Queensbury Tunnel

Risk to the Community

JULY 2018

Queensbury
TUNNEL SOCIETY

Contents & Sources

Sources

Email exchanges between Department for Transport & Highways England Historical Railways Estate *(2016-2017)*

Telegraph & Argus newspaper, Bradford
(June 2018)

Queensbury Tunnel Options Report
Jacobs/Highways England Historical Railways Estate (Draft)(February 2016)

Feasibility Study of Future Asset Management
Jacobs/British Railways Board (Residuary)(October 2009)

1 Executive summary

Queensbury Tunnel was driven as part of an ambitious West Yorkshire railway linking Bradford and Keighley to Halifax. At 2,501yds/2,287m, it was the 11th longest railway tunnel in the country when it opened to freight traffic in 1878. It is currently owned by the Department for Transport (DfT) and managed on its behalf by Highways England's Historical Railways Estate (HRE), the structure having lost its operational status in 1956.

As a result of its risk profile and locally poor condition (including two partial collapses), HRE intends to abandon the tunnel at an estimated cost of £3.2 million (excluding design fee). However a campaign group proposes that the tunnel should be repaired and brought back into use as part of a cycle network, an approach which is supported - in principle - by local authorities and other stakeholders. For that to happen, ownership of the structure would have to be transferred to another statutory body. Bradford Council - the only logical recipient - is unwilling to take on the tunnel without a clear understanding of the costs and challenges involved. Work has begun on a study to gain that understanding, but it could be overtaken by HRE's abandonment scheme, expected to get underway in September 2018 if planning permission is granted.

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A computer-generated visualisation of the tunnel with a cycle path and lighting.

It is the view of stakeholders that no physical abandonment works should take place until any possibility of the tunnel being reopened has been ruled out. HRE insists that a start cannot be delayed because of the risk to the community. This report considers the statements made by HRE to justify its abandonment scheme, the evidence upon which it is based and the short-term risk to dwellings located adjacent to the deepest shafts.

In email exchanges with the DfT during 2016-17, HRE conveys some sense of urgency in terms of the need for abandonment through remarks such as "risks increase daily" and "we should pay £3m as soon as possible". An impression of the threat level posed by the tunnel is revealed by "huge liability" and "risk to properties". In June 2018, Highways England - on HRE's behalf - told a local newspaper that "action now needs to be taken...in order to protect the community".

HRE bases the case for abandonment around a possible 'unravelling' whereby one of the partial collapses triggers a chain-reaction of lining failures back to one of the shafts, causing it to destabilise and undermine properties on the surface. However the condition of the closest shafts is described as 'Fair' in HRE inspection reports from 2015 and no significant defects are recorded in the sections of supporting tunnel lining beneath or immediately adjacent to them. The partial collapses are at least 120yds/110m away, although the arch to the north - towards No.4 shaft - is locally subject to compressive stress, resulting in strips of brick faces being lost. Despite this, nothing suggests that either shaft is likely to fail in the short term.

It is more than four years since the most recent collapse and, at present, the condition of the tunnel is generally stable. Although plausible in the longer term, the concept of an 'unravelling' is difficult to sustain on the basis of load paths; it is more likely that discrete collapses will occur in the future as a result of unique local conditions, although it is possible that these could eventually join together.

Although there is an instinctive logic to the idea that the risk level goes up every day, a more accurate description is that it increases in small steps due to the occasional loss of brick faces from areas of spalling. There is little evidence to suggest that the increase is currently continuous or meaningful.

When asked by local Councillors, HRE was unable to provide any written interpretion of the tunnel's condition to support its assertion that "action now needs to be taken...in order to protect the community". It told the Councillors that "Highways England needs to manage the situation based upon the worst scenario". However it appears to have chosen to abandon Queensbury Tunnel without first seeking to formally establish whether there is any realistic likelihood of this 'worst scenario' occurring and, if so, within what timescale.

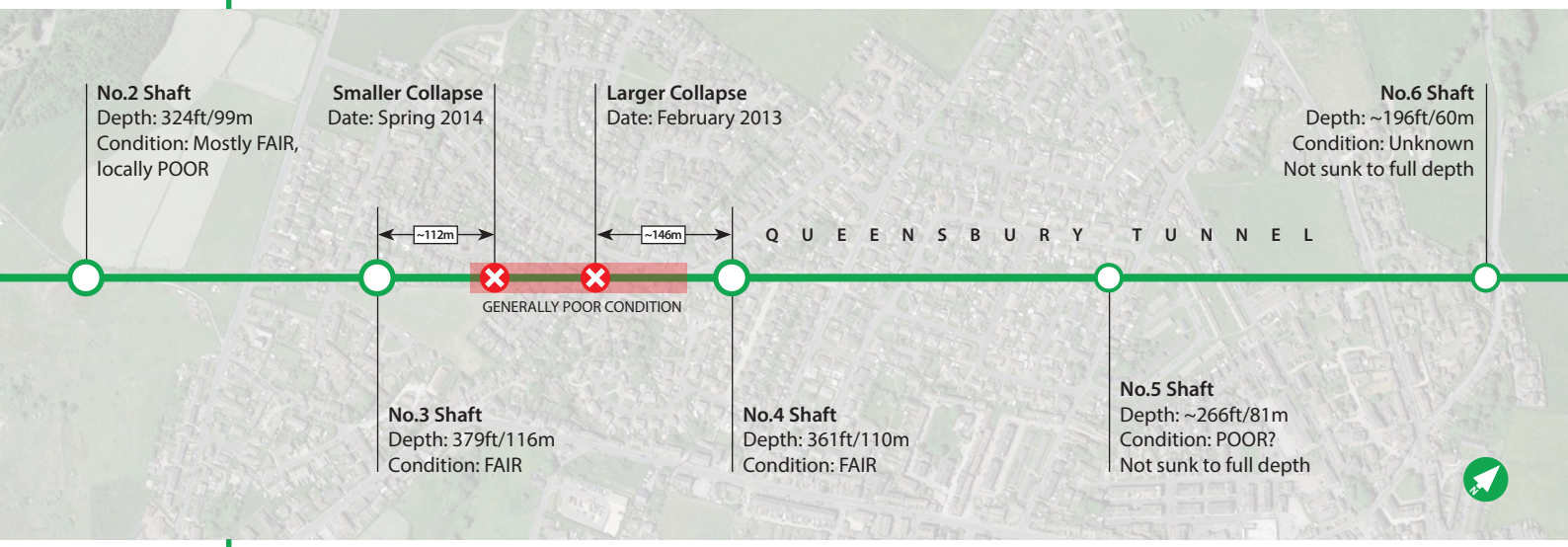
Given the specific circumstances, it is reasonable to expect that a measured assessment of the risks would have been undertaken - based on evidence - so as not to place unnecessary barriers in the way of a potentially transformative outcome for the district. A study by Sustrans in 2016 found that a cycle network with the tunnel as its centrepiece could generate £37.6 million in social and economic benefits over 30 years, with a Benefit:Cost Ratio of around 2.5:1.

Abandonment has questionable legitimacy on the basis of any reasonable approach to risk management, although it is recognised that this might simply reflect the obligations imposed on HRE through its operational protocol with the DfT. Either way, it means that a considerable sum of taxpayers' money could soon be spent putting Queensbury Tunnel permanently beyond use despite the risk to the community never having been quantified. ■

2 Abandonment

Whilst it cannot be disputed that Queensbury Tunnel presents significant challenges, the underlying principles involved in managing it as an asset are no different to any other structure: the associated risks must be identified, their likelihood and potential consequences established, and mitigation measures put in place as appropriate.

As a result of its locally poor condition (including two partial collapses), abandonment has been chosen as the method by which the Historical Railways Estate (HRE) will fulfil its obligation to the Department for Transport (DfT) "to seek to reduce the liabilities for the Secretary of State in terms of individual structure safety", as set out in Clause 5.10 of the HRE Protocol. This will greatly improve the overall risk profile, however it does introduce some new risk brought by the known-unknown of what will happen to the tunnel once the works have been completed and access is no longer possible.



HRE's intention is to infill seven shafts - supporting them where necessary - together with the section of tunnel up to the first shaft at both ends. The remainder will be allowed to collapse and, in the long term, it is possible that the section between Nos. 3 and 4 shafts - south of the midpoint - could do so; there could also be localised collapses at other locations. It is accepted that this approach is unlikely to have any impact on the populated parts of Queensbury due to the depth of the overburden (340-420ft/104-128m), although ground settlement remains a possibility towards the ends of the tunnel as a result of its construction methodology, size and the presence of overhead mine workings. Abandonment involves foregoing any future opportunity to manage this risk.

The tunnel is prone to considerable water ingress and, prior to the installation of pumping equipment, the south portal was often fully below water, with the flood extending inwards almost to the midpoint. HRE's current plan to deal with the water involves the permanent retention/ operation of the pumps. For this to be implemented, a new agreement would have to be reached with the landowner at the south end of the tunnel following the forfeiture of a lease due to the non-payment of £50 annual rent for three years.

The long-term success of these water management arrangements would rely on the various water paths within the tunnel remaining open. In the event of a blockage occurring - perhaps due to debris caused by a collapse - there is the potential for part or all of the tunnel to flood, prompting changes to the local ground water regime.

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Floodwater between Nos. 3 and 4 shafts prior to the installation of pumping equipment.

The alternative approach of repairing the tunnel would also improve the overall risk profile and allow a regime of inspection and maintenance to continue. However this would introduce long-term cost beyond the provision of permanent pumping.

It should be recognised that a repair scheme focussed on risk management need not be as extensive or costly as one designed to facilitate the tunnel's reuse as a public foot/cycle path, as proposed by the Queensbury Tunnel Society. For example, it would be possible to provide additional support both to the ventilation shafts - identified as the source of greatest risk - and adjacent sections of lining.

Either side of the collapses, the tunnel could be the subject of routine masonry/brickwork repairs, as will have to be the case in order to facilitate safe access for engineering staff undertaking the proposed abandonment works below the shafts.

The *Queensbury Tunnel Options Report,* produced by Jacobs for HRE in 2016, did not include any option or costing for a repair scheme intended specifically to reduce risks for asset management purposes. ■

Vocabulary and tone play a key role in the effective communication of risk. The issue is often emotive and undue concern can be caused if care is not taken. It is therefore important for authors - particularly when writing in an official capacity - to use measured and proportionate language to reduce the likelihood of a reader inferring something that is inaccurate, misleading, unintended or overtly alarming.

Over the past couple of years, there have been several email exchanges between HRE and the Department for Transport (DfT) on the subject of Queensbury Tunnel, often discussing matters relating to abandonment or risk control. Highways England, on HRE's behalf, has also made occasional statements to media outlets. Selected extracts are reproduced below:

> *We cannot put off the design of the abandonment work any longer. There is a risk, **which grows daily**, that one of the two known areas of collapse could unravel the tunnel lining back to one of the shafts causing a risk to properties above those shafts. It is impossible to put a timescale on that risk materialising but it is a risk that we know about and so we cannot professionally or legally ignore it.*

> *The tunnel is a huge liability for the SoS as owner and the professional view of my team is that in order to meet the directive of the HRE Protocol we should pay £3m as soon as possible to safely abandon the tunnel (i.e. block both portals permanently and protect the shafts from future collapse).*
>
> HRE email to DfT, 5th October 2016

> *Due to the known condition of the tunnel and the fact that it will not be improving, it remains our highest risk structure given the location of a number of shafts. Some of which are close to domestic and commercial properties at ground level.*
>
> HRE email to DfT, 6th November 2017

> *The more immediate concern is its condition, hence why we are planning major works in the summer of 2018 to safely abandon the tunnel. It remains our opinion that this work is required if the Secretary of State is to continue to carry the statutory liabilities in respect of public safety. Whilst everyone talks about options for the tunnel's future its condition gets worse and the associated **risks increase daily**. It remains our highest risk structure.*
>
> HRE email to DfT, 8th November 2017

> *Whilst we cannot be certain as to the likely timing of any further collapses within the tunnel, the one certainty is that there have been **at least two partial collapses to date and the risk and likelihood of further collapses increase each day**. So doing nothing is no longer an option whilst the tunnel remains in our stewardship.*
>
> HRE email to DfT, 30th November 2017

> *Unless major work is carried out on Queensbury Tunnel **the level of safety risk to the community increases**. Due to the deteriorating poor condition of the tunnel **action now needs to be taken**...*
>
> *We have been clear on our decision, backed by the Department of Transport, to close the tunnel **in order to protect the community** and of our intention to start the safety work in September 2018...*
>
> Highways England statement to the *Telegraph & Argus* newspaper, 25th June 2018

> *Due to the poor and worsening condition of the tunnel it is a priority to permanently close the tunnel on the grounds of public safety...*
>
> Highways England statement to the *Telegraph & Argus* newspaper, 27th June 2018

The email exchanges convey some sense of urgency through remarks such as "risks increase daily" and "we should pay £3m as soon as possible"; an impression of the threat level posed by the tunnel is revealed by "huge liability" and "risk to properties".

Currently, it is not known whether the Department for Transport gave its support for HRE's abandonment strategy based only on email exchanges or whether it was also provided with a formal summary of the tunnel's condition, interpretive analysis and an assessment of risk. However no such evidence was supplied to the Queensbury Tunnel Society following the submission of requests under the *Freedom of Information Act 2000*.

Three days after the publication of Highways England's statement in the *Telegraph & Argus* newspaper, the Queensbury Tunnel Society received its first ever email from a couple living above the tunnel, asking if their property was at risk and seeking reassurances. ■

The typical weight of a shaft lining (assuming 9 feet in diameter, two bricks in thickness) is historically recorded as approximately 3.4 tonnes per yard in depth. Thus, a 350ft/106.7m deep shaft with this specification could be estimated to have a weight of almost 400 tonnes.

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In structural terms, a shaft lining is generally supported by a kerb of masonry, brickwork or cast iron built into the tunnel lining which allows the dead load to be transferred into the ground through the arch, sidewalls and foundations. However some of the load is also dissipated by friction between the extrados of the shaft lining and the surrounding ground. The extent of the friction depends largely on the type of ground through which the shaft was sunk and whether voids are present behind the lining.[1]

It has been asserted by HRE that:

> *There is a risk, which grows daily, that one of the two known areas of collapse could unravel the tunnel lining back to one of the shafts causing a risk to properties above those shafts.*
>
> HRE email to DfT, 5th October 2016

1 During the restoration of Blisworth Canal Tunnel in 1982, it was possible to completely remove and reconstruct the tunnel lining below a shaft whilst the column of brickwork forming the shaft lining was held in place only by friction. However this tunnel was driven through blue clay; Queensbury Tunnel is through millstone grit/hard shales.

This indicates a concern on HRE's part that the loss/destabilisation of the tunnel lining below a shaft could trigger a collapse of that shaft, resulting in the undermining of adjacent surface properties.

However, it is stated in the *Queensbury Tunnel Options Report* that:

> *The shafts have been capped with reinforced concrete slabs that should provide adequate protection to the ground surface and adjacent structures.*
>
> Jacobs' Queensbury Tunnel Options Report (Draft#1), February 2016

For an unravelling to trigger the failure of a shaft, all the following conditions must apply:

- the tunnel lining collapses over a distance of 120yds/110m to No.3 shaft or 160yds/150m to No.4 shaft, including the sections beneath/immediately adjacent to the shaft which were constructed in stone to improve their load-bearing capacity
- the integrity of the relevant shaft lining has been sufficiently compromised by its own poor condition
- there is insufficient friction to hold the shaft lining in place independently
- the reinforced concrete shaft caps do not provide adequate protection to nearby properties.

It should be noted that the condition of Nos. 3 and 4 shafts - those closest to the partial collapses - is described as 'Fair' in HRE inspection reports from February/March 2015.

No significant defects are recorded in the sections of supporting tunnel lining beneath or immediately adjacent to these shafts. There is no evidence of deformation, such as the crown squatting or sidewalls being pushed out; no cracks or compression failures are recorded, as would be the case if the arch was subject to excessive loads.

There is no evidence to suggest that either shaft is likely to fail in the short term.

Overview of the shafts' condition

These observations are based on the HRE inspection reports from 2015. Nos. 1 and 8 shafts have been excluded from this report as they present no meaningful risk to the community due their distance from the populated part of Queensbury and relative inaccessibility.

No.2 shaft

Depth: 324ft/99m **Condition:** Mostly FAIR, locally POOR

Avg mortar loss: 15mm at top, 10mm at bottom **Max mortar loss:** 90mm at top, 70mm at bottom

Key defects: Rotten timber ring beam at depth of 33m, resulting in a 2m deep section of lining (full cross section) dropping <50mm.

Notes: The upper 38.5m of lining is supported independently off a rock ledge. An adit at 78.5m discharges significant volumes of water from Sept-May.

Eye: FAIR (avg mortar loss 30mm, max mortar loss 90mm to 10% of joints)

Tunnel lining beneath: Mostly FAIR, locally POOR (generally wet with open joints, bulge in Up sidewall to south side + fractures to refuge/missing masonry facework)

Location: Adjacent to farm track, 200yds/183m from Roper Lane, 170yds/155m from nearest dwelling.

No.3 shaft

Depth: 379ft/116m **Condition:** FAIR

Avg mortar loss: 3mm at top, 2mm at bottom **Max mortar loss:** 15mm at top, 5mm at bottom

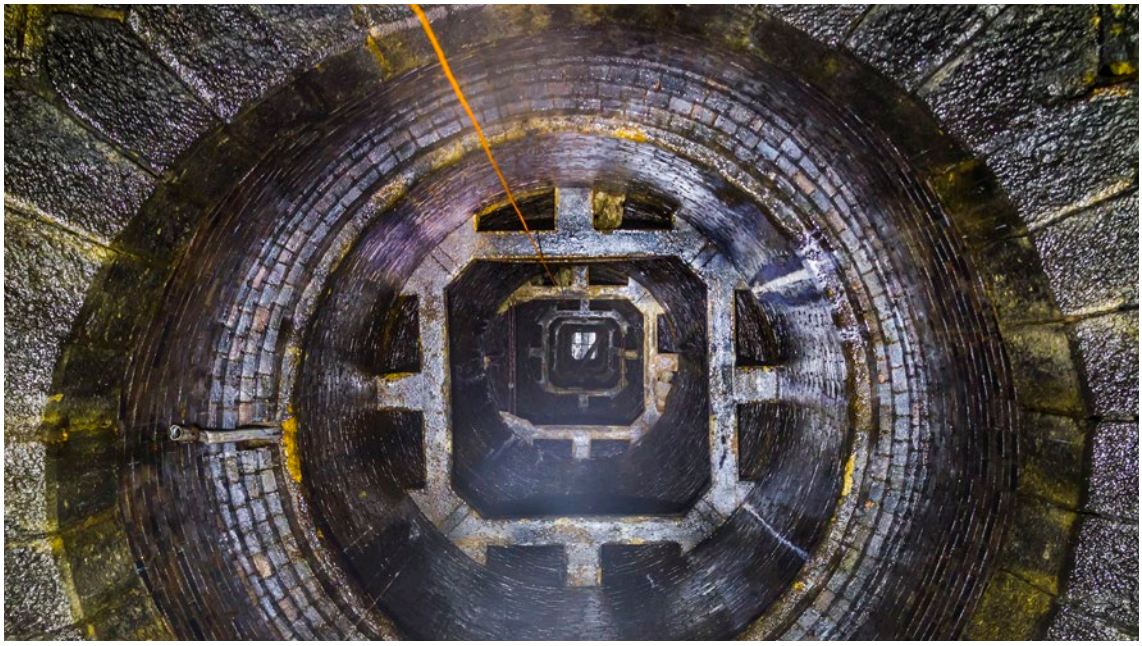
Key defects: Degraded load transfer frames with 15-90% of concrete missing, worse towards top of shaft. Loose blocks supported by reinforcement cages.

Notes: Secondary lining installed in 1935.

Eye: FAIR (avg mortar loss 10mm, max mortar loss 100mm to 5% of joints)

Tunnel lining beneath: FAIR (generally dry with open joints, some spalled stone blocks)

Location: In back garden of bungalow on Highbury Close, capped below ground level.



No.3 shaft was internally lined in 1935 and seven reinforced concrete frames installed which are dowelled into the surrounding ground to transfer load (the contract stipulated a minimum distance of 2 feet to ensure "an adequate bearing on solid rock"). As a result, the short-term risks associated with this shaft are negligible.

No.4 shaft

Depth: 361ft/110m **Condition:** FAIR

Avg mortar loss: 10mm at top, 10mm at bottom **Max mortar loss:** 60mm at top, 20mm at bottom

Key defects: None

Notes: None

Eye: FAIR (wet)

Tunnel lining beneath: FAIR (generally wet with open joints, some spalled stone blocks)

Location: Between two bungalows on Moor Close Road.

No.5 shaft

Depth: ~266ft/81m **Condition:** POOR

Avg mortar loss: 4mm **Max mortar loss:** 40mm

Key defects: Missing/bulging brickwork to underside of cap

Notes: Abandoned during construction - not sunk to full depth. Could be infilled/recapped with no effect on the tunnel. Only inspected to 11m depth due to CO_2 alarm.

Eye: N/A

Tunnel lining beneath: N/A

Location: Behind electricity substation on New Park Road, adjacent to a bungalow.

No.6 shaft

Depth: ~196ft/60m **Condition:** UNKNOWN

Avg mortar loss: Unknown **Max mortar loss:** Unknown

Key defects: Unknown

Notes: Recorded as abandoned during construction. Depth of shaft could not be confirmed during ground investigations - recorded at >98m.

Eye: N/A

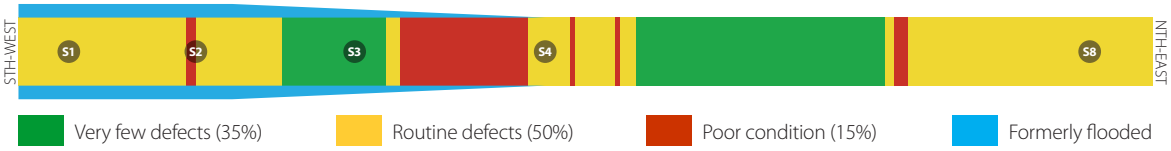
Tunnel lining beneath: FAIR (some light spalling and open joints)

Location: In side garden of cottage on Thornton Road, capped below ground level. ■

Currently, around 15% of Queensbury Tunnel is in 'Poor' condition, with the remainder 'Fair'. The tunnel was closed to rail traffic in 1956, since which time it has been subject to annual inspections but little substantive maintenance. Panels of loose brickwork were removed from the northernmost 437yds/400m of the tunnel in 1990 to provide safe access for British Rail research staff carrying out grouting experiments.

The southern half of the tunnel has been prone to flooding since the infilling of the approach cutting, a process which began in the 1970s. Prior to the installation of permanent pumps in 2016, the depth of water at the portal often reached 35ft/10.7m, with around 470yds/430m of tunnel being flooded to the crown. The furthest extent of the water reached No.4 shaft.

An overview of the tunnel's condition, based on visual inspections:



Expected deterioration in the tunnel's condition over time appears to have been worsened by the drawdown of water during pumping operations and the effect of coal mining which took place above, below and alongside the tunnel from the time of its construction through to 1903 (north end), 1931 (mid section) and 1941 (south end), resulting in distortion of the lining and the need for remedial works.

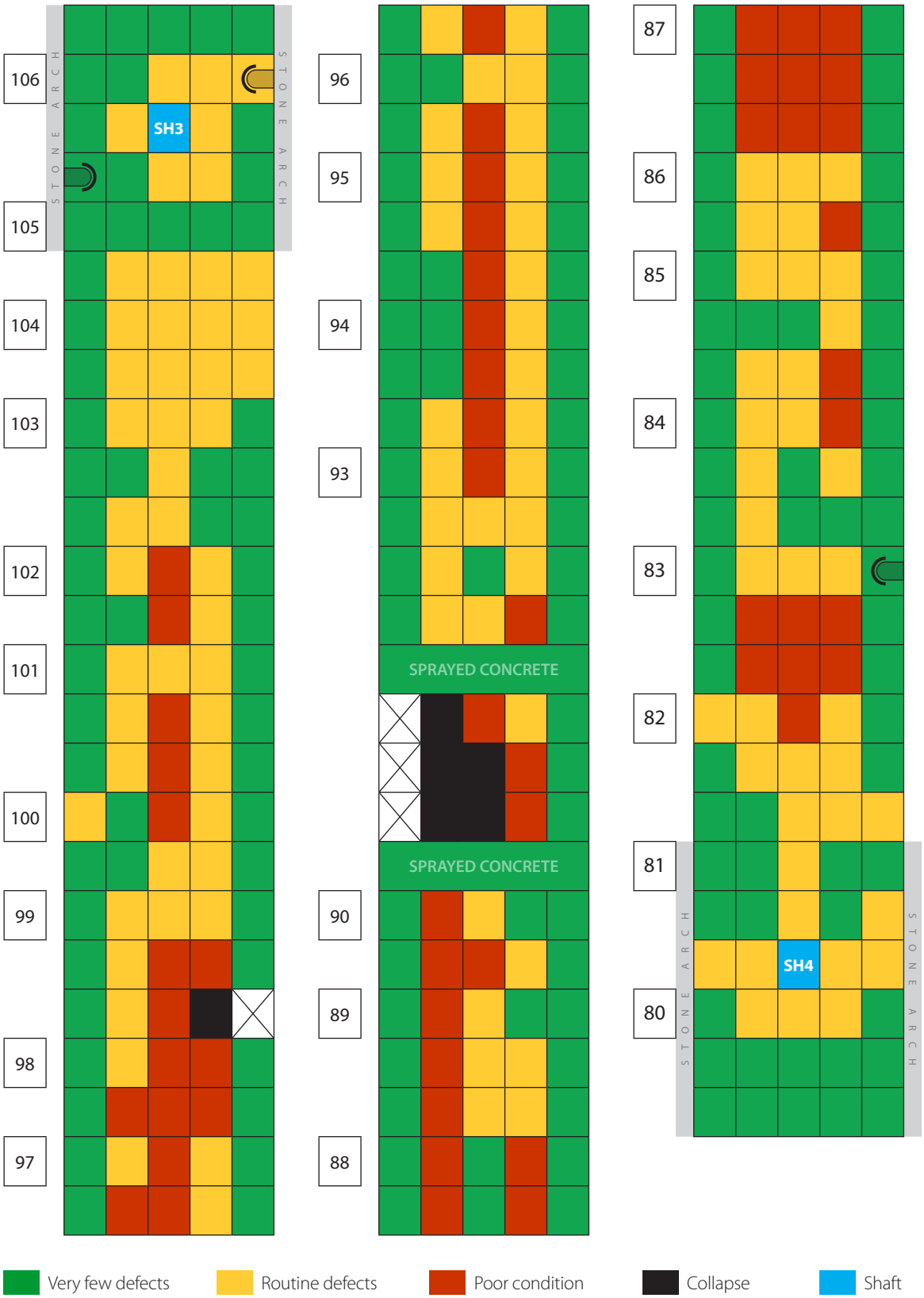
In 1883, around 220yds/201m of sidewall and 18 feet of arch were rebuilt, mostly at a location towards the north end of the tunnel between Tabs[2] 31-35. Here, distortion is again recorded, with the haunches flattening and the crown pushed upwards.

Two partial collapses occurred in February 2013 and the Spring of 2014 at Tabs 90 (Down-side haunch) and 98 (Up-side haunch) respectively, between Nos. 3 and 4 shafts. Patches of the inner ring had already been lost at these locations, with very little mortar visible within the exposed brickwork behind, leading to increased stresses in the lining. Similar conditions are currently exhibited in a much smaller patch at Tab 115 (Down-side haunch).

Between and to the north of these collapses are lining fractures, a patch of missing brickwork (Tab 84, Up-side haunch) and areas of compressive stress resulting in the brick faces being blown in longitudinal strips at the haunches and crown. Some of these strips are developing along the edges of patch repairs from the 1920s using engineering brick. ■

2 The tunnel is 2,501 yards (2,287 metres) long and, for record purposes, is divided into 150 sections each 50 feet (15.24 metres) long. The start and end of each section are known as "tablets" (or "tabs") from the markers used historically. Tab 0 is at the north portal; tab 150 is 1 yard (1 metre) from the south portal.

A representation of the lining's condition between Nos. 3 and 4 shafts, based on visual inspections. Each row represents the Down sidewall/Down haunch/Crown/Up haunch/Up sidewall between pairs of construction joints:



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Distortion of the lining (haunches flattened/arch pushed upwards) between Tabs 31-35, with a bulge in the sidewall.

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Brick faces blown due to compressive stress at the haunches and crown to the south of No.4 shaft.

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The larger of the partial collapses at Tab 90 (Down side), dating from February 2013.

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The smaller partial collapse at Tab 98 (Up side), from Spring 2014.

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Bulged sidewall and distorted/fractured refuge (Up side), immediately south of No.2 shaft.

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A view of the tunnel's typical condition.

6.1 Could the tunnel 'unravel'?

The lining of Queensbury Tunnel was built in short sections (called 'lengths') of about 15ft/4.6m. Although the joints between these lengths could act as weaker anomalies, the brick sections of lining can be regarded as continuous structures. Although most of the load carried by the lining is dissipated into the foundations via the arch and sidewalls, some of it is transferred laterally into adjacent sections.

The two partial collapses have occurred due to long-term ground movement and/or the worsening condition of the lining (for example, due to mortar loss), applying load on the brickwork to a point where its capacity is exceeded. Following a collapse, the ground readjusts as the internal forces are relieved; meanwhile the forces in the lining are redistributed around the failed area.

It is fair to assert that the sections of arch adjacent to the collapse will have a reduced capacity as a result of being unable to transfer load to one side and any damage that may have been sustained during the collapse. However it is also likely - as there is no longer any lateral transfer from the failed area - that these remaining sections may not be under as much load as previously.

So it *cannot* be assumed that there is an increased likelihood of adjacent sections 'unravelling' simply as a result of a collapse. The basic principle remains unchanged: is the load being applied to a particular area more or less than its capacity? Each collapse is a *discrete* event - the function of unique local conditions - although it is clearly possible that these could eventually join together. ■

6.2 Do the risks 'grow daily'?

There is an instinctive logic to the idea that risk levels increase with time, particularly in relation to a 140-year-old structure with significant local defects. But is any such increase meaningful in the context of a possible unravelling or a threat to properties at the top of shafts?

The smaller of the two partial collapses happened more than four years ago and has not changed to any noticeable extent. The larger collapse occurred five and a half years ago; although its debris heap is now bigger - indicating that more material has since fallen from the void, taking some brickwork with it - it should be noted that there are lengths of sprayed concrete lining to both sides of the collapse and neither is showing any sign of distress. The rock above the void appears competent.

A more accurate description of the risk level is that it increases in small steps due to the occasional loss of brick faces from areas of spalling. There is little evidence to suggest that the increase is currently continuous or meaningful. ■

6.3 How great are the short-term risks?

It can be stated that:

- in a structural sense, the partial collapses have not changed since they occurred
- there have been no collapses for at least four years
- there are no records to indicate that the partial collapses have triggered the development of defects in adjacent sections of lining
- the closest shafts either side of the partial collapses are in Fair condition, as are the supporting sections of tunnel lining (no squatting at the crown/compression failures etc)
- no defects are recorded within 50m of No.3 shaft or 20m of No.4 shaft.

The condition of Queensbury Tunnel can therefore be regarded as generally stable, with only a modest increase in risk level since the second partial collapse occurred in Spring 2014, resulting from the occasional loss of brick faces from the spalled areas between the two partial collapses and northwards towards No.4 shaft.

However, in terms of possible impact on the community, the risk is largely defined by the shafts which remain in 'Fair' condition, with no signs of deformation or distress to their support structures. It is therefore reasonable to assert that the short-term risk to the community remains low. The localised nature of the partial collapses - with no subsequent lateral propagation - suggests that the shafts are unlikely to be affected by any future collapses unless they occur within very close proximity.

If there was genuine concern about a rapid deterioration in the tunnel's condition, HRE could have:

- introduced a regime of monthly inspections
- installed monitoring equipment, such as tape extensometers
- applied further lengths of sprayed concrete to strengthen overloaded sections
- undertaken a detailed study of Nos. 3 and 4 shafts and their support mechanisms
- used Finite Element (FE) analysis to help predict possible outcomes.

None of these actions has been taken. ■

7 Conclusions

The Historical Railways Estate has informed stakeholders that it takes a "risk averse" approach to asset management, in line with its obligations to the Department for Transport.

Queensbury Tunnel is a difficult structure with a high risk profile as a result of its locally poor condition and the proximity of housing to four shafts. It is possible that further collapses will occur in the future and these could eventually join together. In this context, abandonment is a legitimate asset management option, although it should be recognised that the current plans do not attempt to mitigate any risk associated specifically with the partial collapses under the populated parts of Queensbury, however small those risks might be.

Abandonment represents a significant investment of taxpayer funds from which the general public derives no benefit. The Queensbury Tunnel Society and other stakeholders have proposed an alternative vision of the tunnel being repaired and brought back into use as part of a cycle path network which, according to a Sustrans study, would deliver £37.6 million of social and economic benefits over 30 years. The cost of delivering a repair scheme for the tunnel is expected to be more than the current £3.2 million estimate for abandonment, but certainly not in the order of 11 times as much, as previously suggested by HRE.

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In order to determine the viability of the cycle network proposal, stakeholders need time to properly assess the associated challenges and how they might be overcome. The key issue is whether the threat now presented by the tunnel makes it impractical to allow them that time.

Over the past two years, HRE has made a case - both implicitly and explicitly - that the level of risk is increasing and safety work needs to be undertaken in the short term. It has told the DfT that the tunnel lining could 'unravel', destabilising a shaft with implications for properties on the surface. A Highways England spokesperson has told a local newspaper that "action now needs to be taken...in order to protect the community".

In response to this latter statement, Councillors representing Queensbury Ward had an exchange of letters with HRE. On 29th June 2018, they wrote:

> "We understand that there are two collapses in the tunnel which are more than 100m from the nearest shafts. Those shafts are in fair condition and the tunnel lining below them is also in fair condition. We do not think it is necessary for us to see the inspection reports. What we would like is your professional interpretation of the evidence."
>
> **Letter sent by Cllr Senior to HRE, 29th June 2018**

HRE was unable to provide *any* documentation to support its assertions in respect of risk. This suggests that no studies have been undertaken in an effort to understand:

- the cause of defects developing between the collapses and the nearest shafts
- the lining's capacity and resistance to overloading
- the rate at which the tunnel's condition is deteriorating
- the likelihood of a collapse triggering other failures
- the mechanism(s) by which a shaft might collapse.

HRE told the Councillors that "Highways England needs to manage the situation based upon the *worst scenario*". However it appears to have chosen to abandon Queensbury Tunnel without first seeking to formally establish whether there is any realistic likelihood of that scenario occurring and, if so, within what timescale.

It is the view of the Queensbury Tunnel Society that HRE was 'spooked' by the collapses and, as a result of its risk averse culture, felt unable to step back and look at the matter proportionately. Whilst that might have been understandable in 2014 - in the immediate aftermath of a second collapse in 16 months - it is more difficult to justify four years later when conditions are generally stable.

The Society's belief that Queensbury Tunnel currently presents little short-term risk to the community is easy to hold when it has no legal or financial responsibility for the structure. That truth is accepted. However, given the specific circumstances, it is reasonable to expect that a measured assessment of the risks would have been undertaken - based on evidence - so as not to place unnecessary barriers in the way of a potentially transformative outcome for the district.

Abandonment has questionable legitimacy on the basis of any reasonable approach to risk management, although it is recognised that this might simply reflect the obligations imposed on HRE through its operational protocol with the DfT. Either way, it means that £3.2 million could soon be spent putting Queensbury Tunnel permanently beyond use despite the risk to the community never having been quantified. ■

Queensbury TUNNEL SOCIETY

Risk to the Community (July 2018)

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queensburytunnel.org.uk

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