



National Audit Office

Report

by the Comptroller
and Auditor General

Department for Transport

Update on the Thameslink programme

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National Audit Office

Department for Transport

Update on the Thameslink programme

Report by the Comptroller and Auditor General

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Sir Amyas Morse KCB
Comptroller and Auditor General
National Audit Office

21 November 2017

This report examines whether the Department for Transport and Network Rail are managing the Thameslink programme effectively to deliver value for money.

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Key facts

£5.5bn

cost of Thameslink infrastructure works (2017 prices)

£1.7bn

lease costs of new Class 700 trains manufactured by Siemens (present value, 2017 prices)

£0.3bn

lease costs of train depots at Three Bridges and Hornsey (present value, 2017 prices)

- £474 million** infrastructure budget increase (9.4%) from 2012 budget (2017 prices)
- 10** new platforms at London Bridge station completed and open to the public
- 45** number of new Class 700 trains in passenger service on the Govia Thameslink franchise (as of September 2017)
- 1 year** deferral to the introduction of the final services, to better manage the risks of each service change
- 24** maximum number of Thameslink trains planned to run through central London in each direction during peak hours from December 2019
- £900 million** estimated extra maintenance and renewals funding needed to improve the reliability of Network Rail assets such as track and signalling across the Govia Thameslink network (cash prices, not included in infrastructure works costs)
- £300 million** amount of the £900 million maintenance and renewals work that will be carried out before April 2019
- 13%** proportion of services cancelled and delayed by more than 30 minutes caused by the failure of Network Rail track and signalling between July 2015 and March 2017 on the Govia Thameslink network

Summary

1 The Department for Transport (the Department) is sponsoring the Thameslink programme (the programme), a complex investment in rail infrastructure and new trains, and a significant change to services. The objectives of the programme are to increase passenger capacity on the Thameslink route by running higher frequency, more spacious trains on an expanded network. The Department estimates that the programme will achieve net passenger benefits of £1.9 billion (2010 prices) through reduced crowding, relief of congestion on London Underground, reduced journey times through quicker interchanges, and more frequent services for passengers on major routes in the region.

2 The programme involves:

- two phases of infrastructure works carried out by Network Rail at a total cost of £5.5 billion (2017 prices);
 - phase one included the redevelopment of Blackfriars and Farringdon stations, and was completed to time and budget in 2011. It cost £2.4 billion; and
 - phase two began in 2013, and included redeveloping London Bridge station and introducing new track and signalling technology in central London. These are expected to enable up to 24 trains an hour through central London in each direction. It has a budget of £3.1 billion;
- a fleet of 115 new trains, with lease costs of £1.7 billion (present value, 2017 prices), and two new maintenance depots to service them, with lease costs of £0.3 billion (present value, 2017 prices). These are delivered through a contract similar to a private finance initiative with a consortium of Cross London Trains (who have financed the trains) and Siemens (who manufacture and maintain the trains, and financed and built the depots); and
- the combined Thameslink, Southern and Great Northern (TSGN) franchise, to maintain passenger services on the Thameslink routes during disruption from the infrastructure works, bring the new trains into service and develop and introduce a new timetable for the extended Thameslink route network. The Department awarded the franchise to Govia Thameslink Railway Ltd (Govia Thameslink).

3 We have previously reported on the programme: in June 2013 we published *Progress in delivering the Thameslink programme*; and in July 2014 we reported on the procurement of the new Class 700 trains in our report *Procuring new trains*.

Scope of this report

4 This report focuses on the Department and Network Rail's management of the remaining elements of the programme as it nears completion. It examines:

- the background to the programme and what has been achieved since we last reported (Part One);
- the causes of the increase in infrastructure costs and delays to the new trains (Part Two); and
- the challenges the programme faces in delivering all of its benefits (Part Three).

We summarise our audit approach and methods in Appendices One and Two. We also detail our approach for reporting the costs of the programme in Appendix Three.

5 This report does not examine the TSGN franchise. We will publish a report on the TSGN franchise in early 2018.

Key findings

6 **There has been significant progress on the programme since we last reported, and the infrastructure and rolling stock elements of the programme are broadly on schedule.** Network Rail has rebuilt and brought into use 10 platforms at London Bridge station, and opened two-thirds of the new street level concourse. Network Rail has also brought into use tunnels at King's Cross, allowing the East Coast Mainline to connect to the Thameslink network. Govia Thameslink has accepted 64 out of the 115 new trains, 45 of which are now in use by passengers. Siemens has built the two maintenance depots. Provided Network Rail successfully completes the London Bridge works scheduled for Christmas 2017, the infrastructure to enable connections between a number of key routes will be in place (paragraphs 1.9, 1.11, 3.3 and 3.4).

Infrastructure delivery

7 **Network Rail has kept the infrastructure works to schedule in a challenging environment, although there has been planned and unplanned disruption to passengers.** While Network Rail carries out work to support the upgrade throughout the year, new infrastructure can only be brought into use at London Bridge station during bank holiday periods, when the station can be closed. Failing to complete planned works during these closures would set the programme back by as much as a year, because of the sequence the works need to be carried out in, and the need to wait until another suitable bank holiday. Network Rail has so far avoided such a delay and only one more set of critical works remains in Christmas 2017. Work to develop and test the new signalling technology is also on schedule. The works have caused passenger disruption. A combination of asset failures and problems introducing a new timetable caused disruption in 2015. Although these had significant effects on passengers at the time, the Thameslink programme has accounted for a small overall proportion of direct route delays since this time (paragraphs 2.3 to 2.7).

8 The total budget for Network Rail's infrastructure works has increased by £474 million (9.4%) to £5.5 billion. The budget for phase two increased by 18.0% from £2,629 million to £3,103 million, and was largely associated with the works at London Bridge. As Network Rail developed its detailed design and accessed the site, it found that conditions at London Bridge were not as expected, requiring changes to the design, additional work, and acceleration of other works to keep to schedule. Network Rail's processes were not set up to deal with the volume of design change needed, and became inefficient in delivering these changes. Network Rail also decided not to pursue a proposed national programme to introduce technology to assist signallers in making decisions. The Thameslink programme had depended on this, meaning Network Rail then had to purchase a separate system for it (paragraphs 2.8, 2.9, 2.11 and Figure 2).

9 Since the budget re-forecast in May 2015, Network Rail has kept its infrastructure budget stable and has improved its financial control of the programme. Network Rail has introduced measures to improve the way it manages design changes and has used more sophisticated cost forecasting techniques. Network Rail is confident that it now has sufficient contingency in place to cover its assessment of future cost risks. It has also taken steps to improve the programme's cost control following cost increases resulting from the impact of design changes at London Bridge which reporting by the main contractor, Costain, and Network Rail's contract management, did not immediately bring to light. Network Rail has subsequently revised the terms of the contract, and adopted closer working relationships with its contractors, to better incentivise efficient change management as well as transparency and alignment of cost reporting. The revised budget includes contingency which can be released as risks reduce. Network Rail is intending to release £23 million from Thameslink to the remainder of its infrastructure projects. The cost of stabling for the new trains in the wider network, managed by the Department, is currently estimated to be higher than initially forecast (paragraphs 2.10 to 2.16 and 2.23).

Delivering new trains

10 The acceptance of the new trains is currently behind schedule, but efforts are being made to recover lost progress. Siemens had difficulties finalising the on-board software for the new trains, which delayed Govia Thameslink's acceptance of the first train. This meant that Govia Thameslink introduced the first train into passenger service just over three months later than initially planned. Further technical issues emerged when the trains were brought into service. Siemens have sufficiently addressed these issues to allow Govia Thameslink to accelerate its acceptance of trains to make up for lost time. If current progress continues, Siemens will have caught up to the original acceptance schedule by December 2017. Govia Thameslink is currently carrying out testing to determine what infrastructure adjustments Network Rail will need to make to fully deploy the trains on the Thameslink network. The new trains currently make up all Thameslink services through central London, and have been introduced on Great Northern and the Wimbledon Loop as well as services to Sevenoaks and between Bedford and Brighton (paragraphs 2.17 to 2.22, Figure 3).

Delivering the benefits of the wider programme

11 The wider rail network cannot yet reliably support the Thameslink programme's new services. Between July 2015 and March 2017, 13% of all attributed cancellations and delays of more than 30 minutes on the franchise have been due to failure of track and other Network Rail assets such as signalling systems. In 2016, Network Rail estimated that an investment of up to around £900 million (cash prices) of maintenance and renewal work was needed to achieve the resilience needed to run the new services on the Thameslink network reliably, in addition to infrastructure investments already planned in that area. Limits on access to the railway means that Network Rail has prioritised a £300 million programme of work in its South East and London North Eastern routes to improve particularly vulnerable parts of the network. These works have been funded by a £250 million grant from the Department, with the remainder being reprioritised from its existing maintenance budget. The remaining work is being considered by Network Rail for inclusion in its plans for the period 2019 to 2024, which are currently being developed (paragraphs 3.11 to 3.16).

12 The Department and Network Rail did not initially make adequate arrangements to manage the introduction of the new services and there is limited time remaining for planning to be completed. Managing the introduction of the new services requires new arrangements for signalling, management of passengers at stations and use of technology. It will be challenging for Govia Thameslink and Network Rail to finalise and test plans in the time remaining. Development of these plans also requires a high degree of collaboration across the rail industry, and clarity over who has the authority to make decisions on how the rail network operates. The Department's arrangements for managing the delivery of the infrastructure and trains, such as Network Rail's protocol agreement, have been broadly effective in focusing industry partners to collaborate in delivering the individual parts of the programme. However, the Department and Network Rail did not fully consider what arrangements they would need to manage the transition to bringing the enhanced services into use. In late 2016, the Department and Network Rail established the Industry Readiness Board, consisting of a wide range of industry representatives, to oversee collaborative planning for the new services. In mid-2017, the Department also took steps to better define accountabilities for operational service on the programme (paragraphs 3.5 to 3.10, 3.17 to 3.21).

13 The Department is deferring the full introduction of the new services by up to a year, in order to improve their ability to manage the risks of each service change. The Department and Govia Thameslink had initially planned for a number of services from Sussex and Kent, the Midland Mainline, the East Coast Mainline and Great Northern line to be connected through central London, in May 2018, with more services to be connected from December 2018. The Department requested options from Govia Thameslink to reduce the risks of passenger disruption from introducing too much change on the network at any one time. In October 2017, the Department approved a proposal it had requested from Govia Thameslink to introduce the new services planned for 2018 more gradually, with the final increase in services occurring in December 2019. The Department expects that this will allow Network Rail and operators to learn and implement lessons from each service change (paragraphs 3.22 and 3.23).

Conclusion on value for money

14 The Thameslink programme is now delivering benefits to passengers through station improvements and more spacious trains. The infrastructure work in central London is nearing completion and costs are now stable, after a 9.4% increase in 2015. There is the potential for further significant benefits to be realised from introducing greater connectivity across London and the South East. Overall, we consider that the programme has a realistic prospect of delivering value for money.

15 Our conclusion is informed by the Department's recent decision to introduce new services more gradually than originally planned, deferring the full benefits of the programme by one year. This is nevertheless a sensible step to protect value for money and passengers from further disruption, and which draws on lessons learned from other major programmes. Challenges remain: the Department and Network Rail did not ensure that efforts began early enough to build the readiness to deliver the new services; and the poor state of the rail network in the South East could undermine passenger benefits. The late schedule change also introduces operational and commercial issues which must be resolved. The Department and Network Rail will need to carefully manage these uncertainties and risks as the programme draws to a close.

Recommendations

16 With regard to the Thameslink programme, the Department and Network Rail should work with industry stakeholders to:

- a** establish a clear set of readiness criteria for each timetable change and prepare contingency plans in case these criteria are not met.
- b** maintain effective engagement once the new services are in place, so that future changes across the Thameslink network can be collaboratively controlled.
- c** develop a communications strategy for the deferral of the new services to explain the reasons to passengers. This should emphasise how these will aid their smoother introduction.

17 With regard to future major programmes, the Department and Network Rail should:

- d** put in place commercial arrangements that incentivise major programme contractors to provide clear visibility of emerging cost risks.
- e** develop detailed plans for bringing major programmes into use, ensuring these are clearly visible as part of the programme critical path.
- f** carry out an assessment of the ability of the existing infrastructure to support planned enhancements, and ensure that renewals and maintenance are aligned with this throughout their lifespans.
- g** ensure that the governance arrangements encourage collaboration to the degree needed by the nature and complexity of the programme, and provide clarity over decision-making authority. These should be flexible to allow them to be adapted at different stages as the programme matures.

Part One

Background to the Thameslink programme

1.1 This part of the report sets out the background and main elements of the Thameslink programme.

The Thameslink programme

1.2 The Department for Transport (the Department) is sponsoring the Thameslink programme (the programme), an investment in the railway designed to respond to the significant growth in passenger demand in London and the South East. The Department expects passenger journeys in this region to increase by 46% by 2033, from 2011 levels.

1.3 The programme requires infrastructure, new trains and new train services so that:

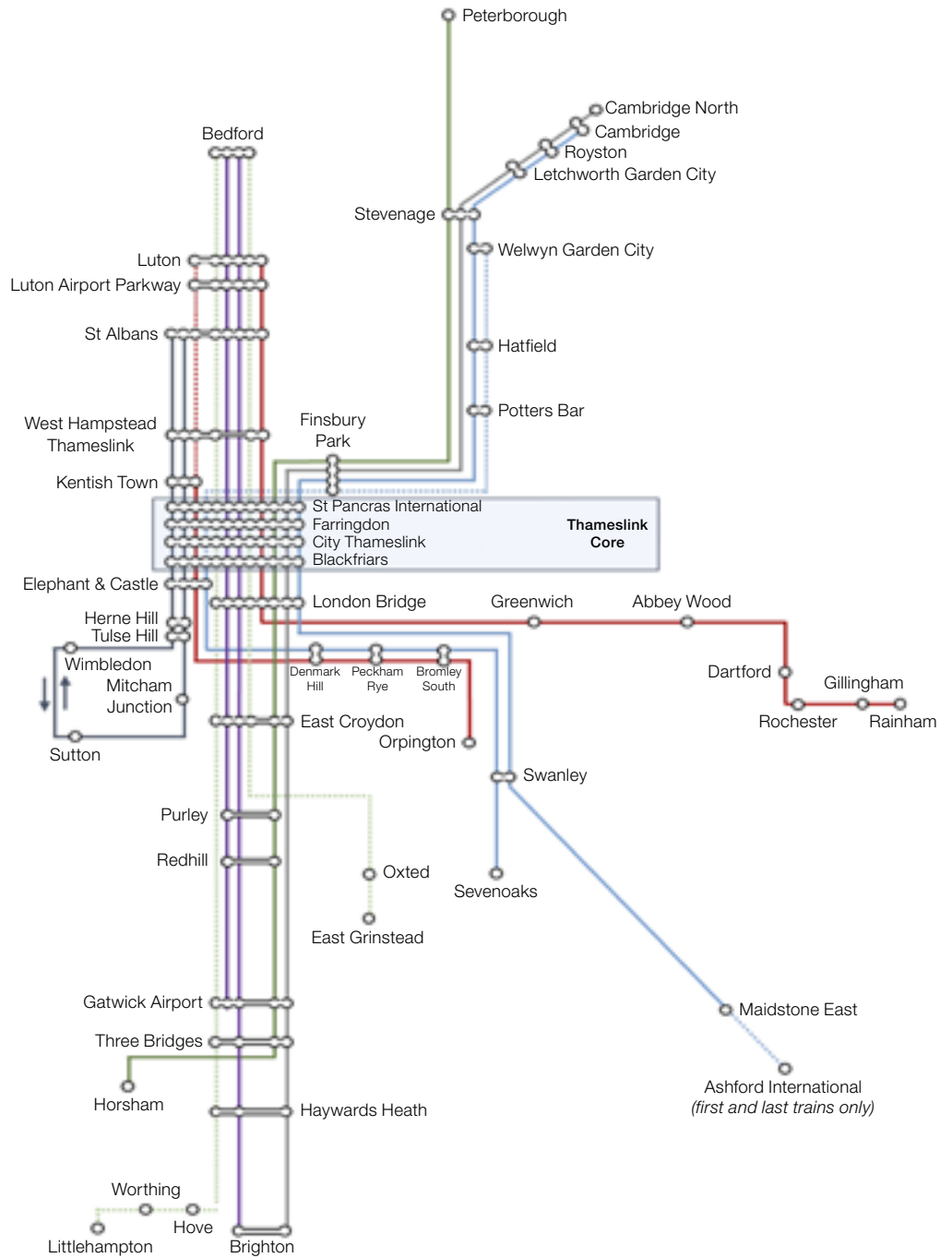
- longer, more spacious trains can run on the route through central London, with improved reliability and frequency;
- fewer passengers need to change trains or use London Underground services to complete their journeys; and
- links with the wider transport network, including Crossrail at Farringdon, High Speed One at St Pancras, and Luton and Gatwick airports will be improved. The route already connects five central London mainline stations and 10 Underground stations on nine Underground lines.

When the programme is complete, up to 24 trains an hour will pass through central London each way at peak times from across the wider South East region (**Figure 1**).

1.4 The programme has a long history that pre-dates the Department's sponsorship. The first proposals to increase capacity north to south through London were made in 1989 and a succession of rail industry sponsors developed these plans in the 1990s and early 2000s. The Department took over from the Strategic Rail Authority as the sponsor of the programme in July 2005, and Network Rail obtained planning consents for the infrastructure work in 2006.

Figure 1
Proposed future Thameslink service patterns

Future Thameslink services will connect locations across the South East through Central London



Note
1 Not all calling points shown.

Source: Department for Transport

1.5 In June 2013, we reported on the successful delivery of Blackfriars and Farringdon stations and the impact of the three-year delay in letting the contract for the manufacture of the new trains.¹ We concluded that the Department had done well to contain infrastructure costs within the budget. However, delays in agreeing the contract to buy new trains meant that delivering value for money for the programme as a whole was at greater risk than we would have expected. At this point, Network Rail had just begun phase two of the infrastructure works and the Department was about to commence letting the contract for the franchise. In July 2014, we reported specifically on the procurement of the rolling stock, finding that the Department assessed that the preferred bidder had offered significantly better value for money than other bidders, and that the Department would need to maintain an effective oversight role.²

1.6 The programme comprises three inter-related projects: infrastructure, new trains, and the Thameslink, Southern, Great Northern (TSGN) franchise.

Infrastructure

1.7 Network Rail is delivering the infrastructure. The Department specifies the outputs of rail infrastructure projects over five-year periods as part of its High Level Output Specifications. Network Rail then delivers the projects, overseen by the Office of Rail and Road, the economic regulator. For the Thameslink programme, the Department also decided to put in place a protocol agreement with payment milestones and financial penalties to incentivise Network Rail to deliver the infrastructure work to time and cost. The Department intended that this approach would better manage the risk of cost increases and enable it to monitor the works more directly over several planning periods.

1.8 The total budget for the programme infrastructure is £5.5 billion (2017 prices) and is split into two phases:

- **Phase one (£2.4 billion):** remodelling Blackfriars and Farringdon stations, extending the platforms between Bedford and London, upgrading signalling and providing stabling facilities for trains. This phase was completed in December 2011.
- **Phase two (£3.1 billion):** remodelling of London Bridge station and the track approaches east and west of the station, and works to install and enable the new signalling and high-capacity infrastructure for the enhanced services, and stabling for trains across the network.

1.9 Construction of phase two of the infrastructure started in May 2013. Since then, Network Rail has rebuilt all six terminating platforms at London Bridge station, opened four new platforms for Charing Cross services and two-thirds of the new street concourse. It has also brought tunnels at King's Cross into use, which connect the East Coast Mainline to the Thameslink network. Network Rail plans to finish the revised track layout at London Bridge in January 2018, and plans for testing of the new signalling technologies to complete by December 2018.

¹ Comptroller and Auditor General, *Progress in delivering the Thameslink programme*, Session 2013-14, HC 227, National Audit Office, June 2013.

² Comptroller and Auditor General, *Procuring new trains*, Session 2014-15, HC 531, National Audit Office, July 2014.

New rolling stock

1.10 The new fleet of 115 Class 700 trains will provide extra capacity by being longer and more spacious. They also have supporting hardware and software for the new signalling technologies, which enable 24 trains an hour to travel through central London. Two new depots are needed to maintain these trains in service. The Department selected a consortium of Siemens (manufacturer) and Cross London Trains (owner) in June 2011 to build the new trains. The Department chose to deliver the trains through a contract similar to a private finance initiative, with lease costs of £1.7 billion (present value, 2017 prices). The two maintenance depots are financed and constructed by Siemens with lease costs of £0.3 billion (present value, 2017 prices). Siemens and Cross London Trains will recover these costs through lease payments from the franchise operator, Govia Thameslink.

1.11 As at mid-September 2017, 64 of the 115 trains have been accepted by Govia Thameslink, with 45 of these brought into passenger service, and all Thameslink services operating through central London are using these new trains. The trains have been late into service. We discuss the reasons for this in Part Two. Siemens completed the two maintenance depots to schedule: Three Bridges opened in 2015 and Hornsey in 2016.

The franchise

1.12 To support the delivery of the programme and run the new services, the Department created the TSGN franchise, bringing together a number of franchises that were previously let separately. The aim was for the franchise operator to maintain passenger services through any potential disruption from the programme, to introduce the new trains, to plan for and implement the new services, and to lead in bringing the new train technologies into use. The Department awarded the franchise to Govia Thameslink Railway Limited, a joint venture of Go-Ahead and Keolis, in May 2014. The franchise commenced in September 2014. Southern services became a part of the franchise in June 2015.

1.13 Over the past three years, Govia Thameslink passengers have experienced service performance consistently below the industry average. Industrial action and train crew shortages were the main causes, alongside other contributory factors such as the poor performance of railway assets. We will report separately on the TSGN franchise in early 2018.

The Department's sponsorship

1.14 The Department oversees the delivery of the programme at a monthly programme board. This is chaired by the Department, and is attended by Network Rail, Siemens, Cross London Trains, Govia Thameslink and Southeastern, who are also significantly affected by the works at London Bridge. This forum provides an opportunity for the Department to hold industry partners to account across each workstream, undertake forward planning and resolve programme-level issues and decisions that may involve more than one industry partner.

Part Two

The management of the infrastructure and the new trains

2.1 This part examines:

- the Department for Transport's (the Department's) and Network Rail's delivery of the infrastructure works, including progress and financial performance since our last report; and
- the roll-out of the new trains by Siemens, and their supporting depots.

The delivery of the infrastructure works

2.2 The second phase of the works involves the remodelling of London Bridge station, as well as introducing European Train Control System (ETCS) and Automatic Train Operation (ATO) signalling technologies, which are being used for the first time on a high frequency UK mainline network, to allow more trains to travel through central London. Network Rail appointed Costain to design and redevelop London Bridge station, Balfour Beatty to carry out track works and Siemens to conduct signalling works.³

2.3 While Network Rail carries out work to support the upgrade throughout the year, new infrastructure can only be brought into use at London Bridge station during bank holiday periods (a blockade), when the station can be closed. Any incomplete blockade work needs to be finished during a future one, and could delay the programme schedule by as much as a year and incur significant extra cost. Network Rail has so far maintained the works to schedule by planning carefully to manage this risk. This includes measures such as accelerating preparatory works throughout the year, and by identifying the minimum necessary work needed.

2.4 Introducing the new signalling technologies is also progressing to schedule. Network Rail started testing the technologies in 2016 using the test track at Hertford North. In 2017, Network Rail began testing the new signalling system with the new trains and has not identified any significant issues so far. Siemens is providing the new signalling technologies, with Hitachi providing the traffic management system.

³ ETCS: European Train Control System: a signalling safety system where safety information is transferred to the train driver cab, instead of through colour lights by the track, and the train is monitored through a signalling centre. The system continuously monitors the maximum allowed speed. ATO: Automatic Train Operation: a technology which controls trains automatically which is necessary to increase the number of trains that can travel through central London from 20 to 24 an hour.

2.5 There was high-profile disruption to Southern services during Network Rail's infrastructure work following the December 2014 blockade. The combination of the failure of newly installed points systems and track circuits, and problems with Network Rail's underlying assumptions on which Govia Thameslink based its timetable, contributed to significant delays and passenger crowding. During January 2015, only 75% of Southern services arrived at their destination within five minutes of their scheduled time, and many were cancelled as a result of the disruption.

2.6 A number of issues, including a points failure, faults with an engineering train, continued issues with the new timetable, and the suspension of lines in and out of Victoria due to an attempted suicide in March 2015 caused further disruption, and only 80% of Southern services arrived at their destination within five minutes of their scheduled time. The rail regulator, the Office of Rail and Road (ORR), reported on this disruption in August 2015.⁴ Whilst significant in their own right, overall the Thameslink programme (the programme) has caused a relatively small proportion of total direct delays across the South East route since this time. In 2015-16, the works caused 58,895 minutes of delays on this route, 3% of the total delays in this area. Network Rail carried out an exercise to understand the causes of the disruption and identify any lessons learned to prevent this in future. Performance improved in 2016-17, with an 81% reduction (down to 11,319 minutes) in South East route delay minutes from 2015-16 caused by the Thameslink works.

2.7 The programme has caused other indirect delays to services on the Thameslink, Southern, Great Northern franchise, as well as to Southeastern services. Network Rail has to take platforms and track out of service to carry out the works. This means there are fewer lines available to manage trains as they arrive in the station, making it more difficult to recover from delays and causing further knock-on delays, known as 'reactionary' delays, in the approaches to London Bridge station. An assessment carried out by ORR in March 2017 found that reactionary delay in the Kent area and at London Bridge "...may be, to some extent, an indirect impact of the [Thameslink programme]".⁵

Managing the costs of the infrastructure

2.8 In 2015, Network Rail completed a budget re-forecast that revealed the cost of the infrastructure programme to be £5.5 billion, £474 million (2017 prices) higher than originally anticipated. The majority of the increase related to the works at London Bridge station (**Figure 2** overleaf). In February 2016, the Department approved a budget increase for the programme, authorising Network Rail to spend these monies to complete the infrastructure works. However, the penalty arrangements in the Department's protocol agreement are still based on the original 2012 budget. As a result, Network Rail will bear penalties of £59 million if it delivers to this revised budget.

⁴ The Office of Rail and Road, *Network Rail's performance delivery to Southern and Govia Thameslink Railway in 2014-15*, August 2015, http://orr.gov.uk/__data/assets/pdf_file/0006/18699/performance-investigation-report-southern-gtr-august-2015.pdf

⁵ The Office of Rail and Road, *Network Rail's performance delivery to Southeastern*, July 2017, http://orr.gov.uk/__data/assets/pdf_file/0011/25202/network-rail-performance-delivery-to-southeastern-july-2017.pdf

Figure 2

Change in Network Rail's infrastructure budget in 2015

The works at London Bridge station were the main cause of the budget increase

Works area	Original (£m)	Revised (£m)	Change (£m)
Phase One	2,419	2,419	0
London Bridge station redevelopment	909	1,222	313
London Bridge railway systems	465	592	127
High-capacity infrastructure	97	163	66
Central programme	458	417	-40
Outer areas	365	373	8
Other	282	282	0
Department for Transport contingency	53	53	0
Total	5,047	5,522	474

Notes

- 1 All figures are in 2017 prices, indexed using a September 2017 Retail Price Index.
- 2 Total figures do not sum as a result of roundings.
- 3 Project lines include contingency.
- 4 London Bridge railway systems: track and lineside signalling equipment.
- 5 High capacity infrastructure: signalling systems needed for a 24 trains an hour service within central London, including ETCS, ATO and traffic management.
- 6 Central programme: central administration, management and spend on programme-wide activities.
- 7 Outer areas: platform lengthening works, bringing the tunnels at King's Cross into use, and other works outside the London Bridge area.
- 8 Other: includes operator compensation and system integration funds.
- 9 Department for Transport Contingency: Contingency set aside by the Department for potential new scope requirements that emerge as the programme progresses.

Source: National Audit Office analysis of Network Rail data

2.9 Network Rail's analysis identified the main causes of the cost increase as:⁶

- **design changes (£210 million):** Network Rail required changes to its design for London Bridge station and railway systems, after it determined that existing designs were inappropriate for the site. Some of these changes involve extra construction work. It also had to fix existing station assets that were in a poorer condition than anticipated;
- **design costs (£60 million):** The volume of design changes that Network Rail required caused the detailed design phase of the station to take 18 months longer than planned;

6 Apportionment of cost numbers is indicative, and included to demonstrate the scale of each cause.

- **programme acceleration (£109 million):** Following the design delays, Network Rail's contractors had to accelerate construction and procurement to meet the blockade dates when London Bridge was closed. This acceleration was necessary to prevent the more severe cost consequences of a missed blockade;
- **national traffic management programme cancellation (£66 million):** The Thameslink programme relied on a proposed national programme to introduce traffic management systems across the network. Cost pressures elsewhere in Network Rail meant that in March 2015 Network Rail's board decided not to pursue this further, judging that it was no longer affordable. As a result, the Thameslink programme had to pay an extra £66 million for its own traffic management technology requirements; and
- **construction inflation (£29 million):** greater demand in the London construction market increased contract prices for the station redevelopment.

The £474 million cost increase includes future costs which will be incurred throughout the remainder of the programme.

2.10 Network Rail failed to fully anticipate the complexity of the London Bridge site, and the pressures this would place on cost. London Bridge station has a long history of redevelopment from the Victorian era which has not always been fully documented. The need to maintain passenger services prevented Network Rail from carrying out intrusive surveys in advance and complicated the reconstruction of the station. When we last reported, the Department and Network Rail already had to make changes to the outline design to keep the second phase within budget.⁷

2.11 Network Rail did not control the required changes effectively, particularly in light of the volume of changes needed. Network Rail structured the design into packages for each geographical area. This approach created efficiencies in the design process, but did not account for the knock-on effects that changes in one area could have on others, meaning that conflicts in the design emerged. These conflicts had to be resolved with further work, delaying the design further.

2.12 Network Rail had to keep to the fixed blockade schedule. When accelerating the works, contractors had to re-prioritise parts of the design and procurement to meet specific blockades. This made the work more complex and less efficient. The fixed blockades also mean cost overruns from delays are more likely to occur. Modelling by Network Rail suggested the budget should have contained more contingency to account for this risk. Network Rail considered that its monitoring, and that of its contractors, would alert it to emerging cost pressures, and did not seek further funds.

⁷ Comptroller and Auditor General, *Progress in delivering the Thameslink programme*, Session 2013-14, HC 227, National Audit Office, June 2013.

2.13 However, Network Rail's contracts did not provide the right incentives to ensure transparent cost reporting. Many of the changes to the London Bridge design involved changes to construction methods, but not the scope of works to be delivered. This meant that Costain could not apply to increase its target price, even though these changes would make the work more expensive. Costain reported these changes in a separate list outside of the target price reporting process. Network Rail failed to challenge this list until the costs of accelerating construction began to materialise. This meant that Network Rail did not see the cost increases until they were incorporated into reporting in late 2014.

2.14 Once Network Rail had confirmed the full cost increase, it and the Department commissioned reviews to identify the causes and improve financial control on the programme. Network Rail has revised its contractual terms and adopted closer working relationships with Costain to provide better transparency and alignment of cost reporting. It recruited a strategic design manager and introduced a weekly design panel that assesses changes and their wider effects. The 2015 budget also incorporates the additional contingency that Network Rail's earlier modelling suggested was needed. Monthly reports sent to the Department also contain better disclosure of potential cost trends, to allow them deeper oversight of Network Rail's financial performance on the works.

Current position and future risks

2.15 Since 2015, the overall financial position of the programme has remained stable, with an anticipated final cost of £5,514 million (2017 prices) as of July 2017 against the authorised budget of £5,522 million (2017 prices). Network Rail has now finalised the detailed design, and so is less likely to need further design changes to deliver the current project scope.

2.16 Network Rail carries out regular analysis of cost risks and compares this against its available contingency. Its latest forecast indicates that its remaining contingency is sufficient to meet its assessed cost risks. This contingency includes funds towards the potential for a significant cost and schedule overrun if Network Rail fails to complete the work planned for the final Christmas 2017 blockade. Risks to the programme reduce as the works near their completion, and Network Rail is intending to release £23 million from Thameslink to the remainder of its infrastructure projects. The cost of providing stabling for the new trains in the wider network, managed by the Department, is estimated to be greater than initially forecast (see paragraph 2.23).

The delivery of the new trains

2.17 In our previous reports, we examined the delay in awarding the contract for the new trains and the impact that this had on the programme. We expressed concern over the feasibility of meeting the programme end date of December 2018 given the delay.⁸ We also recommended that the Department refinance the train contract. After refinancing in February 2015, the Department will save £123 million (present value, 2017 prices) in rolling stock lease charges.

⁸ Comptroller and Auditor General, *Progress in delivering the Thameslink programme*, Session 2013-14, HC 227, National Audit Office, June 2013 and Comptroller and Auditor General, *Procuring new trains*, Session 2014-15, HC 531, National Audit Office, July 2014.

2.18 Since our report on the procurement of the rolling stock, the new trains and their maintenance depots have started to come into service.⁹ Siemens deliver the trains to Govia Thameslink, and if they meet contractual standards following testing, Govia Thameslink will accept them from Siemens. Once a train is accepted, Govia Thameslink can then work to bring it into service. Govia Thameslink was due to accept the first train from Siemens in December 2015 and bring it into service to carry passengers in February 2016. However, because Siemens could not finalise the on-board software in time, Govia Thameslink did not accept the first train until March 2016. Govia Thameslink then had to carry out its required testing and training after the first train was accepted. Govia Thameslink introduced the first train in June 2016.

2.19 Govia Thameslink then accepted the trains at a rate of one a week, but further technical issues arose with the train software during 2016 and the first half of 2017. The delay in train introduction also meant that the driver training programme was disrupted, making drivers less familiar with the new trains and less able to deal with technical faults quickly. Drivers had to be released from service to attend refresher courses, increasing the risk of service cancellations.

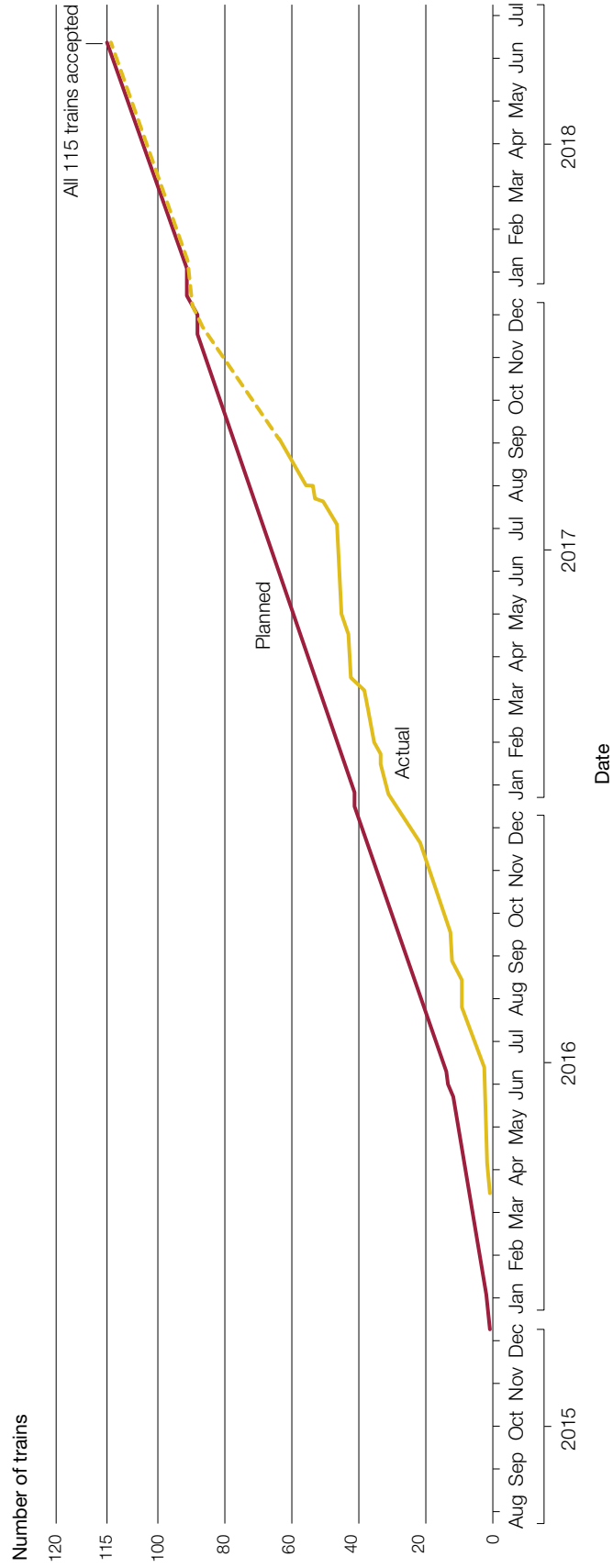
2.20 In September 2016, the Department asked Govia Thameslink and Siemens to put in place a joint performance improvement plan to monitor and improve reliability. Initially the plan had limited impact, and the train acceptance programme was halted altogether from May to July 2017 to allow Siemens to focus on resolving the reliability issues. Following this pause, Siemens has now improved the reliability of the trains enough for Govia Thameslink to be confident that they can perform to a satisfactory level in passenger service. Not all reliability issues have been resolved, though new trains typically perform less well than established fleets over the first few years of operation. Siemens now aims to have two trains accepted a week to recover lost progress, which Govia Thameslink is supporting subject to reliability being consistently delivered. This process has so far been largely successful, and if progress continues, acceptance will have caught up to the original schedule in December 2017 (see **Figure 3** overleaf). As of September 2017, Govia Thameslink had accepted 64 out of 115 trains, and brought 45 of these into passenger service.

2.21 Delays to passenger services have also arisen from the need for further minor infrastructure adjustments to better accommodate the new trains. To introduce new trains the operator must test them on the network to determine if any other adjustments need to be made to the network to accommodate them. Network Rail carry out assessments in advance to identify these issues, but some may only become apparent once the new trains are available for live testing. Until the assessments are complete and issues resolved, the new trains may also be restricted from operating fully across certain routes.

9 Comptroller and Auditor General, *Procuring new trains*, Session 2014-15, HC 531, National Audit Office, July 2014.

Figure 3
Acceptance of trains by Govia Thameslink against the planned schedule

Siemens aim to recover lost progress by December 2017



Note

1 Dotted line shows projected future acceptance based on two trains being accepted a week.

Source: Network Rail

2.22 The new trains currently make up all Thameslink services through central London, and have been introduced on Great Northern and the Wimbledon Loop as well as services to Sevenoaks and between Bedford and Brighton. Testing by Govia Thameslink is underway on the remaining Thameslink routes to determine what further works Network Rail may need to undertake to fully deploy the trains across the Thameslink network. These works are funded through the protocol agreement.

2.23 The Department has also begun to finalise the cost of stabling for the new trains in Bedford Cauldwell, Cambridge and Kent. These locations were originally intended to be developed as part of Network Rail's protocol works, but the Department is now managing these to accommodate the needs of the multiple operators that will use these sites. The revised schemes for Bedford Cauldwell and Cambridge will cost approximately £29 million (cash prices), which is above the initial £16 million budget estimate. Plans for stabling in Kent have not yet been sufficiently developed to allow an accurate estimate.

2.24 The redevelopment of the timetable has also changed future train service patterns, and Govia Thameslink identified a need in August 2016 for new driver accommodation. Before committing funds, the Department asked Govia Thameslink to explain why it needs each depot, and carry out surveying to provide greater certainty over how much these would cost. The accommodation will cost approximately £20 million, and will ensure a more resilient service. Govia Thameslink estimates these will save around £10 million each year. There is limited time to complete these works before they will be needed in May 2018, and the Department is considering putting contingency plans in place.

Part Three

Delivering the programme's benefits

3.1 This part of the report examines the remaining challenges to delivering the full benefits of the Thameslink programme (the programme). In particular, we look at the complexities of introducing more train paths across the wider railway network while also managing the poor performance of the South East railway network. We then look at the Department for Transport's (the Department's) and Network Rail's management of these issues.

Benefits of the programme

3.2 The Department refreshed the business case in 2015, based on a programme completion date of December 2018. The business case sets out the programme's economic case and estimates total benefits of £9.5 billion (2010 prices, present value) against total costs of £7.6 billion, giving net benefits of £1.9 billion, and a benefit–cost ratio of 1.24 to 1 (**Figure 4**). It has fallen slightly since our last report; mostly as a result of methodological changes to the evaluation of costs and benefits, as well as a small increase in assessed infrastructure costs.¹⁰ The programme benefits are predominantly:

- passenger journey time savings: the new train paths through central London connect previously separate geographical areas, allowing faster journey times and greater capacity by removing the need for interchanges, and increasing the number of services travelling to and through central London each hour;
- relief of crowding on the London Underground and National Rail networks; and
- improved 'journey ambience and interchange', which includes better facilities at stations and on trains, increased capacity and better transport network links, including with other mainline services and London Underground.

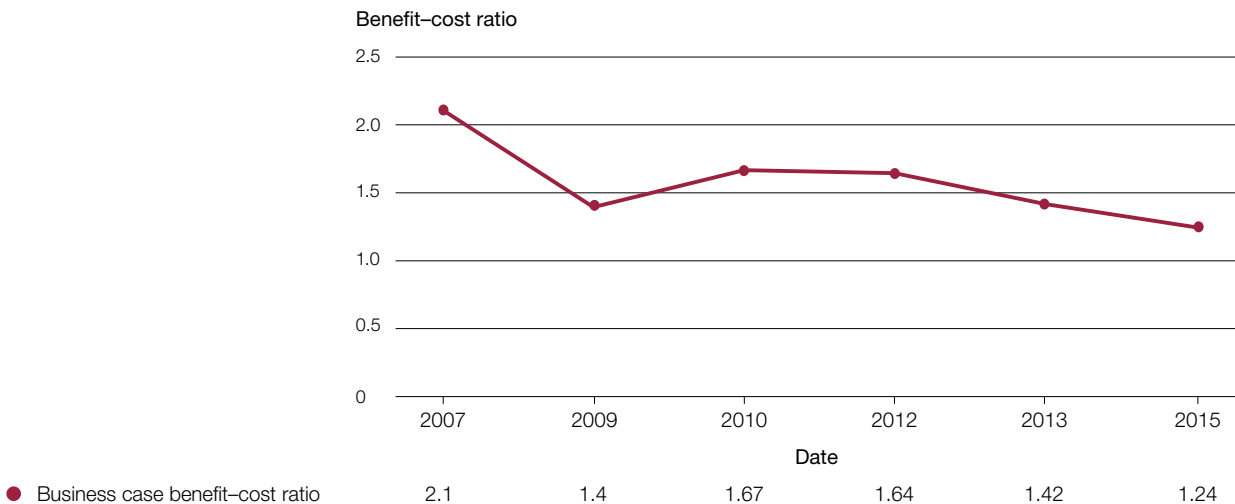
The Department has also identified wider economic impacts from the programme of £1 billion (in 2010 prices), which, in line with HM Treasury guidance, are not included in calculating the benefit–cost ratio. Wider benefits include increased productivity from greater clustering of firms, increased economic activity and labour market effects.

¹⁰ Comptroller and Auditor General, *Progress in delivering the Thameslink programme*, Session 2013-14, HC 227, National Audit Office, June 2013

Figure 4

Change in Thameslink Programme benefit–cost ratio over time

The benefit–cost ratio of the programme has changed as the programme has progressed, and has fallen slightly since our last report in 2013



Source: Department for Transport

3.3 From early 2018, Govia Thameslink Railway Limited (Govia Thameslink) intends to reintroduce services through London Bridge, and introduce new connections across central London between Kent, Sussex, the East Coast Mainline, and Great Northern routes (**Figure 5** overleaf). Each increase in the number of services across central London increases the number of trains an hour travelling through central London in peak hours. These services will be introduced incrementally up to 24 trains an hour as the programme progresses.

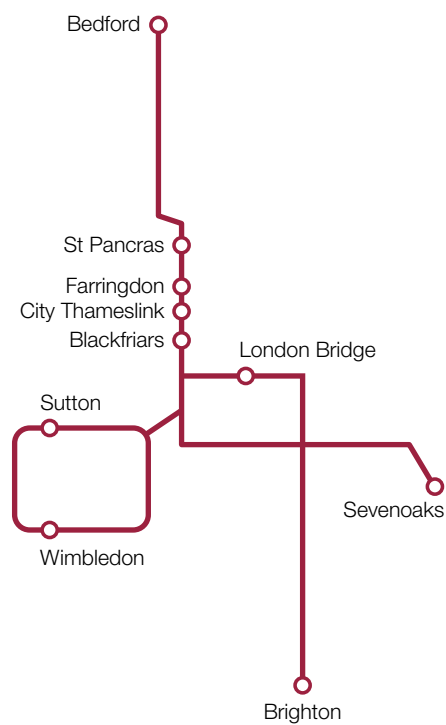
3.4 Network Rail's Christmas 2017 blockade at London Bridge will finalise the track layout at the station and enable the connectivity needed for the planned increases in train services. Network Rail's final signalling technology upgrades in December 2018 will enable 24 trains an hour to travel through central London. In October 2017, the Department decided to defer the full introduction of these services from December 2018 to December 2019. We discuss this in paragraphs 3.22 to 3.24.

Figure 5

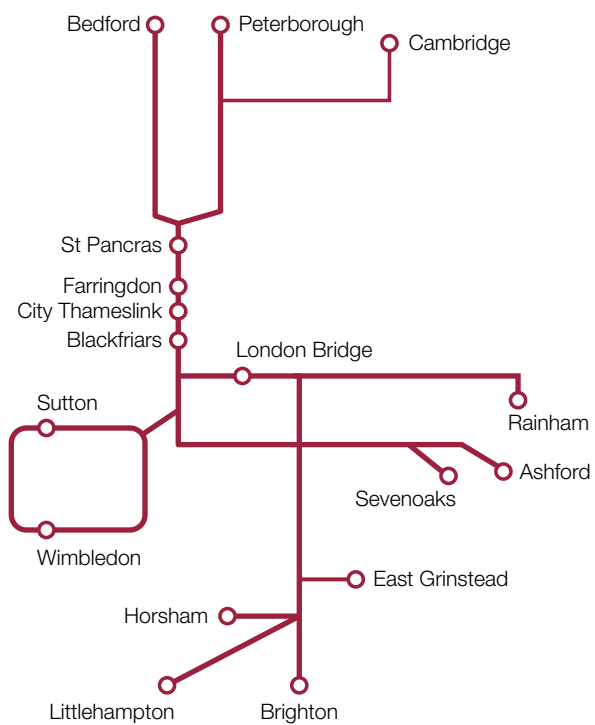
Change in connections on the Thameslink network from early 2018

The timetable changes from early 2018 will create new connections, and introduce new services, across London and the South East

Thameslink network



Proposed final Thameslink network



Note

1 Maps are indicative: exact service patterns not shown. This diagram cannot be used to infer routes or stopping patterns of services.

Source: Network Rail

Risks to operating the new services

3.5 In order to introduce the new services from May 2018, Network Rail, Govia Thameslink and other regional operators need to manage significant changes to the way the railway network operates in London and the South East. In particular, they will need to address risks created by the higher frequency of service, interaction between previously separate locations and the introduction of new technology.

3.6 These risks include specific operational challenges, such as managing passengers at stations so that trains can travel quickly enough through central London, and developing new maintenance and signalling procedures. Network Rail, Govia Thameslink and other operators will also need to train drivers, signallers and other support staff in these new ways of working, as well as recruit them in greater numbers.

3.7 Network Rail and operators have had to agree the final train timetables for the new Thameslink services, to accommodate both the new Thameslink services and those of other regional operators. The Department specified a timetable in the Govia Thameslink franchise agreement that Network Rail advised would require further development to make it workable because its modelling showed that the timetable contained more services than the network could handle in certain locations. Following significant work throughout 2015 to 2017, Govia Thameslink submitted a revised timetable based on an updated specification from the Department. Network Rail and other rail operators are considering this timetable. However, Network Rail remains concerned that making the timetable resilient enough to recover quickly from delays will be challenging, given the increased connectivity between services and operators.

3.8 The detailed plans for operating the services in the timetable are in development but are currently incomplete. Programme working groups have not yet finalised the outline for how the new services will operate, and it has not yet been agreed with Network Rail, Govia Thameslink and other operators. Areas outstanding include plans for ensuring train punctuality and restoring service after delays. The limited time remaining to finalise arrangements puts pressure on the need to model and assess them before they are put into service.

3.9 Alongside the new technology needed to run 24 trains an hour in each direction through central London, Network Rail is introducing a new train traffic management system to help signallers manage delays across the network. It is introducing the new system in two stages. The first, due to commence in January 2018, is over an area of the network from north of Luton to Crystal Palace. The second stage is over a larger area extending to Biggleswade on the East Coast main line and Brighton into Kent, which will start in July 2018. A similar system in Japan took two years to fully work as intended for passenger service.

3.10 A critical requirement to operate the new services is the provision of stabling for the new trains, as well as new driver accommodation. These are referred to in paragraphs 2.23 and 2.24. There is limited time to complete these works in advance of the new train services being introduced, and the Department is currently exploring contingency plans should these not be available in time.

The performance of the wider network

3.11 The greater number of services flowing through central London will place higher demands on the existing infrastructure. There are already maintenance backlogs in central London and a shortage of skilled engineers to carry out the work.

3.12 The risks arising from greater future demand are compounded by performance challenges across the wider network. Of all attributed cancellations and delays of more than 30 minutes across the Govia Thameslink network, between July 2015 and March 2017:

- 13% have been due to the failure of Network Rail assets such as track and signalling systems.
- 12% have been due to Network Rail's management of the network. This includes delays caused by issues such as overrunning works and difficulties recovering from other delays, as delayed trains interfere with those travelling on time.
- 13% have been due to weather and external incidents.

3.13 Trains must run with minimal delay for 24 trains an hour to pass through London during peak hours. In the two years up to December 2016, 23% of northbound and 50% of southbound Thameslink trains arrived in central London on time in the morning peak. Train crew management, train malfunctions and other aspects of day-to-day management have also caused poor performance on the franchise. We will report on the franchise in early 2018.

3.14 In 2016, Network Rail identified a package of railway maintenance work that would reduce the amount of delays from railway asset failures. This includes a range of works, such as track replacement, and cutting back trees and shrubs on and around the tracks. The Department acknowledged the need for additional investment in January 2017, following a recommendation from Chris Gibb in his review of the franchise for the Secretary of State for Transport.¹¹

3.15 Network Rail estimates that it will cost up to £900 million (cash prices) to address all the issues it has identified. However, because of limits on the amount of access Network Rail has to carry out these works, it has had to prioritise £300 million of the works that will have the biggest impact on reducing delays to central London, which it plans to complete by April 2019. These works are on its South East and London North Eastern routes, and have been funded by a £250 million grant from the Department, with the remaining £50 million being reprioritised from Network Rail's existing maintenance budget. It is considering including the remaining £600 million of works in its plans for the next railway spending period starting in April 2019.

¹¹ Chris Gibb, *Changes to improve the performance of the Southern network and train services, and restore passenger confidence*, www.gov.uk/government/publications/southern-rail-network-gibb-report, June 2017.

3.16 Network Rail anticipates that the first £300 million of works will reduce asset failure incidents by between 33% and 40%, and increase the number of trains arriving in central London on time to between 61% and 67%. This analysis is based on the existing timetable, and the performance of future services carries some uncertainties. Improvements in performance should be achieved by the simplification of services on the Southern part of the network in the 2018 timetable and completing works at London Bridge. The introduction of traffic management systems should also reduce the amount of delays from managing the network, though it is not known by precisely how much. However, the increased connectivity between regions will mean delays can spread more readily. While the programme of work delivers a necessary improvement on current performance, the reliability of services could suffer from the remaining weaknesses in the network, which could affect the realisation of Thameslink's benefits, even if the timetable changes are implemented successfully.

Managing the risks

3.17 In our 2013 report, we commended the Department for promoting working relationships across the rail industry. This collaboration allowed the Department and Network Rail to overcome earlier challenges in delivering the infrastructure work and train procurement.¹² We stated that this collaborative approach would continue to be important in addressing future problems that would arise with introducing the new trains and rail services.

3.18 The Department is responsible for specifying the minimum service level requirements for the timetable. Govia Thameslink is responsible for developing a proposed timetable which meets this specification and planning for how it will operate the new Thameslink services. Network Rail is responsible for planning how it will manage and maintain the network when these services run, and for ensuring the timetable is compatible with other operators. Govia Thameslink and Network Rail collaborate through an alliance board for day-to-day operations and future plans. The Department oversees this planning through the Thameslink programme board.

3.19 The regional scope of the Thameslink network means that key decisions will affect other operators across the South East and require consultation and agreement across the rail industry. Network Rail leads an established industry process for timetable development, and has engaged other operators from an earlier stage than usual for the Thameslink programme. However, the arrangements in place for detailed operational planning did not adequately include other operators, and did not provide sufficient clarity over lines of accountability and authority for these industry-wide decisions. This has meant that while the Department's arrangements, such as the Network Rail protocol agreement, have been broadly effective in delivering individual programme elements, operational planning for the new services has been less developed.

¹² Comptroller and Auditor General, *Progress in delivering the Thameslink programme*, Session 2013-14, HC 227, National Audit Office, June 2013.

3.20 The Department and Network Rail carried out an assessment in August 2016 which identified the need to involve the wider rail industry in planning readiness to deliver the new services. Together with recommendations from the Gibb Report,¹³ this resulted in a strengthening of programme management:

- The Department and Network Rail established the Industry Readiness Board in late 2016, which provided a forum for other operators to contribute to planning efforts for the new services, and to resolve areas that require collective agreement across the region.
- The Department also completed a review of overall programme governance in mid-2017, to establish who is accountable for each activity required to bring the new services into use, and how decisions will be made.

3.21 During 2017, the Industry Readiness Board made significant progress in planning for the new services. Prior to its establishment there were no plans in place for signalling control, maintenance, and passenger management, and no critical path mapping out how these would be developed. Significant progress has been made in developing these plans, but completing them in the time remaining will be challenging. Important gaps remain, such as contingency plans for the transition to operations. Given the scale of the changes to be managed, we would have expected the Department and Network Rail to have ensured that this planning began earlier.

3.22 The Department also underestimated the time needed for Network Rail and operators to develop their capability to deliver the new services. The initial plan agreed by the Department, Network Rail and Govia Thameslink allowed four and a half months from January 2018 to build the capability to run 20 trains an hour through central London in May 2018, and a further six and a half months for 24 trains an hour after this in December 2018. Network Rail and Govia Thameslink raised concerns in late 2016 that this did not allow enough opportunity for testing plans before implementing them.

3.23 In our briefing *Lessons for major service transformation*, we recognised the need to avoid ‘big bang’ changes where possible, and that phased or flexible implementation is an important tool for testing the operational working of a programme.¹⁴ This approach has also been adopted previously for service upgrades on London Underground, and is being proposed for Crossrail. In 2017, at the request of the Department, Govia Thameslink developed a proposal to introduce the new services in more incremental steps. This means that 20 trains an hour peak service would be introduced in December 2018, and 24 trains an hour peak service in December 2019, a year later than planned. In October 2017, the Department decided to implement this plan as a means to introduce the changes to the network at a more manageable pace, reducing the risks of each service change and allowing lessons to be learned and implemented.

¹³ See footnote 11.

¹⁴ Comptroller and Auditor General, *Lessons for major service transformation*, National Audit Office, May 2015.

3.24 The specific elements of the proposal are still under development. The proposal will have cost implications which the Department, Network Rail and Govia Thameslink have yet to develop detailed estimates for, as well as commercial and operational considerations such as the need to amend the planned timetable for May 2018. To give an indication of the reduction in benefits, sensitivity analysis that was carried out as part of the 2015 refresh of the business case indicates that a two-year deferral of 24 trains an hour to December 2020 would reduce the benefits of the scheme by £42 million, which does not affect the overall benefit–cost ratio for the scheme. A short-term reduction in benefits does, however, reduce the risk of passenger disruption, and any consequent costs to the rail industry that might arise, from too much change being introduced on the network at any one time.

Appendix One

Our audit approach

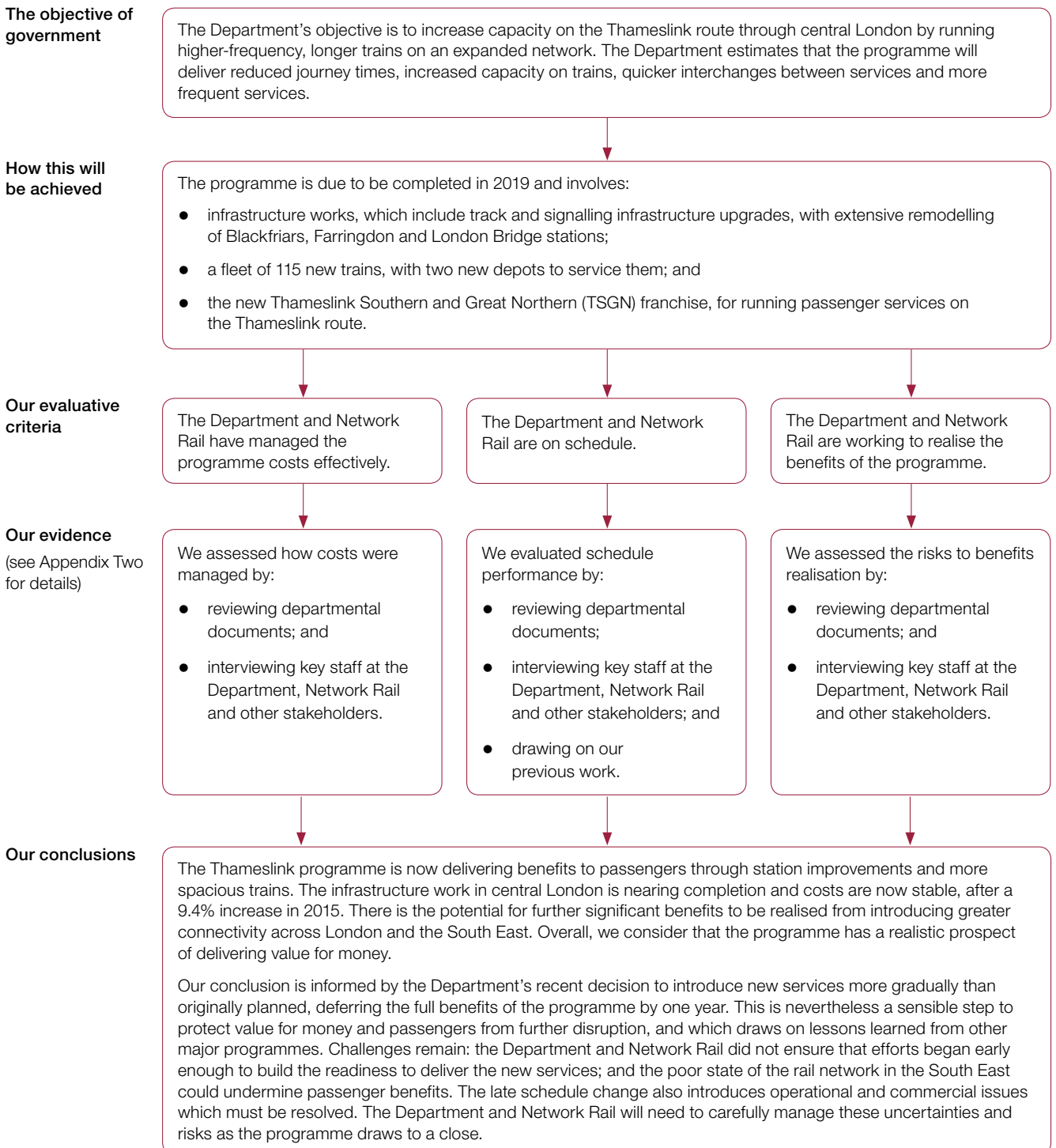
1 This study examines whether the Department for Transport (the Department) and Network Rail are managing the Thameslink programme (the programme) effectively to drive value for money. Our key areas of review were:

- whether the Department and Network Rail have managed programme costs effectively;
- whether the Department and Network Rail have kept the programme to schedule; and
- whether the Department and Network Rail are working to realise the benefits of the programme.

2 Our audit approach is summarised in **Figure 6**. Our evidence base is described in Appendix Two.

Figure 6

Our audit approach



Appendix Two

Our evidence base

1 Our conclusions on whether the Department for Transport (the Department) is managing the Thameslink programme (the programme) effectively, to drive value for money, were reached following our analysis of evidence collected between January and September 2017.

2 Our audit approach is outlined in Appendix One.

3 We examined whether the Department and Network Rail have managed programme costs effectively:

- We assessed key programme reports and programme management information.
- We conducted interviews with key staff from the infrastructure projects team in Network Rail to obtain further information about how Network Rail manages the infrastructure works, and how it worked with the Department.
- We reviewed programme-level documents and the process and timing of key decisions made on the programme.
- We analysed external and internal reviews of the programme.

4 We examined whether the Department and Network Rail have kept the programme to schedule.

- We held interviews with key staff at the Department and Network Rail to obtain further information about the progress made to date.
- We reviewed the Department's and Network Rail's schedule and risk assessment documents to assess what challenges remain for the programme.

5 We examined whether the Department and Network Rail are working to realise the benefits of the programme.

- We reviewed documents that the Department, Network Rail and other key stakeholders provided to assess work on benefits realisation.
- We conducted interviews with the Department, Network Rail and other key stakeholders to discuss their plans for the wider programme.

Appendix Three

Our approach to costing

Overview

1 The Thameslink programme comprises a number of different elements that are reported on in different ways, and have been referred to in different publications. In the public domain, a total programme cost of £7 billion is referred to. This is a cash price figure that includes the infrastructure, the capital costs of the new trains and depots, as well as the Department's management budget.

2 As cash prices do not allow a consistent basis for comparison, we do not report in these where possible. Here we set out the sources and rationale for our reporting.

Infrastructure

3 The protocol budget for the infrastructure works is denominated in 2006 prices, using the November 2006 Retail Prices Index (RPI) value. In our last report, *Progress in Delivering the Thameslink Programme*, we reported consistently with this. Since it has been over a decade since this point, we decided that to give a better sense to the reader of the money involved it was appropriate to rebase these to September 2017 prices using RPI.

4 In June 2013, we reported the initial budget of the infrastructure works as £3.55 billion, of which phase one was £1.704 billion, and phase two was £1.849 billion. In September 2017 prices, these numbers are £5.047 billion, comprising £2.421 billion for phase one, and £2.627 billion for phase two. The numbers for the phases differ slightly from the initial budget figures reported in Part Two, as further savings identified for phase one were transferred to the budget of phase two.

Rolling Stock

5 We express rolling stock and depot costs as the present value of lease payments paid by the operator as at a base date of June 2013 (when agreement was reached), inflated to 2017 prices using the GDP deflator. To focus on the capital value of these assets, these do not include the costs of maintenance payments that will be made by the operator.

Other elements

6 For some elements of cost that we report on, it was not practicable to resolve these to a singular price base, and in these instances we have reported cash price values. This includes, for example, the estimated £900 million of resilience works referenced in Part Two, since plans for Network Rail's next spending period have not been finalised.

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