L.E.K.

NetworkRail

Estimating Freight Avoidable Costs
Final Report

31 October 2012

L.E.K. Consulting LLP, 40 Grosvenor Place, London SW1X 7JL, United Kingdom
T: 44.20.7389.7200 F: 44.20.7389.7440 www.lek.com

Disclaimer (1of 2)

NON-DISCLOSURE RULES AND LIABILITY DISCLAIMER

To: Network Rail Infrastructure Limited (the “Client")

Estimating Freight Avoidable Costs : L.E.K. Final Report dated 14 September 2012 (the "Final Report")

1. **Introduction**

1.1 This Final Report has been prepared by L.E.K. Consulting LLP ("L.E.K." or "we") at the request of the Client in connection with estimating Freight Avoidable Costs (the “Project").

1.2 This Final Report is for the sole benefit and use of the Client. This Final Report has been prepared to address the interests and priorities of the Client and not the interest or priorities of any third party.

1.3 This Final Report must be construed in the context in which it was prepared including the constraints relating to availability of time and information, the quality of that information, the instructions agreed with the Client and our assumptions and qualifications, in each case, as more fully set out in this Final Report.

2. **Disclosure**

2.1 The Client may place reliance on this Final Report on and subject to the terms of the purchase of services agreement agreed with L.E.K. Those third parties who have our written permission may rely on this Final Report on and subject to the terms of the reliance letter agreed with L.E.K. Save in respect of the Client, if you have not agreed a written reliance letter with us you do not have our permission to, and shall not, rely on this Final Report.

2.2 You accept that all costs and expenses (including related legal and professional adviser expenses) incurred by L.E.K. in discharging or extinguishing L.E.K. liability to third parties arising from or as a result of your breach of the terms of this paragraph 2 shall be foreseeable and recoverable as loss and damage.

3. **Limitation of Liability**

3.1 Save in respect of the Client, your interests and priorities are not known to us and have not been considered in the preparation of this Final Report. Unless otherwise agreed in writing, you are not a client of L.E.K. and we owe no obligations or duties to you in respect of this Final Report whether in contract, tort (including negligence), breach of statutory duty or otherwise.

3.2 Save as we have agreed with you in writing under the terms of the purchase of services agreement, reliance letter or non reliance letter, L.E.K. shall have no liability to you or any third party for any loss or damage arising out of or in connection with, the disclosure of the Final Report by us to you, the receipt by any third party of the Final Report through you, or any reliance placed on, or use of, the Final Report by you or any third party, howsoever arising, whether arising in or caused by breach of contract, tort (including negligence), breach of statutory duty or otherwise.

Disclaimer (2 of 2)

3.3 Nothing in this disclaimer shall exclude or in any way limit L.E.K.'s liability to you for (i) fraud, (ii) death or personal injury caused by L.E.K.'s negligence (including negligence as defined in s. 1 Unfair Contract Terms Act 1977), (iii) breach of terms regarding title implied by s. 2 Supply of Goods and Services Act 1982, or (iv) any liability to the extent the same may not be excluded or limited as a matter of law (including under the Financial Services and Markets Act 2000).

3.4 This Final Report shall be governed by the laws of England.

REPORT CONTEXT

Attention: The following points of context are directed at third parties receiving this Final Report with, or without, our permission.

1. Our principal task has been to analyse and present data in relation to the Project. This Final Report is intended to assist the Client in understanding and evaluating those issues.

2. This Final Report is not intended as a recommendation to proceed or not to proceed with any proposal in relation to the Project which decision requires consideration of a broader range of issues and is a commercial decision for the Client and the other Project participants to make entirely at their own risk.

3. This Final Report has been prepared from and includes information received from the Client and other publicly available information sources. The provenance, authenticity, completeness and accuracy of this information may not have been verified. We did not complete such verification and cannot confirm that such verification has been completed by a third party before L.E.K. received this information. L.E.K. makes no representation and gives no warranty, in either case express or implied, as to the provenance, authenticity, accuracy or completeness of such information.

4. This Final Report has been prepared under time constraints and is not exhaustive or based on all available information about the Project. This Final Report does not reveal the matters which would have been identified by unrestricted investigation and research. In particular, the time constraint, the complexity of the Client's business and our limited opportunity to access information, conduct research, interview the management of the Client and the Client's key suppliers and customers affects the utility of this Report.

5. The interests and priorities of persons other than the Client are not known to us and have not been considered in the preparation of this Final Report. Consequently, if you are not the Client, the issues addressed in this Final Report and the emphasis given to them may not fully or adequately address the issues of interest or relevance to you in respect of the Project.

6. Save for reliance on such matters by the Client as permitted under the terms of the purchase of services agreement, L.E.K. makes no representation and gives no warranty, guarantee or other assurance that all or any of the assumptions, estimates, projections or forecasts set out in this Final Report are accurate, reasonable or will materialise or be realised and nothing contained in this Final Report is or should be construed or relied upon as a promise as to the future regardless of any forward looking statements which may be made in the Final Report.

7. This Final Report is based on the information of which we were aware at the time this Final Report was prepared. The occurrence of change after the date of issue of this Final Report affecting this Final Report is a risk accepted by all parties receiving this Final Report. Unless otherwise agreed in writing with you, L.E.K. is not obliged to update this Final Report after its date of issue for your benefit or obliged to advise you of the availability of information not previously available even where we learn of information which if known at the time of preparation of this Final Report would have lead us to vary the content of this Final Report.

8. Your reference to this Final Report is not a substitute for the investigations you would ordinarily undertake or those investigations that you would be recommended to make given your involvement in or in connection with the Project.

9. Your acceptance of this Final Report is in replacement of all Final Reports you may have received from us in connection with the Project.

Agenda

- Executive Summary
- Introduction
- Summary of Freight Avoidable Cost estimates
- Estimated commodity allocation
- Appendix: methodology, data and approach

Executive Summary (1 of 4)

- The main objective of this study has been to produce an estimated range of the theoretical long-run annual cost savings to Network Rail that would result from removing commercial freight traffic from Network Rail's existing network (defined as "Freight Avoidable Cost")

- Freight Avoidable Cost estimates presented in this report were based on
  - Network Rail's efficiency as it is forecast for the end of CP4, but not taking into account further efficiency gains after that date which would reduce Freight Avoidable Costs and should be evaluated by the ORR. If freight avoidable costs are to be used as a basis for setting freight income, freight operating companies ("FOCs") are keen that Network Rail take steps to ensure that these costs are as efficient as possible in the future
  - growth in freight traffic of 42% (in tonne-kilometres) to 2033/34 as forecast in the Initial Industry Plan ("IIP")

- Consequential impacts of removing freight from the network were only considered to the extent that they influence Network Rail's costs. For example, road cost and congestion impacts resulting from freight shifting from rail to road or potential additional passenger revenues from using freight paths were not considered

Executive Summary (2 of 4)

Gross and Net Freight Avoidable Cost estimates – End CP4 efficiency

Millions of FY11/12 pounds p.a.	At 35 year average freight traffic volumes		At CP5 average freight traffic volumes	
	Low case	High case	Low case	High case
Gross Freight Avoidable Cost estimate	**152**	**377**	**92**	**301**
(-) Freight avoidable costs for which Network Rail is already compensated through an existing charge	(110)	(128)	(92)	(107)
Net Freight Avoidable Costs estimate	**42**	**249**	**0**	**194**

- Long run Net Freight Avoidable Costs have been estimated to be c.£42-249m p.a. averaged over 35 years covering CP5-11
  - Net Freight Avoidable Costs do not include those cost items which are associated with an existing freight charge designed to compensate Network Rail for its related costs (see page 36)
  - the figures have been estimated using end CP4 efficiency levels and therefore actual costs would be significantly lower as Network Rail continues to improve its efficiency

See page 36

Executive Summary (3 of 4)

- We estimate Gross Freight Avoidable Costs to be between £152m and £377m p.a. on average over the 35 year period of Network Rail's planning horizon (covering CP5 to CP11 inclusive) (see page 21). Note that these estimates are gross in the sense that they include items for which Network Rail is already compensated through an existing charge. The gross estimate consists of:
  - variable usage costs represent the most significant recurring cost saving, £96-215m p.a., mostly driven by variable track maintenance and renewal costs. This wide range (constituting more than half of the range in the total estimate) was based on two different results from the industry's VTISM model run by Network Rail staff. We were not able to validate or disaggregate these estimates due to the nature of the VTISM model and we recommend that more work is undertaken by the ORR or Network Rail to attempt to narrow this range
  - one-off enhancement costs that could be avoided would represent £64-87m p.a. in annualised terms
  - consequential cost savings of £58-77m from lower performance regime payments including Schedules 4 and 8
  - cost of freight only lines and other fixed assets that would be made redundant of £20-33m p.a.
  - Network Rail staff cost savings of £4-5m p.a.
  - offset by consequential cost increases of £39-88m in Network Rail's provision of engineering trains and other services from FOCs as Network Rail ceases to benefit from marginal pricing by FOCs
- Note that these figures exclude two potentially material items which would increase Gross Freight Avoidable Costs but for which Network Rail was not able to provide supporting data during the timescales of this project. These are the cost savings arising from policy changes to maintenance and renewal of civils structures and the potential sums realised from disposal of freight property assets
- Long run Net Freight Avoidable Costs were estimated to be c.£42-249m, after subtracting items for which Network Rail is already compensated through an existing charge

Note: Costs are shown in constant FY11/12 prices

Executive Summary (4 of 4)

- The remit of this project also required development of an allocation of Freight Avoidable Costs between selected freight commodity groups (see pages 40-53)
- This was based on an allocation of the total cost between the key freight commodities, and not the incremental impact of removing each commodity individually
- We have allocated Gross and Net Freight Avoidable Costs to commodities using a set of metrics for each of the various components of the cost (e.g., tonne-kilometres for some costs, and specific future enhancement costs can be matched to the commodities they would most likely carry). These allocations may require further work. The ORR is currently consulting on allocation metrics for freight charges and this was beyond the scope of this study

Net and Gross Freight Avoidable Cost estimates by key commodity – End CP4 efficiency, 35 year average

Millions of FY11/12 pounds p.a.	Net Freight Avoidable Costs		Gross Freight Avoidable Costs	
	Low case	High case	Low case	High case
Intermodal	27	130	80	191
Coal ESI	1	36	20	60
Other coal (non-ESI)	0	2	1	3
Nuclear	1	1	1	2
Iron Ore	(0)	1	0	1
Other	13	79	49	120
Total	**42**	**249**	**152**	**377**

Agenda

- Executive Summary
- Introduction
- Summary of Freight Avoidable Cost estimates
- Estimated commodity allocation
- Appendix: methodology, data and approach

The main objective of this study was to produce an estimated range for the average long-run Freight Avoidable Cost

- The ORR is proposing a new charge for freight operators intended to contribute to recovering those Freight Avoidable Costs not recovered from other freight charges
- To support this activity the ORR has asked Network Rail to estimate its Freight Avoidable Costs
- Network Rail has commissioned L.E.K. as an independent organisation to engage with the freight industry and assist with the quantification of Freight Avoidable Costs
  - this is defined to be the theoretical long-run annual cost saving, over 35 years, which would result from removing commercial freight traffic from the network in its entirety on a permanent basis
  - the scope of this study includes commercial freight only (i.e., engineering trains needed by Network Rail would remain)
  - the theoretical exercise is based on the existing network configuration as a starting point
- We have also developed an estimated allocation of this cost between freight commodity groups, but we understand that more work on the split will be carried out subsequently

Freight currently contributes to Network Rail's income through a series of charges that are designed to be broadly cost reflective

Total Network Rail Income, FY2011/12
Millions of FY11/12 pounds

			% of total
Total Freight Income		**51**	0.8%
Variable Usage Charges and Freight Only Line Charges*	48		
Traction electricity charges (EC4T)	5		
Capacity Charges	4		
Coal Spillage Charge	5		
Performance Regime	(12)		
Other Income	1		
Total Franchised track access income		**1,593**	25.4%
Grant Income		**3,989**	63.5%
Other single till income		**644**	10.3%
TOTAL INCOME		**6,277**	**100.0%**

Description

- Variable Usage Charges are levied on freight operators as track access charges to recover Network Rail's incremental variable O,M&R costs
- Freight Only Line Charges are currently levied on coal ESI and spent nuclear fuel freight to partially recover fixed costs
- EC4T charges are designed to pass-through the electricity costs of rolling stock traction
- Capacity Charges and Coal Spillage Charge income each cover their respective costs
- Performance Regime payments represent the net flows associated with delays caused by, and to, freight operations
- In FY2011/12, freight connection income was c.£5.6m. This is additional to the income shown opposite as it is subtracted directly from operating costs in Network Rail's accounts

Gross Freight Avoidable Costs include the costs covered by the current charging regimes and other costs that would be avoided if commercial freight were removed from the network permanently

Note: * FOL charges are included in the variable usage charge as they are billed together
Source: 2011/12 Network Rail Regulatory Accounts; L.E.K. research and analysis

A set of guiding principles have been used to lead the estimation of Freight Avoidable Costs

A – No commercial freight

- The estimates of this study were based on the theoretical exercise of removing commercial freight traffic from the network in its entirety on a permanent basis
  - Network Rail would still be required to maintain and renew remaining passenger network, and would therefore own or subcontract engineering trains to support this activity

B – Quantification of freight avoidable cost

- Freight Avoidable Costs were calculated using the estimated difference in Network Rail's cost structure under two different scenarios, with and without commercial freight
  - existing offsetting Network Rail revenues and / or funding have not been considered

C – Efficiency

- Freight Avoidable Cost estimates were based on current (end of CP4) efficiency levels and reflect the expected pre-efficiency long-run cost savings
  - consideration of the potential time required to achieve these savings, which could be several years, along with additional efficiency overlays were not included

D – Impact on Network Rail's cost structure

- The impacts considered include only those on Network Rail's cost structure and exclude the impacts on third parties, such as:
  - marginally priced freight locos rented / leased to TOCs
  - impacts arising as a result of freight switching to road

E – Consequential impacts

- Capacity freed-up by removal of commercial freight could be used by Network Rail (e.g. to improve access / increase possession length)
- However, this additional capacity would not be available to third parties (e.g. no option for TOCs to increase their number of services)

F – Materiality

- Costs considered to be small relative to the total were not included in the overall calculation of Freight Avoidable Costs, but were noted where they appear

Given this approach, there are further potential impacts resulting from the removal of commercial freight which are out of scope and have not been assessed

Further potential out of scope impacts

- Road cost and congestion impacts resulting from freight shifting from rail
- Timetable and/or path changes to passenger services and their consequential impacts
  - including, e.g., the capability for passenger train operators to run additional Sunday morning services
- Network Rail revenue items and funding implications

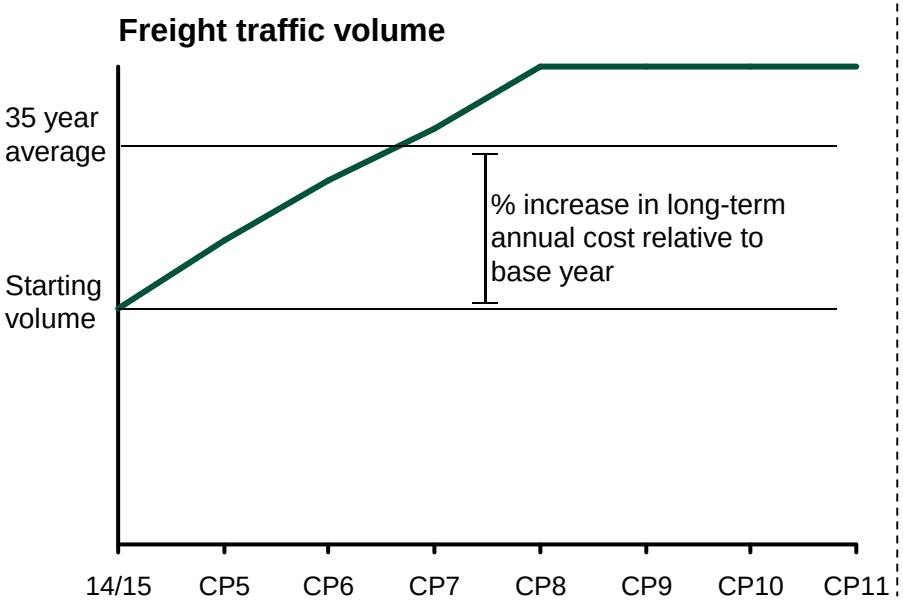
The cost implications of removing freight from the network were estimated as the difference between two base scenarios utilising forecasts from the most recent IIP

	Scenario A: Mixed use railway as per IIP	Scenario B: No commercial rail freight
Traffic	• Traffic would be composed essentially of passenger and freight services and additional support services, including engineering and inspection trains. Traffic growth and mix would be consistent with those projected by Network Rail in the September 2011 IIP	• Freight traffic would be removed in its entirety but passenger and support services would not be impacted, including diversions. The projected growth of the remaining traffic would also remain unaffected
Network configuration	• The initial set of assets supporting rail transport are considered to be those currently in place, based on the existing network's physical and operational configuration	• Assets that are not required to support the remaining activities would be decommissioned. Additional freed-up capacity would not be used for extra passenger services
Support functions	• Support services such as engineering trains, de-icing, leaf removal and weed-spraying trains, as well as certain yards and sidings are subcontracted by Network Rail mainly from freight operators	• Support services will still be required to support the remaining passenger network and therefore need to either be sub-contracted to service providers or be provided internally by Network Rail
Enhancement programmes	• Major enhancement programmes with schemes required to support IIP volume growth projections	• Certain enhancement programmes could become partially or entirely redundant and would therefore not be carried out

Recurring costs were considered in the context of freight traffic growth forecasts whilst one-off costs were treated as adjustments to the RAB with an annual impact based on amortisation and Network Rail's allowed return

Recurring costs

- Certain recurring costs are associated with traffic volumes and were therefore adjusted for traffic growth forecasts
  - in cases where traffic was forecast to decrease, this adjustment implied a long-term cost that is lower than in the base year



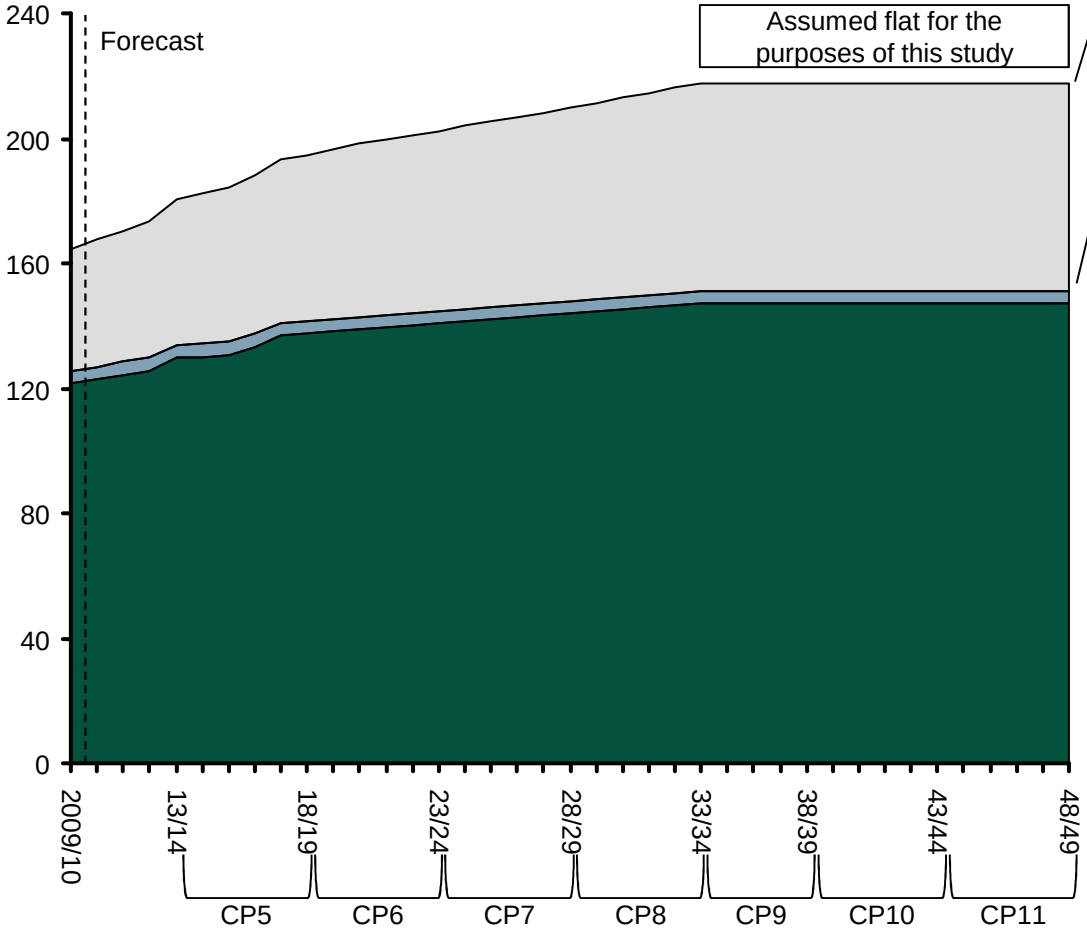
One-off costs

- One-off costs (or savings) were quantified for the years in which they occur
- They were then converted to estimated long-run annual impacts by:
  - treating them as if they were adjustments to Network Rail's RAB from the year in which the cost or saving would occur
  - calculating an annual impact based on Network Rail's allowed return of 4.75% p.a.
  - including an additional amortisation element, to cover notional future renewal costs. This was based on a 30 year standard amortisation period, implying c.3.3% p.a.
  - averaging the resulting total values over 35 years, which was the forecast period available for this study

The underlying IIP traffic forecasts assume that freight will grow by 42% (in gtkm) between the end of CP4 and 2033/34

Total Network Rail traffic forecast (2009/10 – 48/49)

Billions of tonne km



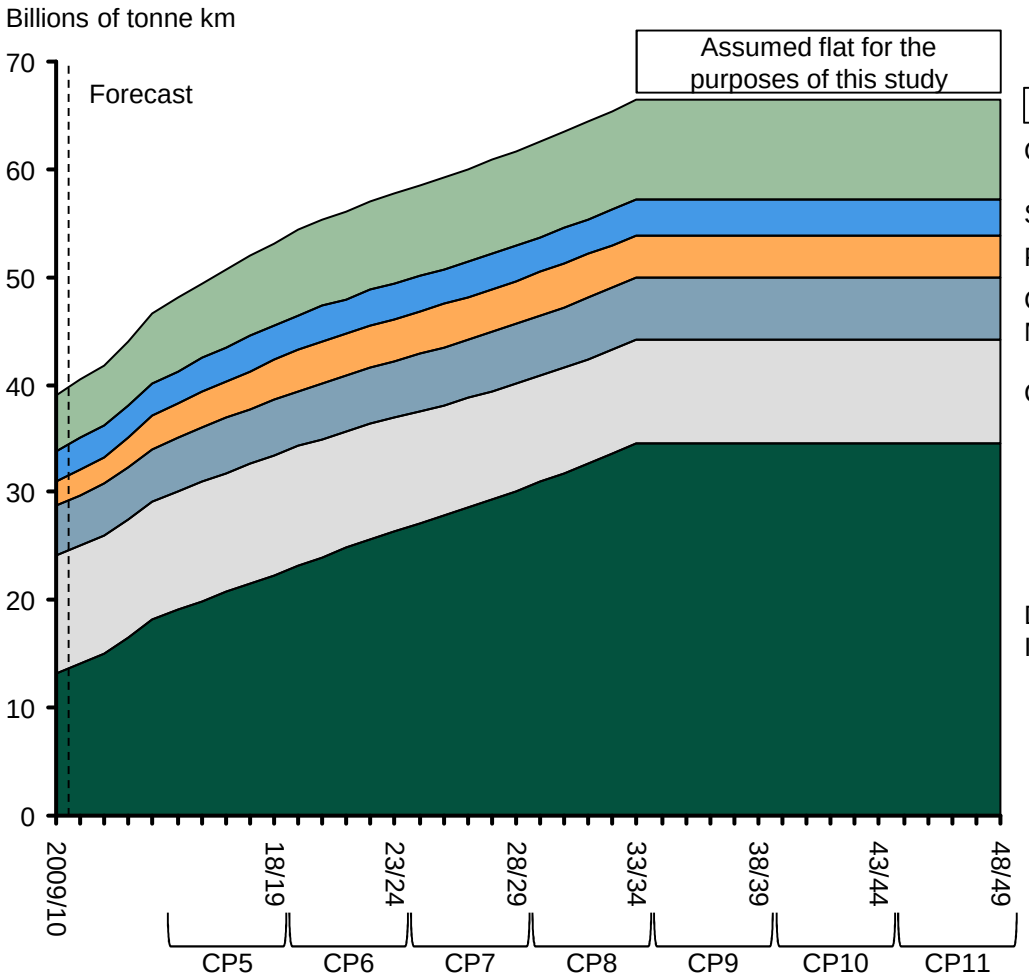
	End CP4 (bgtkm)	Average over 35 years (bgtkm)	Average over CP5 (bgtkm)	End CP11 (bgtkm)	Growth (bgtkm)	Growth %
Total Scenario A	180.5	209.0	189.4	217.8	37.3	21
Freight Traffic	**46.7**	**61.5**	**50.7**	**66.5**	**19.8**	**42**
Total Scenario B	133.8	147.5	138.7	151.4	17.5	13
Engineering Haulage	4.2	4.2	4.2	4.2	0	0
Passenger Traffic	129.6	143.3	134.5	147.2	17.5	14

- After CP8 (when IIP forecasts finish), traffic volumes are held constant through the remainder of the forecast period to the end of CP11
- The estimate of Freight Avoidable Cost was based on removing 25% of Network Rail's 2011/12 traffic (rising to 31% by CP8)

Source: Network Rail; IIP

The commodity mix transported by rail is expected to change with domestic intermodal freight being responsible for the largest share of the forecast growth

Total Network Rail freight traffic forecast (2009/10 – 48/49)



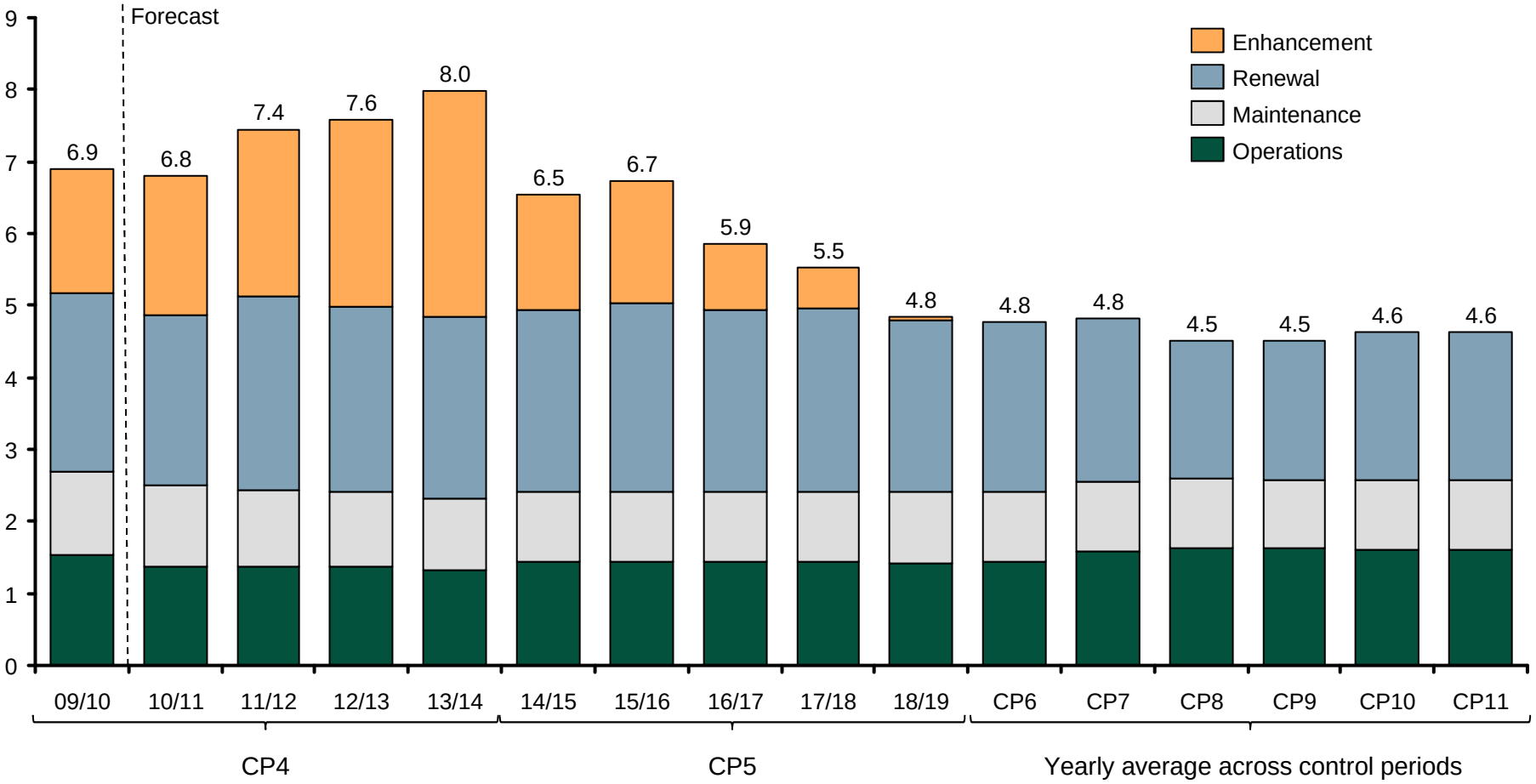
	End CP4 (bgtkm)	Average over 35 years (bgtkm)	Average over 35 years (bgtkm)	End CP11 (bgtkm)	Growth (bgtkm)	Growth %
Total	**46.7**	**61.5**	**50.7**	**66.5**	**19.8**	**42**
Other	6.5	8.7	6.5	9.3	2.8	42
Steel	3.1	3.3	3.2	3.3	0.2	7
Petroleum	3.0	3.9	3.4	4.0	1.0	32
Construction Materials	5.0	5.5	5.0	5.7	0.7	15
Coal ESI	11.0	10.1	11.0	9.7	(1.3)	(12)
Domestic Intermodal	18.2	30.1	21.6	34.5	16.4	90

Note: Excludes engineering trains
Source: Network Rail; IIP

Apart from enhancements, Network Rail's overall pre-efficiency costs are expected to be broadly flat

Network Rail IIP pre-efficiency forecast expenditure (CP4 – 11)

Billions of FY11/12 pounds



Note: Forecast excludes efficiency overlays except for a subset of operations expenditure

Source: Network Rail; IIP

Agenda

- Executive Summary
- Introduction
- Summary of Freight Avoidable Cost estimates
- Estimated commodity allocation
- Appendix: methodology, data and approach

We have considered freight avoidable costs in seven categories

1 Freight Only Line costs	• Costs associated with Freight Only Lines as identified in Network Rail's March 2012 conclusions letter to the ORR*
2 Redundant freight assets costs	• Fixed costs associated with predominantly freight lines, loops, sidings, 2/3/4th track lines, and property that are made redundant by removal of commercial freight operations • These could be removed from the network over time and / or freed-up for disposal
3 Variable usage costs	• Variable usage costs associated with commercial freight traffic on mixed usage lines
4 Redundant enhancement costs	• Currently-planned network enhancement costs (e.g. SFN) that would be made redundant by removing commercial freight
5 Consequential cost reductions	• Potentially improved maintenance access and potentially reduced Network Rail's expenditure associated with performance regimes (including Schedules 4 and 8)
6 Consequential cost increases	• Increased costs due to lack of access to marginally-priced freight services such as engineering trains, de-icing, leaf removal, weed-spraying
7 Network Rail staff costs	• Freight related staff costs at HQ and in the regions that could be avoided by removing commercial freight

Note: * Subject to two minor changes impacting 1.7% of the lines (Turnchapel Branch Jn to Cattewater was removed from the list and Neath and Brecon Jn to Burrows Sidings was attributed to Coal ESI)

For each category, a range of impacts has been identified

1 Freight Only Line costs

1. Maintenance, Renewals, and Inspection cost savings
2. Decommissioning and ongoing costs

2 Redundant freight assets costs

1. Additional redundant freight lines
   - track loops
   - network sidings
   - 2/3/4th tracks
2. Potential reduction in size of Network Rail's survey and measurement trains fleet
3. Freight property assets

3 Variable usage costs

- Usage-based reduction in M&R activity
  1. track
  2. civils
  3. signalling
  4. electrification

4 Redundant enhancement costs

1. Strategic Freight Network
2. Other enhancement schemes with freight components
3. ERTMS loco fitments

5 Consequential cost reductions

1. Policy driven cost saving (e.g. through track re-categorisation / criticality changes)
2. Easier engineering access impact on unit costs for remaining M&R activities
3. Coal spillage
4. Schedule 4
5. Schedule 8
6. Service variations & cancellations
7. Capacity / congestion costs
8. Network Change / Major Project Notice

6 Consequential cost increases

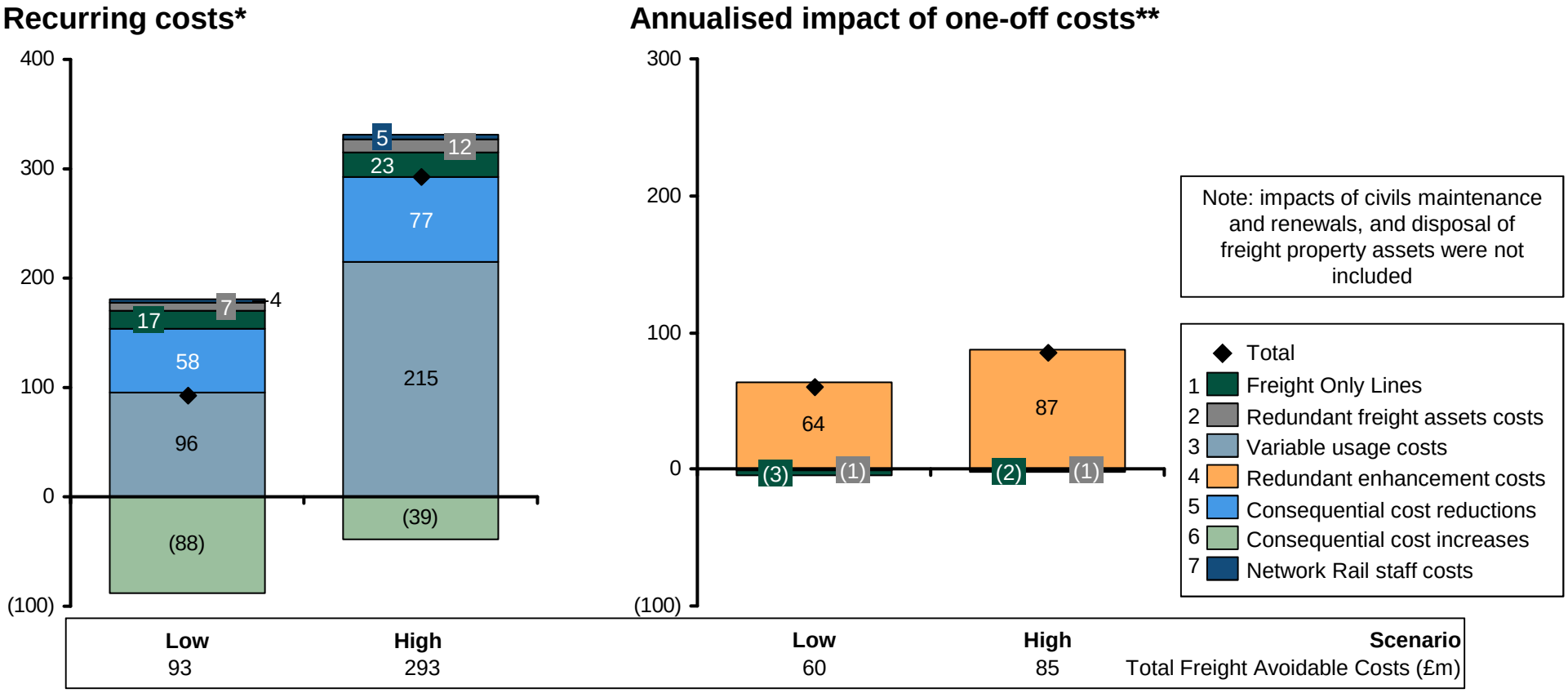
- Requirement for internal or subcontracted support operations capability
  1. services subcontracted to commercial freight operators
  2. engineering trains, seasonal treatment and infrastructure monitoring
  3. local distribution centres
  4. corporate overhead

7 Network Rail staff costs

- Cost of HQ and route freight teams
  1. central freight team
  2. freight planning team
  3. freight performance team
  4. freight property team
5. Cost of other employees partially associated with freight operations

The results suggest a range of potential Gross Freight Avoidable Costs of c.£152-377m p.a.

Long-term annual Gross Freight Avoidable Costs
(Millions of FY11/12 pounds, 35 year average pre-efficiency)



Low	High	Low	High	Scenario
93	293	60	85	Total Freight Avoidable Costs (£m)

See pages 24-30

Note: *To enable comparison of high and low cases, the one-off costs related to rolling stock purchasing in the low case is shown as an annualised recurring cost; ** Based on notional RAB adjustment methodology

Source: L.E.K. analysis

The estimated range of Freight Avoidable Costs reflects uncertainties arising not only from future forecasts but also from the estimates and calculation methodologies available

- The majority of the range in the estimate is the uncertainty in track variable costs modelled by VTISM (item 3.1). The estimates resulting from the model show a significant non-linearity between positive and negative changes in traffic. Network Rail has not had the resources to provide further VTISM runs within the timeframe of this project that might have allowed a narrower range of estimates for this cost category

- The second cost category contributing uncertainty to the estimated range is the increase in Network Rail's costs resulting from the removal of freight operators (section 6). The estimates used have been based on high-level estimates provided by operators, which proved to imply lower levels of cost increase than estimates sourced from Network Rail's NDS. More precise estimates would require detailed analysis of how NDS would organise itself in Scenario B, which was beyond the scope and timeframe of this project

- In other cases, different methodologies have been applied to estimate avoidable costs and the ranges reflect the variation in results that these different methodologies imply
  - coal spillage costs were based on both Network Rail's initial CP5 estimates and Halcrow's 2008 report
  - the redundant fixed asset cost range reflects the ACTRAFF-based methodology used as well as a sample-based analysis of Quail maps used to scale up these results
  - staff cost estimates were based on budgeted expenditure and incorporate some growth in staff numbers due to long-term increased staff requirements for Network Rail, whilst Schedule 4, service variation and cancellation, and electrification charges were based on historical variations in actual costs

- Some cost elements have been based on a single point estimate and a methodology was derived to introduce a representative range
  - FOLs and variable usage costs (excluding track) were assumed to have a range of +/-15%, consistent with previous methodologies applied by Network Rail and the ORR
  - redundant enhancement cost ranges are dependent on the level of development of the project to date, and reflect a range of feedback from stakeholders. For ERTMS costs, the range was based on the estimate of the number of locomotives that would be needed by Network Rail's NDS

Some of the Freight Avoidable Costs relate to serving existing traffic whilst some relate to future growth

		At end CP4 freight traffic	Impact of freight traffic growth	At 35 year average freight traffic	At average CP5 freight traffic
	Average annual freight avoidable cost over 35 years (FY11/12 prices)				
A	Recurring avoidable costs	£55-222m	£38-71m	£93-293m	£65-259m
	One-off avoidable costs	£(4)-28m of total RAB adjustments*	£823-1,126m of total RAB adjustments	£819-1,153m of total RAB adjustments*	£600-882m of total RAB adjustments
B	Annualised one-off costs	£(0)-2m p.a.	£60-83m p.a.	£60-85m p.a.	£27-42m p.a.
A + B	Gross Freight Avoidable Costs	**£55-224m**	**£98-154m**	**£152-377m**	**£92-301m**
C	(-) Costs with associated charges**	£(85)-(99)m	£(25)-(29)m	£(110)-(128)m	£(92)-(107)m
A + B - C	Net Freight Avoidable Costs	**£(30)-124m**	**£73-125m**	**£42-249m**	**£0-194m**
	Average annual freight volumes in kgtkm	46.7m	14.8m (1.0% CAGR)	61.5m	50.7m

Note: * One-off costs do not include rolling stock purchasing of c.£916m in the low case; ** Freight avoidable costs for which Network Rail is already compensated through an existing charge

Source: L.E.K. analysis

Summary of results (1 of 7)

Freight Only Lines avoidable costs				Long-run annual Freight Avoidable Cost (£m, FY11/12 prices) (*)	
		Source of quantification	Notes	Low case	High case
1	**Net total**			**14**	**21**
1.1	Maintenance, renewals, and inspection cost savings	FOL definition resulting from the recent FOL consultation with Network Rail, Freight Operators and the ORR with minor updates (c.573 track km) FOL cost estimates based on Network Rail's quantification using Coal / Nuclear FOL methodology. Network Rail improved the FOL modelling by incorporating level crossing costs into related renewals	Previous work by NR identified £6.1m for Coal ESI and Nuclear FOL costs. Figures shown net of variable usage costs (included in item 3 below)	18	24
1.2	Decommissioning and ongoing costs – recurring costs	Network Rail review of its asset management policy for FOLs and quantification of associated costs (e.g., fencing and structures maintenance)	Ongoing costs for track and civils inspections, one-off costs for signalling abandonment	(1)	(1)
	Decommissioning and ongoing costs – annualised one-off costs			(3)	(2)

See pages 55-61

Note: (*) Positive figures indicate savings for Network Rail. Negative figures indicate cost increases for Network Rail
Source: L.E.K. analysis

Summary of results (2 of 7)

Redundant freight assets avoidable costs				Long-run annual Freight Avoidable Cost (£m, FY11/12 prices) (*)	
		Source of quantification	Notes	Low case	High case
2	**Net total**			**6**	**12**
2.1	Additional redundant freight lines – recurring costs	Network Rail and freight operators review of ACTRAFF-based list of potential assets as well as sample-based analysis of Quail maps	Range estimated based on feedback / comments to date and Quail maps sample analysis	7	12
	Additional redundant freight lines – annualised one-off costs	Quantification based on same cost/km as FOLs		(1)	(1)
2.2	Measurement trains fleet	Discussions with Network Rail suggest estimated impact not material	Zero	-	-
2.3	Freight property assets	Property valuation would require detailed surveys, which were out of the scope of this study	Potentially material cost, but these were included in present study	-	-

See pages 62-67

Note: (*) Positive figures indicate savings for Network Rail. Negative figures indicate cots increases for Network Rail
Source: L.E.K. analysis

Summary of results (3 of 7)

Freight variable usage avoidable costs				Long-run annual Freight Avoidable Cost (£m, FY11/12 prices)	
		Source of quantification	Notes	Low case	High case
3	**Net total**			**96**	**215**
3.1	Track	VTISM based estimates for M&R activity for each of scenarios A and B produced by Network Rail	Track high case based on 'no freight' VTISM run and low case based on VTISM VUC estimates	70	178
3.2	Civils – Structures and Embankments	Variable costs as per Network Rail's VUC estimates	Current estimates based on VUC analysis and IIP growth, range based on Network Rail's estimates	14	18
3.3	Signalling			4	5
3.4	Electrification	Network Rail suggests impact not material other than electricity for traction	Estimates based on historical EC4T freight income and forecast electrified freight train miles	9	13

- This analysis assumes a significant step change in traffic volumes, which is different from the volume assumptions used in assessing Variable Usage Charges (VUCs). As a result variable costs identified through the VTISM runs conducted by Network Rail for this project were larger than those identified by VUC methodology
- The same could be true for civils costs being estimated through an ongoing modelling exercise, but results were not available for this project

See pages 68-79

Source: L.E.K. analysis

Summary of results (4 of 7)

Redundant freight enhancement avoidable costs				Long-run annual Freight Avoidable Cost (£m, FY11/12 prices)	
		Source of quantification	Notes	Low case	High case
4	**Net total**			**64**	**87**
4.1	Strategic Freight Network – annualised one-off costs	Identification by Network Rail of freight-specific elements of each scheme and review from operators	£200m total for CP5 SFN enhancements Potential for similar requirement in CP6	28	31
4.2	Other enhancement schemes with freight components – annualised one-off costs	Identification by Network Rail of freight-specific elements of each scheme and review from operators	List of schemes reviewed by operators, range based on comments received	32	51
4.3	ERTMS locos fitment – annualised one-off costs	One-off cost based on Network Rail's estimate of engineering loco requirements relative to total loco fleet	c.£180k per loco, for estimate of avoidable range (325 to 290 locos)	4	4

See pages 80-91

Source: L.E.K. analysis
Network Rail. Freight Avoidable Costs.

Summary of results (5 of 7)

Freight avoidable costs: Consequential cost reductions				Long-run annual Freight Avoidable Cost (£m, FY11/12 prices)	
		Source of quantification	Notes	Low case	High case
5	**Net total**			**58**	**77**
5.1	Policy driven maintenance and renewal cost savings	Network Rail's VTISM, Inspection Model and analysis to identify affected routes and impacts	Stated by Network Rail to be low for track, but not to be quantified during this study	-	-
5.2	Engineering access	Case studies produced by Network Rail (LNE and Wessex for potential white space, MML for cost optimisation)	Review of case studies suggests potential for reducing unit costs for M&R work from removing freight is not material, but Network Rail suggests incentives for cancelling first and last passenger services could change	-	-
5.3	Coal spillage	Based on ORR CP4 final determination, adjusted for end of CP4 efficiencies and FY11/12 prices and Network Rail initial CP5 estimates	£4.1m was the cost of coal spillage given in the Halcrow report, it has been adjusted for inflation and to end of CP4 efficiency, grown with Coal gtkm	3	6
5.4	Schedule 4	Historical payments, delay minutes, benchmarks and payment rates provided by Network Rail	Based on actual cost, grown with freight train km	14	20
5.5	Schedule 8		Based on FOC on TP benchmark delay and payment rates, grown with freight train km	29	33
5.6	Service variations & cancellations	Historical payments	Range of actual costs over last 3 years, grown with freight train km	5	9
5.7	Capacity / congestion cost			5	7
5.8	Network Change / Major Project notice			2	2

See pages 92-109

Source: L.E.K. analysis

Summary of results (6 of 7)

Freight avoidable costs: Consequential cost increases				Long-run annual Freight Avoidable Cost (£m, FY11/12 prices) (*)	
	Source of quantification		Notes	Low case	High case
6	**Net total**			**(88)**	**(39)**
6.1	Services subcontracted to commercial freight operators	Current payments to commercial freight operators	Engineering haulage, seasonal treatment, infrastructure monitoring and associated support logistics – current costs c.£147m p.a.	147	147
6.2	Engineering trains, seasonal treatment and infrastructure monitoring – operational costs	Changes to NDS rates over time since privatisation, and bottom-up estimates for recurring costs, both provided by freight operators	Costs of a dedicated operation are expected to be higher as a result of losing the marginal-pricing benefits that Network Rail is currently able to take advantage of	(145)	(122)
	Engineering trains, seasonal treatment and infrastructure monitoring – rolling stock leasing / ownership costs	One-off costs based on Network Rail leasing or purchasing the required (245-280) engineering locomotives and wagons (1,630)		(74)	(51)
6.3	Local distribution centres	Based on estimates from freight operators		(14)	(12)
6.4	Corporate overhead			(4)	(2)

See pages 110-115

Note: (*) Positive figures indicate savings for Network Rail. Negative figures indicate cost increases for Network Rail
Source: L.E.K. analysis

Summary of results (7 of 7)

Network Rail freight staff avoidable costs				Long-run annual Freight Avoidable Cost (£m, FY11/12 prices)	
		Source of quantification	Notes	Low case	High case
7	**Net total**			**4**	**5**
7.1	Central freight team (c.27 people)	Estimates based on Network Rail's FY12/13 budget and expected long-term staffing requirement		2	2
7.2	Freight planning team (c.51 people)			1	2
7.3	Freight performance team (c.6 people)			0	0
7.4	Freight property team	Property management would still be required while Network Rail continued to own the assets	Zero impact	-	-
7.5	Other staff partially involved with freight	Not avoidable	Zero impact	-	-

See pages 116-117

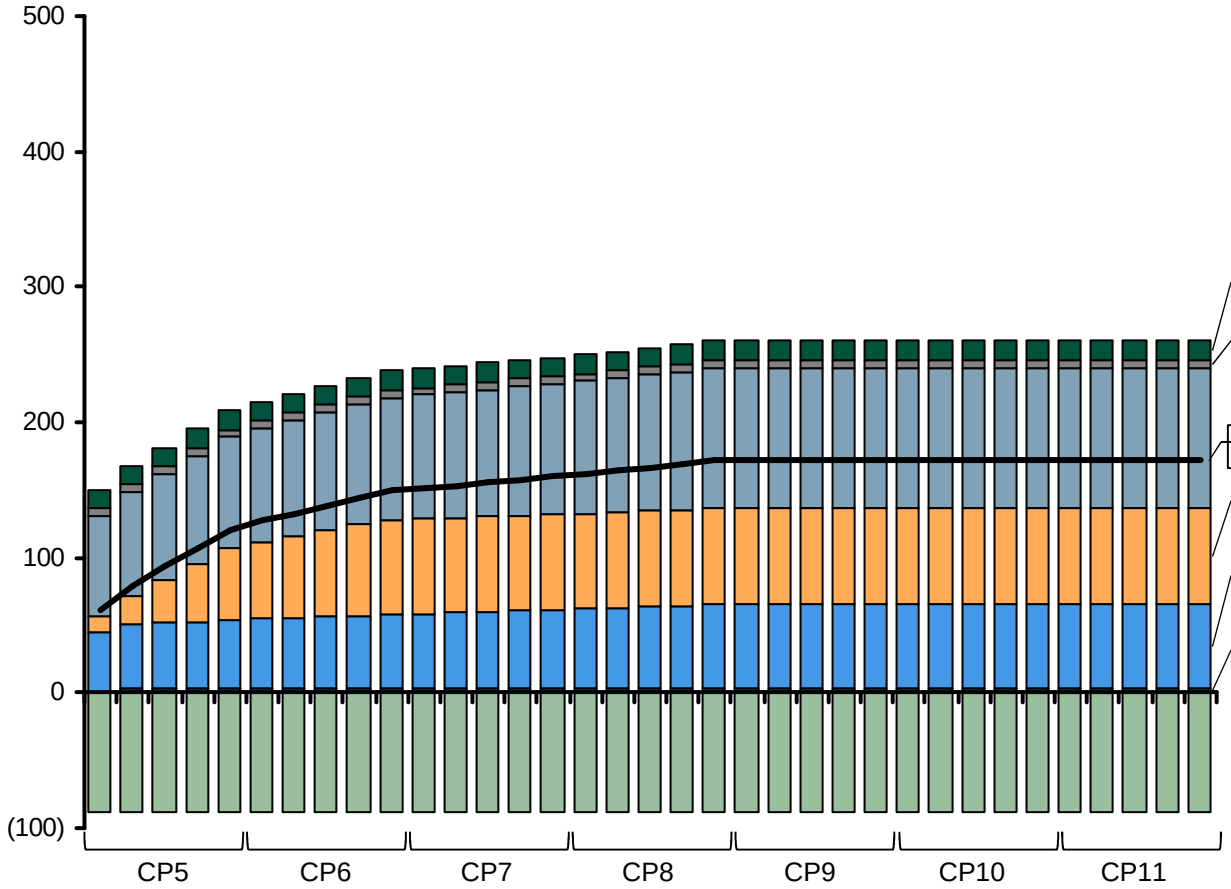
Source: L.E.K. analysis
Network Rail. Freight Avoidable Costs.

Gross

Gross Freight Avoidable Cost by category and year: low case

Gross Freight Avoidable Cost – low case including recurring costs and annualised one-off costs

(CP5-11) - Millions of FY11/12 pounds



	35 Year Average	CP5 Average
Freight Only Lines	14	14
Redundant freight assets costs	6	6
Variable usage costs	96	78
Total	**152**	**92**
Redundant enhancement costs	64	32
Consequential cost reductions	58	48
Network Rail staff costs	4	3
Consequential cost increases	(88)	(88)

Note: One-off costs based on notional RAB adjustment methodology at Network Rail's allowed return of 4.75% plus amortisation allowance of c.3.3%

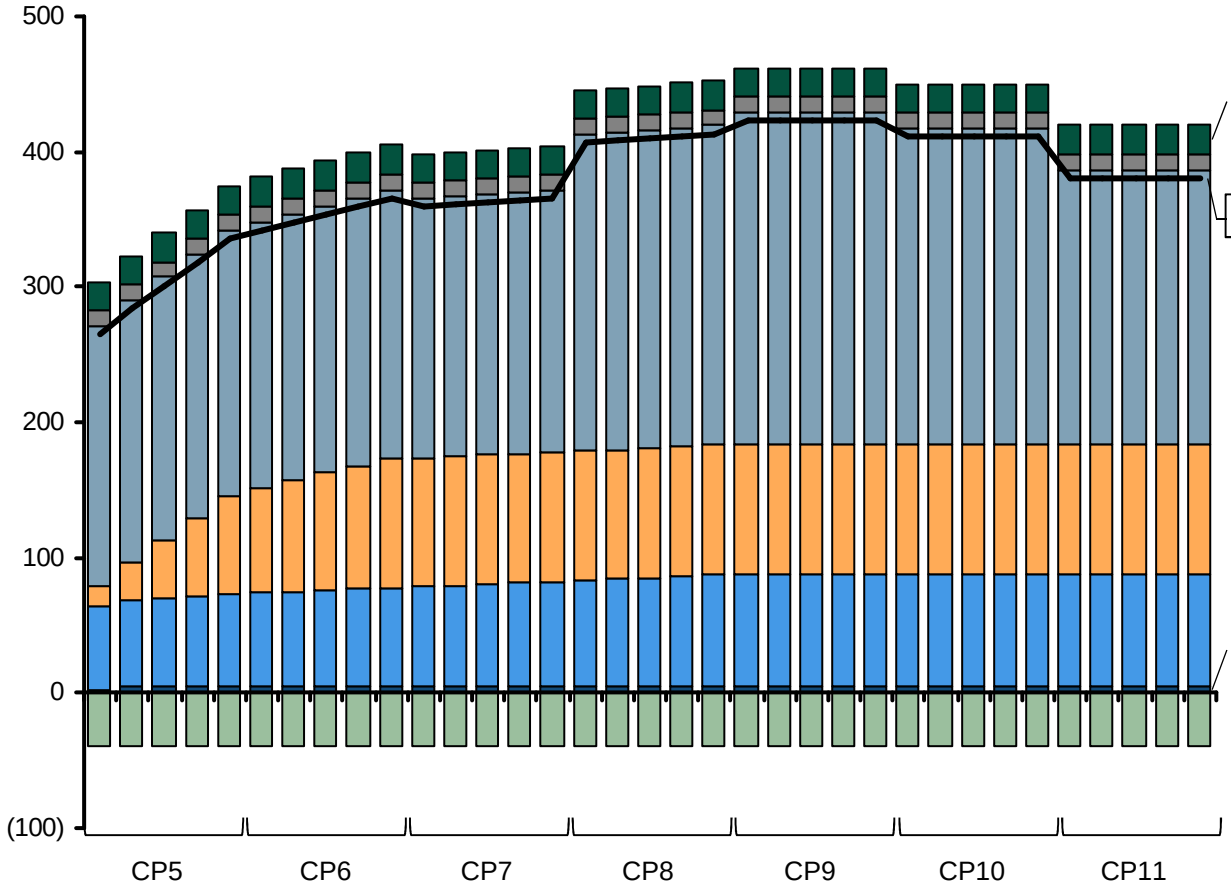
Source: L.E.K. analysis

Gross

Gross Freight Avoidable Cost by category and year: high case

Gross Freight Avoidable Cost – high case including recurring costs and annualised one-off costs

(CP5-11) - Millions of FY11/12 pounds



	35 Year Average	CP5 Average
Freight Only Lines	21	21
Redundant freight assets costs	12	12
Total	**377**	**301**
Variable usage costs	215	194
Redundant enhancement costs	87	44
Consequential cost reductions	77	64
Network Rail staff costs	5	4
Consequential cost increases	(39)	(39)

Note: One-off costs based on notional RAB adjustment methodology at Network Rail's allowed return of 4.75% plus amortisation allowance of c.3.3%

Source: L.E.K. analysis

Although we consider the estimated range to be reasonable, there are a number of limitations to the freight avoidable cost quantifications which should be considered

- Freight avoidable cost estimates were based on inputs and assumptions provided by Network Rail and industry participants and results were limited to the validity of these assumptions and inputs
  - outputs from the models used, such as Network Rail's VTISM, were dependent on the quality of their inputs and the modelling methodology applied. Freight operators have expressed reservations about the outputs from VTISM in some cases, particularly for the large changes in volumes considered in this study
  - some inputs and forecasts, such as the scope and cost of enhancement programmes, were not finalised and could be re-evaluated at any point before they become committed schemes
  - additional engineering access opportunities have been assessed as zero based on case-studies and not as a result of a network wide evaluation
  - additional redundant assets have been based on an ACTRAFF-derived list and could be missing assets due to potential data issues inherent to the dataset, where these have not been captured by the subsequent Quail adjustment
  - quantification of some potentially significant impacts, e.g., the value of freight property assets and the impact on civils maintenance and renewals, has not been possible because Network Rail has been unable to quantify these elements in the time available. These issues will be addressed separately
  - other elements that were believed to have small potential cost impact have been assumed to be zero
- Within the constraints of our work on this project we believe these assumptions to be reasonable for this purpose
- Uncertainty of some estimates leads in some cases to wide ranges of potential Freight Avoidable Costs
  - for example, VTISM variable usage costs and NDS consequential cost increase estimates imply a wide range and numbers could be refined with more detailed analysis, which has not been possible within this project's timescale

There are certain areas that would warrant further study

- Network Rail is undertaking further modelling work on civils as part of its SBP programme which could provide different estimates when compared to the current VUC estimates. Additionally, the model could provide inputs to evaluate the impact of M,R&I policy changes on civils costs
- VTISM cost saving estimates for negative changes in traffic were significantly different from those for positive traffic changes. Further study could be undertaken to identify underlying causes of these differences
  - the ORR has commissioned an external Reporters to review Network Rail's VTISM runs used in this study
- Potential freight avoidable costs resulting from changes in route criticality could be estimated by Network Rail after this project for possible subsequent inclusion
- Given the early stages of some enhancement programmes included in the report, estimates might change as the schemes become more developed over time
- Current Network Rail NDS operational cost increase estimates result in a wide range and further study could be conducted to refine these estimates
- Potential freight avoidable costs resulting from freight property asset sales were not included in this report. This could be a material number and Network Rail's current view is that the asset sale could realise several hundred million pounds
  - for consistency, if included, this number should be treated as other one-off impacts as described previously, i.e. as a nominal adjustment to Network Rail's RAB
  - Network Rail could conduct detailed property surveys of these freight property assets to establish their market value for non-freight uses in order to provide a quantification in this area

The following one-off costs have been annualised using the nominal RAB adjustment methodology previously described

(Millions of FY11/12 pounds)

	Cost Item	Description	One-off cost		Timing of one-off cost	Annualised one-off costs	
			Low case	High case		Low case	High case
1	**Freight Only Lines**						
1.2	Decommissioning and ongoing costs	One-off costs incurred in point end abandonment	(39)	(20)	At the beginning of CP5	(3)	(2)
2	**Redundant freight assets costs**						
2.1	Additional redundant freight lines	One-off costs implied by FOL cost estimates	(13)	(8)	At the beginning of CP5	(1)	(1)
4	**Redundant enhancement costs**						
4.1	Strategic Freight Network	Freight avoidable elements of enhancement schemes	400	450	Distributed through CP5 and CP6	28	31
4.2	Other regional enhancement schemes		419	673	Distributed through CP5	32	51
4.3	ERTMS locomotive fitments	Locomotive fitments	52	58	Distributed through CP5 and CP6	4	4
6	**Consequential cost increases**						
6.1	Engineering trains, seasonal treatment and infrastructure monitoring	One-off costs related to the purchase of locomotives and wagons	(916)	(776)	At the beginning of CP5	(74)	(63)

Annualised ownership costs were estimated to be higher than leasing costs in the high case and were therefore not included – see pages 110-115 for further details

Some of the cost impacts identified are already compensated for by specific charges levied on freight operations

Freight Avoidable Costs net of costs associated with existing charges – End CP4 efficiency

(Millions of FY11/12 pounds)

Element of Net Freight Avoidable Cost	At 35 year average volumes		At CP5 average volumes		Notes
	Low case	High case	Low case	High case	
Gross Freight Avoidable Cost estimate	152	377	92	301	
(-) Freight Only Line costs for coal ESI and spent nuclear fuel	(6)	(8)	(6)	(8)	Current charges are based on coal ESI and spent nuclear fuel whilst the overall freight avoidable costs attributed to FOLs includes other commodities
(-) Variable usage costs based on marginal traffic changes	(87)	(94)	(72)	(77)	Current charges are based on variable cost estimates from marginal changes in traffic which might not capture all cost impacts from removing freight in its entirety. For track, only the low case usage cost is based on marginal traffic changes, and this has been used in both the low and high cases to estimate the variable usage cost based on marginal traffic changes shown in the table
(-) Electricity traction costs	(9)	(13)	(6)	(10)	EC4T charges are designed to be cost reflective
(-) Forecast coal spillage costs	(3)	(6)	(3)	(6)	Coal Spillage charges are designed to be cost reflective
(-) Capacity /congestion costs	(5)	(7)	(4)	(6)	Capacity Charges are designed to be cost reflective
Net Freight Avoidable Cost estimate	**42**	**249**	**0**	**194**	

Methodological consistency should be maintained between existing freight charges and the elements of freight avoidable costs that are intended to mirror these charges. To the extent that forecast avoidable costs do not match the current charges levied in relation to those costs, the ORR would need to consider either recalibrating the charges as part of PR13 or adjusting the costs to match the charges in order to ensure no double counting of costs for freight operators

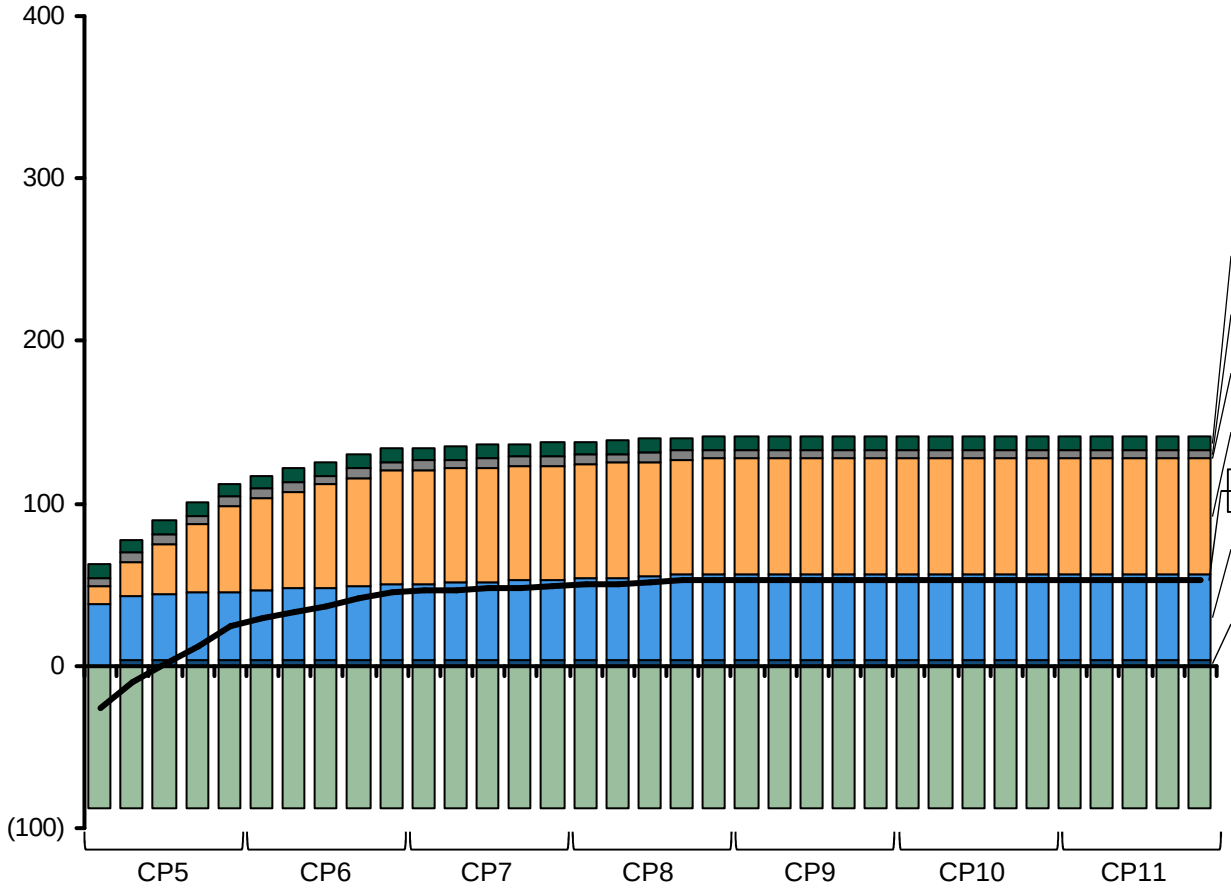
Source: Network Rail; L.E.K. research and analysis

Net

Net Freight Avoidable Cost by category and year: low case

Net Freight Avoidable Cost – low case including recurring costs and annualised one-off costs

(CP5-11) - Millions of FY11/12 pounds



	35 Year Average	CP5 Average
Freight Only Lines	8	8
Redundant freight assets costs	6	6
Variable usage costs	-	-
Redundant enhancement costs	64	32
Total	**42**	**0**
Consequential cost reductions	49	40
Network Rail staff costs	4	3
Consequential cost increases	(88)	(88)

Note: One-off costs based on notional RAB adjustment methodology at Network Rail's allowed return of 4.75% plus amortisation allowance of c.3.3%

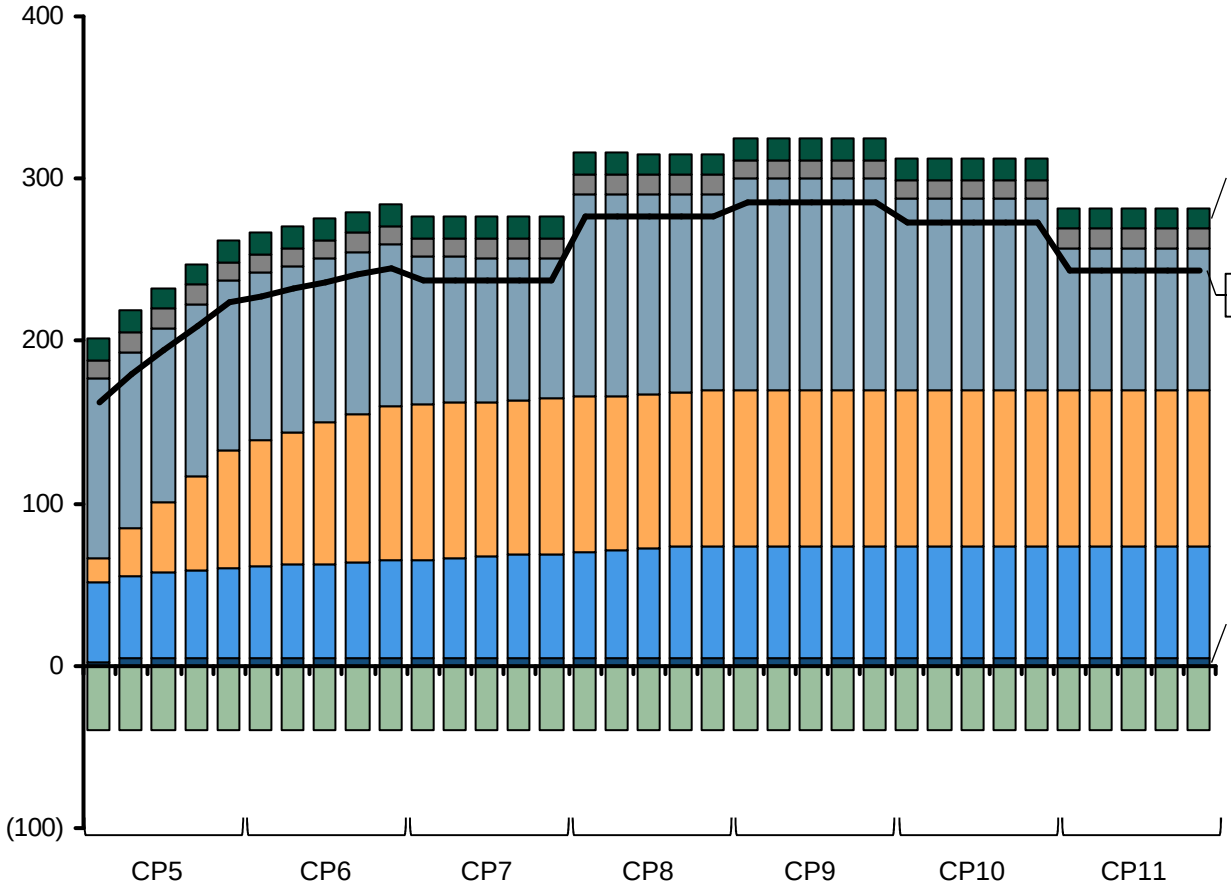
Source: L.E.K. analysis

Net

Net Freight Avoidable Cost by category and year: high case

Net Freight Avoidable Cost – high case including recurring costs and annualised one-off costs

(CP5-11) - Millions of FY11/12 pounds



	35 Year Average	CP5 Average
Freight Only Lines	13	13
Redundant freight assets costs	12	12
Total	**249**	**194**
Variable usage costs	108	107
Redundant enhancement costs	87	44
Consequential cost reductions	64	52
Network Rail staff costs	5	4
Consequential cost increases	(39)	(39)

Note: One-off costs based on notional RAB adjustment methodology at Network Rail's allowed return of 4.75% plus amortisation allowance of c.3.3%

Source: L.E.K. analysis

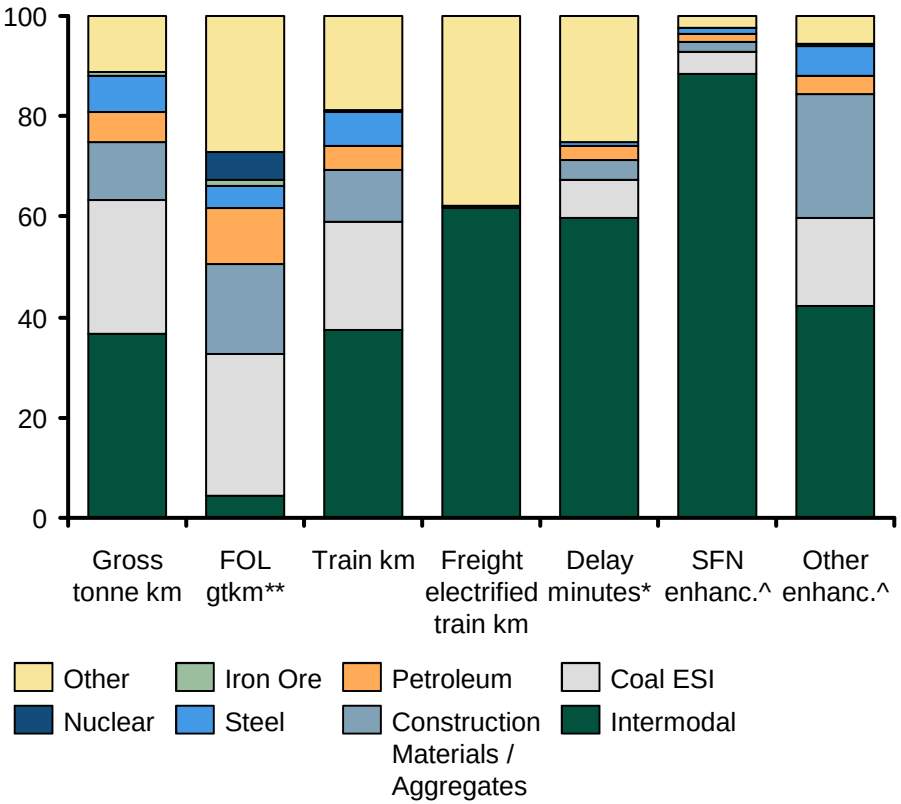
Agenda

- Executive Summary
- Introduction
- Summary of Freight Avoidable Cost estimates
- Estimated commodity allocation
- Appendix: methodology, data and approach

The overall Freight Avoidable Cost estimate can be allocated among the main commodity groups based on a high level and indicative methodology

Estimated freight commodity mix by metric (2010/11)

Percent



- **Principles**
  - The allocation of total Freight Avoidable Costs was based on the total estimate resulting from the proposed methodology
    - it was not based on the incremental impact of removing the traffic related to each commodity individually
  - The present study has set out potential options and metrics for allocating the long-run average Freight Avoidable Cost between the main freight commodities
  - These potential metrics are not final and will require further analysis and discussion
  - Different metrics have been used for different costs as outlined in the following pages
- The high level methods we have been asked to apply would not necessarily be appropriate for ORR to apply in setting charges
  - the ORR is currently consulting on allocation metrics for freight charges and this remains beyond the scope of the study

Note: * Delay minutes based on freight operator incidents causing more than 1,000 minutes of third party delay in 2011/12, split between Coal ESI and Other Coal based on gtkm, no data for Construction Materials; ** Estimated from Network Rail's FOL analysis; ^ Based on manual review of enhancement schemes and FY14/15 tonne km for high case

Source: Network Rail; ACTRAFF; L.E.K. research and analysis

Basis for estimated commodity allocation

		Basis for cost allocation
1	**Freight Only Lines**	
1.1	Maintenance, renewals, and inspection cost savings	FOL gross tonne km and manual input
1.2	Decommissioning and ongoing costs	
2	**Redundant freight assets costs**	
2.1	Additional redundant freight lines	Gross tonne km
2.2	Measurement trains fleet	No commodity allocation, no cost estimate at present
2.3	Freight property assets	
3	**Variable usage costs**	
3.1	Track	Gross tonne km
3.2	Civils - Structures	
3.2	Civils - Embankments	
3.3	Signalling	Train km
3.4	Electrification	Electrified train km
4	**Redundant enhancement costs**	
4.1	Strategic Freight Network	Individual schemes allocated to specific commodities, costs apportioned based on gross tonne km
4.2	Other enhancement schemes with freight components	
4.3	ERTMS locos fitment	Train km

		Basis for cost allocation
5	**Consequential cost reductions**	
5.1	Policy driven maintenance and renewal cost savings	No commodity allocation, no cost estimate at present
5.2	Engineering access	
5.3	Coal spillage	100% allocated to coal, split based on gtkm
5.4	Schedule 4	Train km
5.5	Schedule 8	Delay minutes
5.6	Service variations & cancellations	Train km
5.7	Capacity / congestion cost	
5.8	Network Change / Major Project notice	
6	**Consequential cost increases**	
6.1	Services subcontracted to commercial freight operators	Gross tonne km
6.2	Engineering trains, seasonal treatment and infrastructure monitoring	
6.3	Local distribution centres	
6.4	Corporate overhead	
7	**Network Rail staff costs**	
7.1	Central freight team(c.27 people)	Gross tonne km
7.2	Freight planning team(c.51 people)	
7.3	Freight performance team(c.6 people)	
7.4	Freight property team	No commodity allocation, no cost estimate at present
7.5	Other staff partially involved with freight	

Gross

Long-run (35 year) annual average Gross Freight Avoidable Cost by commodity – low case

Millions of FY11/12 pounds p.a.		Intermodal	Coal ESI	Aggregates / Construction Materials	Petroleum	Steel	Coal Other	Nuclear	Iron Ore	Other	Total
1	Freight Only Lines	1	4	3	2	1	0	1	0	3	**14**
2	Redundant freight assets costs	1	3	1	-	0	0	0	-	0	**6**
3.1 3.2	Track and Civils variable usage costs	42	14	7	5	4	1	0	0	9	**83**
3.3	Signalling variable usage costs	2	1	0	0	0	0	0	0	1	**4**
3.4	Electrification	6	0	0	0	0	-	-	-	3	**9**
4.1	SFN enhancements	25	1	0	0	0	0	0	0	1	**28**
4.2	Other freight avoidable enhancements	14	4	10	2	1	0	0	0	1	**32**
4.3	ERTMS locomotive fitments	2	0	0	0	0	0	0	0	1	**4**
5.3	Coal spillage	-	3	-	-	-	0	-	-	-	**3**
5.4 5.6 - 5.8	Schedule 4 and Service variations & cancellations, Capacity / congestion cost, Network Change / Major Project notice	13	3	2	1	1	0	0	0	4	**25**
5.5	Schedule 8	17	2	1	1	0	0	-	-	7	**29**
6	Consequential cost increases	(45)	(15)	(8)	(6)	(5)	(1)	(0)	(0)	(10)	**(88)**
7	Staff costs	2	1	0	0	0	0	0	0	0	**4**
TOTAL		**80**	**20**	**18**	**6**	**4**	**1**	**1**	**0**	**21**	**152**

Source: L.E.K. analysis
Network Rail. Freight Avoidable Costs.

Gross

Long-run (35 year) annual average Gross Freight Avoidable Cost by commodity – high case

Millions of FY11/12 pounds p.a.		Intermodal	Coal ESI	Aggregates / Construction Materials	Petroleum	Steel	Coal Other	Nuclear	Iron Ore	Other	Total
1	Freight Only Lines	1	6	4	2	1	1	1	0	5	**21**
2	Redundant freight assets costs	2	6	2	-	0	0	0	-	2	**12**
3.1 3.2	Track and Civils variable usage costs	100	32	18	12	10	2	0	1	21	**196**
3.3	Signalling variable usage costs	3	1	0	0	0	0	0	0	1	**5**
3.4	Electrification	9	0	0	0	0	-	-	-	4	**13**
4.1	SFN enhancements	28	1	1	0	0	0	0	0	1	**31**
4.2	Other freight avoidable enhancements	25	7	12	3	2	0	0	0	2	**51**
4.3	ERTMS locomotive fitments	2	1	0	0	0	0	0	0	1	**4**
5.3	Coal spillage	-	6	-	-	-	0	-	-	-	**6**
5.4 5.6 - 5.8	Schedule 4 and Service variations & cancellations, Capacity / congestion cost, Network Change / Major Project notice	19	5	3	2	2	0	1	0	6	**39**
5.5	Schedule 8	20	2	1	1	0	0	-	-	8	**33**
6	Consequential cost increases	(20)	(7)	(4)	(2)	(2)	(0)	(0)	(0)	(4)	**(39)**
7	Staff costs	2	1	0	0	0	0	0	0	1	**5**
TOTAL		**191**	**60**	**38**	**19**	**15**	**3**	**2**	**1**	**47**	**377**

Source: L.E.K. analysis
Network Rail. Freight Avoidable Costs.

Gross

CP5 annual average Gross Freight Avoidable Cost by commodity – low case

Millions of FY11/12 pounds p.a.		Intermodal	Coal ESI	Aggregates / Construction Materials	Petroleum	Steel	Coal Other	Nuclear	Iron Ore	Other	Total
1	Freight Only Lines	1	4	3	2	1	0	1	0	3	**14**
2	Redundant freight assets costs	0	3	1	-	0	0	0	-	0	**6**
3.1 3.2	Track and Civils variable usage costs	29	15	7	5	4	1	0	0	8	**69**
3.3	Signalling variable usage costs	1	1	0	0	0	0	0	0	1	**3**
3.4	Electrification	4	0	0	0	0	-	-	-	2	**6**
4.1	SFN enhancements	9	0	0	0	0	0	0	0	0	**10**
4.2	Other freight avoidable enhancements	8	3	7	1	1	0	0	0	1	**20**
4.3	ERTMS locomotive fitments	1	0	0	0	0	0	0	0	0	**2**
5.3	Coal spillage	-	3	-	-	-	0	-	-	-	**3**
5.4 5.6 - 5.8	Schedule 4 and Service variations & cancellations, Capacity / congestion cost, Network Change / Major Project notice	9	4	2	1	1	0	0	0	4	**21**
5.5	Schedule 8	14	2	1	1	0	0	-	-	6	**24**
6	Consequential cost increases	(38)	(19)	(9)	(6)	(6)	(1)	(0)	(0)	(10)	**(88)**
7	Staff costs	1	1	0	0	0	0	0	0	0	**3**
TOTAL		**40**	**16**	**12**	**3**	**2**	**1**	**1**	**0**	**15**	**92**

Source: L.E.K. analysis
Network Rail. Freight Avoidable Costs.

Gross

CP5 annual average Gross Freight Avoidable Cost by commodity – high case

Millions of FY11/12 pounds p.a.		Intermodal	Coal ESI	Aggregates / Construction Materials	Petroleum	Steel	Coal Other	Nuclear	Iron Ore	Other	Total
1	Freight Only Lines	1	6	4	2	1	1	1	0	5	**21**
2	Redundant freight assets costs	0	7	2	-	0	0	0	-	2	**12**
3.1 3.2	Track and Civils variable usage costs	77	39	18	12	11	2	0	1	20	**180**
3.3	Signalling variable usage costs	2	1	0	0	0	0	0	0	1	**4**
3.4	Electrification	6	0	0	0	0	-	-	-	4	**10**
4.1	SFN enhancements	9	0	0	0	0	0	0	0	0	**10**
4.2	Other freight avoidable enhancements	14	5	8	2	2	0	0	0	1	**33**
4.3	ERTMS locomotive fitments	1	0	0	0	0	0	0	0	0	**2**
5.3	Coal spillage	-	6	-	-	-	0	-	-	-	**6**
5.4 5.6 - 5.8	Schedule 4 and Service variations & cancellations, Capacity / congestion cost, Network Change / Major Project notice	13	5	3	2	2	0	1	0	5	**31**
5.5	Schedule 8	16	2	1	1	0	0	-	-	7	**27**
6	Consequential cost increases	(17)	(9)	(4)	(3)	(2)	(0)	(0)	(0)	(4)	**(39)**
7	Staff costs	2	1	0	0	0	0	0	0	0	**4**
TOTAL		**124**	**64**	**33**	**17**	**15**	**3**	**2**	**1**	**41**	**301**

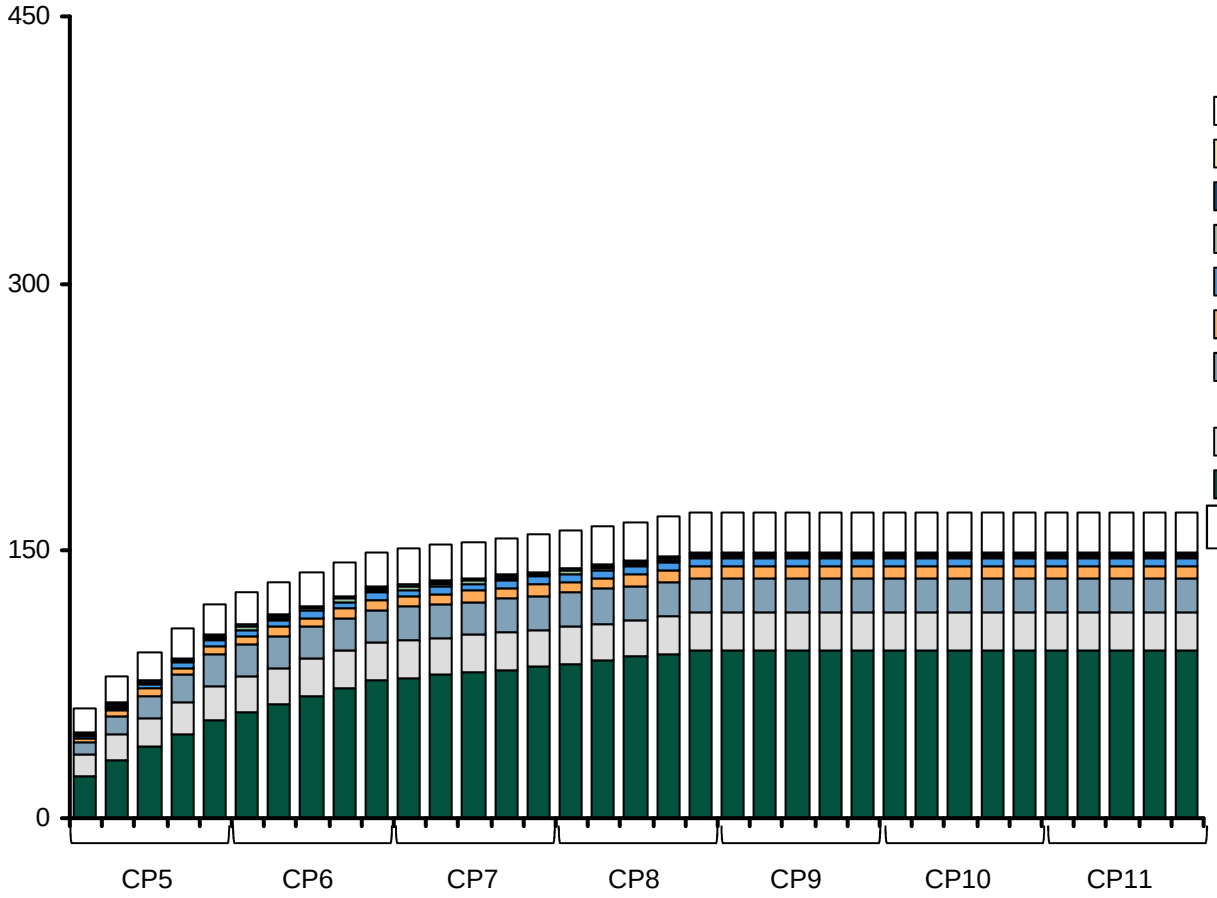
Source: L.E.K. analysis
Network Rail. Freight Avoidable Costs.

Gross

Gross Freight Avoidable Cost by commodity and year: low case

Freight Avoidable Cost – low case including recurring costs and annualised one-off costs (CP5-11)

Millions of FY11/12 pounds



	35 Year Average	CP5 Average
Other	21	15
Iron Ore	0	0
Coal Other	1	1
Nuclear	1	1
Steel	4	2
Petroleum	6	3
Aggregates/ Construction Materials	18	12
Coal ESI	20	16
Intermodal	80	40
Total	**152**	**92**

Note: One-off costs based on notional RAB adjustment methodology at Network Rail's allowed return of 4.75% plus amortisation allowance of c.3.3%

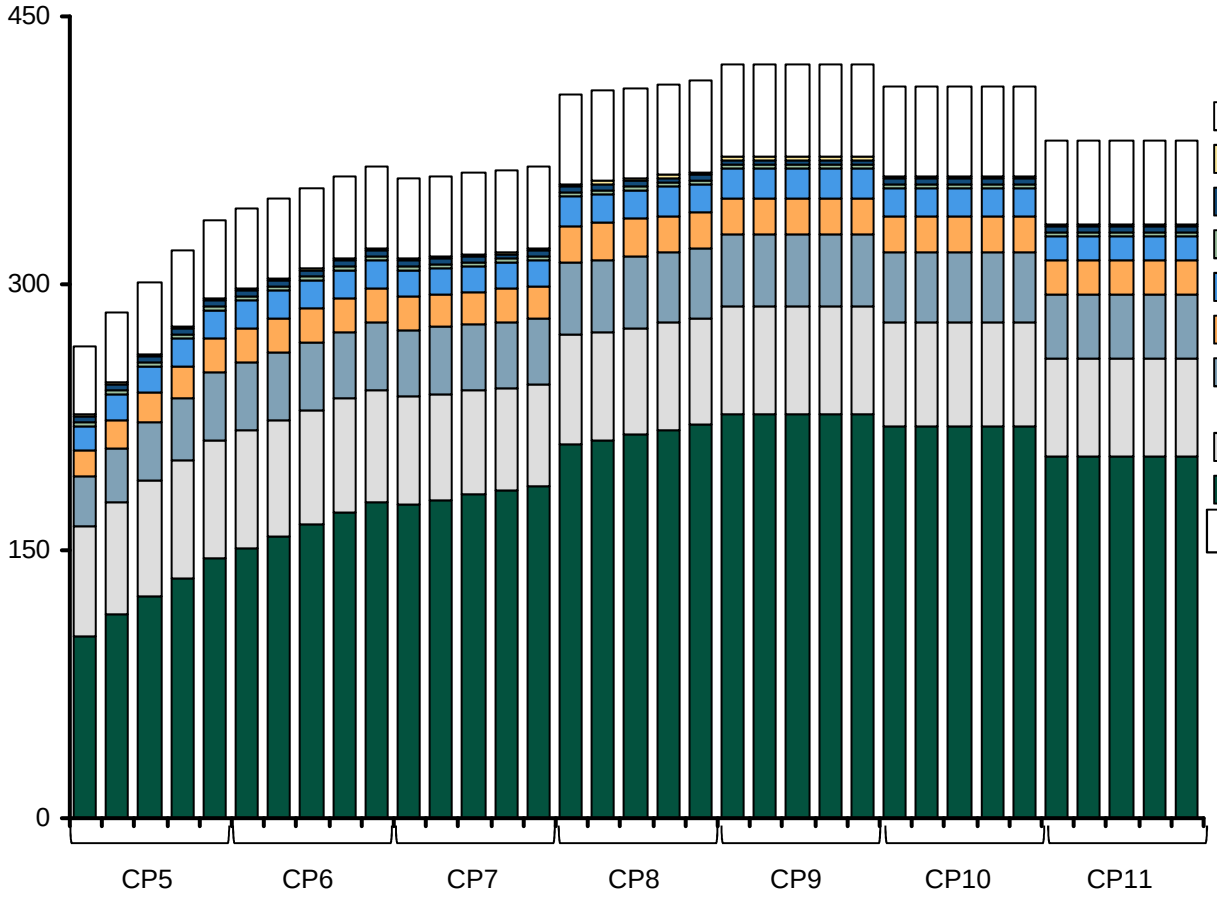
Source: L.E.K. analysis

Gross

Gross Freight Avoidable Cost by commodity and year: high case

Freight Avoidable Cost – high case including recurring costs and annualised one-off costs (CP5-11)

Millions of FY11/12 pounds



	35 Year Average	CP5 Average
Other	47	41
Iron Ore	1	1
Coal Other	3	3
Nuclear	2	2
Steel	15	15
Petroleum	19	17
Aggregates/ Construction Materials	38	33
Coal ESI	60	64
Intermodal	191	124
Total	**377**	**301**

Note: One-off costs based on notional RAB adjustment methodology at Network Rail's allowed return of 4.75% plus amortisation allowance of c.3.3%

Source: L.E.K. analysis

Network Rail. Freight Avoidable Costs.

Net

Long-run (35 year) annual average Net Freight Avoidable Cost by commodity – low case

Millions of FY11/12 pounds p.a.		Intermodal	Coal ESI	Aggregates / Construction Materials	Petroleum	Steel	Coal Other	Nuclear	Iron Ore	Other	Total
1	Freight Only Lines	0	2	1	1	0	0	0	0	2	**8**
2	Redundant freight assets costs	1	3	1	-	0	0	0	-	0	**6**
3.1 3.2	Track and Civils variable usage costs	-	-	-	-	-	-	-	-	-	**-**
3.3	Signalling variable usage costs	-	-	-	-	-	-	-	-	-	**-**
3.4	Electrification	-	-	-	-	-	-	-	-	-	**-**
4.1	SFN enhancements	25	1	0	0	0	0	0	0	1	**28**
4.2	Other freight avoidable enhancements	14	4	10	2	1	0	0	0	1	**32**
4.3	ERTMS locomotive fitments	2	0	0	0	0	0	0	0	1	**4**
5.3	Coal spillage	-	(0)	-	-	-	(0)	-	-	-	**(0)**
5.4 5.6 - 5.8	Schedule 4 and Service variations & cancellations, Capacity / congestion cost, Network Change / Major Project notice	10	3	2	1	1	0	0	0	3	**20**
5.5	Schedule 8	17	2	1	1	0	0	-	-	7	**29**
6	Consequential cost increases	(45)	(15)	(8)	(6)	(5)	(1)	(0)	(0)	(10)	**(88)**
7	Staff costs	2	1	0	0	0	0	0	0	0	**4**
TOTAL		**27**	**1**	**9**	**(1)**	**(1)**	**0**	**1**	**(0)**	**6**	**42**

Source: L.E.K. analysis
Network Rail. Freight Avoidable Costs.

Net

Long-run (35 year) annual average Net Freight Avoidable Cost by commodity – high case

Millions of FY11/12 pounds p.a.		Intermodal	Coal ESI	Aggregates / Construction Materials	Petroleum	Steel	Coal Other	Nuclear	Iron Ore	Other	Total
1	Freight Only Lines	1	4	2	1	1	0	1	0	3	**13**
2	Redundant freight assets costs	2	6	2	-	0	0	0	-	2	**12**
3.1 3.2	Track and Civils variable usage costs	55	18	10	7	6	1	0	0	12	**108**
3.3	Signalling variable usage costs	-	-	-	-	-	-	-	-	-	**-**
3.4	Electrification	-	-	-	-	-	-	-	-	-	**-**
4.1	SFN enhancements	28	1	1	0	0	0	0	0	1	**31**
4.2	Other freight avoidable enhancements	25	7	12	3	2	0	0	0	2	**51**
4.3	ERTMS locomotive fitments	2	1	0	0	0	0	0	0	1	**4**
5.3	Coal spillage	-	-	-	-	-	-	-	-	-	**-**
5.4 5.6 - 5.8	Schedule 4 and Service variations & cancellations, Capacity / congestion cost, Network Change / Major Project notice	16	4	2	2	2	0	1	0	5	**31**
5.5	Schedule 8	20	2	1	1	0	0	-	-	8	**33**
6	Consequential cost increases	(20)	(7)	(4)	(2)	(2)	(0)	(0)	(0)	(4)	**(39)**
7	Staff costs	2	1	0	0	0	0	0	0	1	**5**
TOTAL		**130**	**36**	**28**	**12**	**10**	**2**	**1**	**1**	**30**	**249**

Source: L.E.K. analysis
Network Rail. Freight Avoidable Costs.

Net

CP5 annual average Net Freight Avoidable Cost by commodity – low case

Millions of FY11/12 pounds p.a.		Intermodal	Coal ESI	Aggregates / Construction Materials	Petroleum	Steel	Coal Other	Nuclear	Iron Ore	Other	Total
1	Freight Only Lines	0	2	1	1	0	0	0	0	2	**8**
2	Redundant freight assets costs	0	3	1	-	0	0	0	-	0	**6**
3.1 3.2	Track and Civils variable usage costs	-	-	-	-	-	-	-	-	-	**-**
3.3	Signalling variable usage costs	-	-	-	-	-	-	-	-	-	**-**
3.4	Electrification	-	-	-	-	-	-	-	-	-	**-**
4.1	SFN enhancements	9	0	0	0	0	0	0	0	0	**10**
4.2	Other freight avoidable enhancements	8	3	7	1	1	0	0	0	1	**20**
4.3	ERTMS locomotive fitments	1	0	0	0	0	0	0	0	0	**2**
5.3	Coal spillage	-	-	-	-	-	-	-	-	-	**-**
5.4 5.6 - 5.8	Schedule 4 and Service variations & cancellations, Capacity / congestion cost, Network Change / Major Project notice	7	3	1	1	1	0	0	0	3	**16**
5.5	Schedule 8	14	2	1	1	0	0	-	-	6	**24**
6	Consequential cost increases	(38)	(19)	(9)	(6)	(6)	(1)	(0)	(0)	(10)	**(88)**
7	Staff costs	1	1	0	0	0	0	0	0	0	**3**
TOTAL		**3**	**(5)**	**4**	**(2)**	**(3)**	**(0)**	**1**	**(0)**	**3**	**0**

Source: L.E.K. analysis
Network Rail. Freight Avoidable Costs.

Net

CP5 annual average Net Freight Avoidable Cost by commodity – high case

Millions of FY11/12 pounds p.a.		Intermodal	Coal ESI	Aggregates / Construction Materials	Petroleum	Steel	Coal Other	Nuclear	Iron Ore	Other	Total
1	Freight Only Lines	1	4	2	1	1	0	1	0	3	**13**
2	Redundant freight assets costs	0	7	2	-	0	0	0	-	2	**12**
3.1 3.2	Track and Civils variable usage costs	46	23	11	7	7	1	0	1	12	**107**
3.3	Signalling variable usage costs	-	-	-	-	-	-	-	-	-	**-**
3.4	Electrification	-	-	-	-	-	-	-	-	-	**-**
4.1	SFN enhancements	9	0	0	0	0	0	0	0	0	**10**
4.2	Other freight avoidable enhancements	14	5	8	2	2	0	0	0	1	**33**
4.3	ERTMS locomotive fitments	1	0	0	0	0	0	0	0	0	**2**
5.3	Coal spillage	-	-	-	-	-	-	-	-	-	**-**
5.4 5.6 - 5.8	Schedule 4 and Service variations & cancellations, Capacity / congestion cost, Network Change / Major Project notice	11	4	2	1	2	0	0	0	4	**25**
5.5	Schedule 8	16	2	1	1	0	0	-	-	7	**27**
6	Consequential cost increases	(17)	(9)	(4)	(3)	(2)	(0)	(0)	(0)	(4)	**(39)**
7	Staff costs	2	1	0	0	0	0	0	0	0	**4**
TOTAL		**83**	**38**	**23**	**11**	**9**	**2**	**1**	**1**	**26**	**194**

Source: L.E.K. analysis

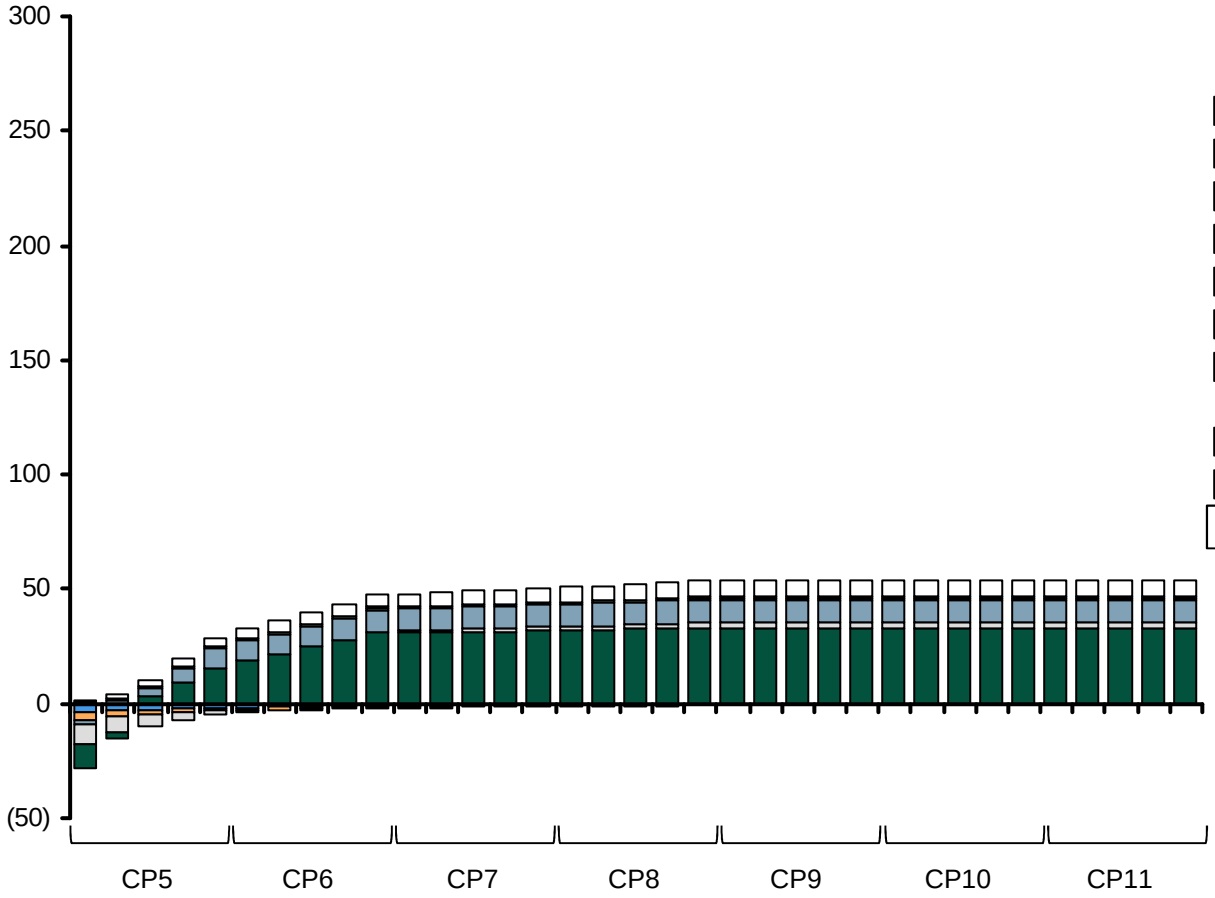
Network Rail. Freight Avoidable Costs.

Net

Net Freight Avoidable Cost by commodity and year: low case

Freight Avoidable Cost – low case including recurring costs and annualised one-off costs (CP5-11)

Millions of FY11/12 pounds



	35 Year Average	CP5 Average
Other	6	3
Iron Ore	(0)	(0)
Coal Other	0	(0)
Nuclear	1	1
Steel	(1)	(3)
Petroleum	(1)	(2)
Aggregates/ Construction Materials	9	4
Coal ESI	1	(5)
Intermodal	27	3
Total	**42**	**0**

Note: One-off costs based on notional RAB adjustment methodology at Network Rail's allowed return of 4.75% plus amortisation allowance of c.3.3%

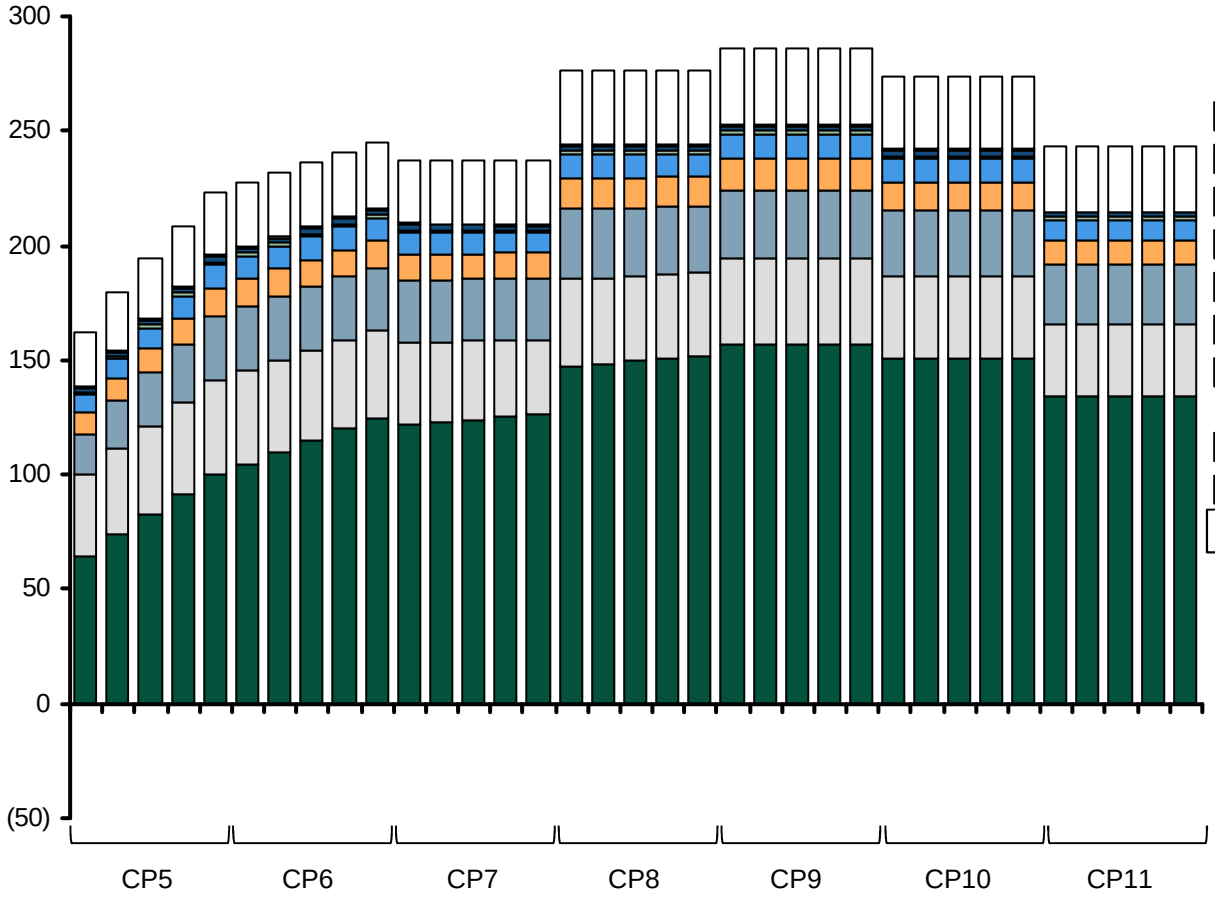
Source: L.E.K. analysis

Net

Net Freight Avoidable Cost by commodity and year: high case

Freight Avoidable Cost – high case including recurring costs and annualised one-off costs (CP5-11)

Millions of FY11/12 pounds



	35 Year Average	CP5 Average
Other	30	26
Iron Ore	1	1
Coal Other	2	2
Nuclear	1	1
Steel	10	9
Petroleum	12	11
Aggregates/ Construction Materials	28	23
Coal ESI	36	38
Intermodal	130	83
Total	**249**	**194**

Note: One-off costs based on notional RAB adjustment methodology at Network Rail's allowed return of 4.75% plus amortisation allowance of c.3.3%

Source: L.E.K. analysis

Agenda

- Executive Summary
- Introduction
- Summary of Freight Avoidable Cost estimates
- Estimated commodity allocation
- Appendix: methodology, data and approach

1.1 1.2 Freight Only Lines would be closed if commercial freight was removed from the network

Assumption under "mixed use" scenario A	Assumption under "no freight" scenario B
• The overall costs associated with Freight Only Lines (FOLs) maintenance and renewals are included in Network Rail's cost estimates	• Maintenance and renewal cost of Freight Only Lines will be considered a freight avoidable cost • Some ongoing costs, e.g. fencing and structures maintenance, would remain

Commentary

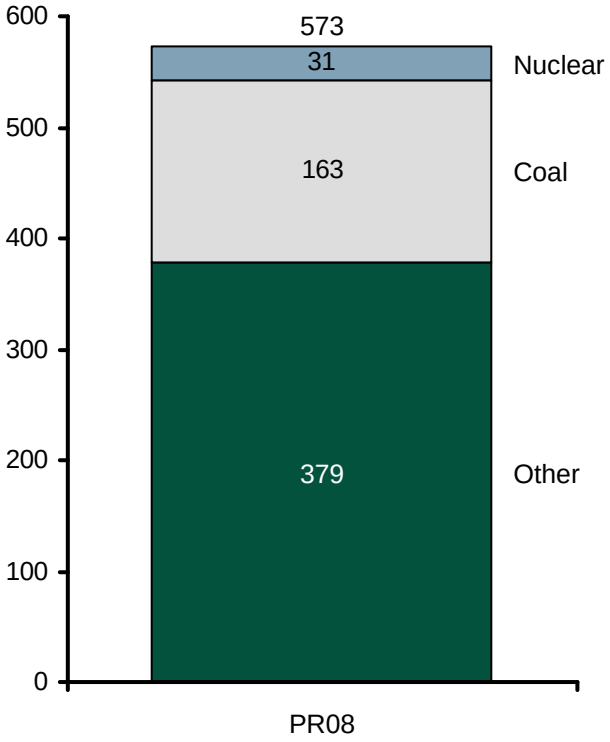
- Work has already been completed by Network Rail identifying methodology and costs for FOLs as per the agreed definition
  - out of all FOLs identified, only one was electrified and therefore electrification costs were not considered in the estimates
  - operators have generally expressed their agreement with the use of the FOL definition and list provided by Network Rail
- The definition of Freight Only Lines is narrow and as a result sections classified as FOLs represent a minimum list of assets that can be directly linked to freight operations
- Maintenance costs of these lines could be expected to vary by region and the adopted methodology addresses this by using estimates of the relevant Strategic Route Section costs
- Changes to passenger services were out of scope and alternative passenger use of FOLs was considered not possible
- Network Rail would have to incur one-off decommissioning costs and ongoing residual maintenance costs associated with closing the FOLs

Total FOL costs of c.£14-21m would be avoidable per year, driven by annual maintenance savings of c.£18-24m, and ongoing maintenance of c.£(1)m. The estimated one-off decommissioning costs range from c.£(20)m to £(39)m or c.£(2)-(3)m annualised

1.1 Freight Only Lines (FOLs) are narrowly defined and form only a small part of the total network

Length of Freight Only Lines

(2010/11)
Track km



The total network had c.31.1k track km in 2010/11, with FOLs therefore representing c.1.8% of the total

Definition of FOLs

- In the November 2011 consultation with industry participants, Freight Only Lines were defined as lines that:
  - would close if freight services ceased to operate
  - include segments of branches used only by freight traffic
  - are terminal lines
- Freight Only Lines do not include:
  - through lines, as these generally provide operational benefits for the mixed-use network
  - freight-only sections that are used for passenger diversionary traffic or empty coaching stock on a normal basis
  - freight-only lines on which there is a realistic prospect of extensive passenger services
  - goods/slow lines that run parallel to passenger lines
  - lines where franchised passenger services have access rights regardless of how frequently they are used
- As a result, there are some other of Network Rail's assets that would no longer be required without commercial freight but were not included in the FOL definition. For the purposes of the analysis these were considered under item 2.1, redundant fixed assets

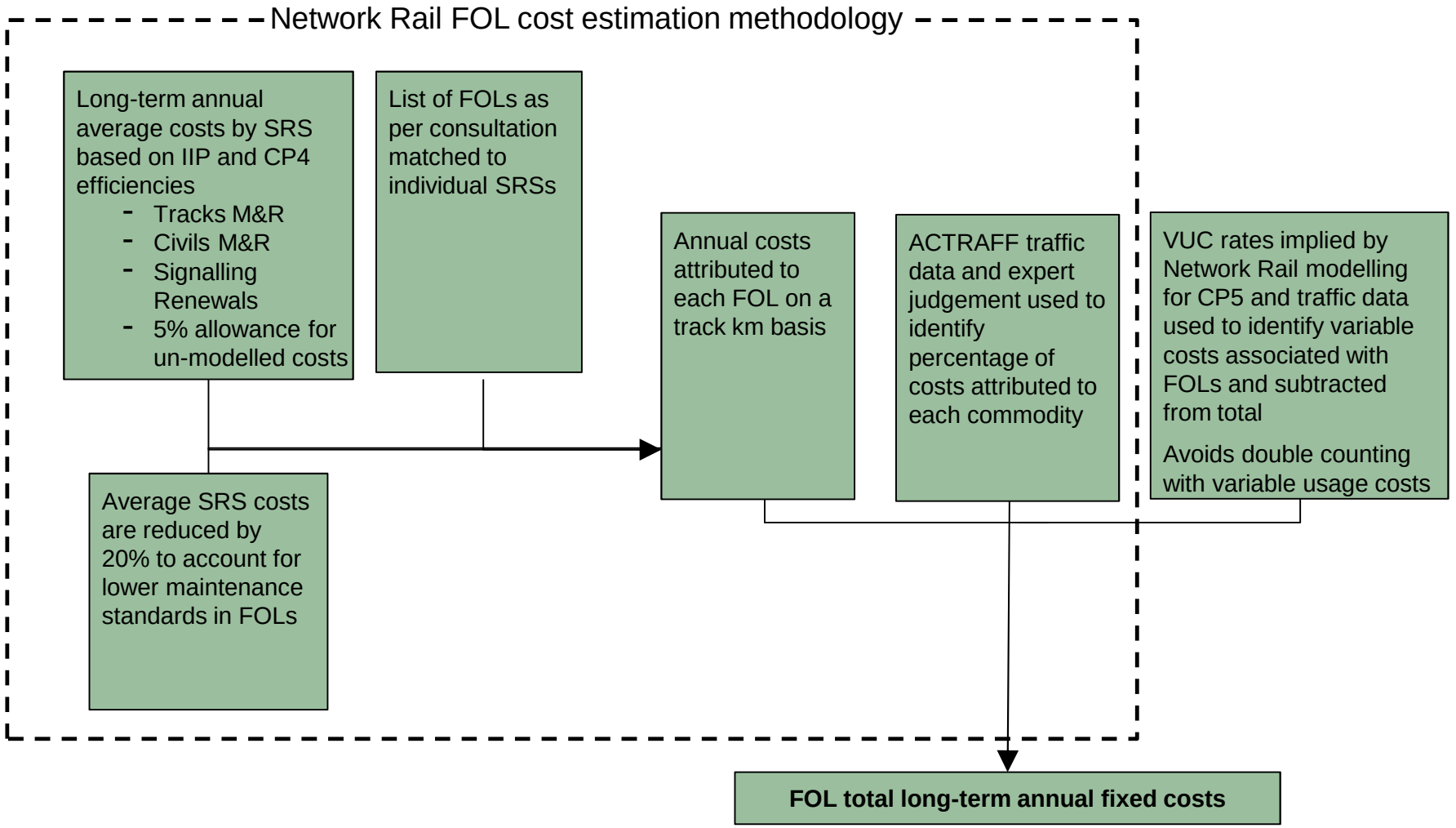
Source: Network Rail; L.E.K. research and analysis

1.1 There are no cost accounts available directly at FOL level and costs therefore need to be estimated

- Network Rail does not have cost forecasts disaggregated to the FOL level
- The most disaggregated level of Network Rail data is at Strategic Route Section (SRS) level, which is typically more aggregated than the FOLs
  - there are 339 SRSs in the network
  - 83% of the 573 track km identified by Network Rail as FOL can be matched to 25 SRSs
  - FOLs represent 33% of total track km of the 25 SRSs above, but this percentage varies significantly
- Therefore the M&R costs of Freight Only Lines, as well as any decommissioning costs associated with closing these lines need to be estimated
- Network Rail has accomplished this, initially for estimation of Coal ESI and Nuclear FOL costs, through development of a FOL cost forecast model. This approach has been extended by Network Rail to estimate total FOL costs for this project

Source: Network Rail FOL model; SRS Reference Data; L.E.K. analysis

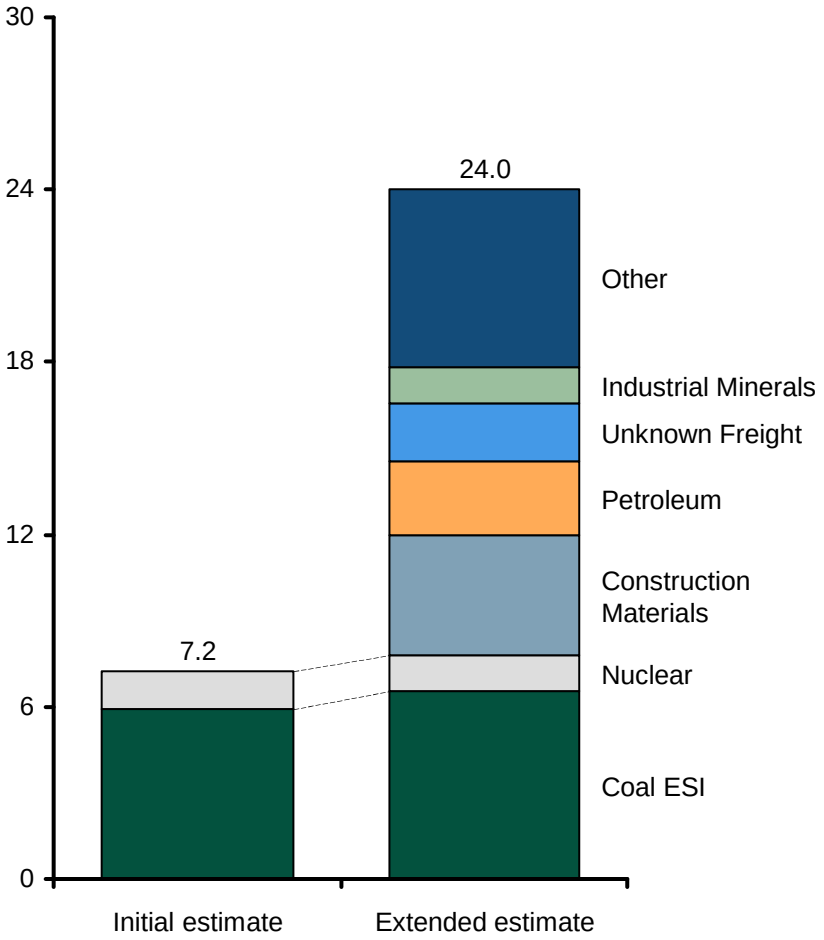
1.1 Network Rail's Freight Only Line cost estimation methodology was used as the basis for the cost quantification



1.1 Network Rail has extended its methodology to include other commodity groups in its Freight Only Line M&R cost estimate

FOL variable and fixed cost estimates

Millions of FY11/12 pounds



- In November 2011 Network Rail consulted on initial estimates for fixed costs attributed to coal ESI and nuclear spent fuel Freight Only Lines
  - this analysis has been extended by Network Rail to include other commodity groups
- Nuclear Spent Fuel and Coal ESI FOLs' costs have been revised when compared to the previous November 2011 figures
  - related renewals level crossing costs have now been estimated
  - Neath & Beacon Junction to Burrow Sidings FOL (8.2 km) has now been attributed to Coal ESI instead of Other FOLs
  - as a result, Coal ESI costs increased to c.£6.5m, from c.£5.9m and Nuclear FOL costs decreased marginally by c.£0.03m
- The FOL from Parson Street Junction to Portbury, with length of c.12.3km, has been included in the Great Western ITT and could be removed from the FOL list as it may have an alternative passenger use. Therefore, this line was only included in the high-case scenario

Source: Network Rail Analysis; L.E.K. research and analysis

Network Rail. Freight Avoidable Costs.

1.1 The estimated average cost per track km is lower for FOLs than for other lines. This results in an average £42k per track km of M&R cost savings in the long-term

Total FOL Costs (Millions of FY11/12 pounds)

	Freight Only Lines					Network wide (£k/ track km) *
	Coal (£m)	Nuclear (£m)	Other (£m)	Total (£m)	Total (£k/ track km)	
Track						
Maintenance	1.3	0.3	3.2	4.7	8.3	15.5
Renewals	2.1	0.5	4.5	7.1	12.4	22.6
Signalling						
Maintenance	0.4	0.1	0.9	1.4	2.4	5.4
Renewals	0.6	0.1	2.5	3.2	5.5	14.3
Civils						
Renewals	1.9	0.4	4.4	6.7	11.6	12.0
Allowance for other costs	0.3	0.1	0.7	1.0	1.7	
Total	**6.5**	**1.3**	**16.2**	**24.0**	**42.0**	**69.7**

- Costs were estimated by FOL and then apportioned to each commodity group based on traffic data and other Network Rail inputs
- In addition to tracks, civils, and signalling M&R costs, an allowance of c.5% is included by Network Rail to account for other costs not included in the analysis above
- The results estimate both fixed and variable costs attributed to FOLs. For the purposes of the initial consultation variable costs were deducted from the estimates using the VUC tariff and an assumption of 15% variable costs for those lines that had no traffic data available
- For comparison, Network Rail's FY11/12 regulatory accounts indicate a network wide average c.£70k/track km for track, civils and signalling M&R costs

- Variable usage costs were subtracted from the total Freight Only Line cost of c.£24m to avoid double counting, resulting in a net cost of c.£22m p.a.
- High and low case estimates were based on a range of +/-15% of the figures above, implying a total FOL cost range of £18 – 24m p.a.

Note: * Based on FY11/12 regulatory accounts and c.31.1k km of track

Source: Network Rail Freight Only Line model and FY11/12 regulatory accounts; L.E.K. research and analysis

1.2 Tracks and boundaries would continue to be inspected leading to annual ongoing costs whilst signalling abandonment would require some one-off costs

Track one-off and residual maintenance costs

- Track inspections are expected to take place once per year at a cost of c.£89 per track mile
- Boundaries would be inspected once every 3 years at an average cost of £51 per mile*
- It was also assumed that c.1/3 of all boundaries inspected in a given year will need additional maintenance, at c.£8 per yard
- One-off costs would essentially be those related to fencing the FOL off the main line, which would represent just a few metres per FOL and were therefore considered immaterial
- High and low cases were calculated using +/-15% intervals

Estimated ongoing costs of c.£(0.5)-(0.7)m

Signalling one-off and residual maintenance costs

- Several asset maintenance policies could be applied to signalling assets in closed FOLs
  - mothballing: minimum level of ongoing maintenance whilst renewals are postponed. Leads to the lowest initial cost but exposes the network to asset failure risks
  - minimal recoveries: assets connected to the main line are recovered whilst other assets are mothballed
  - full recoveries: with the highest initial cost, all redundant assets are removed
- Network Rail states that it would follow the minimum recovery policy resulting in one-off cost of minimal recoveries of S&C assets at c.£175k per point end, and a range of 116 to 232 point ends to recover

Estimated ongoing costs negligible but one-off costs range from c.£(20)-(39)m

Civils one-off and residual maintenance costs

- Annual visual bridge examinations would still be necessary, costing c.£35 per bridge
  - detailed examinations are not expected to be required
- Bridge fencing maintenance and removal of vegetation in addition to general serviceability maintenance are expected once every 5 years, at a total cost of c.£2,200 per bridge (c.£440 per year on average)
- Network Rail estimates an average of 1 structure every c.2 route km that would require maintenance
- High and low cases were calculated using +/-15% intervals

Estimated ongoing costs of c.£(0.2)-(0.3)m

Note: * Each route would have 2 boundaries to inspect and was assumed to have on average 2 track miles per route mile; prices shown in FY11/12 pounds

Source: Network Rail; L.E.K. research and analysis

2.1 228 to 304 km of additional track could be made redundant if commercial freight was removed from the network

Assumption under "mixed use" scenario A	Assumption under "no freight" scenario B
• Predominantly freight lines, additional tracks, loops, sidings, and freight avoiding lines part are part of mixed use lines and included in overall network costs	• A share of these assets might not be required for the remaining passenger, maintenance, renewals and other network operations. These assets would therefore become redundant and could be decommissioned

Commentary

- Certain sections of track that are typically only used by freight trains could provide operational flexibility to the network and therefore would not be closed, even without freight
  - operators have also argued that engineering access costs could be made more expensive due to reductions in diversionary opportunities
- To compile a comprehensive list of these assets would require a detailed analysis of the network by route freight managers, route asset managers and timetablers to determine which assets would be kept for operational flexibility and to determine if the removal of certain assets would be compatible with existing timetables
  - Network Rail has been unable to conduct this review within the timeframe of this study
  - a case study could be used but it might not be representative of the entire network and would require a similar review by different areas within Network Rail
- An alternative ACTRAFF database driven methodology has therefore been developed and reviewed to identify sections of the network that would be made redundant
  - this has been supplemented by a Quail map based review to determine the robustness of this approach on a sample basis

Estimated impact of savings ranges from c.£7-12m per year, and one-off cost range c.£(13)-(8)m (c.£(1)m on an annualised basis) giving a total impact of c.£6-12m

2.1 A bottom-up database driven approach for estimating additional redundant assets was applied, initially identifying c.200-267 km of track

Methodology

- Network Rail's ACTRAFF database was used to identify an initial list of lines that could potentially become redundant:
  1. using 09/10 traffic data, the constant traffic sections with freight traffic (positive number of trains) were ordered based on the number of passenger services (up to 1 per week)
  2. Freight Only Lines were identified and removed from the initial list
  3. Network Rail and industry participants reviewed the list to identify which of the remaining lines would be made redundant, based on traffic data and their knowledge of the network
- While we believe this approach is appropriate, the ACTRAFF database has some drawbacks that could reduce the confidence in the estimates derived, which are difficult to quantify
  - it contains c.26k track km of CTSs whilst the network is estimated to contain c.31k km of track and it is known to contain data gaps in traffic, underestimating the amount reported
  - it uses 09/10 data and results could vary if other years were included. Some freight operators have expressed reservations about the use of this data, arguing that more recent years should be available
  - use of the NETRAFF database has been proposed by freight operators as an alternative to ACTRAFF as it would cover the entire network. ACTRAFF was chosen as it measures actual traffic, reducing the risk of a line being attributed to freight when it is actually used by unscheduled passenger services. ACTRAFF also serves as a basis for the IIP, and its use was therefore consistent with IIP forecasts

Additional lines identified

	Steps 1 and 2		After step 3	
# of Passenger services in 09/10	# of CTSs	Track km	# of CTSs	Track km
Zero	58	309	33	200
1	16	57	4	25
2	7	34	1	11
3	4	5	-	-
4	8	12	-	-
5	3	3	-	-
6	5	3	-	-
7	4	13	1	6
8	4	27	3	25
9	3	3	-	-
10 to 19	13	51	-	-
20 to 29	8	51	-	-
30 to 40	5	9	-	-
40 to 52	2	5	-	-
TOTAL	**140**	**583**	**42**	**267**

The initial list identified 140 CTSs spanning 583 track km. After being reviewed by Network Rail and freight operators, most CTSs with more than 3 passenger services in 09/10 were not considered to be potentially redundant and were excluded from the final list of 42 CTSs and 267km

Source: ACTRAFF; Network Rail; freight operators; L.E.K. research and analysis

2.1 To complement the database driven approach, Network Rail conducted a sample analysis of Eastern Quail maps encompassing LNE and Anglia routes

Uplift estimate – Eastern Quail maps

	Total
Total redundant track km in LNE and Anglia identified in ACTRAFF-based list (track km)	156
Additional redundant track km in LNE and identified in Quail map review (track km)	22
Uplift implied by Quail map review	**14%**

- In addition to the ACTRAFF-based analysis, Network Rail conducted a detailed review of the Eastern Quail maps, which includes LNE and Anglia routes
  - operators have objected to the use of Quail maps for this exercise as it is not an official Network Rail source and is perceived to have issues with reliability. However, we do not believe this invalidates the approach as the Quail maps review was carried out by Network Rail and experienced operators
- This review identified additional tracks that could potentially be redundant in the no freight scenario
  - operators have reviewed the list of potentially redundant assets and provided comments where they identified alternative uses for the lines and where these would be redundant
  - in the great majority of instances where operators have identified alternative uses for the lines these were removed from the final list
- Following Network Rail and operator review, there remained c.22 km of additional track that would be redundant in the no freight scenario
  - comparing these additional lines with the c.156 track km previously identified in LNE and Anglia regions results in an uplift to ACTRAFF-based estimates of c.14%

Source: Network Rail; freight operators; L.E.K. research and analysis

2.1 Combining both approaches to identifying additional redundant assets results in c.£7-12m of recurring avoidable costs and c.£(1)m of annualised one-off costs

Redundant assets cost estimates

	Low case	High case
Redundant CTSs identified in ACTRAFF-based list	33	42
Redundant mileage in CTS list (track km)	200	267
Uplift implied by Quail maps review	14%	14%
Estimated redundant lines (# of lines)	33	48
Estimated redundant track mileage (track km)	228	304
Recurring cost per track km based on FOL estimates (£k / track km)	29.8	40.1
One-off cost per track km based on FOL estimates (£k / line)	340	170
Redundant assets recurring freight avoidable costs (£m)	**7**	**12**
Redundant assets one-off freight avoidable costs (£m)	**(13)**	**(8)**

- The ACTRAFF-based methodology encompasses the whole network and was therefore used as the basis to estimate the mileage of additional redundant assets
  - all 42 CTSs identified by Network Rail and operators as redundant were included in the high case, spanning c.267 km of track
  - the low case includes only those CTSs with no passenger traffic in 09/10 that were considered redundant, representing c.200 km of track
- The review of Quail maps for the eastern routes revealed an additional 22 km of track, representing an uplift of c.14% to the ACTRAFF based list
- The overall avoidable M&R costs were estimated using a cost per track km estimate derived from the preceding FOL quantification
  - the total recurring costs attributed to FOLs were estimated at c. £30-40k per track km per year, net of the ongoing maintenance costs required
  - one-off costs were estimated to be c.£340-170k per line
- The methodology described would imply c.£7-12m per year of recurring costs and c.£(13)-(8)m of one-off costs, representing c.£(1)m in annualised terms

Source: L.E.K. research and analysis
Network Rail. Freight Avoidable Costs.

2.2 Any reduction in Network Rail's survey and measurement train fleet appears not to represent a material cost saving opportunity

Assumption under "mixed use" scenario A	Assumption under "no freight" scenario B
● The cost of Network Rail's fleet of inspection and measurement trains is included in its overall maintenance costs	● Removal of freight operations could, in theory, allow some fixed cost saving if it enables Network Rail to operate a reduced fleet of measurement vehicles

Commentary

- The existing fleet of 6 measurement and inspection trains that survey tracks for damage and provide information for maintenance and renewals is currently used at close to maximum capacity
- Even without freight trains operating, capacity utilisation of measurement trains would likely remain close to the maximum
  - there is an increasing need for these trains from passenger operations
  - removal of freight operations could therefore only have a marginal impact on capacity utilisation
- Discussions therefore indicate little or no freight avoidable cost saving potential

This cost category should not be materially impacted by the removal of freight operations; therefore avoidable costs will be considered to be zero over the 35 year projection period

2.3 Network Rail has a portfolio of freight property assets which could be disposed of but an estimated value of these properties was not available

Assumption under "mixed use" scenario A	Assumption under "no freight" scenario B
• Network Rail continues to receive rents for its freight property portfolio, leased to freight operators	• Removal of commercial freight would enable gradual disposal of Network Rail's freight properties

Commentary

- Network Rail has c.370 freight properties leased to operators with long leases
  - the leases are typically at peppercorn rents but some properties generate income amounting to c.£22m p.a. for Network Rail
  - these properties currently have their use restricted to freight operations, with a current value therefore equivalent to the perpetuity value of rents currently received
  - on removal of commercial freight, these lease revenues would cease and the properties would revert to Network Rail for potential disposal. Network Rail expects that the sale value in this scenario would be significantly higher than the current perpetuity value as the land would become available for other potential uses, representing a potential freight avoidable cost
- As such, one proposed approach to identifying the annual costs could be the conversion of the cash released by a potential sale into an equivalent annuity using Network Rail's allowed return on its RAB, net of the rent lost
  - unlike other one-off costs, the inclusion of the amortisation charge would not be appropriate
  - the actual timing of sale of these assets would impact the resulting calculations under this method
  - as noted above, this approach would value the properties based on their existing use for freight operations, and would be likely to underestimate their value. In order to derive a more representative valuation the land would need detailed property surveying to establish its market value for non-freight use

The opportunity costs of ownership of these assets should in theory be included. Network Rail expects the sale value to at least compensate for the lost rent, but the actual estimation of this impact would involve a detailed survey of each property, which was beyond the scope of this project. Therefore, no freight avoidable cost has been attributed to this cost impact

3.1 Track maintenance and renewals cost would be reduced as a result of lower traffic volumes on the remaining passenger network

Assumption under "mixed use" scenario A	Assumption under "no freight" scenario B
• Traffic is a key driver of track M&R activity and the projected levels of network traffic are reflected in the M&R cost forecast	• The reduction in traffic induced by the removal of commercial freight would lead to lower levels of M&R activities in the remaining lines that could be appropriately captured by existing Network Rail models

Commentary

- Network Rail's VTISM model can be used to estimate the impact of commercial freight removal on M&R activity levels, and hence on their associated costs
  - VTISM has been previously used by Network Rail to estimate track variable M&R costs for Variable Usage Charges and track IIP submission; it will also be used for the CP5 Strategic Business Plan (SBP)
  - operators have raised concerns regarding the use of VTISM and its results in previous runs
- The scenario underlying the estimates needed for the present study implies a step change in freight traffic to zero, and resulting variable cost estimates were larger than those from previous runs
  - previous runs used marginal changes in overall traffic of +5%, +10%, +20% and -10%
  - the negative change in traffic implied a higher £/kgtkm variable cost than the positive growth scenarios
  - traffic was assumed constant at different levels than described under either scenarios A and B above
- Further potential savings arising as a result of track maintenance and renewal policy changes can be assessed in a similar way. These would be considered as a consequential efficiency gain in section 5.1

Track variable freight avoidable costs were estimated to range from c.£70m to c.£178m based on VTISM results (for variable usage charges estimates and new runs)

3.1 VTISM has been used as the main source of estimation for track variable costs. Its use has a range of both advantages and disadvantages

Pros	Cons
• Widely used by Network Rail, and was developed together with other industry participants through RSSB* - CP5 IIP and SBP forecast estimates use VTISM • Uses engineering relationships to link traffic data to track maintenance and renewals activities • Calibrated to historical costs	• Freight operators have expressed concern about its ability to robustly estimate large changes in traffic • Not entirely an automated process – model requires some manual intervention (e.g., related to timing of activity) • Accuracy of results constrained by imperfect knowledge of asset conditions and future M&R requirements • Work has been completed in a short timeline and further analysis, such as optimisation of activities in reduced traffic scenario and additional runs to refine results, have not been completed, leading to a wide range of estimates • Model results are opaque with no supporting detail available to provide insight into the resulting activity and cost impacts

Despite disadvantages of VTISM, given the timing and resource constraints for the project, and within Network Rail, no better results were available

Note: * Rail Safety and Standards Board

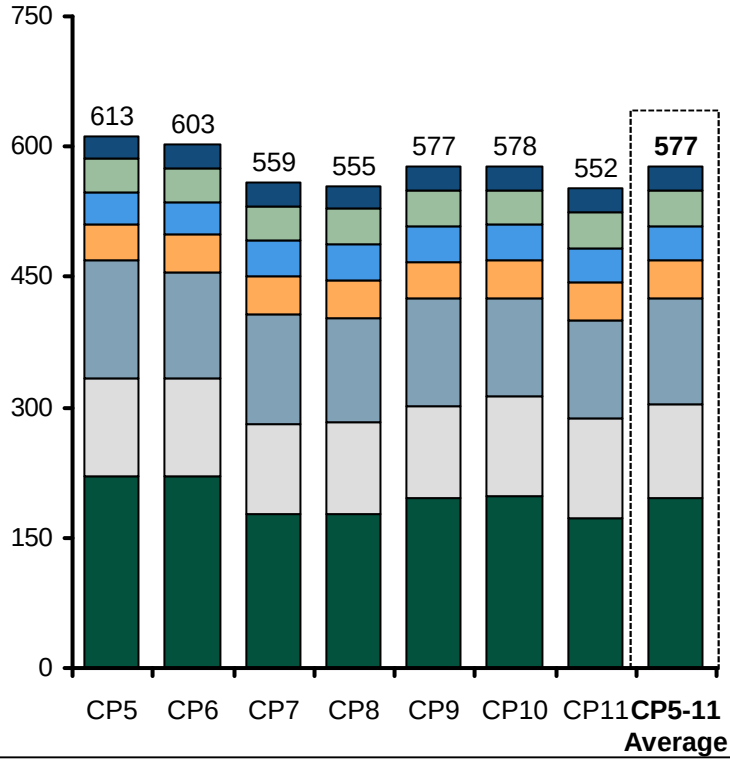
Network Rail. Freight Avoidable Costs.

3.1 Track variable freight avoidable costs estimated using VTISM are mostly driven by S&C and plain line renewals and refurbishments

Average track M&R cost forecast per control period: VTISM output (CP5-11)

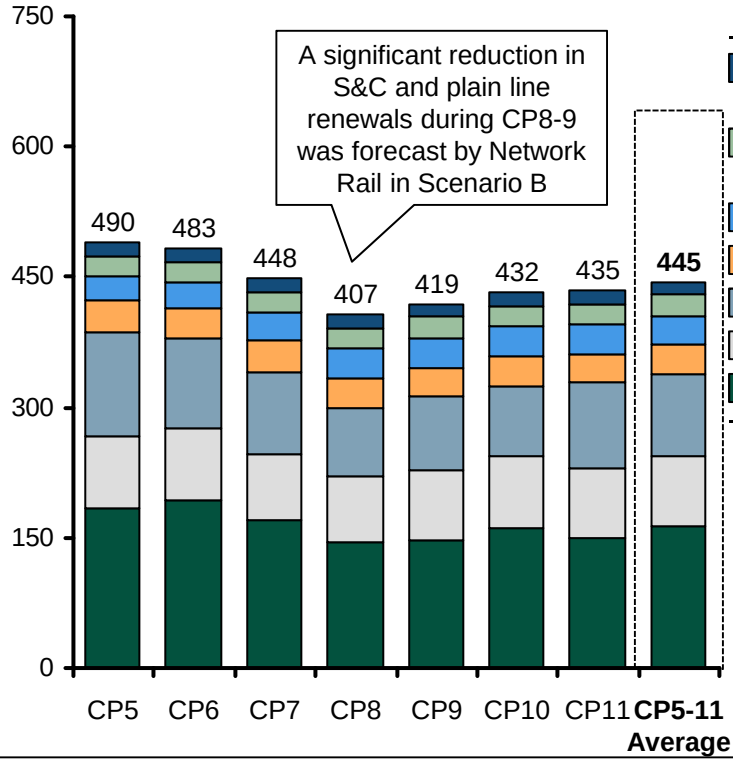
Scenario A – IIP traffic

Millions of FY11/12 pounds



Scenario B – No freight traffic

Millions of FY11/12 pounds



Change in CP5-11 average: Scenario A to Scenario B

	£m	%
S&C on-track machine	(12)	(45)
Plain Line on-track machine	(17)	(41)
Rail	(7)	(18)
S&C Refurb	(9)	(21)
S&C Renew	(27)	(22)
Plain Line Refurb	(29)	(27)
Plain Line Renew	(31)	(16)
TOTAL	**(132)**	**(23)**

	CP5	CP6	CP7	CP8	CP9	CP10	CP11	CP5-11 Average	CP5	CP6	CP7	CP8	CP9	CP10	CP11	CP5-11 Average	EMGTPA (millions)	%
Average EMGTPA (millions)	9.7	10.3	10.7	11.1	11.2	11.2	11.2	10.8	6.4	6.7	6.8	7.0	7.0	7.0	7.0	6.8	(3.9)	(37)

Source: Network Rail; VTISM

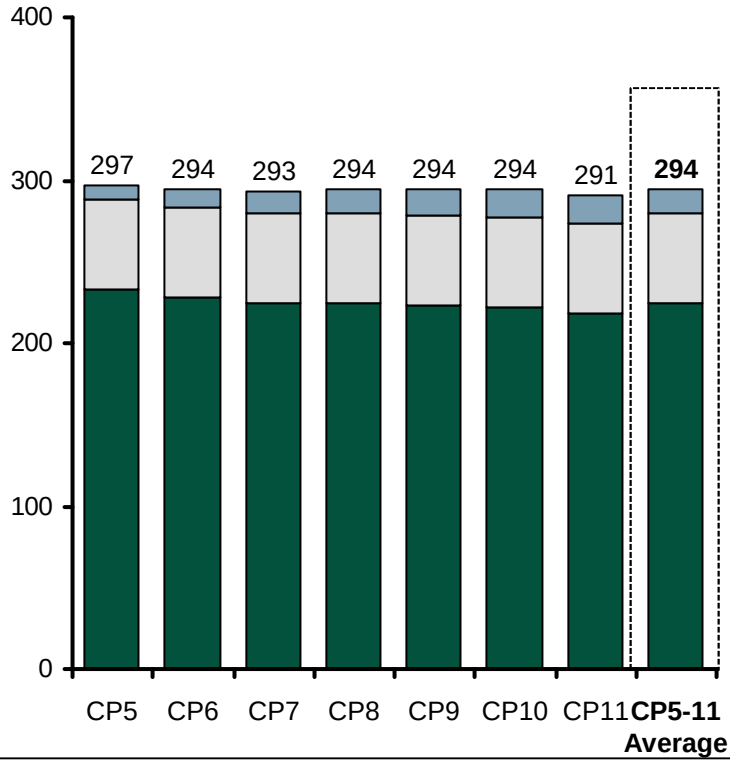
Network Rail. Freight Avoidable Costs.

3.1 In addition to VTISM, Network Rail's SRS maintenance model has been used to estimate variable freight avoidable costs for non on-track machine maintenance

Average track M&R cost forecast per control period: SRS Maintenance model output (CP5-11)

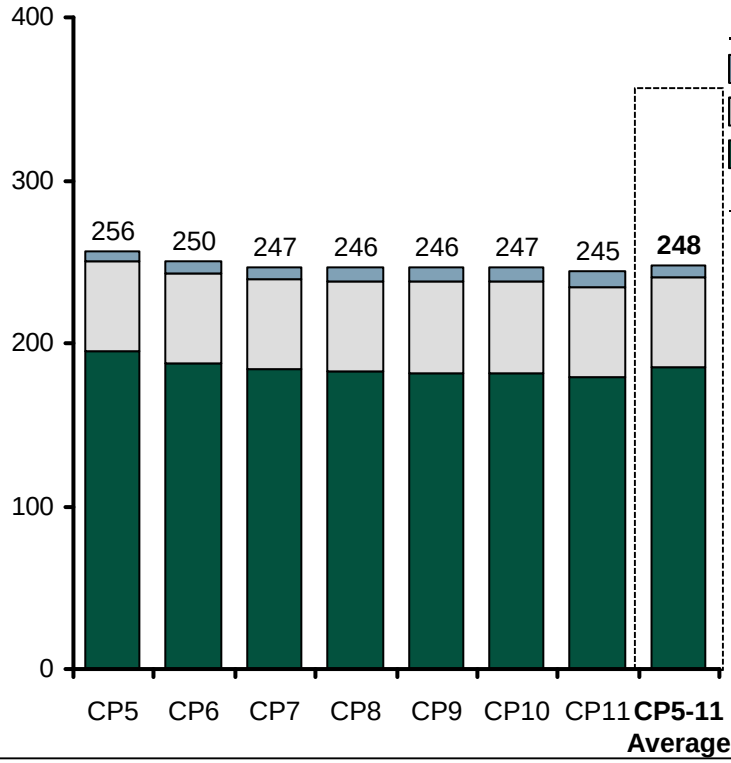
Scenario A – IIP traffic

Millions of FY11/12 pounds



Scenario B – No freight traffic

Millions of FY11/12 pounds



Change in CP5-11 average: Scenario A to Scenario B

	£m	%
NDS delivery	(6)	(43)
Offtrack	0	(0)
Maintenance delivery	(40)	(18)
TOTAL	**(46)**	**(16)**

	CP5	CP6	CP7	CP8	CP9	CP10	CP11	CP5-11 Average	CP5	CP6	CP7	CP8	CP9	CP10	CP11	CP5-11 Average	EMGTPA (millions)	%
Average EMGTPA (millions)	9.7	10.3	10.7	11.1	11.2	11.2	11.2	10.8	6.4	6.7	6.8	7.0	7.0	7.0	7.0	6.8	(3.9)	(37)

Source: Network Rail; VTISM

3.1 The high case estimate of variable track cost savings was derived from new runs of Network Rail's VTISM and SRS maintenance model

Network Rail's variable usage cost estimates

(Millions of FY11/12 prices)

Scenario	Scenario A average cost estimate CP5-11 (£m)	Scenario B average cost estimate CP5-11 (£m)	Annual average cost saving (£m)	Cost saving as % of Scenario A
Plain line renewals, refurbishment and OTM	345	268	76	22%
S&C renewals, refurbishment and OTM	192	144	48	25%
Rail	40	33	7	18%
Non-OTM maintenance	294	248	46	16%
Total	**871**	**693**	**178**	**20%**

	Scenario A	Scenario B	change	% of Scenario A
Average traffic forecast (bgtkm) CP5-11	209.0	147.5	61.5	29%

- A base case Scenario A level of track M&R activity was estimated using VTISM under the traffic forecast used for the IIP
  - resulting activity levels were then costed using the same unit costs used for the IIP
- A second cost estimate was produced for Scenario B under the assumption that all commercial freight traffic was removed
  - the estimate assumes the same set of unit costs
- Non-On-Track-Machine costs were estimated by Network Rail's SRS maintenance model
- A comparison of the two scenarios suggests a variable usage avoidable cost of c.£178m,
  - for comparison with previous Network Rail VUC estimates, the new estimates provided imply c.£2.9 per kgtkm of variable freight avoidable costs

Source: Network Rail VUC analysis; VTISM; ACTRAFF L.E.K. research and analysis

3.1 The low case estimate of variable track cost savings was based on Network Rail's current estimates for CP5 Variable Usage Charges (1 of 2)

Network Rail's variable usage cost estimates

Scenario	Forecast average annual change in traffic CP5-11 (bgtkm)	Estimated average change in annual cost (£m, FY11/12 prices)	Estimated variable track cost per kgtkm (£/kgtkm)
+20% freight and passenger traffic	36	48	1.34
+10% freight and passenger traffic	18	24	1.35
+5% freight and passenger traffic	9	12	1.38
(10)% freight and passenger traffic	(18)	(34)	1.88

- Network Rail has produced a series of variable cost estimates based on its VTISM and SRS maintenance model to serve as inputs for VUC estimates
  - traffic increase scenarios of +20%,+10%, and +5% resulted in similar estimates of variable costs
  - an additional scenario of 10% reduction in traffic was produced resulting in a significantly larger estimate of variable costs
  - in contrast to the estimates used in the high case, the estimates produced for the VUC calculation assumed that traffic would remain constant at the level implied by each scenario

Source: Network Rail VUC analysis; VTISM; L.E.K. research and analysis

3.1 The low case estimate of variable track cost savings was based on Network Rail's current estimates for CP5 Variable Usage Charges (2 of 2)

Variable usage avoidable costs – low case

	Total	Passenger	Freight
Estimated variable track cost per kgtkm (£/kgtkm)	1.34		
End CP4 traffic (bgtkm)	176.3	129.6	46.7*
Total track variable costs (£m, FY11/12 prices)	**237**	**184**	**53**
Track surface variable costs (£m, FY11/12 prices)	71	61	10
Other track variable costs (£m, FY11/12 prices)	166	123	43

	Low case
Track variable usage freight avoidable costs at end CP4 traffic (£m, FY11/12 prices)	53
Uplift due to traffic growth	32%
Track variable usage freight avoidable costs at 35 year average traffic (£m, FY11/12 prices)	**70**

- The avoidable variable usage cost was based on the low end of Network Rail's estimate of track variable costs in the +20% traffic scenario
- The total variable cost estimate was then split between passenger and freight traffic using the same equivalent vehicle miles methodology applied in VUC estimates, adjusted for end CP4 traffic
  - out of total track variable costs, c.30% was assumed to be related to track surface costs, of which 15% was apportioned to freight traffic. Of the remaining 70%, 26% was assumed to be apportioned to freight
  - the share of costs apportioned to freight is currently being reviewed by Network Rail
- The resulting freight variable track costs of £53m were uplifted by c.32% to account for traffic growth from end of CP4 to CP5-11 average, resulting in a low case estimate of c.£70m

Note: * End of CP4 freight traffic estimate does not include engineering haulage
Source: Network Rail VUC analysis; VTISM; L.E.K. research and analysis

3.2 New Network Rail modelling of civils costs was not available. Estimates were based on the VUC modelling methodology, but these could increase

Assumption under "mixed use" scenario A	Assumption under "no freight" scenario B
• Freight traffic is a key component of civils M&R costs and these costs are included in existing forecasts	• M&R costs for structures could be reduced by removing commercial freight operations • Embankments M&R costs are not very sensitive to traffic

Commentary

- The traffic-related damage to structures is associated with the combination of speed, weight, and frequency of the trains running on it
  - in some cases freight already operates at reduced speeds over sensitive structures in order to minimise damage
  - Network Rail's view is that heavy trains (both freight and engineering) remain a significant driver of civils M&R activity
  - freight operators have raised reservations on the use of expert judgement for the estimates of variable civils costs, particularly regarding understrength bridges
- Additional savings could result from policy changes that could be made possible by the removal of freight traffic (e.g., removing the need to enhance understrength bridges). This impact is further discussed in section 5.1

Variable civils freight avoidable costs were estimated to range from c.£14m to c.£18m, based on the VUC quantification

3.2 Using Network Rail's VUC estimates and PR08 methodology, c.£14-18m was attributed to freight avoidable variable costs for structures and embankments

Variable usage costs – Civils structures and embankments

(Millions of FY2011/12 pounds)

	Annual average (£m)	% of variable costs	Variable usage cost (£m)	% attributed to freight	Total freight variable costs (£m)
Embankments renewals	32	6%	1.9	47%	0.9
Metallic underbridge renewals	49	20%	9.7	47%	4.6
Brick and Masonry underbridge renewals	93	20%	13.3	47%	6.3
Culverts renewals	9	5%	0.5	47%	0.2
Total	**183**	**14%**	**25.5**	**47%**	**12.1**

Civils variable usage freight avoidable costs at end CP4 traffic (£m, FY11/12 prices)	Base case: 12.1	
	Low case	**High case**
Estimated cost range (%)	(15)%	15%
Civils variable usage freight avoidable costs at end CP4 traffic (£m, FY11/12 prices)	10	14
Uplift due to traffic growth	32%	32%
Civils variable usage freight avoidable costs at 35 year average traffic (£m, FY11/12 prices)	**14**	**18**

- Annual average civils M&R costs were estimated for the period comprising CP5 to CP11
- For each cost category a percentage of variable costs was estimated based on internal Network Rail expert judgment, as applied in its VUC analysis
  - the methodology applied by Network Rail to estimate these costs has been subject to criticism by operators
- Civils variable costs were then attributed to freight based on equivalent gross tonne miles
- The resulting cost estimate was then forecast for future years based on IIP gross tonne km growth estimates
  - the c.£12m variable usage cost impact implies a range of c.£10-14m using a +/- 15% interval
  - by applying a c.32% uplift due to traffic forecast growth we estimate the range of c.£14-18m

Source: Network Rail VUC estimates; L.E.K. research and analysis

3.3 Signalling M&R cost reductions were estimated to be in line with those already identified by the Variable Usage Charge methodology

Assumption under "mixed use" scenario A	Assumption under "no freight" scenario B
• Signalling M&R activity remains as projected in existing cost forecasts	• Signalling M&R cost is largely driven by renewal activity and reductions could be realised over the renewal cycle as assets are renewed / enhanced

Commentary

- Signalling assets are inspected and maintained to the same standard, irrespective of the level of traffic or track criticality
- A significant cost saving may come from the removal of freight avoiding lines as these loops require extra signalling equipment that in many cases cannot be used for passenger traffic
  - freight operators have noted that the removal of signalling equipment could also lead to an additional one-off cost associated with redesigning signalling plans. This may or may not be incremental to other signalling re-planning activity
- Network Rail is reviewing its S&C rationalisation opportunities to deliver ongoing efficiency improvements and the removal of freight may change the business case for rationalisation in some areas
- In particular, ERTMS drives some one-off cost savings where ERTMS fitment on freight locomotives would be avoided. These were considered separately in section 4.2

Variable signalling freight avoidable costs were estimated to range from c.£4m to c.£5m, based on the VUC quantification

3.3 Using Network Rail's VUC estimates and PR08 methodology, c.£4-5m was attributed to freight signalling avoidable variable costs

Variable usage costs calculation – Signalling

(Millions of FY2011/12 pounds)

	Annual average (£m)	% of variable costs	Variable usage cost (£m)	% attributed to freight	Total freight variable costs (£m)
Maintenance	137	6%	8.2	26%	2.1
Minor works points renewals	12	44%	5.4	26%	1.4
Total	**149**	**26%**	**13.6**	**26%**	**3.5**

	Base case	
Signalling variable usage freight avoidable costs at end CP4 traffic (£m, FY 11/12 prices)	3.5	
	Low case	**High case**
Estimated cost range (%)	(15)%	15%
Signalling variable usage freight avoidable costs at end CP4 traffic (£m, FY 11/12 prices)	3	4
Uplift due to traffic growth	32%	32%
Signalling variable usage freight avoidable costs at 35 year average traffic (£m, FY11/12 prices)	**4**	**5**

- Annual average signalling M&R costs were estimated for the period comprising CP5 to CP11
- For each cost category a percentage of variable costs was estimated based on internal Network Rail expert judgment, as applied in its VUC analysis
  - the methodology applied by Network Rail to estimate these costs has been subject to criticism by operators
- Signalling variable costs were then attributed to freight based on equivalent gross tonne miles
- The resulting cost estimate was forecast for future years based on IIP gross tonne km growth estimates
  - the c.£3.5m variable usage cost impact implies a total freight avoidable cost of c.£4-5m after including traffic growth of 32% and an estimated range of +/-15%

Source: Network Rail VUC analysis; L.E.K. research and analysis

3.4 Electrification M&R costs would not be materially impacted by the removal of freight operations from the network. Some EC4T costs would be saved

Assumption under "mixed use" scenario A	Assumption under "no freight" scenario B
• Electrified freight trains represent only a small portion of overall network traffic and the related costs are included in existing forecasts	• Electrification M&R costs are only marginally impacted by removing freight operations and the potential cost reductions would not be material

Commentary

- Electrified freight trains make up less than 5% of total electrified vehicle miles and the removal of freight trains from the network would have negligible impact on electrification asset life
- As M&R costs should not be materially impacted by removal of freight, they have not been quantified as a freight avoidable cost
- The only material cost impact would be the use of electricity by electrified freight services, which is already captured by EC4T tariffs
- In FY11/12 freight traction electricity costs represented c.£4.8m, lower than the c.£6.5m in FY09/10 and c.£5.4m in FY10/11
  - this cost was forecast forward based on electrified train km growth estimates from IIP, with an uplift of c. 82%

Electrification variable freight avoidable costs were based on EC4T and range from c.£9m to c.£13m

4.1 Strategic Freight Network enhancement schemes could be avoided or reduced in scope

Assumption under "mixed use" scenario A	Assumption under "no freight" scenario B
● Strategic Freight Network enhancement costs are included in the overall projected costs, supporting delivery of continued freight growth	● Elements of the SFN enhancement schemes, if not the whole scheme, could be avoided if freight operations were removed

Commentary

- SFN funding is viewed by freight operators as a benefit to freight and would not be available if freight was removed from the network. Nonetheless it represents a funding requirement to Network Rail by its funders / taxpayer and therefore represents a potential cost saving
- Enhancements completed during CP4 are more related to gauge enhancements than those in CP5 (and hence can be more directly related to freight benefits)
- CP5 enhancements sometimes allow for future electrification of lines and are typically directed towards capacity enhancements, both potentially having passenger as well as freight benefits
- Network Rail anticipates that funding for CP5 would be c.£200m with a similar requirement for CP6 to deliver schemes in full
  - if freight funding is allocated to deliver the freight benefits of each scheme, then potential enhancement cost savings could be of similar magnitude
  - enhancements would only be needed to the extent that they support delivery of Scenario A freight volumes
  - the timing of enhancement costs will be affected by, amongst other things, the available funding, freight operator preferences, and how Network Rail intends to develop the capability required to deliver its 2030 freight traffic targets

One-off freight avoidable SFN enhancement costs were estimated to range from c.£400m to c.£450m resulting in annualised costs of c.£28m to £31m

4.1 Strategic Freight Network enhancement schemes could be avoided saving £200m in CP5 and a potentially similar figure during CP6

Route / Programme	Anticipated final cost (£m)	Estimated freight avoidable costs (£m)	Notes	Commodity
Felixstowe to Nuneaton	**30**	**30**		
Leicester remodelling	-	-	Not considered an SFN enhancement, and included in NE list of schemes	
Capacity improvements	30	30	Works include incremental headways on resignalling, and junction doubling	Intermodal
Southampton to West Coast	**50**	**50**		
Soton-WCML capacity	50	50	Capacity for additional intermodal services from Southampton	Intermodal
WCML	**50**	**50**		
2 x locations with loops lengthened / created for 775m trains	50	50	Works are lengthening / provision of new loops on WCML for 775m trains and provision of additional paths	Intermodal
GWML W12 gauge	**30**	**30**		
			Gauge clearance to provide W10/12 as increment to electrification	Intermodal
Other schemes	**40**	**40**		
			To be determined e.g. infill gauge, electrification, capacity for Biomass traffic	All
Total	**200**	**200**		

Source: Network Rail; L.E.K. research and analysis

4.2 Additional enhancement schemes with freight avoidable elements have been identified

Assumption under "mixed use" scenario A	Assumption under "no freight" scenario B
● Future enhancement schemes currently included in cost forecast might include elements that can be directly attributed to freight operations	● Schemes could be re-specified to remove the components associated with freight operations

Commentary

- In addition to the SFN enhancement projects previously identified, Network Rail has identified c.£419-673m of cost from redundant freight elements of other enhancement schemes across different routes
  - an initial list of additional enhancement schemes with freight components, and the avoidable costs of these freight components, was identified and estimated by Network Rail
  - this initial list was subsequently reviewed by freight operators who provided a wide range of comments, including requests for further detail on estimates, objections to uncommitted schemes being included, and details as to why certain schemes had benefits that could not be directly attributed to freight operations
  - the schemes with significant objections from freight operators have been excluded from the low case and the resulting range reflects differences of opinion between Network Rail and freight operators regarding the inclusion of the freight component into the estimates. Further details on each component included in the high and low cases are shown on the following pages
- Given the early stage of development of some of these schemes, operators have raised concerns that the cost estimates provided by Network Rail could be too conservative and include high levels of contingencies and a wide scope
- In some cases, the AFC of the overall scheme was not available but an estimated freight avoidable cost of specific components was provided by Network Rail based on the scheme's development stage

One-off freight avoidable costs associated with additional enhancement programmes identified range from c.£419m to c.£673m, equivalent to £32-51m p.a.

4.2 Additional enhancement programmes with freight avoidable elements have been identified in individual routes (1 of 7)

Route	Estimated freight avoidable cost (£m)		Programmes included
	Low case	High case	
North East	58	276	ECML 2018 Capacity programme, Leicester remodelling, North Lincolnshire Resignalling, MML Capacity Schemes, Grimsby Light Railway, Wrawby/Barnetby Up Sidings, Immingham (Robinsons LC) Loop, Brocklesby, Pushpole/Brocklesby, Horbury Jn/Turners Lane Jn, Derby Remodelling Scheme, Barnetby Reception sidings No 1 & 2
Western	245	245	Crossrail - Acton Diveunder, Reading station West Grade Separation and Chord, GWML Electrification, Re-signalling of freight infrastructure, Oxford Corridor, Greater Bristol programme
London North West	69	69	Water Orton Capacity Enhancements, Northern Hub – Dore, Northern Hub – Grindleford, Stafford area improvements, Bromsgrove, North West Electrification, Transpennine Electrification, Weaver to Wavertree, Preston and Warrington resignalling enhancements, East West Rail, Leamington to Coventry Capacity Enhancement
Scotland	22	58	Electrification of Sub, Highland Main Line, Mossend Capacity – Loops and access, EGIP, Carstairs remodel, Aberdeen to Central Belt capacity, ECML to WCML W12 Gauge enhancement
South East	20	20	Electric Spine
National	5	5	Midland Main Line electrification, Gospel Oak to Barking electrification
Wales	-	-	No freight avoidable schemes identified in Wales
Total	**419**	**673**	

These estimates were based on Network Rail's current best view of the total cost and freight avoidable elements of these schemes and incorporate comments from freight operators. However, these figures will be subject to further refinement as the projects become more developed over the course of the periodic review

Source: Network Rail; L.E.K. research and analysis

4.2 Additional enhancement programmes with freight avoidable elements have been identified in individual routes (2 of 7)

Route / Programme	Anticipated final cost of total scheme (£m)	Estimated freight avoidable cost (£m)		Description	Commodity
		Low case	High case		
North East					
ECML 2018 Capacity programme	605	-	92	Out of the total CP5 fund of £240m identified by the DfT, c.£20m could be avoided. Additionally, the GN/GE Southern access work costing c.£72m could be avoided , included in the high case only	All
Leicester remodelling	150	-	75	Leicester remodelling is still in early stages of development. It is likely to involve 4 tracking between Syston and Wigston, doubling Syston Jn, relocating Syston station, providing a flyover at Wigston Jn and electrification of the layout, included in the high case only	Intermodal, Construction, Petroleum, Metals
North Lincolnshire Resignalling	n/a	40	40	A total of £26m would be saved as a result of the signalling renewal on the freight only lines between Humber Road Jn to Ulceby Jn, and the Down Goods line between Brocklesby to Barnetby/Wrawby Jn. £14m would also be saved from freight capacity improvements	Coal, Metals, Petroleum
MML Capacity Schemes	n/a	-	33	Total cost of £33m avoided for not providing dynamic loops (estimate of 2 x freight loops), included in the high case only	All
Grimsby Light Railway	n/a	-	9	Scheme to undertake resignalling of the railway including renewal and removal of a section of track would no longer be needed, included in the high case only	Coal, Metals, Petroleum
Wrawby/Barnetby Up Sidings	n/a	-	7	Scheme to bring back the Up Sidings into use by providing a new connection and a possible new loop no longer needed, included in the high case only	Coal, Metals, Petroleum
Sub-total		**40**	**256**		

Source: Network Rail; L.E.K. research and analysis

4.2 Additional enhancement programmes with freight avoidable elements have been identified in individual routes (3 of 7)

Route / Programme	Anticipated final cost of total scheme (£m)	Estimated freight avoidable cost (£m)		Description	Commodity
		Low case	High case		
North East					
… continued					
Immingham (Robinsons LC) Loop	n/a	7	7	No need to create a new loop which would require new connections and track	Coal, Metals, Petroleum
Brocklesby	n/a	4	4	2 additional crossovers and bi-directional signalling along a 4 mile section would no longer be needed	Coal, Metals, Petroleum
Pushpole/Brocklesby	n/a	4	4	No need for the Loop on the Up Main between Pushpole LC and Brocklesby	Coal, Metals, Petroleum
Horbury Jn/Turners Lane Jn	n/a	3	3	Installation of a simpler track layout at Wakefield Kirkgate station, and the abandonment of the ground frame connection into Horbury Sidings at Horbury Jn	Coal, Intermodal, Construction
Derby Remodelling Scheme	n/a	-	2	Cost saved as a result of removing the need to provide freight loops at Derby, included in the high case only	Coal, Intermodal, Metals
Barnetby reception sidings No 1 & 2	n/a	To be determined		Potential savings would be made if the current scheme of providing bi-directional signalling, which would allow freight trains to stable in sidings, was no longer needed. The scheme is currently awaiting a cost estimate	Coal
Sub-total		**18**	**20**		
Total North East		**58**	**276**		

Source: Network Rail; L.E.K. research and analysis

4.2 Additional enhancement programmes with freight avoidable elements have been identified in individual routes (4 of 7)

Route / Programme	Anticipated final cost of total scheme (£m)	Estimated freight avoidable cost (£m)		Description	Commodity
		Low case	High case		
Western		**245**	**245**		
Crossrail - Acton Diveunder	n/a	120	120	The diveunder is being built to remove any conflicts between Crossrail services on the Relief Lines and freight trains to and from Acton Yard	Aggregates
Reading station West Grade Separation and Chord	n/a	75	75	The purpose of the grade separation at Reading is the improvement of routing freight traffic but it also provides passenger benefits. The estimated cost is for the viaduct and new chord	Intermodal
GWML Electrification	n/a	24	24	Wiring of freight loops and connections to yards/sidings	All
Re-signalling of freight infrastructure	260	13	13	c.5% rationalisation (of SEUs) could be achieved through not re-signalling freight infrastructure. Total cost of re-signalling project is £260m, during CP5 with committed funds	All
Oxford Corridor	n/a	10	10	Bi-directional signalling through the Oxford Corridor would not be required. Also, the W12 gauge clearance diversionary route via Kew (Southern) would not be required to support the Oxford Corridor works	All
Greater Bristol programme	n/a	3	3	Recover Through Lines at Bristol Temple Meads Bristol East Remodelling made easier	All

Source: Network Rail; L.E.K. research and analysis

4.2 Additional enhancement programmes with freight avoidable elements have been identified in individual routes (5 of 7)

Route / Programme	Anticipated final cost of total scheme (£m)	Estimated freight avoidable cost (£m)		Description	Commodity
		Low case	High case		
London North West		**69**	**69**		
Water Orton Capacity Enhancements	34	31	31	Freight enhancement estimated costs associated with northern access to Kingsbury terminal and signalling enhancements which would not be required	All
Northern Hub - Dore	38	18	18	Passing loop freight enhancement	All
Northern Hub - Grindleford	10	10	10	Freight loop ceases to be required	All
Stafford area improvements	222	8	8	For performance reasons provision is being made for a freight recess facility at Stafford station by joining one of the Salop sidings to the Royal Mail line	All
Bromsgrove	51	1	1	Bromsgrove station relocation and Bromsgrove Electrification	All
North West Electrification	398	1	1	Gauge works Chorley tunnel c.£589k, Weaste run out c.£141k, SEU cost at Salwick private siding c.£320k	All
Transpennine Electrification	To be determined	To be determined		Cost of providing W12 (not yet funded) over and above electrical clearance – no figure yet but looks to be substantial	All
Weaver to Wavertree, Preston and Warrington resignalling	To be determined	To be determined		These schemes include rationalisation work which is yet to be costed	All
East West Rail	51	To be determined		W12 gauge clearance, currently at pre-GRIP stage	All
Leamington to Coventry Capacity Enhancement	41	To be determined		Cost has not yet been determined, part of Electric Spine (see separate SE scheme, page 89)	Intermodal

Source: Network Rail; L.E.K. research and analysis

4.2 Additional enhancement programmes with freight avoidable elements have been identified in individual routes (6 of 7)

Route / Programme	Anticipated final cost of total scheme (£m)	Estimated freight avoidable cost (£m)		Description	Commodity
		Low case	High case		
Scotland		**22**	**58**		
Electrification of Sub	20	-	20	Electrification of the Edinburgh Suburban lines, providing a fully electrified route between the East Coast Main Line and the West Coast Main Line. Included in the high case only	Intermodal
Highland Main Line	37	-	10	Full specification not defined but likely to be a longer loop for freight. Removal of freight would not necessarily lead to cost reduction as NDS services would still require enhancements. Included in high case only	Aggregates, Intermodal, Nuclear
Mossend Capacity – Loops and access	10	10	10	Early stages of development, initially looking to extend loops. Enhancement programme funded by SFF*	Aggregates, Intermodal, Other
EGIP	650	8	8	Electrification and enhancements between Grangemouth Junction and Grangemouth. EGIP** scope has still to be agreed. Included in high case only	Aggregates, Intermodal, Nuclear, Petroleum
Carstairs remodel	6	-	6	Enhancement programme funded by SFF, included in the high case only	Coal
Aberdeen to Central Belt capacity	5	3	3	Enhancement programme funded by SFF	Aggregates, Intermodal, Other
ECML to WCML W12 Gauge enhancement	6	1	1	Enhancement programme funded by SFF, only considering CP5 estimated cost	Intermodal

Note: * Scottish Futures Fund; ** Edinburgh Glasgow Improvement Programme

Source: Network Rail; L.E.K. research and analysis

4.2 Additional enhancement programmes with freight avoidable elements have been identified in individual routes (7 of 7)

Route / Programme	Anticipated final cost of total scheme (£m)	Estimated freight avoidable cost (£m)		Description	Commodity
		Low case	High case		
South East		**20**	**20**		
Electric Spine	n/a	20	20	Around £5m of avoidable freight costs on Wessex for wiring of goods loops and reception roads, c.£15m for additional grid supply	Intermodal
National		**5**	**5**		
Midland Main Line electrification	n/a	3	3	Additional works to lower tracks or reconstruct bridges on the route to enable W12 clearance for freight services	All
Gospel Oak to Barking electrification	n/a	2	2	Wiring of the freight-only Thameshaven branch	Intermodal
Wales					
				No freight avoidable schemes identified in Wales	

Source: Network Rail; L.E.K. research and analysis

4.3 ERTMS locomotive fitments could be avoided for those locomotives not required by NDS

Assumption under "mixed use" scenario A	Assumption under "no freight" scenario B
● Future enhancement schemes currently included in cost forecast might include elements that can be directly attributed to freight operations	● Schemes could be re-specified to remove the components associated with freight operations

Commentary

- The European Traffic Management System (ERTMS) is being implemented in Great Britain and impacts freight operations as locomotives would have to be fitted with new on-board signalling equipment early in the process
  - the costs associated with locomotive fitments in excess of the number of locomotives needed by Network Rail's NDS operations would be avoided
  - one particular concern raised by operators was that ERTMS is being installed to drive signalling renewal cost savings and therefore accounting for renewals and ERTMS could risk double counting. Estimates assumed CP4 efficiency levels, and future gains in efficiency would potentially require additional adjustments which have not been considered or developed. Additionally, signalling costs included in the variable usage costs are relatively small, minimising the potential impact
- The principle of including this cost has also been a point raised by operators. They suggest that they should be held harmless of any ERTMS costs such as these that result from government policy decisions. In particular, they raise concerns that inclusion of ERTMS costs within Gross Freight Avoidable Costs implies charging freight operators for ERTMS introduction, against government policy

ERTMS locomotive fitment one-off costs were estimated to be c.£52-58m, equivalent to c.£4m p.a.

4.3 ERTMS savings of £52-58m were derived from an estimated 290 to 325 fewer freight locomotives

ERTMS fitment costs

(FY 11/12 pounds)

ERTMS fitments	CP5	CP6	Total
# of commercial freight locos that would be fitted	357	213	570
# of engineering locos needed - High case	(153)	(92)	(245)
# of engineering locos needed - Low case	(175)	(105)	(280)
Remaining locos to be fitted - High case	204	121	325
Remaining locos to be fitted - Low case	182	108	290
Average fitment price per loco (£k/loco)			179
Total fitment costs - High case (£m)	**36**	**22**	**58**
Total fitment costs - Low case (£m)	**33**	**19**	**52**

- Freight locomotives will have to be fitted with ERTMS equipment early in the enhancement process as they run over the entire network
  - c.570 freight locomotives would need to be fitted in Scenario A
  - Network Rail estimates the average fitment costs at c.£180k per locomotive
- A range of 245 to 280 locomotives was estimated to still be required by Network Rail's NDS operations and the fitment costs associated would therefore not be avoidable
  - see pages 110 to 115 for further details on the estimated number of locomotives required by NDS
- The remaining 290-325 freight locos would have their ERTMS fitment costs avoided in Scenario B

	Low case	High case
Locomotive fitment (£m)	52	58
Annualised cost as % of total	7.2%	7.2%
Annualised locomotive fitment costs (£m)	4	4

Annualised costs as % of one-off costs are lower than the RAB adjustment and amortisation allowance due to timing of loco fitments

Source: Network Rail; NDS; L.E.K. research and analysis

5.1 The potential for track re-categorisation and changes in route criticality classifications could, in principle, lead to additional cost saving opportunities

Assumption under "mixed use" scenario A	Assumption under "no freight" scenario B
● Forecast track M&R costs are partially driven by track criticality and categorisation policies which in turn are consistent with underlying traffic forecasts	● The removal of freight traffic could lead to changes in inspection, maintenance, and renewal policies as a result of changes in track category and criticality classifications for some routes

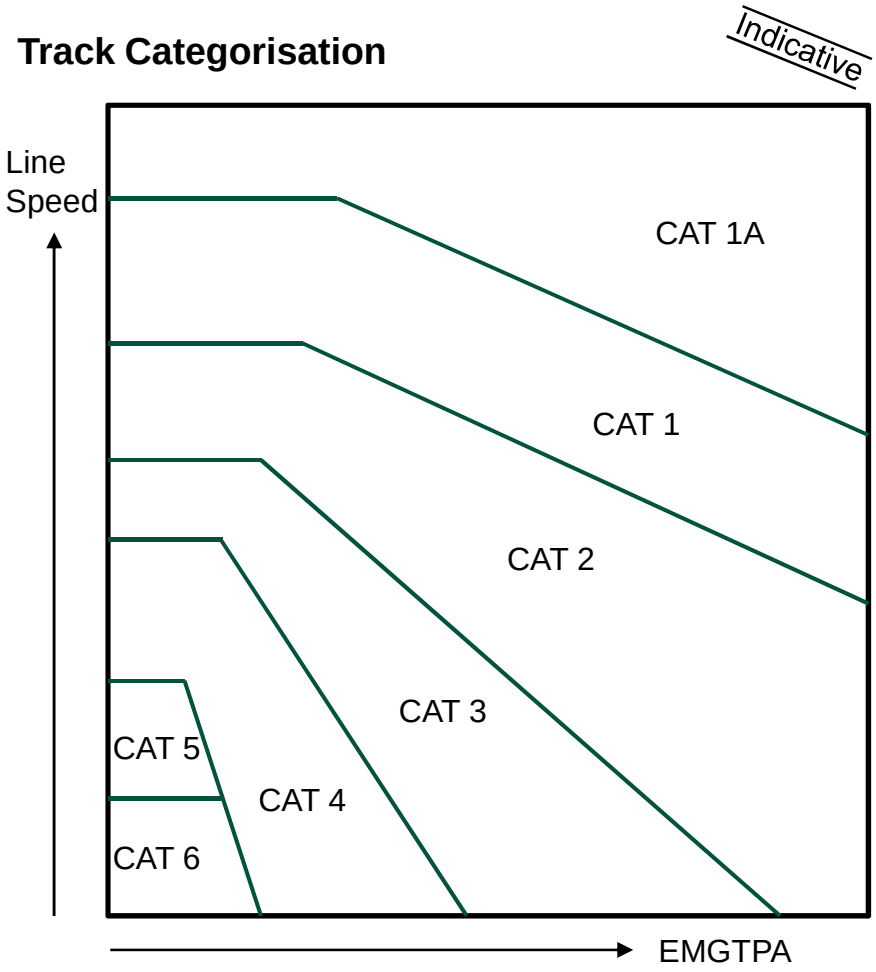
Commentary

- Removal of commercial freight could allow for policy changes that would enable Network Rail to achieve savings, e.g. as a result of changes to the inspection and M&R policies applied to affected parts of its network
  - freight operators have argued that engineering trains would still have high capacity requirements, acting as a constraint on changes in categorisation ratings
  - in some cases, changes would require regulatory approval

No estimates for this cost category have been provided to date and no costs have been included

5.1 Inspection costs are driven by a categorisation that depends on line speed and traffic tonnage

Track Categorisation



- Under Network Rail's CP5 policies, the categorisation of a track section is determined by a combination of its maximum line speed and total tonnage
- This categorisation will dictate the frequency of inspection, with basic visual inspections occurring often and with detailed inspections, by Section Managers, occurring at larger intervals
  - inspections can occur up to 4 times more frequently in CAT 1A than in CAT 6
  - there are step changes between groups of categories' inspection profiles as, for example, CAT 1A and CAT 1 are largely identical
  - given their more frequent inspections, most intensively used sections of track can be maintained more effectively as faults are typically detected sooner
- The impact of track categorisation changes, enabled by the removal of commercial freight in Scenario B, has been captured in the VTISM and SRS maintenance model runs discussed under item 3.1 (high case)

Note: Equivalent Million Gross Tonnes Per Annum (EMGTPA) measure of the annual tonnage carried by a section of track, taking into account variations in track damage caused by normal traffic

Source: Network Rail asset management policies; L.E.K. research and analysis

5.1 Track M&R costs are driven by a criticality rating combining track safety, performance and contribution to delay costs

Definition of CP5 criticality bands

Band	Definition: cost per incident	# of SRSs
Band 1	> 2x mean delay	15
Band 2	> 1x mean delay	34
Band 3	> 1/2x mean delay	73
Band 4	> 1/4x mean delay	86
Band 5	< 1/4x mean delay	96

- Under Network Rail's CP5 policy, SRSs will be divided into five criticality bands, an expansion from the two bands which exist in CP4
  - bands are determined by the potential delay cost per failure, with SRSs far above the mean located in the highest band
  - delay cost per failure is determined from the historical Schedule 8 charges paid
  - new CP5 criticality classifications correlate, although imperfectly, with track categorisation described previously, as the cost of train delays is likely to be higher on the more heavily used SRSs
- This analysis is done on an SRS level as these are designed to have broadly homogenous traffic levels and infrastructure types
- The purpose of assessing route criticality is to determine the most efficient use of M&R expenditure
- Freight avoidable cost savings which might be delivered as a result of changing criticality rating for some sections of the network have not been quantified to date by Network Rail, and are not included

Source: Network Rail asset management policies; L.E.K. research and analysis

5.1 Network Rail has indicated that structures costs are driven by Route Availability ratings dependant on maximum speed and traffic tonnage

- Network Rail's service contract specifies the ability of the network to carry a specific load at a predetermined maximum speed across a section of track over structures
  - these capabilities are specified in different Route Availability categorisations
  - Network Rail's published capability is typically RA8, with some RA10 exceptions – higher RA classifications imply higher loads / speed capabilities
- Structures such as metal bridges and under-bridges would have different levels and frequencies of inspection depending on their RA classifications
- Network Rail has indicated that it could reduce overall RA ratings, and hence its costs, if freight was removed from the network
  - freight trains typically have a high RA requirement
  - engineering trains could have their speed reduced when crossing structures with lower RA classifications
- Network Rail is currently conducting modelling work to forecast its civils costs. This model could be used to inform the civils cost impacts of changes in RA policy that the removal of freight might enable
  - given Network Rail's timing in the development of its model, estimates were not available within the timeframe of this project and therefore were not included in the quantification
- Realisation of savings would only be possible with regulatory agreement to reduce its RA capabilities for relevant parts of its network

Source: Network Rail; L.E.K. research and analysis

5.1 Understrength bridges

- Network Rail is planning enhancement work during CP5 to increase the strength of bridges which do not meet its current RA requirements
- These structures require strengthening because, although they do not carry significant freight volumes, their RA ratings require them to be capable of carrying this traffic if necessary
- Therefore, in the absence of commercial freight, this work could potentially be avoided
- Network Rail is currently conducting modelling work to forecast its civils costs. This model will be used to develop estimates of the cost of this understrength bridge enhancement activity
  - given Network Rail's timing in the development of its model, estimates were not included in the quantification
- As for other potential policy-driven civils freight avoidable cost savings, they are only avoidable with regulatory permission to change RA classifications

Source: Network Rail; L.E.K. research and analysis

5.2 Cost savings enabled by longer / more frequent engineering access windows due to the removal of commercial freight traffic would not be material

Assumption under "mixed use" scenario A	Assumption under "no freight" scenario B
● The interruption caused by night freight traffic can lead to inefficient use of M&R staff time as well as increased set-up costs, resulting in an increased M&R unit-cost, which is reflected in the cost projections	● With the removal of freight operations, more engineering access would be available and could potentially be used for more efficient use of resources

Commentary

- Wider maintenance windows and increased access to track might not necessarily lead to lower costs in some cases, e.g., where existing windows are already sufficient for planned operations
  - freight operators have argued that current enhancement programmes, once completed, could also reduce the need for engineering access given their capacity improvements, such as on the Southampton line
- Case studies reviewed on Wessex, LNE and MML indicate that potential engineering access white-space created will not lead to the minimum thresholds of 6 - 8 hours that Network Rail believes would be required in order to allow efficiency gains to be realised
  - although these case studies seem to indicate no efficiency gains, similar analysis in other routes could potentially identify some benefits
  - in some cases the removal of freight operations could increase the likelihood of cancelling first and last passenger trains to enable the efficient length of maintenance windows (c. 6.5 hours) to be achieved. Related work is ongoing within Network Rail
- Network Rail would expect that without freight trains, cancelling first / last passenger trains might become more likely. Although possible, this impact is likely to relate only to situations where the business case for this activity is so marginal that it is dependent on payment (or not) of Schedule 4 compensation to freight operators. This appears to constrain any potential further savings to be small

No freight avoidable cost savings have been identified as a result of improved engineering access

5.2 The potential for additional "white space" made available by removing freight needs to be considered in the context of actual need for access and critical resource availability

Additional white space created

- The first step in identifying potential freight avoidable costs due to improved engineering access is to determine the white space that could be made available if freight trains where removed from the network

Actual need for additional engineering access

- Not necessarily all additional white space created would be needed by a given workbank. For example, limitations could include:
  - critical resources might not be available
  - staff T&Cs might constrain the use of white space, e.g. midweek nights
  - additional white space might be redundant for specific workbanks

Resource constraints and minimum windows

- Finally, additional white space effectively used does not translate directly into cost savings
  - set-up costs, dislocation, and planning restrictions reduce the potential cost impacts of increased access
  - Network Rail has indicated that minimum windows of between 6 hours to 8 hours are necessary for it to achieve efficiency gains that lead to cost reductions

Source: Network Rail; L.E.K. research and analysis

5.2 In the Wessex case study, access does not increase to the critical mass required for renewals of c.8 hours and rarely to the c.6 hours needed for maintenance

	Current Access	Improved Access	Comments
Waterloo			
c.75km		• No potential improvement	
Basingstoke			
c.37km	• 4h05m on a limited number of days	• 2h15m towards London and 5h30m away from London; Double line blocks would become available	• Section with significant need for renewals and with large portion of freight operations and difficulty in mid-week access • Improved access in blocks too short to allow for significant efficiency gains
Eastleigh			
c.16km	• 3h05m on a limited number of days	• 5h00m towards London and 4h40m away from London; double line blocks would be available	• As with above section the windows on this section are governed by passenger diagrams, there is little improvement from a theoretical cessation.
Southampton			
c. 8km	• 2h55m on a limited number of days	• 6h40m towards London and 5h44m away from London; double line blocks would be available	• Millbrook to Redbridge might have a short stretch that could use increased access
Redbridge			
c.48km		• No potential improvement	
Bournemouth			

Source: Network Rail; L.E.K. research and analysis

5.2 In the LNE case study, access does not increase to the critical mass required for renewals of c.8 hours and rarely to the c.6 hours needed for maintenance (1 of 2)

	Current Access	Potential Improvements	Comments
Kings Cross			
c.123km	• 5h50m for two lines	• No impact on access as the line is weaved	
Peterbrough			
c.42km	• 6h30m for two lines	• 4h50m on all four lines would be possible; if the possessions were taken by direction it could be between 5h50m and 6h25m	• Unlikely to offer benefit as passenger stock considerations are dominant
Stoke Junction			
c.83km	• 3h30m on one line	• In theory it would be possible to take possession of two tracks in sections between Peterborough and Stoke Junction for between 4h20m and 3h30m	• Some maintenance benefits as blocks on two track sections are not widely available. Improved access too short to allow for significant efficiency gains for renewal work
Loverall Carr Junction			

Source: Network Rail; L.E.K. research and analysis

5.2 In the LNE case study, access does not increase to the critical mass required for renewals of c.8 hours and rarely to the c.6 hours needed for maintenance (2 of 2)

	Current Access	Potential Improvements	Comments
Loverall Carr Junction			
c.13km	• Route open 24 hours during midweek	• Little to no impact as the line is weaved and constantly in operation	• Improved access too short to allow for significant efficiency gains
Shaftholme Junction / Doncaster			
c.35km	• 5:49 minuets on a single line four weeks per year	• A 6h10m possession would be possible	• Improved access too short to allow for significant efficiency gains, but could allow for 2 lines access for maintenance which is currently restrictive
Colton junction			
c.56km	• Between 6h40m and 7h00m depending on location and time of the week	• Passenger would remain and engineering access would be similar without freight	• Improved access too short to allow for significant efficiency gains
Longlands Junction			
c.83km	• Between 6h30m and 5h15m on various days and various sections, up to 8 weeks a year	• 4h40m to 2h20 minutes would be available throughout the year without disrupting passenger traffic	• Only on sections approaching 4 hours and above would offer benefit to maintenance
Newcastle			

Source: Network Rail; L.E.K. research and analysis

Network Rail. Freight Avoidable Costs.

5.2 A further MML case study indicates that significant cost savings in M,R&E could be achieved by improved engineering access planning but there was little evidence of incremental freight avoidable costs

Objectives

- The Industry Access Planning Improvement Program is seeking to identify engineering access improvement opportunities
- A case study on Midland Mainline was conducted to optimise train path and access footprints to reduce disruption and M,R&E costs
  - the optimisation was done by guaranteeing a minimum 6.5 to 7 hour access window, re-planning of workbank and a pre-determined timetable

Benefits identified

- Cost savings ranging from 6% of renewals costs to 21% of Schedule 4 compensation could be achieved
- The new planning process could allow a reduction of c.50% of maintenance possession hours and a c.38% reduction in disruption at weekends
- Lower disruption during weekends could lead to revenue improvements for FOCs

Potential for incremental freight avoidable costs

- The MML case study presents little evidence of additional freight avoidable costs, even though the MML is not particularly impacted by freight operations
  - significant reductions in possession times could be made possible by improved access planning, reducing the actual need for additional access
  - only 4 of 11 possession opportunities identified in the study would potentially require cancellation or diversion
  - impacting freight train was defined as a freight train that had entered the demarcated zone of a specified possession block area (e.g. Bedford to Kettering North Jn), within a possession curfew time. c.2/3 of impacting freight trains occurred during the first 4 hours (21:00 to 01:00) of possession

Source: Network Rail; L.E.K. research and analysis

5.3 Additional costs associated with coal spillage have been identified in previous studies and are already paid for by a specific charge

Assumption under "mixed use" scenario A	Assumption under "no freight" scenario B
• Coal dust spilled on network assets reduces the asset life of both points and track ballast	• Coal dust would no longer contaminate network assets which would then have longer assets lives

Commentary

- Movement of coal on the network causes coal dust spillage due to various reasons including the action of wind over the coal loads and improper loading
- The low case cost of coal spillage was estimated to be c.£4.1m p.a. in an external report published by Halcrow in 2008
  - these costs did not reflect end of CP4 efficiency and have therefore been adjusted by 8% to meet CP3 efficiency and by a further 22% to meet CP4 efficiency
  - costs have also been adjusted by RPI (c.19%) to reflect inflation, and coal IIP traffic forecast growth (c.(8)%)
  - the resulting estimate was c.£3m per annum of freight avoidable costs
- The high case cost was based on Network Rail's current initial estimate of coal spillage cost of c.£6m, updating the 2008 report by Halcrow
- Operators have noted that forecast declining coal traffic, increases in preventative maintenance and cleaning equipment at coal terminals may reduce future freight avoidable costs below the numbers shown in this report

Coal spillage annual freight avoidable costs were estimated to be range from c.£3m to c.£6m

5.4 5.5 5.6 5.7 5.8

Costs associated with performance regimes and other service cancellations and variations could be avoided

Assumption under "mixed use" scenario A	Assumption under "no freight" scenario B
• Compensations under Schedules 4 and 8 are funded by network grants and are included in current cost forecasts	• No freight services would be affected by Network Rail disruption or cause TOC delays • The reduced complexity of network traffic resulting from the removal of freight traffic could possibly lead to lower net payments under Schedule 8

Commentary

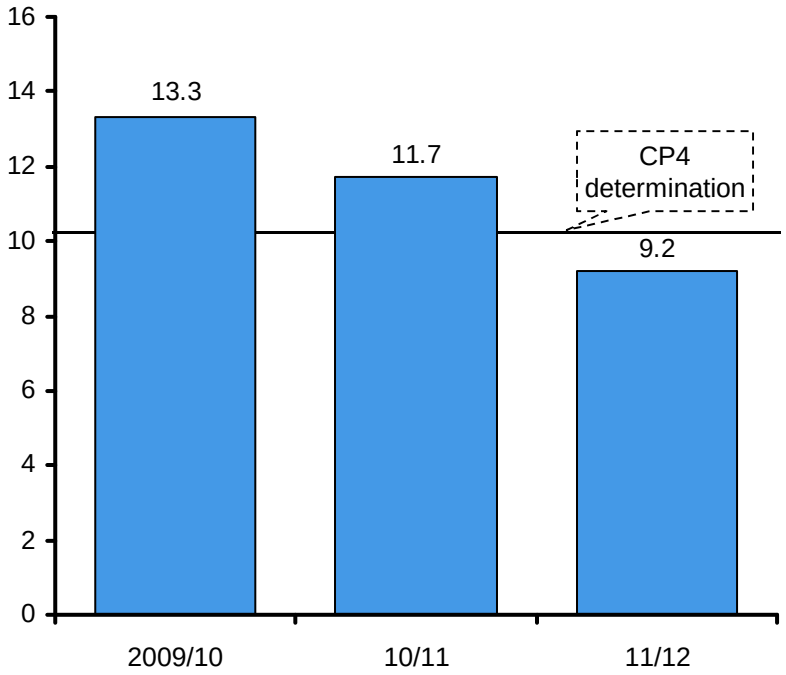
- Pre-planned cancellations due to Network Rail disruptions would give rise to compensations to FOCs under Schedule 4. These compensations could be entirely avoided if freight operations were removed from the network
  - a similar impact would arise for late notice service variation and cancellation compensation payments made by Network Rail to FOCs
- Any freight-caused operational delay would be avoided. However, most payments under Schedule 8 are made during peak-hours, when freight typically is not running
  - lower delays would result in cost savings (or additional income) to Network Rail's funders / taxpayer, representing a freight avoidable cost
  - allocation by freight commodity type needs specific consideration as commodities vary significantly in their usage of the network
- Network Change and Major Project Notice compensations, in addition to congestion costs would also be avoided

Freight avoidable costs from pre-planned cancellations were estimated to be c.£14-20m, whilst those from late notice service variation and cancellation were estimated to bec.£5-9m. Schedule 8 cost savings were estimated at c.£29-33m. Congestion cost savings were estimated to be c.£5-7m whilst those related to Network Change and Major Project Notice compensations were estimated at c.£2m

5.4 Network Rail payments made to freight operators due to Schedule 4 pre-planned service cancellations would be entirely avoided

Pre-planned cancellation historical payments

Millions of FY11/12 pounds



	Low case	High case
Schedule 4 payments at 11/12 traffic (£m)	9.2	13.3
Uplift due to traffic growth	51%	51%
Schedule 4 payments at 35 year average traffic (£m)	**14**	**20**

- The ORR CP4 determinations for Schedule 4 include three tiers of compensation for planned disruptions notified 12 weeks or more in advance
- The freight compensation regime was calibrated such that Network Rail would be expected to pay £10m p.a. (£9m in 07/08 prices)
  - in the absence of freight operations, this amount would be entirely avoidable
  - actual historical payments over the last 3 years have ranged around the expected value
  - as this charge is intended to be cost reflective we have forecast future cost savings using train km growth
  - operators have suggested that the actual payments are kept artificially low to ensure that Network Rail does not pay out more compensation than it has been funded for. However, the ORR indicated its intent to keep Schedule 4 rates cost reflective
- The amount of pre-planned cancellation cost savings resulting from lower Schedule 4 payments were estimated based on historical actual payments, forecast to grow in line with train km
  - in the low case: based on the lowest of historical actual payments (2011/12)
  - in the high case: based on the highest of historical actual payments (2009/10)

Source: Network Rail; ORR CP4 determination; L.E.K. research and analysis

5.5 Compensation under Schedule 8 resulting from FOC caused delays would be avoided, resulting in a cost saving (or additional income) for Network Rail

Schedule 8 benchmarks and payment rates

		FY 09/10	FY 10/11	FY 11/12
	FOC-on-TP benchmark delay minutes (min / 100 train miles)	2.63	2.89	2.89
	Historical FOC train miles (million train miles)	24.6	24.1	25.3
a.	FOC-on-TP delay minutes (thousands of minutes)	646.7	695.4	731.9
b.	Estimated FOC-on-FOC delay minutes (thousands of minutes)	200.5	215.6	226.9
c.	FOC-to-NR payment rate (FY11/12 £/ delay minutes)	35.3	35.3	35.3
d.	NR-to-FOC payment rate (FY11/12 £ / delay minutes)	18.2	18.2	18.2
a x c - b x d	**Total Schedule 8 Freight Avoidable cost estimate (millions of FY11/12 pounds)**	**19**	**21**	**22**

	Low case	High case
Schedule 8 payments at 11/12 traffic (£m)	19	22
Uplift due to traffic growth	51%	51%
Schedule 8 payments at 35 year average traffic (£m)	**29**	**33**

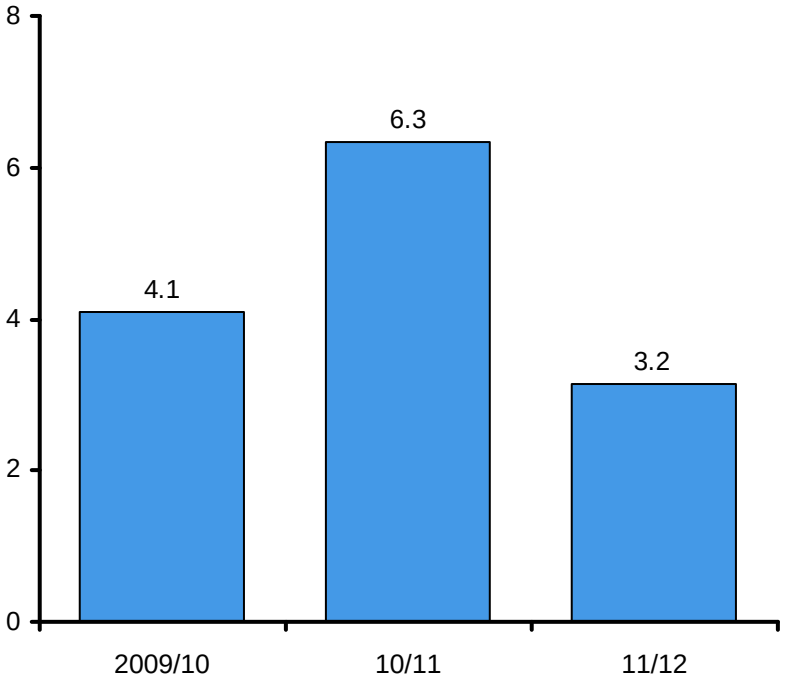
- Total delays across the network would be expected to reduce if commercial freight were removed
  - delays caused by FOCs would be avoided if freight was not running on the network
  - similarly, compensation payments for delay caused to FOCs would not be required
- The value of compensations for the disruptions caused by FOCs on third parties (excluding other FOCs) are ultimately paid for by Network Rail's funders and in the scenario without commercial freight, this value would be avoided
  - third party-on-FOC delays would also cease to occur, but given that the actual payments are subject to a benchmark, it would be expected that the long-run value of these payments would be zero
- The current compensation system is calibrated to be broadly cost reflective and the total value of disruptions caused by freight can be estimated using payment rates and benchmarks
- The value of disruptions caused by FOCs has been estimated by multiplying the FOC-on-third party delay minutes at benchmark by the respective payment rate and deducting an estimated value of FOC-on-FOC delay
  - FOC-on-third party delay minutes was provided by Network Rail
  - FOC-on-FOC delay minutes was estimated to be 31% of FOC-on-third party minutes (based on a small sample of recent disruptions)

Source: Network Rail Third Party Incidents; L.E.K. analysis

5.6 Network Rail's service variation and cancellation payments to FOCs would be avoided if commercial freight was removed from the network

Service variation and cancellation historical payments

Millions of FY11/12 pounds



	Low case	High case
Variation and cancellation payments at 11/12 traffic (£m)	3.2	6.3
Uplift due to traffic growth	51%	51%
Variation and cancellation payments at 35 year average traffic (£m)	**5**	**9**

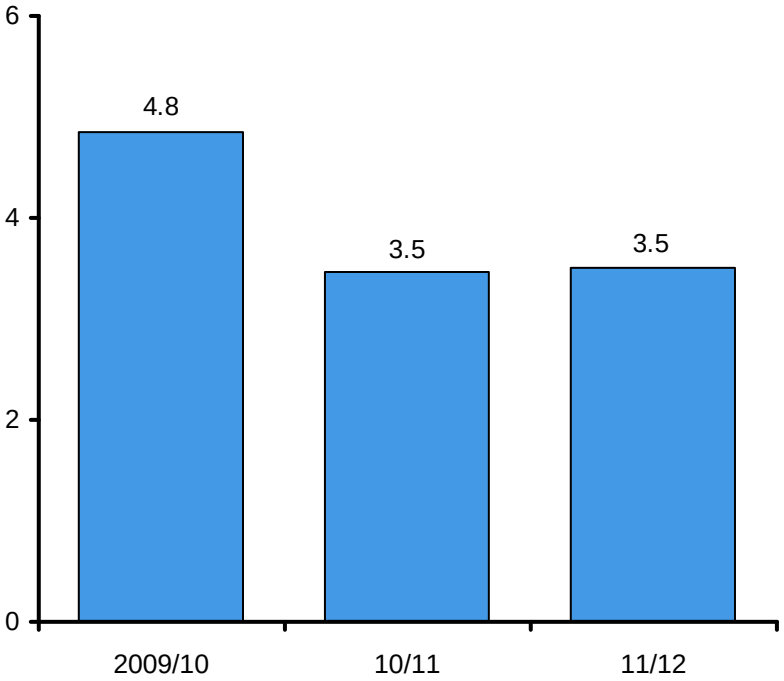
- In addition to pre-planned cancellations freight operators are compensated for cancellations and service variations notified within the 12 week period before the scheduled service
  - this compensation is intended to cover additional costs incurred by the freight operator due to variations such as late departure time or the use of a longer diversionary route
- As with the pre-planned possessions, the costs Network Rail incurs (to compensate freight operators) due to late notice possessions would be entirely avoidable
- As shown in the chart to the left, these payments have varied between c.£3m to c.£6m in FY11/12 prices
- Adjusting for the expected growth in freight train km would imply an estimated freight avoidable cost ranging between £5m and £9m

Source: Network Rail; L.E.K. research and analysis

5.7 Reduced overall traffic on the network would increase Network Rail's ability to respond to disruptions, avoiding some compensation payments to TOCs

Historical Network Rail Capacity Charge Income

Millions of FY11/12 pounds



	Low case	High case
Capacity / congestion costs at 11/12 traffic (£m)	3.5	4.8
Uplift due to traffic growth	51%	51%
Capacity / congestion costs at 35 year average traffic (£m)	**5**	**7**

- In the Scenario without freight traffic, Network Rail could be expected to have greater operational flexibility and therefore be able to reduce the amount of compensation it has to pay to the remaining operators for any disruption Network Rail may cause
- Capacity charges are designed to be broadly cost reflective and therefore have been used as the basis for estimating the freight avoidable costs
- As shown in the chart to the left, these payments have varied between c.£3m to c.£5m in FY11/12 prices
- Adjusting for the expected growth in freight train km would imply an estimated freight avoidable cost ranging between £5m and £7m

Source: Network Rail; L.E.K. research and analysis

5.8 Compensation payments under Network Change and Major Project Notice that are incremental to those already capture in Schedule 4 would be avoided

MPN and NCN compensation*

	Millions of pounds
Total Network Rail MPN and NCN compensation paid to operators since 2009*	3.1
Average per year	1.0

	Low case	High case
MPN and NCN costs at 11/12 traffic (£m)	1	1
Uplift due to traffic growth	51%	51%
MPN and NCN costs at 35 year average traffic (£m)	**2**	**2**

- Network Rail has been able to identify c. £3.1m of payments made to freight operators under Network Change (NCN) and Major Project Notice (MPN) compensation since 2009
  - over the period of 3 years this compensation has therefore averaged c.£1m p.a.
- A further bespoke arrangement in 2009/10 of c.£3.7m has not been included in the estimation of the long-term average as this was a one-off event and payment was outside normal industry structures
- Adjusting for the expected growth in freight train km would imply an estimated freight avoidable cost of c.£2m p.a.

Note: * Incremental to Schedule 4 compensation already captured
Source: Network Rail; L.E.K. research and analysis

6.1 6.2 6.3 6.4 Network Rail would have to develop in-house engineering train capability or sub-contract certain support operations, such as de-icing and leaf clearing trains

Assumption under "mixed use" scenario A	Assumption under "no freight" scenario B
● Network Rail currently subcontracts freight operators on a marginally priced basis to provide support services such as engineering trains, de-icing, leaf removal, weed-spraying trains, and yards and stabling areas	● The nature of certain costs, such as those associated with fixed assets, and drivers' salaries and training, would make in-house or externally provided support services more expensive

Commentary

- Network Rail / NDS would have to bear to full costs of providing and operating its engineering trains and supporting activities, without the benefit of any marginal pricing that it currently receives from freight operators
  - support services have demand peaks during the weekend and in certain periods of the year, such as winter and autumn, which would need to be accommodated
  - some locomotives run only on certain tracks and this could also drive higher costs for an in-house operation
- In some cases, freight operators also provide services to third parties, and these in turn provide services to Network Rail. By removing freight, the cost of these third-party services could also increase
  - freight operators claim that inputs sourced by Network Rail through rail freight facilities could also have their unit costs increased without commercial freight, such as ballast sourced from quarries linked to the network. This impact has not been explicitly quantified

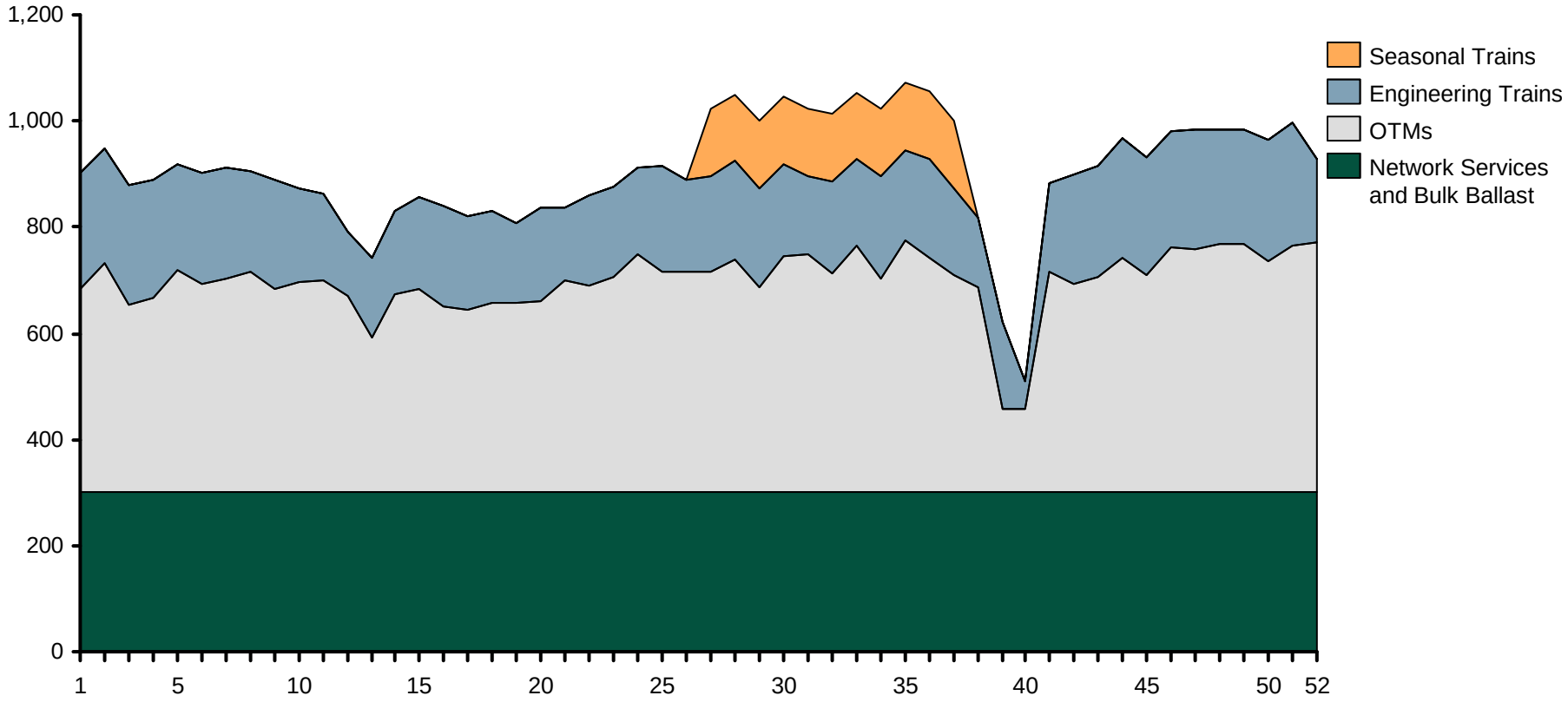
Recurring costs savings were estimated to range from c.£(39)m to c.£(88)m due to higher costs of in-house provision of NDS services

6.1 6.2 6.3 6.4 Network Rail's NDS services demand is seasonal with peak demand in excess of 1k services per week

Indicative demand profile of NDS services by week

(FY2011/12)

Number of services



Source: Network Rail / NDS; L.E.K. research and analysis

6.1 Service seasonality allows NDS to subcontract freight operators on a marginal pricing basis. The values of these contracts would be avoided in Scenario B

NDS costs avoided

(Millions of FY11/12 pounds)

	Total annual costs (£m)
Engineering haulage and wagons	93
Seasonal treatment	31
Infrastructure monitoring	21
Total haulage activities subcontracted to freight operators	**145**
Local distribution centres	2
Total activities subcontracted to freight operators	**147**

- Network Rail's current possession patterns implies a concentration of Network Rail's NDS services during the weekend
  - additionally, NDS services are influenced by the seasonality of specific work such as Autumn leaf clearing, winter de-icing, and spring and summer weed-spraying
- NDS services are currently contracted to freight operators allowing a better overall utilisation of resources throughout the week and the year
- The current provision of services by freight operators allows fixed costs to be shared between commercial freight and NDS services implying a marginal pricing for services provided to NDS
  - current costs subcontracted to operators would be avoided, but additional costs relating to an in-house operation would arise. These additional costs are discussed on the following pages

Source: Network Rail / NDS; L.E.K. research and analysis

6.2 6.3 6.4 Due to lower asset utilisation, NDS operational costs were estimated to increase significantly in the scenario without freight traffic

NDS consequential costs increase – Scenario B: Low case (Millions of FY11/12 pounds)

	Operations	Rolling stock leasing	Total
6.1 Engineering trains, seasonal treatment and infrastructure monitoring	145	88	232
6.2 LDCs	14	-	14
6.3 Corporate overhead	4	-	4
Total annual costs	**162**	**88**	**249**

NDS consequential costs increase – Scenario B: High case (Millions of FY11/12 pounds)

	Operations	Rolling stock leasing	Total
6.1 Engineering trains, seasonal treatment and infrastructure monitoring	122	51	172
6.2 LDCs	12	-	12
6.3 Corporate overhead	2	-	2
Total annual costs	**136**	**51**	**186**

- If commercial freight trains were removed from the network, the marginal pricing benefit to NDS would no longer exist and overall NDS costs would be expected to increase
  - in the event that NDS took its activities in house, it would re-evaluate the approach to each work site and would possibly make different decisions about the allocation of resources (potentially lowering its costs)
- The low case cost estimates were based on analysis of potential changes to NDS rates, provided by operators
- The high case costs were based on bottom-up estimates of NDS costs in Scenario B, provided by operators
- In both cases operations cost includes rolling stock maintenance, drivers, ground staff and fuel costs
- Rolling stock leasing costs were based on NDS's estimate of c.245-280 locomotives required and c.1,630 wagons in addition to the ones it currently owns
  - leasing costs were estimated to be c.£140-240k per loco per year and c.£10-13k per wagon per year implying annual leasing costs of c.£51m in the high case and c.£88m in the low case
  - further details on loco and wagon requirements are provided on the following page

Source: Network Rail / NDS; freight operators; L.E.K. research and analysis

6.2 6.3 6.4 Given the estimated ownership costs, NDS could be expected to lease its rolling stock requirements in the high case but own rolling stock in the low case

Consequential one-off costs in Scenario B

(FY 11/12 prices)

One-off costs	Scenario B	
	Low case	High case
Number of additional locomotives	280	245
Average cost per locomotive (£m)	2.4	2.4
Number of additional wagons	1,630	1,630
Average cost per wagon (£k)	150	115
Total one-off costs (£m)	**916**	**776**
Allowed return	4.75%	4.75%
Amortisation allowance	3.33%	3.33%
Annualised one-off costs (£m) – ownership costs	**74**	**63**

Estimated annualised ownership costs of £74m in the low case was lower than the leasing costs of c.£88m previously described. The converse is true in the high case with ownership cost of c.£63m higher than c.£51m leasing cost

- Based on peak demand for NDS services c.245 to 280 locomotives were estimated to be needed to carry out the required operations
  - 180 to 215 locomotives for engineering trains, network services and bulk ballast
  - 50 locomotives for seasonal treatment
  - 15 locomotives for track recording
- NDS estimates that it could purchase these locomotives cost at an average cost of c.£2.4m per locomotive
  - some operators have suggested that this price could be higher
- NDS already owns some wagons but currently leases c.2,130 wagons from freight operators and expects this number to increase to c.2,330 wagons over time
- If NDS had to procure an alternative to these leased wagons it estimates a requirement of c.1,630 replacement wagons at an total cost of c.£188-244m
  - c.1,400 30t wagons would be replaced by 700 more efficient 60t wagon at a total cost ranging from £100-130k
  - 50 manual hoppers could be replaced by autoballasters costing c.£150-195k each
  - the remaining c.880 wagons would cost c.£125-163k each
  - the price range was based on 30% uplift due to rising steel prices

Source: Network Rail / NDS; freight operators; L.E.K. research and analysis

6.2 6.3 6.4 The consequential increases in one-off and operational costs offset other freight avoidable cost savings by c.£88-39m

Consequential cost increase in Scenario B

(Millions of FY11/12 pounds)

	Low case	High case	Notes
6.1 Avoided cost of services subcontracted to commercial freight operators*	147	147	Current NDS costs, see page 112
6.2 Cost increase in engineering trains, seasonal treatment and infrastructure monitoring – operations cost	(145)	(122)	Engineering operations cost, see page 113
6.2 Cost increase in engineering trains, seasonal treatment and infrastructure monitoring – rolling stock leasing / ownership cost	(74)	(51)	Leasing cost (high case) and ownership cost (low case) see pages 113-4
6.3 Cost increase in LDCs	(14)	(12)	see page 113
6.4 Cost increase in corporate overhead	(4)	(2)	see page 113
Total freight avoidable costs (consequential cost increase)	**(88)**	**(39)**	Total

Note: * Includes rolling stock capital costs

Source: Network Rail / NDS; freight operators; L.E.K. research and analysis

- The current NDS expenditure of £147m in subcontracting services from commercial freight operators would be avoided
- Most cost increase is driven by higher engineering haulage, seasonal treatment and infrastructure monitoring costs
  - operations cost increases are mostly a consequence of higher driver, maintenance and ground staff costs due to lower asset utilisation
  - in the high case, given that the option of purchasing the rolling stock would imply higher annualised costs, leasing costs provided by operators have been used to estimate total cost increases
  - conversely, in the low case ownership costs were estimated to be lower than those leasing costs estimated by operators and therefore NDS could be expected to own its rolling stock requirements
- As LDCs would not have an alternative use during troughs in NDS demand, NDS would have to bear the full cost of its operations
- Corporate overhead cost increases are driven by the lack of alternative commercial freight operations to share the cost burden

7 Staff costs directly associated with freight operations could be avoided whilst the cost of staff partially involved with freight would unlikely be avoided

Assumption under "mixed use" scenario A	Assumption under "no freight" scenario B
• The general and administrative costs included in the forecasts are broadly consistent with current 2013 budget forecasts	• The full cost of teams associated with freight operations could be avoided, including direct compensation, taxes and pension costs

Commentary

- Freight team costs are associated to specific cost centres by Network Rail and can be directly observed
- The Freight property team would still be required as long as Network Rail maintains ownership of its existing assets used by freight operations
- The degree to which the costs from employees partially associated with freight can actually be avoided is unclear, but the potential saving is likely to be low and were not included
- Freight operators have raised concerns regarding the inclusion of staff costs where these have recently been increased to allow Network Rail to meet its minimum obligations

Estimated recurring costs of £4-5m per annum and one-off redundancy costs of c.£(2)m to c.£(3)m

7 Network Rail staff costs were estimated to be reduced by c.£4-5m per year if commercial freight was removed from the network

Network Rail staff avoidable costs

(FY11/12 prices)

	Number of employees		Average gross annual cost per employee (£k)	Total staff costs (£m)	
	Low	High		Low	High
7.1 - Central freight team	26	32	65	2	2
7.2 - Freight planning team	51	73	30	1	2
7.3 - Freight performance team	5	8	49	0	0
Total	82	113	43	4	5

7.4 - Freight property team	The team currently managing properties that are used by freight operations would not be avoided until disposal of these properties
7.5 - Other staff partially involved with freight operations	Other staff partially involved with freight operations would not be avoided as the other activities they currently perform would still be required

- Costs were estimated based on FY12/13 budget and are expressed in 11/12 prices
  - central freight team avoidable costs also include c.£0.2m for general overhead
  - annual staff costs include salaries, wages, allowances, National Insurance, pensions and performance bonuses
- The teams identified as having freight avoidable costs (7.1 to 7.3) are expected to grow in the next few years, which Network Rail indicates are to support permanent additional requirements
  - central freight team is expected to expand to 32 people
  - freight planning team is expected to expand to 73 people
  - freight performance team is expected to expand to 8 people
- Redundancy costs were estimated to be between 6 and 12 months of salaries and other staff costs

Total Network Rail Staff freight avoidable cost was estimated at c£4-5m and redundancy costs were estimated to range between c.£(2)m and c.£(3)m, incurred in the first year

Source: Network Rail; L.E.K. research and analysis

Stakeholder engagement and input has been a key component in deriving the estimated range of Freight Avoidable Costs

Plenary meetings and workshops	Bilateral meetings	Meetings with Network Rail specialists	Operator input and comments

• Kick-off meeting
• Presentation of proposed methodology
• Workshop with ORR and broader industry participants
• Presentation of initial results
• Presentation of Final Report
	• ORR
	• Operators
	  - Freightliner
	  - Direct Rail Services
	  - DB Schenker
	  - GB Railfreight
		• Tracks, civils, signalling, electrification
		• Finance, modelling and planning
		• Freight operations, freight performance
		• Enhancement schemes sponsors
		• Network Rail's NDS
			• All interim and draft material
			• ACTRAFF and Quail based lists of potential redundant assets
			• List of enhancement schemes and freight components
			• NDS cost increase estimates
			• Freight Only Line modelling

At each stage L.E.K. has sought comments and inputs from stakeholders to ensure as open and transparent a process as possible