Network Rail Asset Management Policy
Civil Engineering Policy

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1 Introduction

1.1 This asset management policy for civil engineering assets has been written to demonstrate how these assets will be managed to meet the requirements of Network Rail's corporate objectives and the Network Rail asset management policy. The policy is the subject of continuous improvement taking into account best knowledge gleaned from asset information and condition trends, this information is drawn from our asset data systems.

1.2 This Policy seeks to ensure that civil engineering assets contribute directly to the agreed suite of outputs for CP4, these are: improved safety, performance, capacity, availability together with retained capability and investment that contributes towards the sustainability of the Network. Civils assets contribute towards these objectives as follows;

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- PERFORMANCE - sustained level of performance by the control of temporary speed restrictions, allowing the timetable to be delivered.
- CAPABILITY - maintained capability of the network by ensuring that assets have load carrying capacity which is at least equal to the heaviest load permitted to travel on each route at 2001, or the published route availability, whichever is the greater, or otherwise subject to network change.
- SUSTAINABILITY - extension of the useful life of assets by the use of whole life evaluation and the implementation of cost-effective maintenance strategies. Renewal of assets is undertaken only when it is proven to have whole life cost benefits. Our approach to whole life stewardship evolves through continuous improvement on the basis of new / better asset knowledge.
- AVAILABILITY - avoidance of unplanned performance interruptions through loss of functionality or unacceptable risk levels by using a 'predict and prevent' approach to examinations and work specification which will enable work to be implemented before performance restrictions or interruptions occur.
- SAFETY - reduction in the instances of unplanned performance and safety incidents involving hazards that arise from outside of the railway boundary, this includes road vehicle incursion, bridge strike and flood water.

Activity undertaken on each asset is informed by asset information and must accord with financial governance rules that assure value for money. Additionally any investment in excess of £50k requires national staged approval via investment panels. These standing forums consider business cases for each investment that describe priority scores, justification of the selected option and risk, financial and implementation proposals. Intended investment plans are defined in detail for 3 years and in outline for a further two years within our business plans, this aids efficient procurement and delivery. These investment plans cover approximately 75% of available funds, the balance being retained for a minor works programme and emerging need.

As part of our whole life cost evaluation we consider the likely change in operating environment resulting from climate change and how this may impact upon the performance of the asset.

We plan to deliver the defined capability (and capacity) for each route. Where changes to the existing capability of the network are required, we will need to have clarity on the availability of funding, recognising that our renewals plans are prepared on the basis of maintaining existing capability. Where a RUS or other strategic analysis has not yet been completed for a route our plans will be targeted with maintaining the current capability of the route together with any agreed amendments.

We will pursue opportunities to enhance the value of a route where proposed asset renewal plans provide us with the opportunity to improve the alignment between actual and required capability.

A strategic investment model (CECASE) has been developed to provide a top down assessment of future investment need and to determine sustainable levels of investment, activity and the means to measure this. Our work in this area needs further work before we can say with confidence what a sustainable funding profile looks like. Whilst the current model is unproven it does suggest that current rates of investment will need to grow, albeit the timing and scale of this is yet to be proven. In the absence of such a means to measure sustainable funding levels a series of other performance, risk and condition indices will be used to monitor progress towards sustainability.

2 Overview of Asset Portfolio

2.1 Civil engineering assets comprise:

- underbridges (those where something passes under the railway)
- overbridges (those where something passes over the railway)
- embankments
- rock and soil cuttings
- retaining walls
- tunnels
- footbridges
- culverts
- major structures (a subset of underbridges)
- coastal and estuarine defences

2.2 These assets share some common features:

- they have long lives and generally slow rates of deterioration;
- many of them date back to the date of the original construction of the railway, or to major railway upgrading work carried out in the late nineteenth and early twentieth centuries, with the most recent major investment having taken place during the early 1960's;
- the assets are generally bespoke designs to suit their location and use, and reflecting the common technology in use at the time of their construction;
- they are subjected to different loads than they were originally designed for, this requires specific attention to those attributes in some assets that are more vulnerable to particular dynamic loads and comprise hidden details that may shroud significant defects. Monitoring and review of trends in condition are a necessary part of understanding how volumes of traffic impact on structures.
- many masonry structures are capable, with appropriate maintenance, of being kept in service almost indefinitely. Other material forms such as metalwork are subject to fatigue degradation which limits their serviceable life.

2.3 Underbridges

Underbridges carry rail traffic across a geographic feature or obstruction such as a road, river, valley, estuary, railway etc.

2.4 Overbridges

Overbridges carry another service (roadway, footway, bridleway, public utility etc) over the railway. This asset group includes public highways as well as accommodation and occupation bridges.

2.5 Embankments

Embankments carry rail traffic above the natural topography such as a flood plain and provide approaches to a bridge across an obstruction such as a road, river, valley, estuary, railway etc.

2.6 Rock and soil cuttings

Cuttings, whether through rock or soil, carry rail traffic below the natural topography of the land at an acceptable level and track gradient.

2.7 Retaining walls

Retaining walls provide support to ground adjacent the railway to maximise the available space. Retaining walls can also provide support to the track.

2.8 Tunnels

Tunnels allow the passage of services through or under a land feature such as high topographic relief, or under a river, where the formation of alternative structures such as cuttings or bridges would have been undesirable on economic or technical grounds.

2.9 Footbridges

Footbridges carry pedestrians over the railway. The structures in this group are mainly for public use and do not include footbridges at stations which may have restricted use and are covered separately under the Operational Property Policy.

2.10 Culverts

Culverts enable water to pass through embankments. Culverts are defined as structures spanning between 450mm and 1800mm, while larger spans are defined as bridges.

2.11 Major structures

Major structures are individual underbridges which have been identified as being extremely costly to replace if this ever became necessary. There are separate policy statements for major structures because of their special nature. Examples are the Forth Bridge, Tay Bridge and Britannia Bridge.

2.12 Coastal and estuarine defences

The purpose of a coastal defence is to support and/or protect the railway from the effects of the sea (flooding, scour and erosion, overtopping waves etc). Estuarine defences perform a similar function in river estuaries. There is no separate sub class of asset for embankments that provide river defences.

2.13 Asset populations

The number or volume of assets in each category, and where appropriate sub-categories, is given in the following table:

Asset	Type	Number	Elements	Unit
Underbridges	Brick	11,221	24,758	Spans
	Stone	359	806	
	Concrete	3,021	3,635	
	Steel	6,706	8,554	
	Wrought iron	2,005	2,908	
	Other (Cast	669	1,752	
	(Iron &Timber)			
	Total	**23,981**	**42,413**	
Overbridges	Brick	3,344	4,441	Spans
	Masonry	39	416	
	Stone	587	1,223	
	Concrete	4,083	5,669	
	Steel	1,745	2,127	
	Wrought iron	753	1,046	
	Other	595	1,096	
	Total	**11,146**	**16,016**	
Embankments (subset of earthworks)	Soil	7,861		Km
Cutting (subset of earthworks)	Rock	850		Km
	Soil	5,475		Km
Retaining walls		17,000		Number
Tunnels	Lined length	327		Km
	Unlined length	8		Km
	Open shafts		453	Number
Footbridges	TOC Stations	791	2,880	Number (including station footbridges)
	Others	2,089		
Culverts			23,973	Spans
Coastal and estuarine defences		300	240	Km

3 Policy Statements

Differing asset forms require different management practices, although common principles apply to gathering asset data. The following statements describe the approaches required across each asset type. These statements and the company standards that underpin them are subject to continuous improvement driven by analysing trends within asset information or asset knowledge where this emerges.

Number	Policy Statement
Civil-1	Examination of civil engineering assets shall be carried out at regular intervals, selected to achieve the optimum balance between cost and risk, and the condition of each asset inspected shall be recorded.
Civil-2	Examination results shall be used to develop a bespoke plan for each asset, consistent with the policy selected for the asset, to remedy the defects found, if any, in order to maintain the asset's functionality
Civil-3	Each civil engineering asset shall be identified as being managed under policy 1, or 2
Civil-4	The selection and timing of the maintenance work to be carried out shall take into consideration: • asset condition and strength required • short term and long term historical changes in the asset condition • the overall policy for the asset (policy 1 or 2) • the customer driven requirements of the route section on which the asset is located, including increases in traffic volume and loading. • the life cycle cost of each viable alternative (including cost of possessions and track outages) • statutory requirements, including the rights of users and heritage requirements • the timing of other asset interventions to reduce the impact on route availability
Civil-5	Assets shall be replaced only when the risk to performance applicable to the asset requires it and it is cheaper, in whole life cost terms, than the maintenance needed to continue to meet the requirements of the route
Civil-6	Where replacement of any asset is necessary this shall be selected on the basis of the least whole life cost solution that would meet the route's performance requirements.
Civil-7	Replacement work shall take into account the same considerations as listed under Civil-4
Civil-8	Each bridge shall be allocated a Structures Condition Marking Index from 0 to 100 to reflect the condition found on detailed examination. Bridge assets with critical hidden details shall have such revealed and verified periodically.
Civil-9	The Route Availability of each underbridge shall be maintained to be consistent with the requirements of the route on which the underbridge is located. Remediating any bridge that is below the requirements required will be prioritised in accordance with customer needs.
Civil-10	Overbridges within the remit of Bridgeguard 3 shall be assessed to check their ability to carry 40 tonne vehicles and any necessary strengthening work to meet Network Rail's obligations implemented.
Civil-11	Each embankment shall be allocated a condition on a poor /marginal/serviceable rating.
Civil-12	Each cutting shall be allocated a condition on a poor /marginal/serviceable rating.
Civil-13	Each retaining wall shall be allocated a condition on a good/fair/poor rating.
Civil-14	Each culvert shall be allocated a condition on a good/fair/poor rating.
Civil-15	Each culvert shall be maintained in a condition consistent with Route Availability and such that it's hydraulic capacity is adequate.
Civil-16	Earthworks shall be repaired not replaced, particular emphasis will be

Number	Policy Statement
	placed on managing drainage of earthworks, including assessing the risks of water entering onto the earthwork from adjacent land.
Civil-17	The condition of each tunnel shall be ranked using good/fair/poor ratings
Civil-18	Tunnel maintenance work shall be specified on the assumption that replacement of a tunnel is not affordable and that each tunnel must remain in a fit for purpose condition for an indefinite period.
Civil-19	The condition of each footbridge shall be ranked using good/fair/poor ratings
Civil-20	Each major structure shall be allocated a Condition Marking Index from 0 to 100 to reflect the condition found on detailed examination.
Civil-21	A maintenance manual shall be produced for each major structure.
Civil-22	As far as it is economic to do so major structures shall be maintained so that the need for complete replacement is avoided.
Civil-23	The condition of each coastal and estuarine defence shall be ranked using good/fair/poor ratings
Civil- 24	An ongoing focus will be paid to evaluating and managing performance and safety risks arising from road rail interfaces.

Examination and mitigation regime

Whilst the deterioration profile of civils assets can be determined through modelling of the national asset portfolio; the occurrence of significant deterioration in individual assets is much harder to predict. Hence in common with other operators of like infrastructure we operate an examination regime with associated examination driven maintenance. These exams identify defects and highlight the need for work.

The relative priority of an identified defect is developed from an initial evaluation of likelihood and impact (that is total risk) to achieve a minimum acceptable performance level. All risks above a threshold are dealt with at this point. Due to limits on funding we are not able to treat all identified defects so in order to make best use from the balance of funds that remain we evaluate residual risks further by considering in more detail whole life stewardship implications of the defect and factor in related impacts such as delay to passengers and freight and line availability. These aspects are used to compute a priority score and allow differentiation between structures and locations.

4. Policy Options

4.1 Definitions

We manage the risk of failure by applying to each asset one of three alternative policies, policy 1, 2 or 3:

Policy 1 *Return and maintain the asset to steady state by the use of maintenance activities that will retain performance levels and extend the remaining life of existing assets. This is the closest approach to a whole life cost optimum.*

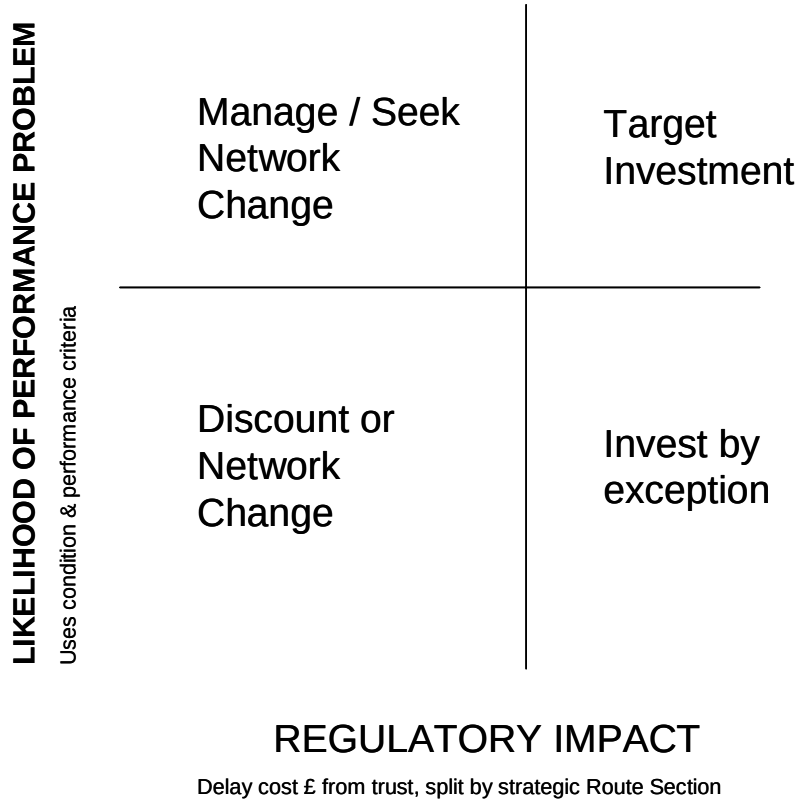
Policy 2 *Allow assets to deteriorate until intervention is essential to maintain safety standards or raise performance levels to an acceptable level. At the time of intervention carry out works that represent best value for money and exceptionally where the demand of the route section in question warrants such consider further*

improved performance where exceptional value will be delivered, this will particularly apply to the heavy volume and heavy tonnage routes.

Policy 3 Applies to closed lines only - *maintain at a level to comply with essential public health and safety obligations*

4.2 Decision Matrices

We apply these policies to achieve a balance between delivering current route capability and train performance, lowest whole life cost and maximise the delivery possible with the level of funding required. To aid decision making we use decision matrices to aid definition of when we will need to take action under Policy 2 and the limited number of circumstances where we can achieve additional value by applying a solution much closer to the whole life optimum. The following is a generic figure that describes the means by which exceptional locations will be identified.



4.3 Critical Assets

Whilst the Policy statements above detail the overall generic policy approach in some cases an exceptional judgement will be required on individual assets that are so critical that they threaten a disproportionately negative effect on the performance of the route. We intend to expand upon the work previously completed in defining a list of Major Structures and develop a nationally held list of most critical structures, this work will conclude by March 2011 and allow more proactive attention to these to reduce the likelihood of a performance impact.