

Light at the End...

Richard Rayson, Asset Management Consultant, Jacobs. Richard.rayson@jacobs.com

Tunnels Context

Network Rail's (NR's) funding requirements are issued to the Office for Rail and Road (ORR) every 5 years.

They are required to provide assurance of best practice Asset Management.

The ORR assesses the values requested and the management processes outlined in the Asset Management Policy in order to determine the actual value to be issued.

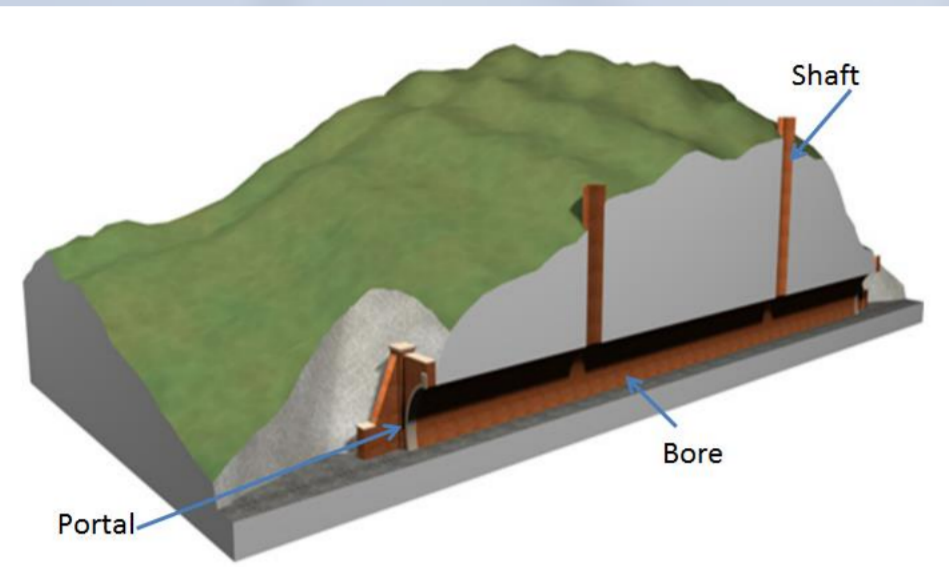


Figure 1: Tunnel elements

There are 627 Network Rail Tunnels UK Wide.

Most tunnels were built individually during the 19th century to differing specifications and using a range of techniques and materials. Some common elements are shown in Figure 1.

Tunnels were previously included in an Asset Management Policy covering 72,256 structural assets. As a result the policy was perceived not to fully represent the unique nature of tunnels and the range of issues encountered in their management.

Due to some of the management challenges a specific Tunnels Asset Management Policy was proposed for Control Period 6 (CP6) (April 2019 – March 2024) to raise the profile of these difficulties.

Issues

Money

To secure funds an evidence based approach to cost-efficient renewal and maintenance strategies must be demonstrated.

Detailing the important contribution of NR's tunnels to the railway network and the unique risks associated is required to ensure effective planning and funding requests.

Age

Due to the age of these assets most are beyond their design life and asset condition is not at a steady state. However tunnel performance is required to continue in perpetuity due to replacement currently being uneconomical.

Time

Demand for capacity across the network is increasing, leaving less time for track possessions to allow work to be completed.

Sustainability

To ensure the lowest whole life cost (WLC), all repair work completed must be sustainable in order to reduce the requirement for repeat repair works.

Hidden Shafts

Shafts used in the construction of tunnels were sometimes infilled and covered on completion and therefore pose a particular management challenge. Hidden shafts present a risk of the ground above collapsing, or the shaft failing resulting in debris penetrating the tunnel bore.

Conclusion

The creation of a new Tunnel specific Asset Management Policy is the first step to achieving the vision of a higher performing, safe and sustainable Tunnel portfolio providing benefit across the network.

The vision statements for future tunnel performance are shown in Figure 5.

Current Management

Modelling of degradation rates is used to predict how tunnel assets will degrade and therefore how much funding will be required to maintain condition in the next CP. Bottom-up workbanks are also created by each Route Business detailing their work plans for the coming control period.

Tunnel Condition Marking Index (TCMI)

- Used by engineers during examination to score condition of Tunnel Assets.
- Defects are scored, weighted and aggregated by type, extent, severity and location to produce a condition score.
- Issues below a Basic Safety Limit (BSL) are identified for repair and prioritised by risk level.

Policy-on-a-Page (PoAP) Document

- Used to compare failure types to determine when to intervene and the most sustainable method of repair.
- Introduced across the network to ensure the consistent management of assets.

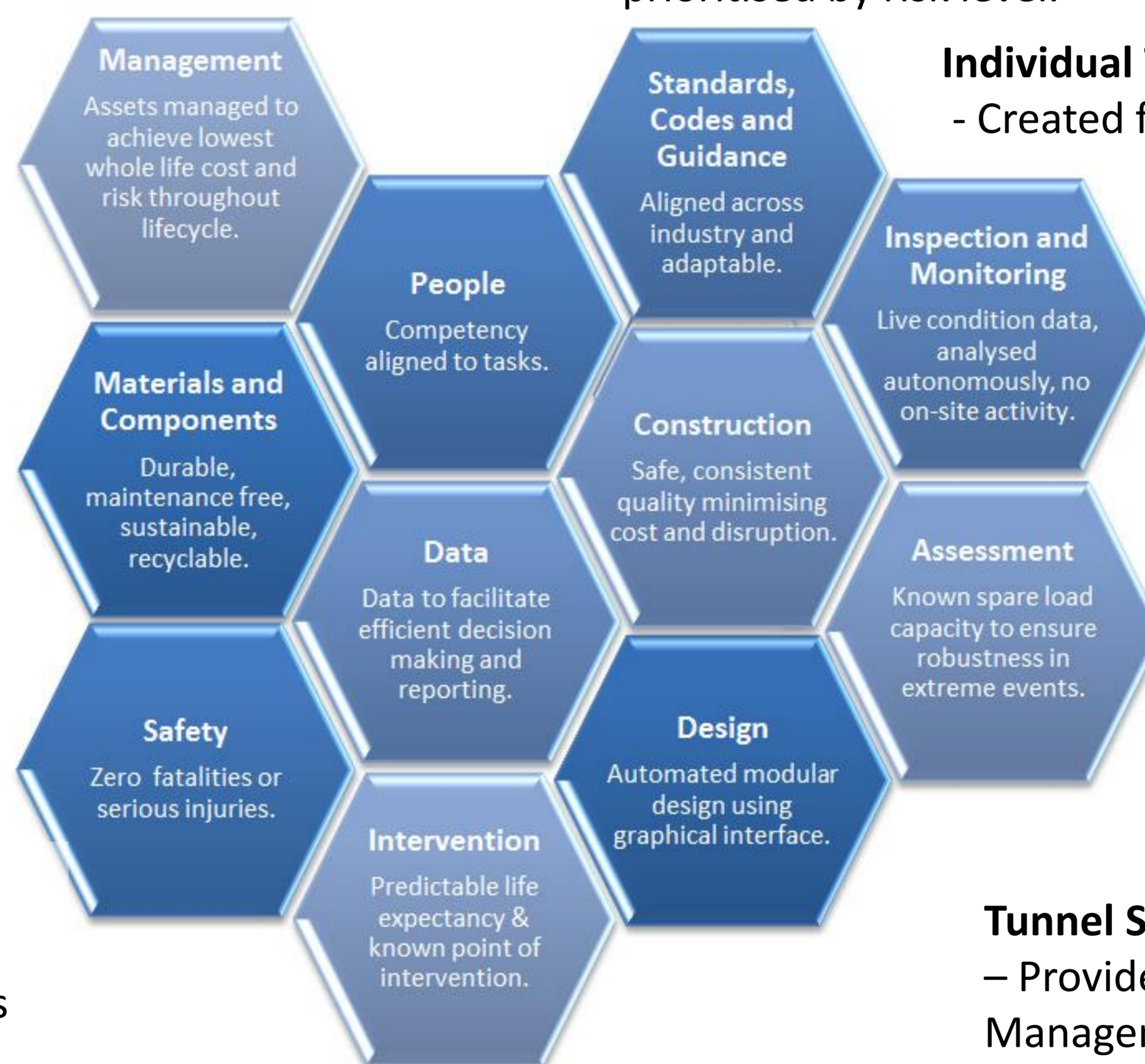


Figure 5: Tunnel vision statements

Individual Tunnel Management Strategies (TMS)

- Created for each individual Tunnel and includes:

- Examination intervals.
- Safe methods of working and access.
- Location and Process for maintenance records.
- Future changes of land use above the tunnel.

Future Direction

Tunnel Specific Asset Management Policy

– Provides greater emphasis on tunnel Asset Management and allows the tunnels team to apply specific management methods to unique assets and provide focus on a number of tunnel specific issues.

Technology is being developed, trialled and targeted to introduce the approved methods during the second half of CP6.

Examination – condition scanning technology to improve reliability of examination. Small changes in condition between examinations will be detected by comparing scanned images of the structure (see Figure 3).

Enhancement – technology will enable widening of tunnel bores whilst still permitting trains to run (see Figure 4). This will allow tunnels to accommodate trains of greater gauge to meet future network demands.

Repairs – effective re-lining of tunnels will improve condition to a standard allowing tunnels to be maintained in a more effective manner.

Decision Support Tools - to determine the optimal time of intervention to ensure lowest WLC.

Preventative Maintenance

The above changes are intended to improve the overall portfolio condition to a steady state. As tunnel condition is improved the focus will move towards preventative and risk based maintenance.



Figure 2: Balcombe Tunnel portal



Figure 3: DIFCAM image



Figure 4: Tunnel bore widening

With thanks to Network Rail and Jacobs

