data, including key resource demands, was submitted to the Office of Rail Regulation (ORR) as usual prior to the Christmas work programme commencing.

As part of this investigation, the plan has been reviewed and benchmarked against other similar works to establish if the timings for the various activities were reasonable. It has been established that the timings of each activity were consistent with other previous worksites. The plan also had typical time contingency built in at each stage of the plan and at the end.

Equipment is key and there was contingency with spare track burners (used to cut the track into pieces), spare log grabs (used to remove the scrap track and rail sleepers) *(fig 6)*, as well as in other hand and powered tools.

Figure 6. Log grabs

The Road Rail Vehicles (RRVs) *(fig 7)* were sourced and provided by an approved supplier to ensure that the risk of mechanical failure was minimised. The supplier of the plant and equipment also provided eight new log grabs to reduce the risk of key plant failures. Seven log grabs were needed to deliver the plan and a spare was provided as a contingency. The plant supplier also provided an on-site fitter so that any equipment problems could be fixed quickly.

Figure 7. Typical RRV.

This report concludes that overall the final plan had been adequately assessed and in line with industry norms.

Did the staff making the decisions have the necessary competence and experience?

The Alliance's key staff on site had an appropriate level of experience and competence in order to be able to manage the plan. Whilst many of the machine controllers were individuals known to the Alliance, some were less experienced, because of the high demand, and thus less able to support optimum production rates.

The project was supported by experienced Network Rail staff at the Network Rail Infrastructure Projects (IP) Tactical Control Room and at the London North East (LNE) Route Control Room. When issues became apparent on site, the project received immediate support from the contractor's senior management team up to Managing Director level and within Network Rail up to Managing Director level also.

Was the project contingency plan adequate?

Ultimately, the contingency plan failed to secure the hand-back of the planned two railway lines on Saturday 27 December. In the final event, two lines were handed back on the Sunday 28 December and all four lines were successfully opened as planned on Monday 29 December.

The current Network Rail process results in two separate contingency plans, one for the project delivery works and one for the railway operations. Whilst they are created with the awareness of the other, this does not promote a holistic approach. As a result, the combined Project and Operational contingency plans did not, together, ensure that the potential impact to the travelling public was reduced to an acceptable level.

This should be addressed going forward as it should not matter to the passenger whether any disruption is minimised in the project delivery phase or by effective operational mitigation.

The change to the plan to be able to open a two line railway on Saturday 27 December, and the consequent requirement for many activities to be conducted in parallel, introduced a "point of no return" in the project very early on. This occurred at around 09:00 on Christmas Day morning when the decision needed to be taken as to what depth the ballast should be excavated. Significant time can be saved at this point if the ballast is purely "skimmed" rather than fully excavated. If the ballast is only skimmed however, the life of the new crossings and track is significantly reduced e.g. from a typical 25 years to perhaps only 10 years or less.

Once this "point of no return" had passed, little opportunity remained to recover any further slippage and the full works on site were committed. This is a key failing of the project contingency plan and is explained in more detail in the next section.

One question is whether the contingency plan should have included the option to simply clear the two lines being occupied by engineering trains and open the lines for passenger service on Saturday 27 December. However, the presence of the engineering trains on the two lines adjacent to the worksites was critical to conducting the track and ballast removal and relaying activities. All of the scrap and waste ballast had to be loaded onto the trains for removal and, likewise, the trains brought in the new materials. The crane, which was used to load and unload the rail panels was also rail mounted. Clearing the lines of engineering trains in order to open for service on Saturday would have caused prolonged and severe disruption to the East Coast Mainline during the following week. In particular, on the Monday morning, the network would have been unable to cope with the normal levels of passenger traffic on only two of the required four lines. For this reason the contingency plan did not include this as an option. During the re-planning activities on Boxing Day, the idea was briefly discussed but then discounted.

What was the cause of the overrun? Where was the time lost against the plan and were the right decisions made at the right times?

Approximately one hour was lost during the process of isolating the 25,000 volt overhead lines and then issuing the required permits to work before the site work could start. Because all of the projects on the route started at approximately the same time, there was a known bottleneck in the

issue of permits to work. A pre-agreed prioritisation of worksites was in place and Holloway was second in the prioritised isolation plan.

Approximately 3 hours were then lost during the process of "scrapping out" where the 500m of old track and sleepers were flame cut, dismantled and loaded onto engineering trains marshalled on the adjacent track. There were a number of reasons why time was lost, including some due to machine operator experience, but the primary reason was that the fittings between the Road Rail Vehicles and the brand new log grabs kept leaking hydraulic fluid, losing pressure and not working correctly. The on-site fitter was constantly working to fix these problems and delays mounted. The plant supplier had provided new log grabs to specifically reduce the delivery risk. However, the unintended consequence was to introduce a delivery risk because the grabs had never been operated with these specific RRVs. The issue of the leaking fittings is under separate review. In addition, one of the seven RRVs was disabled by a fault for 3 hours 35 minutes. The repair was beyond the capability of the on-site fitter so an off-site specialist was called to site.

At the end of scrapping out, at approximately 09:00 on Christmas Day, the 4 hours lost less the 45 minutes of contingency built in the final plan up to this point, meant that the project was now 3 hours 15 minutes behind plan.

The project had now reached the "point of no return" referred to above, being the key decision in the contingency plan of how deep to excavate the ballast. The contingency plan allowed for the project to be up to 4 hours behind at this point and to still deliver the full 300mm deep ballast excavation (around 6,000 tonnes of stone). As the project was less than 4 hours behind the plan, the decision was rightly made by those on site to progress with the full dig. Though most of the contingency had been used up, the site team believed that time could be made up later and they did not declare an overrun.

Once the decision had been taken on the depth of the excavation, it had to be completed to that depth along the entire length of the track otherwise it could introduce serious track quality issues with a potential risk of train derailment when the infrastructure was returned to use.

Shortly after the decision was made to proceed to the excavation phase however, two engineering trains, which were loaded with scrap rails and sleepers, were due to leave site. Some of the scrap was not correctly positioned to safely travel on the open railway and had to be adjusted. By the time that this was completed, the drivers of these trains had reached the end of the limit for the length of a shift and were unable to take the trains to New Barnet, approximately 7 miles away. This seemingly minor issue proved to be the catalyst for a major issue, though this did not materialise for a further 12 hours.

The drivers of two of the spoil wagon trains (used to transport the old ballast) were cascaded forward to drive the scrap trains away. Moving drivers from one train to another is not unusual; however, the engineering trains were spread out over the 9 mile worksite so time was lost with each driver move.

The site was now two train drivers short and continuing to gradually lose time. By 14:00 on Christmas Day, the project was approximately six hours behind the plan. The programme delay had

been escalated to Senior Network Rail, Amey and Alliance staff and they were now fully engaged. In the evening of Christmas Day, it was still felt that the Saturday hand back of two railway lines was possible, although tight, because of the contingencies built into Boxing Day.

However, as noted above, the project had been cascading train drivers throughout the day and, shortly after midnight, the supply of new drivers to support this cascade, ran out. There was one remaining driver and five engineering trains still on-site and this was the point at which the project started to rapidly lose time. Whilst all the drivers involved were cooperative and committed to completing the project, they reached their maximum shift duration limits, which for safety reasons cannot be exceeded.

The huge amount of construction activity over Christmas required the support of over 200 engineering trains. This demand exhausted the national supply of freight train drivers and some planned work had already been cancelled in the run up to Christmas because it could not be supported by train crew. The train plan for each worksite was carefully constructed but, due to the constraints of driver hours and shift patterns, could only cope with a finite amount of project delay. After this point, the work activities and the engineering trains to support them become out of sync and this is what happened at Holloway during the early hours of Boxing Day.

With only one driver and five trains spread out over the length of the site, progress on site slowed to a crawl as trains were in the wrong place to support the planned pace of work. This was compounded by the mechanical failure of one of the ballast wagons which failed in such a way that it could not be moved for a number of hours.

The rapid loss of time should have been escalated during the night but the on-site staff became focussed on dealing with the problems and their communications to the IP Tactical Control in Peterborough and the LNE Route Control in York became less clear and timely.

In the morning of Boxing Day, senior Network Rail, Amey and Alliance staff sought to identify a solution but, by 11:00, the project was around 15 hours behind the original plan. Network Rail IP Tactical Control and LNE Route Control were made aware that an overrun would occur on Saturday 27 December. The overrun was also escalated to Network Rail's Managing Director Infrastructure Projects and Chief Executive.

By 13:00 on Boxing Day, a revised plan had been put together which showed that the railway could not be safely handed back until Saturday night. This was after the time when any passenger trains were planned to be operating so a 24 hour overrun was therefore declared. This revised plan had two lines being opened for passenger service on Sunday 28 December at 05:30 and all four lines as originally planned at 05:30 on Monday morning.

Was the decision to declare an overrun made at the right time?

After the project had started the excavation phase and the logistics plan with the engineering trains subsequently started to fall out of sync with the delivery plan, it became very likely that an overrun would occur.

The issue of the delay to the two engineering trains loaded with scrap and the knock on effect this would have with train drivers was not fully recognised and the consequent severity of the overrun this would cause was not appreciated.

This report concludes that the risk of a significant overrun could reasonably have been identified on the evening of Christmas Day.

What was the impact on services and passengers on the 27 December?

Saturday 27 December was expected to be one of East Coast's busiest days across the holiday period, with 36,714 tickets booked in advance, and 85 services planned (84 ran) into and out of King's Cross. First Hull Trains planned to run nine trains (six ran) with predicted passenger numbers of 2,000, with similar figures for the 28 December. Grand Central planned to run nine services (eight ran) with 1,500 reservations. Govia Thameslink Rail (GTR) planned to run 467 services (133 ran) on the Great Northern Service Group with predicted loadings of around 35,000.

Although there were comprehensive contingency plans in place in the event of a project overrun at the end of the works (on Monday 29 December), the contingency plans for the handing back of the two lines on the 27 December focussed mainly on the likelihood that any delay would be a few hours at most, which would be realistic for this sort of work. There was no operational contingency plan specifically for this project that anticipated all four lines remaining closed for the whole of the 27th. When the length of the likely overrun became apparent, in the afternoon of the 26 December, the Route decided to adapt and implement an amended version of the Operational King's Cross Alpha One contingency plan which is the standard plan for when all lines are blocked into King's Cross. It is normal practice to have to customise and amend standard contingency plans to meet the exact circumstances of the incident. This involved many trains starting and terminating at Finsbury Park, two tube stops north of King's Cross, and others further north for example at Stevenage and Peterborough. London-bound trains would arrive in to Platform 4 to allow passengers to disembark then shunt across to Platform 5 before departing to destinations north of London.

The decision to run trains had to balance the disruption that would be caused by running services terminating at Finsbury Park, versus the even greater disruption that could have been caused by cancelling services altogether or directing them to other destinations more remote from King's Cross. In this decision, Network Rail was accountable for deciding if it was safe to run trains and for preparing the route plans. Decisions were made based on the advice given by the TOCs regarding passenger handling and capacity at key stations along the route including Finsbury Park, along with the BTP and other key stakeholders.

A message to passengers was jointly agreed at 17:10 on the 26 December and issued through all owned and other media channels. This message strongly advised deferring travel arrangements to Sunday 28 or Monday 29 but, if this was not possible, to go to Finsbury Park station.

At the start of services on 27 December GTR services began to arrive (southbound) and depart (northbound) with some using platform 4 in both directions. Around 100 had arrived, departed or passed through by 10.00 with average delays of around 10 minutes, reflecting the difficulties of operating a further revision to the already limited timetable at short notice. Unfortunately there

was then a short term breakdown in communication about how to handle the longer distance trains that were the due to start arriving and departing. It was agreed locally between the station staff and the King's Cross signal box that they would also arrive and depart from platform 4, whereas the plan agreed by all parties the previous night was that they would depart from platform 5. As a result, passengers were unable to get off London-bound trains on to platform 4 due to the platform already being occupied by northbound passengers. This error contributed to the overcrowding in the rest of the station and the understandable passenger confusion. This was corrected after the third London-bound train arrived at Finsbury Park around midday, following the implementation of a passenger flow system at the station.

By about 10:30 it became clear that passenger flows were extremely difficult, with crowded platforms meaning that passengers on incoming trains were even unable to alight. As a result, at approximately 11:00, GTR closed the station for about 30 minutes due to overcrowding and the safety risk to passengers (supported by the British Transport Police (BTP)). The overcrowding led to several hundred passengers having to queue outside the station, in some cases in excess of two hours. GTR and BTP implemented a one way system at the station and, by 14:00, the crowd were organised and being managed. By 17:00 the queues had largely disappeared.

A further 106 trains were operated between 10.00 and 17.00 with average delays of around 37 minutes, although a number of trains experienced delays for up to two hours. Although the vast majority of passengers were able to board a train to their destination, a reduced service meant that trains were cramped with many passengers forced to stand for some or their entire journey.

Passenger services to and from King's Cross were resumed on Sunday 28 December on two railway lines and all four lines were opened, as originally planned, for services on Monday 29 December.

The industry was criticised for its level of passenger timetable and on-site information during the disruption on Saturday 27 December, which was not adequate. The main challenge to providing robust passenger information was driven by the method under which the revised train plan was implemented on the 26 December. The new timetable was uploaded through a process called the 'Very Short Term Planning' (VSTP) system. Train services that were originally planned to run on Saturday, 27 December were cancelled out of the timetable and the amended timetable uploaded. This caused a number of problems with the Customer Information Systems and, consequently, information displayed on platforms as well as on web sites by National Rail Enquiries and the TOCs was ineffective. Improvements to the way amended timetables are uploaded are already being taken forward through the Industry Customer Information Strategy, but the events on 26-27 December are being reviewed to establish what further lessons may need to be learnt in this area.

Was the recovery plan robust in order to hit Sunday morning and Monday morning handbacks?

This report concludes that the recovery plan introduced at around lunchtime on Boxing Day was robust and safely delivered the necessary hand back of two lines on Sunday morning and all four lines on Monday morning. With the site team feeling the full focus of the national media and the consequent pressure to deliver on-time, specific safety briefs were held at the start of each shift change to emphasise the need for safe working.

The recovery plan was supported by an off-site gold control and an on-site silver control both of which were manned by Network Rail, Amey and Alliance Senior Staff.

How was the service recovery plan arrived at?

On the evening of 26 December Network Rail was able to hold conference calls with TOC representatives, at 18:30 and 21:00, to discuss options for the next day. TOC planning resources started to become available from 20:00 on the 26 December which enabled the re timetabling of services for the 27 December. This then meant that the timetable had to be uploaded as "very short notice" and led to the passenger information issues already described.

The Alpha One contingency plan is designed to manage situations when all the lines to King's Cross are blocked, but it assumes that some passengers will disperse to other mainline stations in London as well as Finsbury Park. However, on 27 December the West Coast Main Line was closed at Watford and East Midlands Trains services on the Midland Main Line were also at capacity. On the 27 December the majority would have used Finsbury Park. As with all operational contingency plans, Alpha One had to be adapted to fit the exact situation on the 27 December.

On the call at 18:30, concerns were expressed about potential crowding issues at Finsbury Park, and it was agreed that a number of trains that would have started or finished in King's Cross would be redirected to Peterborough and Stevenage rather than Finsbury Park. GTR services were terminated at Letchworth or Welwyn Garden City where practical for interchange with the Northern City Line services to Moorgate. GTR and East Coast made great efforts to procure and supply buses to all passengers but were unable to obtain the amount required. The two Hull trains services originally planned to run into St Pancras on the 27 December ran as planned. All representatives on the call agreed that the plans were the best in the circumstances and would be manageable.

What lessons have been learned?

The major lessons from this passenger disruption are:

1. The overall structure and content of project and operational contingency plans will be improved to ensure that minimising passenger disruption is at the very heart of our planning.
2. Contractors will be required to test any new equipment in an off-the-railway environment before it is used on live railway work.
3. Recognising the risks that are introduced at times of peak project delivery, such as Christmas and Easter, consideration will be given to moving more work away from these peak times.
4. A review will be undertaken of Network Rail processes for communicating operational train service contingency plans to our own and other staff at short notice.
5. Engineering train crew and contingency at times of peak work will be treated with the same level of nationwide cross-project scrutiny and planning as other resources in short supply, such as signal testers and overhead line engineers.
6. Network Rail will work with industry colleagues to improve service recovery and to provide better information to passengers.

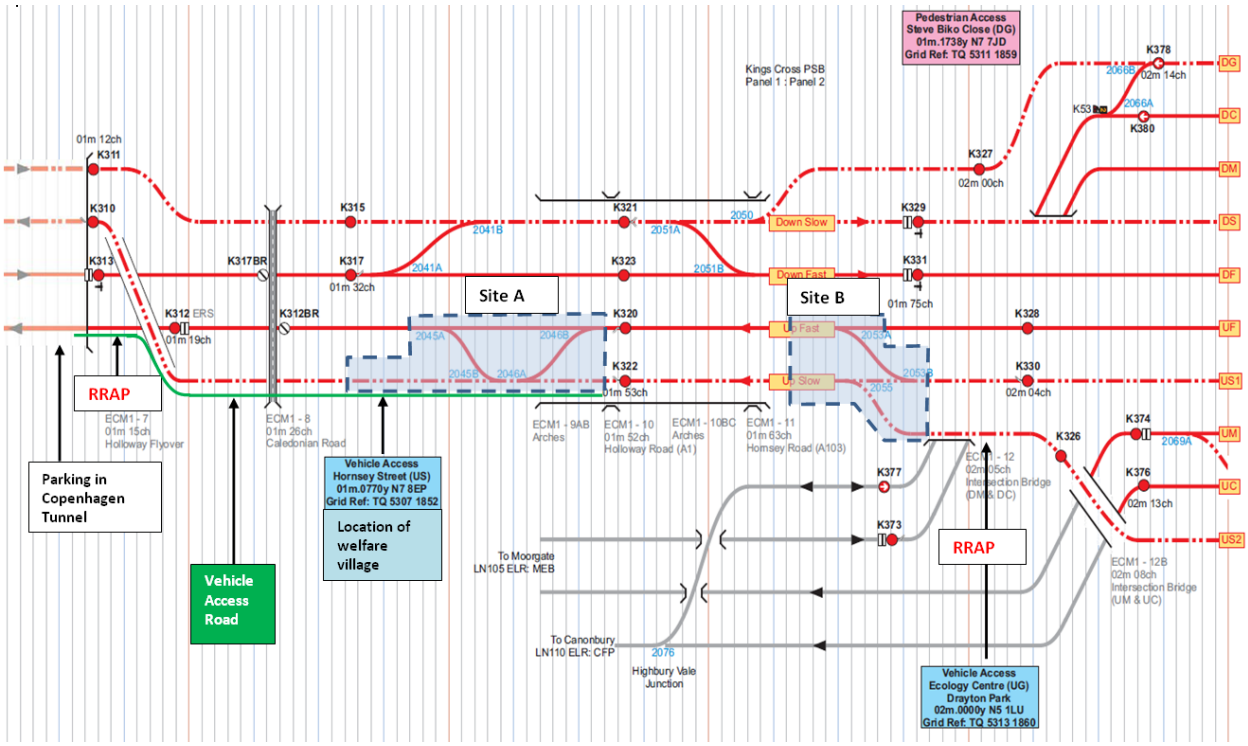


Figure 8. Site layout

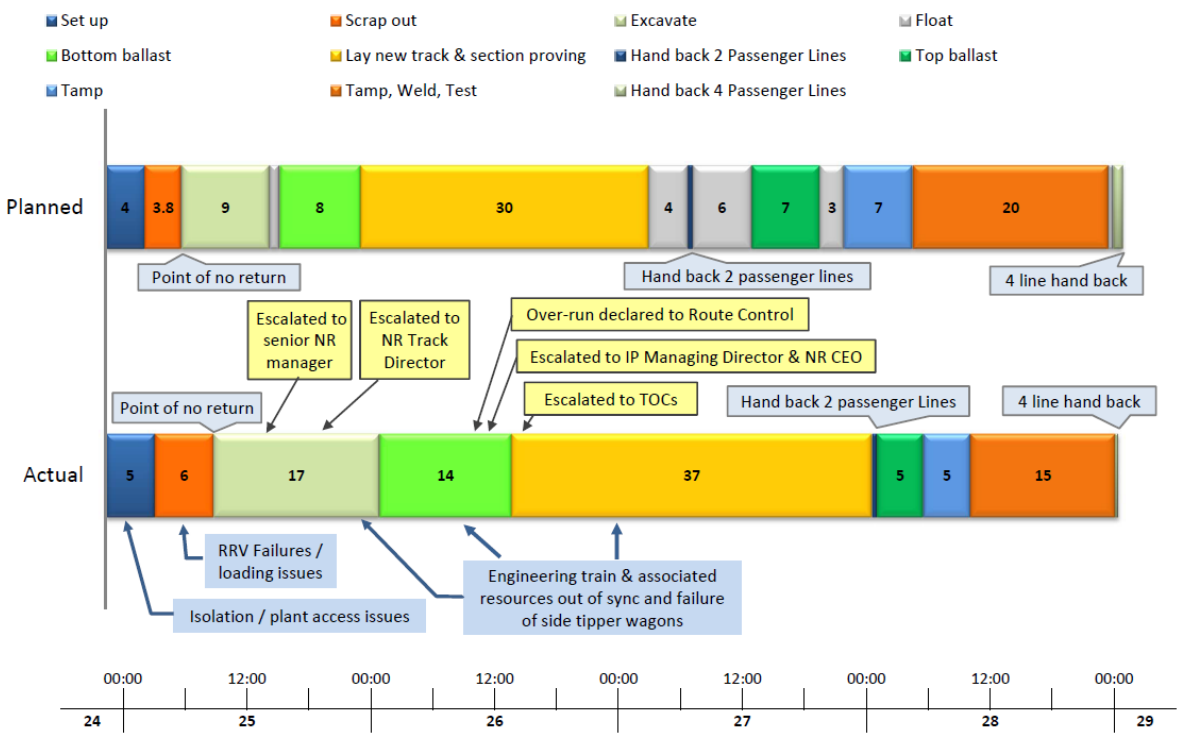


Figure 9. Holloway timeline

Old Oak Common

What work was being undertaken and why was it necessary?

Between 24 December 2014 and 2 January 2015, Network Rail undertook major engineering works across the 25 mile stretch of railway between Paddington and Maidenhead to replace ageing infrastructure and to upgrade the railway for future services.

The work being undertaken included:

- Introduction of a brand new 1,750m long flyover and junction to enhance connections to Heathrow Airport.
- Major track layout, overhead line and signalling changes at Old Oak Common depot to enable future rolling stock use of this complex depot – this was the item which overran on 27 December.
- Demolishing two road bridges in the Slough area, to enable the installation of new overhead power lines.
- New and lowered track in the Slough area, to enable the installation of new overhead lines.
- Installation of overhead line equipment between Slough and Maidenhead.
- A new track layout and subway structure at West Drayton.
- Station works along the route.
- Bridge reinforcement in the Paddington approaches.
- Track signalling and overhead line works at the North Pole Train Depot.
- Heavy maintenance of existing track in the approach to Paddington station; and
- Paddington station roof refurbishment.

The work to deliver this huge level of activity peaked on Christmas Day and Boxing Day when, as planned, all of the railway lines into Paddington were closed with over 1,200 construction and test staff, split into 2 x 12 hour shifts, working on the infrastructure. Over the following days, between 27 and 30 December, around 350 to 400 people were employed per shift.

The work required the support of 18 engineering (freight) trains and over 200 construction machines such as 500 tonne mobile cranes, Road Rail Vehicles (RRVs) and piling machines throughout the area. 10,000 tonnes of track ballast (stone) was removed and a similar amount of new ballast brought in. During this period around 2 km of track work was completed and a further 2 km of new track brought into use. 23 sets of track points were commissioned and multiple new signalling systems were brought into service.

This work was part of the wider works undertaken by the Network Rail Western and Wales Region, which undertook major works in the Reading area, Bristol area and electrification works across the route.

Figure 10 shows the geography of the worksites. Figures 11 and 12describe the work undertaken at Old Oak Common and Stockley and Figure 13 is an aerial view of Stockley.

Figure 10. Paddington to Maidenhead - Christmas 2014 Works

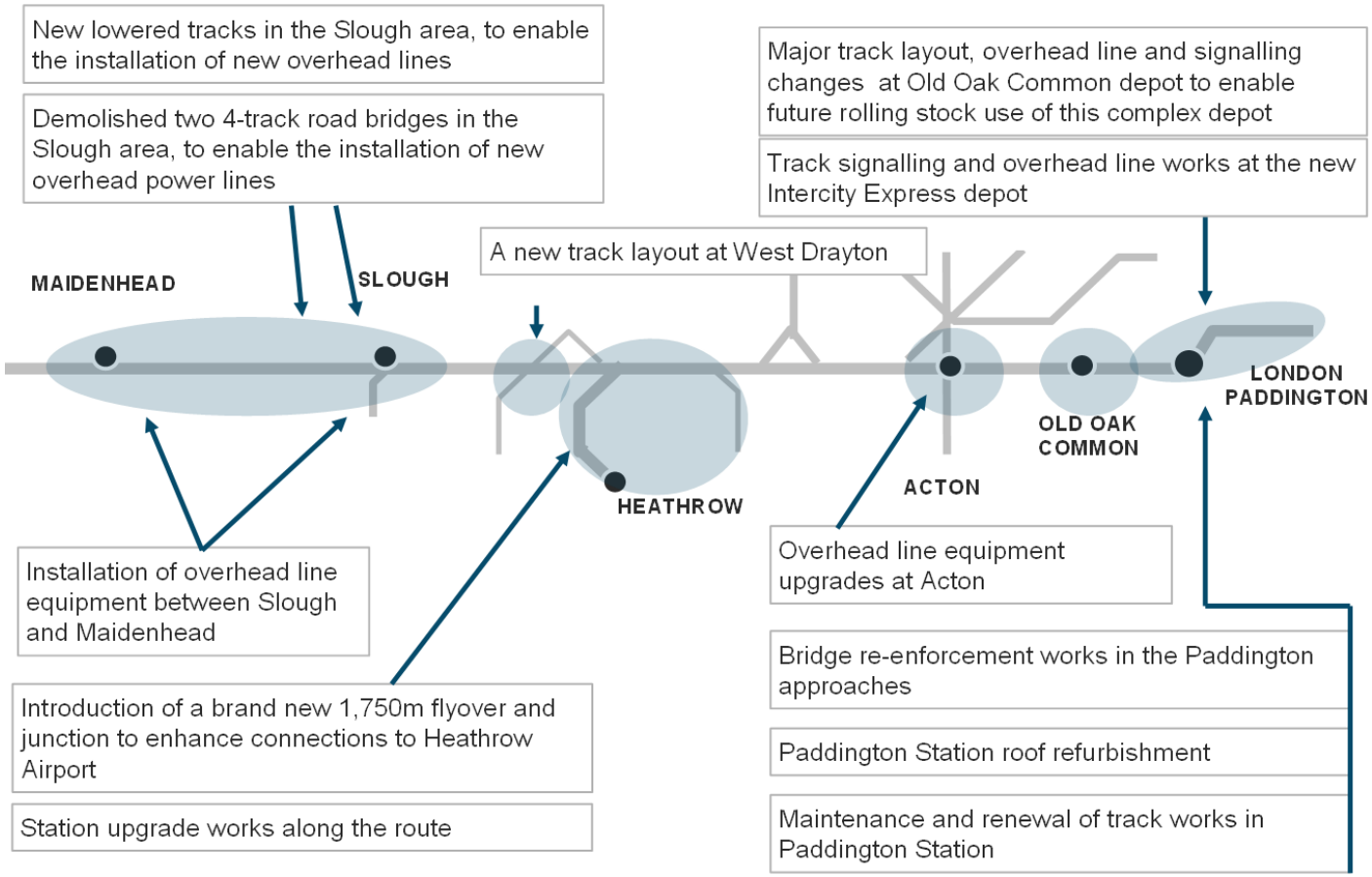


Figure 11. Old Oak Common and Paddington Approaches (OOCPA) - Christmas 2014 Works

Continued works to commission upgraded signalling system in the Paddington area which included:

- Upgrade of the signalling data control system.
- 37 major updates and tests of the existing signalling equipment.
- 8 new sets of signalling equipment being installed and commissioned.
- 6 points ends commissioned.
- 5 new signals installed.
- New signal structure installed.

In addition, to other infrastructure upgrade and renewals completed in the area.

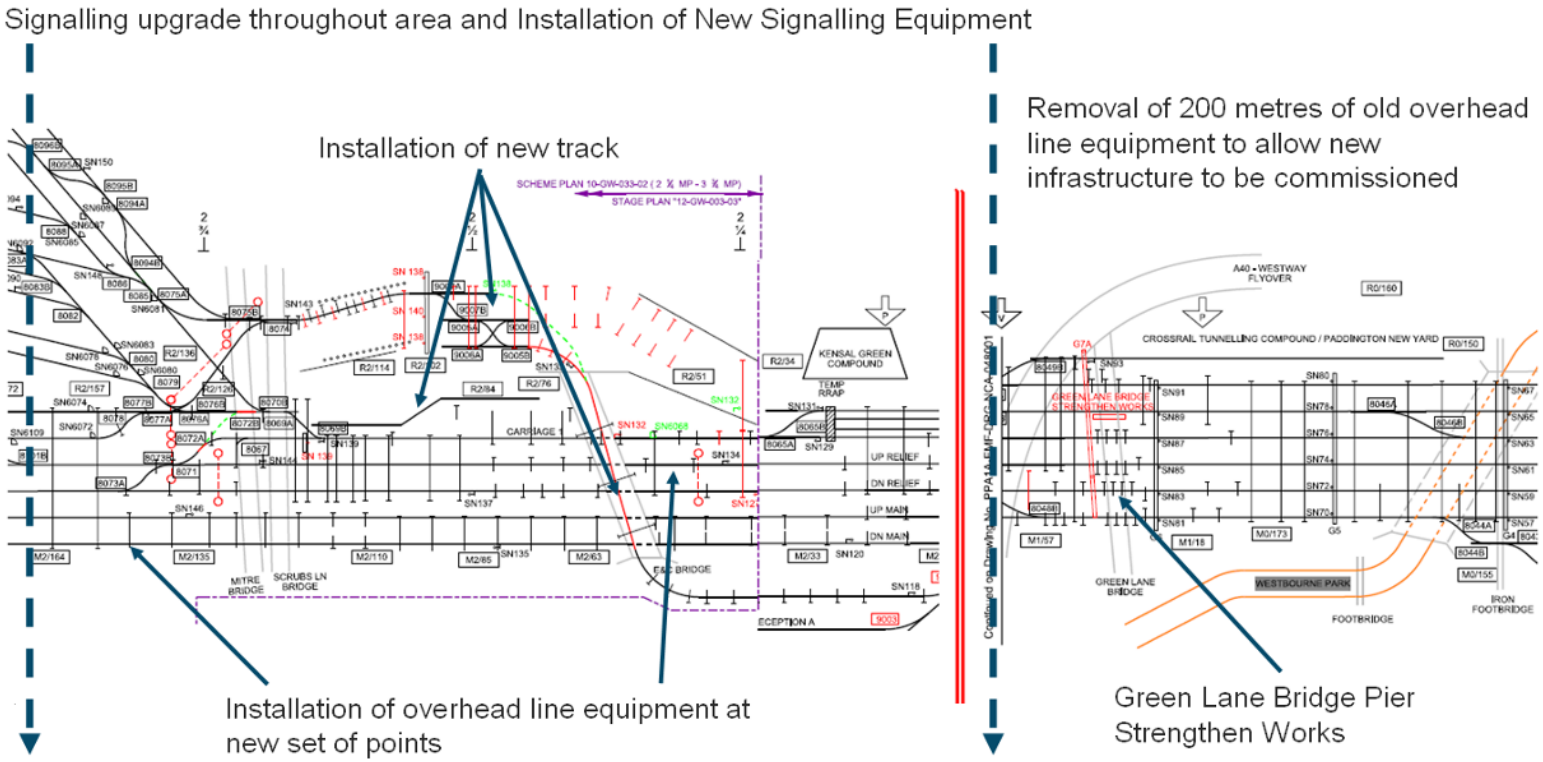
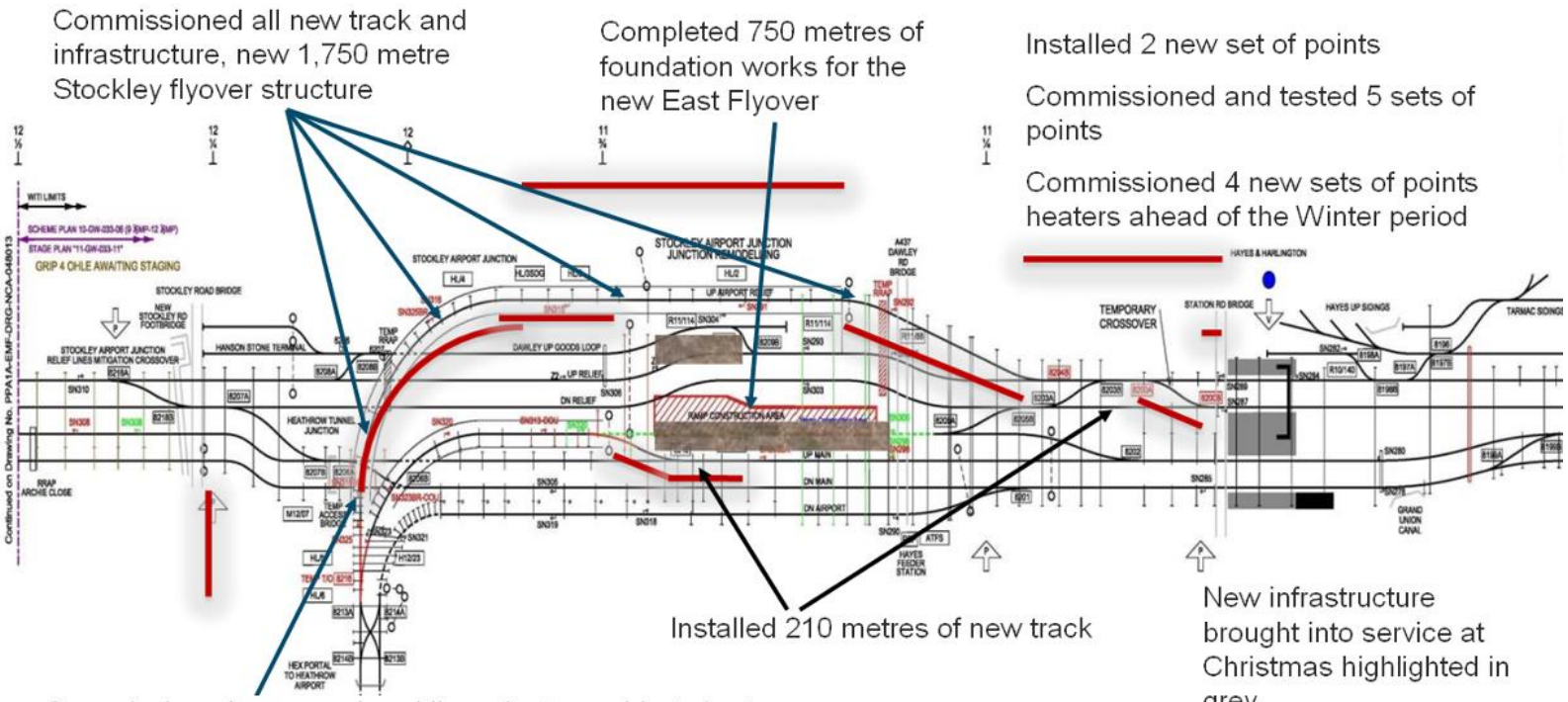


Figure 12. Stockley Airport Junction - Christmas 2014 Works

Opened New 1,750m flyover and junction to enhance connections to Heathrow Airport from the Great Western main line



- Commissioned new overhead line wire to enable trains to run on new line
- Commissioned 14 new signals and signalling infrastructure for new Line
- Installed new overhead line equipments structures for new Line and removed redundant structures

- Removed 850 metres of old overhead line equipment
- Removed 610 metres of old track
- Removed 3 existing signals

Figure 13. Stockley Airport Junction - Christmas 2014 Works

Was the initial plan adequate?

The optimum engineering plan required three full days of track closure to complete the major track layout changes at Old Oak Common and Stockley. However, as it was felt to be too disruptive to the travelling public, a revised plan was developed with only two full days of track closure. In this plan, the railway would be handed back to operation in sections, starting from 07:00 on Saturday 27 December.

This phased approach to opening the railway resulted in a complicated set of track closure plans which meant that the limits of the worksite would change 88 times during the period of 24-31 December. This increased the complexity of the planning and control of the work and removed flexibility to re-plan activities if issues arose. It also made the management of a large and multi-disciplined workforce much more challenging.

Each element of the project was risk assessed using the standard industry risk assessment tools and each passed its risk assessment. In the specific case of the signalling work at Old Oak Common, the risk assessment passed with a greater than 95% likelihood of completing on time.

The plan for the work at Old Oak Common, and for the work at the other 58 high risk worksites over Christmas, followed Network Rail's Delivering Work Within Possessions (DWWP) process (described in the appendix). Formal deliverability reviews were held 12 weeks, 8 weeks, 4 weeks and 2 weeks and 1 week prior the works being undertaken. The site status, action log and an extensive pack of supporting data, including key resource demands, was submitted to the Office of Rail Regulation (ORR) as usual prior to the Christmas work programme commencing.

As part of this investigation, the plan has been reviewed and benchmarked against other similar works to establish if the timings for the various activities were reasonable. It has been established that the timings of each activity were consistent with other previous worksites. The plan also had typical time contingency built in.

The commissioning of the signalling system on this project was being undertaken by Signalling Solutions Limited (SSL), a Balfour Beatty Plc and Alstom UK joint venture. SSL are one of Network Rail's appointed signalling framework suppliers. A significant overrun had been experienced in May 2014 with SSL in the commissioning of the new signalling system at Poole to Wool. At that time, the key issues identified were: there was no senior SSL management on site; progress reporting to Network Rail had been poor; and that this had been exacerbated by the SSL Office and the Network Rail Project Offices being geographically distanced.

To mitigate this risk at Old Oak Common, a number of actions had been taken:

- The SSL Operations Director was present throughout the night of the key signalling commissioning on the 26 December.
- The SSL Managing Director was present during the morning of the intended handback of the railway on the 27 December.
- The SSL Office was adjacent to the Network Rail Project Office.
- Two Network Rail staff were present in the SSL Office to facilitate communication; and

- A Network Rail signalling specialist was located in SSL's offices in Derby for the 3 months running up to the commissioning to validate the robustness of the signalling data.

Equipment is clearly important and there was contingency built in for key equipment such as spare Road Rail Vehicles and on-site fitters to support them. The provision and reliability of the on-site equipment did not play a part in the overrun on Friday 27 December.

This report concludes that the plan had been adequately assessed as reasonable and in line with industry norms.

Did the staff making the decisions have the necessary competence and experience?

In line with the scale and complexity of the work in this area, Network Rail deployed an experienced team of Network Rail staff supported by a team from Bechtel acting as delivery partner.
Each member of the combined team had extensive experience of managing major possessions in this area, on the Reading Station Upgrade or on the modernisation of the West Coast main line.

Over the Christmas period, a dedicated Project Control Room was in place, manned by the Senior Programme Management and Construction Management teams on a 24 hour cycle. Network Rail also had experienced signalling, technical and project management staff in place throughout the works.

During the evening of the 26 December, a three hourly senior management conference call, including the Network Rail Route Managing Director and Network Rail Infrastructure Projects Regional Director, was put in place to ensure that the Senior Programme Management team and Route Operations team were aligned.

During the period of the overrun on the morning of the 27 December, this was increased to an hourly conference call.

Were the project contingency plans adequate?

Ultimately, the contingency plan failed to secure the hand-back of the railway lines on Saturday 27 though all subsequent hand-backs after the 27 December were completed on time including the major new flyover and junction at Stockley on the 31 December.

There were detailed contingency plans for all elements of the planned construction and signalling testing activities and these were enacted a number of times to bring the construction and signal testing activities back on schedule. This was achieved by a combination of providing additional resources or de-scoping non critical activities and these works finished on time.

However, the contingency plan could not cope with the fact that the final validation of the signalling system test process took significantly longer than the two hours planned as it was the very last activity.

What were the key issues, events and decisions?

SSL reported that their signal testing work was complete on the main lines at 03:30. At this point, the project appeared to be on time to hand back the planned railway lines at 07:00 to allow passenger services to commence. As it turned out, this reporting was inaccurate.

Due to the highly safety critical nature of the signalling system, the process which enables signalling to be signed into use is naturally extremely thorough. SSL's Tester In Charge may not issue the safety documentation and sign the railway back into use until the testing is completed to their satisfaction and independently verified. The Tester In Charge is solely responsible for the safety of the signalling system and is required therefore to hold specific competencies and licences.

At 06:30 the safety certificate for the main lines had not been presented by SSL. The Network Rail Project Team alerted Route Control and the Train Operating Companies that there was a risk of overrun, although the Old Oak Common Carriage Lines and main lines would be handed back as a priority.

Dialogue between the Network Rail and SSL project teams continued to be very regular (every 15 to 20 minutes) at both at Old Oak Common and the Control Room in Stockley. Despite this the SSL team were unable to confirm when the Safety Certification for the main lines would be issued.

At approximately 08:30, the Network Rail project team stopped the Tester In Charge and asked him for a candid view of the issues and confirmation of what the revised timescales would be. The Tester In Charge then stated that the document for Old Oak Common would be issued at 11:15. Route Control and the Operations teams therefore planned on this basis.

Subsequently, the Tester In Charge found that the amount of work that still needed to be done was greater than initially expected. This came to light as safety validation checks on the paperwork were completed. The cause of this was a combination of physical testing work needing to be redone or rechecked and inconsistencies in the paperwork needing to be resolved.

At 09:00, the Tester In Charge identified that additional site checks/tests on the main lines were required to be undertaken prior to the Safety Certification being issued. Access to track was urgently arranged and staff undertook testing commencing at 09:50.

Ultimately, the documentation was finally issued to enable the signalling and thus the railway lines to be handed back into use at 13:14.

Despite implementing lessons from the previous commissioning, problems clearly still occurred. It is likely that the previous investigation into signal testing overruns had not identified all of the underlying root causes. Therefore, the work management processes of SSL that led to the incorrect conclusion that the signalling testing of the main lines was complete at 03:30 will be thoroughly reviewed by SSL and Network Rail staff.

What was the impact on passenger services?

As soon as it was recognised that the overrunning engineering would affect train services, action was taken to implement the agreed passenger contingency plans. Reading station was running with only

three through platforms on 27 December so many London-bound trains were turned at Swindon and Didcot to keep them away from Reading and avoid congestion. Passengers had to change trains to continue their journeys but, overall, this delivered more punctual/reliable journeys.

Passengers to/from London Paddington were generally diverted from Reading to London and vice versa using services to/from London Waterloo. However, a rugby match at Twickenham meant that neither additional services nor longer trains were available, which led to overcrowding.

Oxford to London passengers were diverted via Banbury and Chiltern services and this generally worked well, although the services were very busy with displaced passengers from the West Coast Main Line in addition to the normal levels of Chiltern passengers.

Could passenger services have been managed better?

Estimates for the completion time of the signalling validation slipped repeatedly throughout the morning. This made it very difficult for the Route Control to manage the emerging situation and to know whether to replan the train service, to arrange diversions and road transport, or to advertise the disruption to those travelling and therefore to reduce the material impact of the overrun train operators and passengers. Given the situation, the integrated Network Rail / First Great Western Route Control did the best it could in the circumstances.

What lessons have been learned/next steps?

The major lessons from this passenger disruption are:

- SSL are a key supplier to Network Rail on a number of contracts, so their work management processes that led to the incorrect conclusion that the signalling testing of the main lines was complete will be thoroughly reviewed by SSL and Network Rail staff.
- Consideration will be given to providing additional contingency time for the validation process where major signalling works or multi-disciplined works are being undertaken.

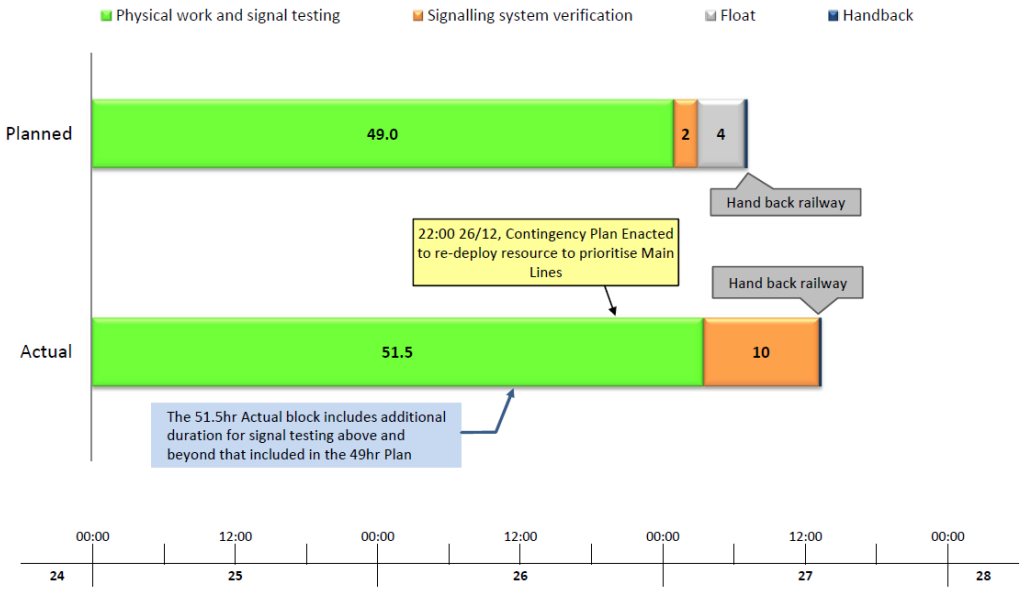


Figure 14. Old Oak Common timeline

Appendices

Appendix 1 – overview of Network Rail's capital investment programme

Britain's railway continues to see exceptionally strong growth in passenger numbers. However, we know that too many passengers do not get the level of reliability they have a right to expect and that this has a real impact on their daily lives. Increasing capacity or improving capability on a complex network, at the same time as keeping it running every day, is the challenge we face. This challenge is going to get tougher with passenger numbers set to double over the next 25 years.

Between 2014 and 2019, Network Rail is delivering one of, if not the largest capital investment programmes in Europe, and the most significant expansion of Britain's railway in generations as we continue to renew and improve the railway, following decades of underinvestment. Of the £38.3 billion included in the Office of Rail Regulation's final determination for the five year control period, £12.7 billion was for projects to increase the capacity or capability of the railway, and a further £9.2 billion for renewing parts of the infrastructure. The total value of improvements and renewals to the railway over the five years will therefore be over £4 billion a year.

This programme includes projects such as Thameslink, electrification of the Great Western Main Line, the Northern Hub, the transformation of Birmingham New Street station and improvements to the line between Edinburgh and Glasgow.

The capacity this programme is delivering enables more trains to run, with 600,000 more services now running each year compared to five years ago, the equivalent of more than 1,700 additional services every day, and thousands of seats for passengers. With passenger numbers having now reached 1.59 billion (in 2013/14, an increase of 5.7% on 2012/13) these increases in capacity are essential.

As a result of the investments we will be making in the next five years, we will be delivering 225 million more passenger journeys, 355,000 more trains and 30% more freight by 2019. Our investment will provide 170,000 extra seats - a 20% increase - on trains going into our large cities nationwide. In London the £6.5 billion Thameslink Programme, and in Birmingham the New Street development, will both be completed, as will our £7 billion modernisation of the Great Western Main Line from Wales and the West Country to London. In Scotland the Borders project will reconnect the Scottish Borders to Edinburgh for the first time in 50 years.

Ultimately, getting passengers to where they want to be safely and on-time underpins everything we do and is where our day-to-day focus remains.

Over the same four years, Network Rail will also be renewing track, signals, crossings, bridges, embankments, conductor rail and a huge range of other assets to the value of some £2 billion a year.

In just 2014/15 we are a renewing 400 miles of track, equivalent to the length of the M1 and the M4 motorways combined. We are also renewing or replacing almost 200 miles of earthworks and hundreds of switches and crossings.

So, in the four peak years between 2013/14 and 2016/17, the value of capital investment being delivered is actually £5 billion a year.

(All costs are stated in 2012/13 prices.)

Appendix 2

The Delivering Work within Possessions (DWWP) process – Mitigating the risk of possession overruns.

Background to the DWWP

In response to the audit findings and the ORR Enforcement Order placed after the three overruns at Rugby, Liverpool Street and Shields Junction in January 2008, Network Rail identified and developed 12 risk mitigation work streams led by subject matter experts from across the industry. These introduced a number of key processes and templates which were subsequently encapsulated in the Delivering Work within Possessions (DWWP) Network Rail standard.

The DWWP was successfully launched in to the business in January 2009 and led to the ORR lifting the Enforcement Order. Since then Network Rail has maintained a full time, dedicated central DWWP team, and has been continually developing the DWWP to reflect best practice and enhance relationships with internal and external stakeholders.

DWWP – Essential elements

The DWWP is a mandatory process that is designed to provide operational readiness assessments of all worksites prior to the commencement of works, and a holistic assessment of the total risks and constraints across the portfolio. It is applied at all times, but is of particular significance at Bank Holidays due to the volume of work executed. It starts 12 months before the commencement of works (T-52) and continues through works execution, to completion and lessons learned. It builds on Network Rail's possession management strategy that sees planning for possessions start three years ahead of the actual work.

The process demands that each project team:

- Diligently plans the works and identifies critical resources early in the process.
- Conducts a worksite complexity assessment to determine the inherent level of risk to the operational railway through a structured, software based, assessment tool. Sites with high operational risk are flagged RED and are subsequently subject to the most stringent risk reviews. For these sites the project manager must:
  - Conduct formal Quantitative Schedule Risk Assessments supported by risk specialists to deliver a plan with success probability greater than 90% with specified time contingencies.
  - Conduct risk readiness reviews and independent peer reviews.
  - Progressively document completion of all essential precursors prior to commencement of the works.
  - Agree contingency plans with their route teams (who in turn engage TOCs and FOCs) in the event of an overrun.

In parallel the National DWWP team:

- Captures the emerging national critical resource demand and confirms with the national resource category owners that sufficient resource including contingency is available.
- Facilitate deliverability reviews across the whole portfolio at T-12, T-8, T-4, T-2, T-1.
- The T-4 review is a GO/NO GO review and exceptions need to be approved by the Infrastructure Projects Managing Director who chairs these reviews.
- Provide the ORR with documented evidence of the outcome of the deliverability reviews and also of developments in the process.
- Facilitate the management of national risks, such as weather conditions, strike warnings, or major sporting events.
- Facilitate national communications to the public about the holiday period works.
- Maintains the online DWWP Knowledge Hub as a reference source for all practitioners.
- Manage the systems and process and conduct lessons learned and on-going business improvement.
- Provide governance and assurance in the lead up to the commencement of works over peak periods.

Outcomes

Following the introduction of the DWWP process in 2007 a 50% reduction in delay minutes attributable to possession overruns was demonstrated. In recent years the application of the process has allowed increasing volumes of work in more restrictive possessions to be carried out.