Arup/AHR | March 2021

## TRANSPORT AND WORKS ACT 1992

## Transport and Works (Applications and Objections Procedure) (England and Wales) Rules 2006

# THE NETWORK RAIL (HUDDERSFIELD TO WESTTOWN (DEWSBURY) IMPROVEMENTS) ORDER

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# DOCUMENT NR15A: HUDDERSFIELD STATION DESIGN AND ACCESS STATEMENT

| | |
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## GLOSSARY OF TERMS

| Term | Definition |
|---|---|
| ATG | Automatic Ticket Gate |
| BREEAM | Building Research Establishment Environmental Assessment |
| CEEQUAL | Civil Engineering Environmental Quality Assessment & Awards Scheme |
| CIS | Customer Information Screens |
| COP | Code of Practice |
| DAS | Design and Access Statement |
| DfT | Department for Transport |
| GI | Ground Investigation |
| GRIP | Governance for Railway Investment Projects |
| HE | Historic England |
| KMBC | Kirklees Metropolitan Borough Council |
| LNWR | London & North Western Railway |
| LYR | Lancashire & Yorkshire Railway |
| MEWP | Mobile Elevated Work Platform |
| NR | Network Rail |
| NPPF | National Planning Policy Framework |
| OLE | Overhead Line Equipment |
| PRM | Persons of Reduced Mobility |
| S&C | Switches and Crossings |
| SPD | Supplementary Planning Document |
| SuDs | Sustainable Draining System |
| TOC | Train Operating Company |
| TPE | TransPennine Express |
| TRU | TransPennine Route Upgrade |
| TSI | Technical Specifications for Interoperability |
| TWAO | Transport and Works Act Order |
| WAG | Wide Aisle Gate |

# 1.0 INTRODUCTION

## 1.1 TRANSPENNINE ROUTE UPGRADE

Network Rail is applying for a Transport and Works Act Order (TWAO) to authorise changes proposed to Huddersfield station as part of the wider TransPennine Route Upgrade project. The station is Grade 1 Listed and as such will require Listed Building Consent and the work as a whole will require Planning Consent.

## 1.2 AIMS FOR THE HUDDERSFIELD AREA

At Huddersfield Station, the approach for the development of the new platform and roof design was to ensure that the design takes account of the high level requirements of the TRU and stakeholder ambitions for both the short and long term. Whilst this begins with the permanent way design, it also responds to the requirements of the stakeholder consultation with Historic England and Kirklees Metropolitan Borough Council with respect to the heritage significance and exceptional interest of the station.

The approach to the design was to ensure the following core design principles.

- A facility that provides safety, security and comfort to passengers
- A platform arrangement to accommodate forecast numbers
- Platform facilities that provide operational train planning capacity
- Platform arrangement that can be safely and efficiently managed
- Best practice sustainability design principles applied to the design
- Step free access for all in accordance with the Equality Act 2010
- Arrangements to ensure wayfinding routes are easily identifiable
- A design across all levels which complement the existing station, the adjacent context and the character of the area
- Respect for the qualities of the heritage assets and local urban grain

### 1.2.1 Station interventions

The key interventions proposed for Huddersfield station are as follows:

1. Altered platforms and new track layout in order to achieve the high-level objectives of the TRU programme.
2. A new footbridge providing alternative access to all island platforms.
3. A new through platform at the rear of the station and the footbridge. This will be accessed via an extension to the existing subway. The existing bay platforms of the existing island platform will be infilled and reduced in width.
4. Platforms extended over the first span of Huddersfield Viaduct to achieve a minimum of 150m and 200m usable platform length for bay and through platforms respectively (excluding the Penistone Line).
5. Modifications to, and partial removal of, the existing roof structures.
6. A new roof to replace removed structures, and new small-scale canopies over extended platforms.
7. Relocation of the Tea Rooms.

Key constraints at Huddersfield include aspects of the station's heritage significance, along with various limitations imposed by surrounding buildings and structures. Please refer to the Heritage Assessment for further details. There are also a number of constraints from Network Rail requirements that need to be factored into the design. In particular, but not limited to, the Stations Design Principles for Network Rail and Design Standards for Accessible Railway Stations.

## 1.3 THIS DOCUMENT

This design & access statement addresses the following:

1. The design principles and concepts applied to the design of the new elements of the station and conservation works to retained elements.
2. Measures taken to address the physical context in which the new design elements are to take place.
3. The approach to access and how the design takes account of Grade I listed status of the station.
4. Alterations to John William Street bridge as integral to the overall station improvements.

Throughout, the statement has focused on how the design and access principles have taken account of:

1. The exceptional architectural and historic interest of the station
2. The setting of the station
3. Passenger experience, inclusivity and accessibility

The design & access statement specifies the TRU proposals following consultation with Historic England and Kirklees Metropolitan Borough Council.

The design & access statement explains each of the elements of the station which are undergoing a design intervention in individual sections, explaining the design principles and concepts. The statement also explains how access and maintenance have informed the design process. Accessibility and inclusivity measures are explained and, finally, applicable sustainability principles are discussed in the statement.

The John William Street Bridge is the first span of the Huddersfield Viaduct and as such it is part of the Viaduct Grade 2 listing. The viaduct is subject to a separate Listed Building application, but this design & access statement is also applicable to the bridge.

This design & access statement is to be read in conjunction with the wider design & access statement.

# 2.0 PLANNING CONTEXT

## 2.1 NATIONAL PLANNING POLICY

### 2.1.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF), first published in 2012 and revised in 2019, supported by Planning Practice Guidance (updated July 2019), sets out the government's planning policies for England and how they are expected to be applied.
Policies dealing with the conservation and enhancement of the historic environment are set out principally in Section 16, which directs local planning authorities to provide "a positive strategy for the conservation and enjoyment of the historic environment, including heritage assets most at risk through neglect, decay or other threats".

### 2.1.2 Listed Buildings and Conservation Areas Act 1990

Sections 66(1) and 72 of the Planning (Listed Buildings and Conservation Areas) Act 1990 place a statutory duty on the local planning authority to have special regard to the desirability of preserving listed buildings and their settings and to pay special attention to the desirability of preserving the character and appearance of conservation areas.

Listed building consent must be obtained from the local planning authority, or as the case my be, the Secretary of State, for any proposed work to alter or extend a listed building in a way that affects its character or appearance as a building of special architectural or historic interest.

It is a criminal offence to carry out work which needs listed building consent without obtaining it beforehand.

## 2.2 REGIONAL PLANNING POLICY

Huddersfield is identified as an Urban Growth Centre Spatial Priority Area in the Leeds City Region Strategic Economic Plan. Priorities include supporting mixed infrastructure including employment, commercial and residential opportunities.

## 2.3 LOCAL PLANNING POLICY

### 2.3.1 Kirklees Metropolitan Borough Council: Local Plan

The Kirklees Metropolitan Borough Council Local Plan includes the following policies which are relevant to conservation and adaptation works at the station. Due to the Grade 1 listed nature of the station we have paid particular attention to policy which impacts the historic environment such as LP35 below, but other Local Planning Policy also applies.

*Policy LP35 – Historic Environment*

*1. Development proposals affecting a designated heritage asset (or an archaeological site of national importance) should preserve or enhance the significance of the asset. In cases likely to result in substantial harm or loss, development will only be permitted where it can be demonstrated that the proposals would bring substantial public benefits that clearly outweigh the harm, or all of the following are met:*

*a. the nature of the heritage asset prevents all reasonable uses of the site;*
*b. no viable use of the heritage asset itself can be found in the medium term through appropriate marketing that will enable its conservation;*
*c. conservation by grant-funding or some form of charitable or public ownership is demonstrably not possible; and*
*d. the harm or loss is outweighed by the benefit of bringing the site back into use.*

*2. Proposals which would remove, harm or undermine the significance of a non-designated heritage asset, or its contribution to the character of a place will be permitted only where benefits of the development outweigh the harm having regard to the scale of the harm and the significance of the heritage asset. In the case of developments affecting archaeological sites of less than national importance where development affecting such sites is acceptable in principle, mitigation of damage will be ensured through preservation of the remains in situ as a preferred solution. When in situ preservation is not justified, the developer will be required to make adequate provision for excavation and recording before or during development.*

*3. Proposals should retain those elements of the historic environment which contribute to the distinct identity of the Kirklees area and ensure they are appropriately conserved, to the extent warranted by their significance, also having regard to the wider benefits of development. Consideration should be given to the need to:*

*a. ensure that proposals maintain and reinforce local distinctiveness and conserve the significance of designated and non-designated heritage assets;*
*b. ensure that proposals within Conservation Areas conserve those elements which contribute to their significance;*
*c. secure a sustainable future for heritage assets at risk and those associated with the local textile industry, historic farm buildings, places of worship and civic and institutional buildings constructed on the back of the wealth created by the textile industry as expressions of local civic pride and identity;*
*d. identify opportunities, including use of new technologies, to mitigate, and adapt to, the effects of climate change in ways that do not harm the significance of heritage assets and, where conflict is unavoidable, to balance the public benefit of climate change mitigation measures with the harm caused to the heritage assets' significance;*
*e. accommodate innovative design where this does not prejudice the significance of heritage assets;*
*f. preserve the setting of Castle Hill where appropriate and proposals which detrimentally impact on the setting of Castle Hill will not be permitted*

### 2.3.2 Supplementary planning documents

*The Huddersfield Town Centre Blueprint Supplementary Planning Document (SPD)*
The Huddersfield Town Centre Blueprint SPD sets out the vision and ambitions for the future of Huddersfield Town Centre for the period to 2031. The SPD sets a framework to capitalise and build on the unique aspects and character of Huddersfield to promote its regeneration and bring forward new uses which reflect the changing nature of our town centres. The Blueprint encompasses Huddersfield Station.

### 2.3.3 Conservation areas

Huddersfield Station lies within the Huddersfield Town Centre conservation area.

# 3.0 EXISTING STATION

## 3.1 PHYSICAL CONTEXT

### 3.1.1 Surroundings

Huddersfield Station forms the west side of St George's Square in the centre of the town. The principal pedestrian approach is through the square, with the strict symmetry of the station façade recently reinforced by public realm improvements in the square itself (Fig.3.1a). Many of the buildings around the square are also listed. These are mostly commercial, with the exception of the George Hotel, and generally reflect the scale and classical architecture of the station building.

The rear of the station is overlooked by two large Victorian railway warehouses which previously formed part of a large railway goods yard, along with a surviving accumulator tower – all listed at Grade II (Fig.3.1b). The goods lift of the larger warehouse, which features an arcade of large Doric columns, is aligned approximately with the central axis of the Principal Building. Although several railway sidings survive, the majority of the goods yard is now a public car park.

The station is overlooked from the south by the Westgate Bridge, which forms the northern portal to Huddersfield Tunnel (Fig.3.1c). To the north, the railway runs over the John William Street bridge and along the elevated Huddersfield Viaduct (both listed at Grade II) with commanding views over the surrounding landscape (Fig.3.1d).

The site is part of the Huddersfield Town Centre Blueprint initiative and also sits within the Huddersfield Conservation Area.

**Figure 3.1a: Overlooking St George's Square**

**Figure 3.1b: Overlooking the former goods yard**

**Figure 3.1c: Looking south-west**

**Figure 3.1d: Looking north over Huddersfield viaduct**

### 3.1.2 Heritage assets nearby

The station lies within the Huddersfield Town Centre Conservation Area, the boundary of which is indicated on Fig.3.1.2a with a blue dashed line. The list below identifies the listed buildings adjacent to the train station, with the level of designation indicated by the colour key.

| | | |
|---|---|---|
| 1. | Large Brick Warehouse | Grade II |
| 2. | Stone Warehouse | Grade II |
| 3. | New North Parade | Grade II |
| 4. | 2-6 Railway Street & 8–20 St. Georges Square | Grade II* |
| | 28-42 Westgate & 1-3 St George Street | Grade II |
| 5. | 7 St Georges Square | Grade II* |
| 6. | Britannia Buildings | Grade II* |
| 7. | Lion Buildings | Grade II* |
| 8. | The George Hotel | Grade II* |
| 9. | 64 – 78 John William St & 1-3 Northumberland St | Grade II |
| 10. | Princess Cinema | Grade II |
| 11. | 23 Byram Street | Grade II |
| 12. | Empire Cinema | Grade II |
| 13. | 1 – 3 Brook Street | Grade II |
| 14. | 11 – 17 Brook Street | Grade II |
| 15. | Wholesale Market | Grade II* |
| 16. | Crescent Hotel | Grade II |
| 17. | 13 – 18 Byram Street | Grade II |
| 18. | Kirklees District Dept. Of Social Services | Grade II |
| 19. | 22 – 34 John William Street & Byram Arcade | Grade II |
| 20. | Station Street Buildings | Grade II |
| 21. | 15 Station Street | Grade II |
| 22. | 1– 11 Railway Street & 13-21 Railway Street | Grade II |
| 23. | The Sportsman and The Marhaba Takeaway | Grade II |
| 24. | 72 – 78 Fitzwilliam Street | Grade II |
| 25. | Freemasons Hall | Grade II |
| 26. | 82 & 84 Fitzwilliam Street | Grade II |
| 27. | 9 Bath Street | Grade II |
| 28. | 83 & 85 Fitzwilliam Street | Grade II |
| 29. | Church of St. Patrick | Grade II |
| 30. | St Patrick's Presbytery 30-32 New North Road | Grade II |
| 31. | Tower in North west corner of railway yard | Grade II |

Grade I listed
Grade II* listed
Grade II listed


**Figure 3.1.2a: Heritage context plan**

### 3.1.3 Key views

The views to the right indicate the pedestrian approaches to the site from Railway Street (image 1), St. George's Square (image 2), Brunswick Street (image 3) and Trinity Street (images 4 & 5).

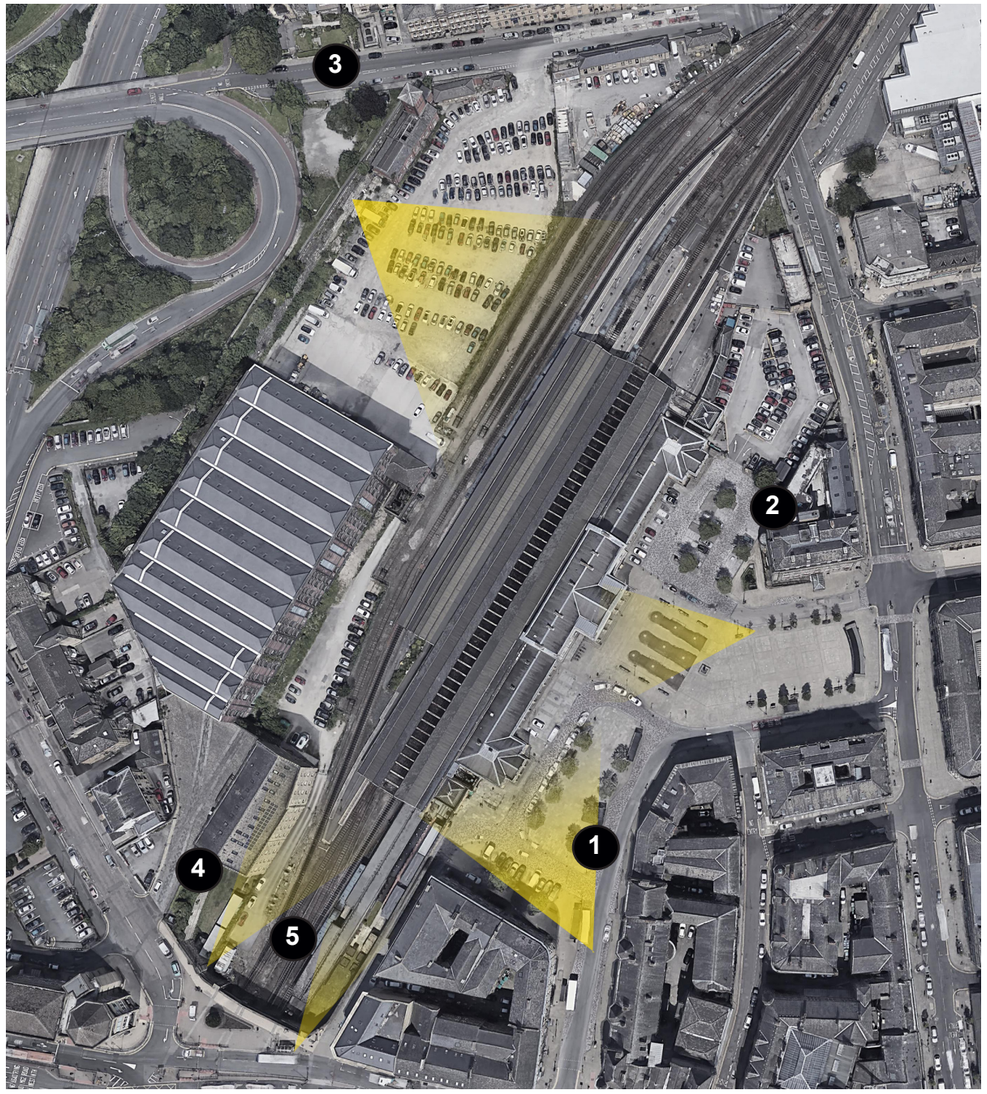








**Figure 3.1.3a: Approaches to station**

## 3.2 STATION

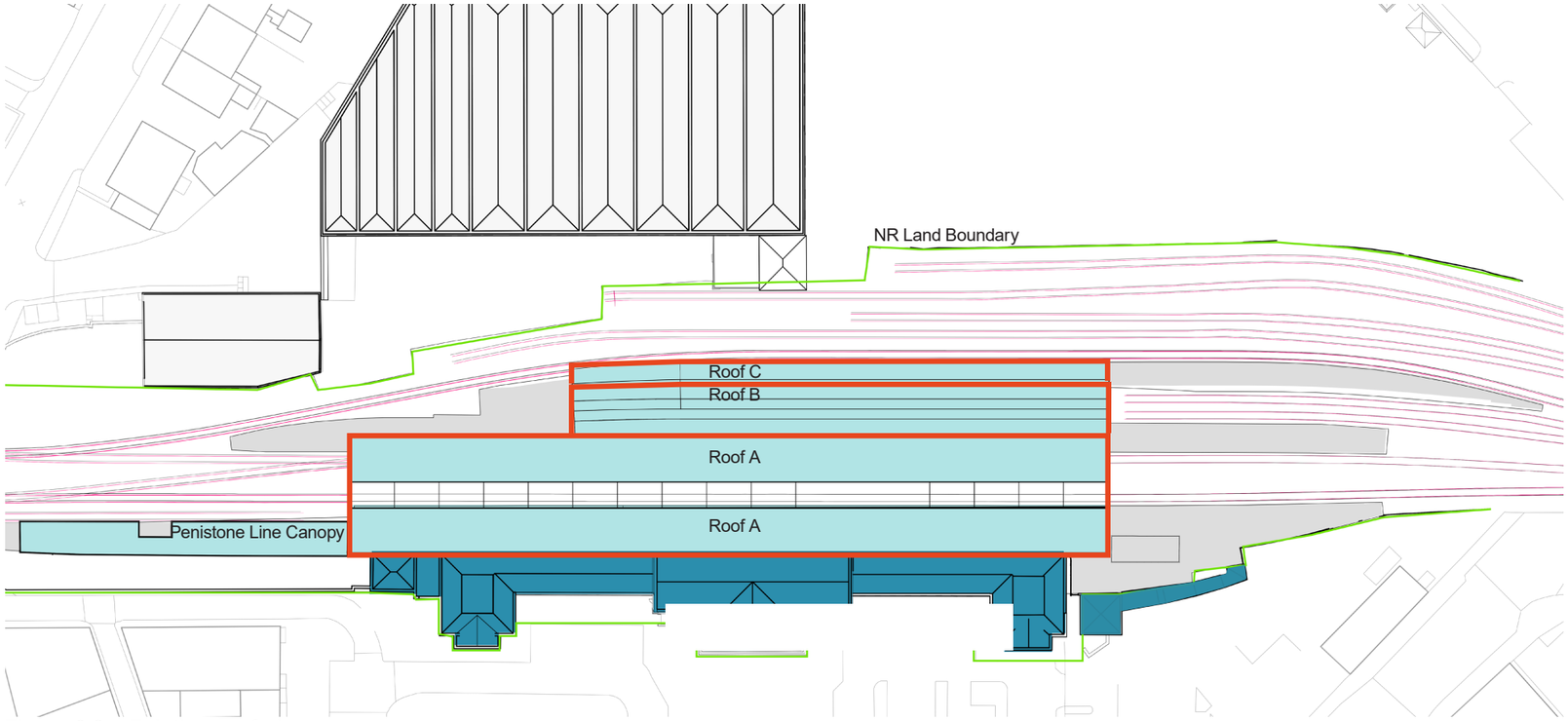



**Figure 3.2a: Existing roof plan**

1. Relay Room
2. Coffee Stand
3. Acc. WC / Baby
4. Customer Assistance
5. Male/Female WC
6. Waiting Room
7. Cafe
8. Cycle Storage
9. WC's
10. Newsagents
11. Principal Existing Building & Main Entrance
12. Ticket Office
13. Existing Lift & Stair
14. Existing Tea Rooms location

Existing
Platform
Circulation

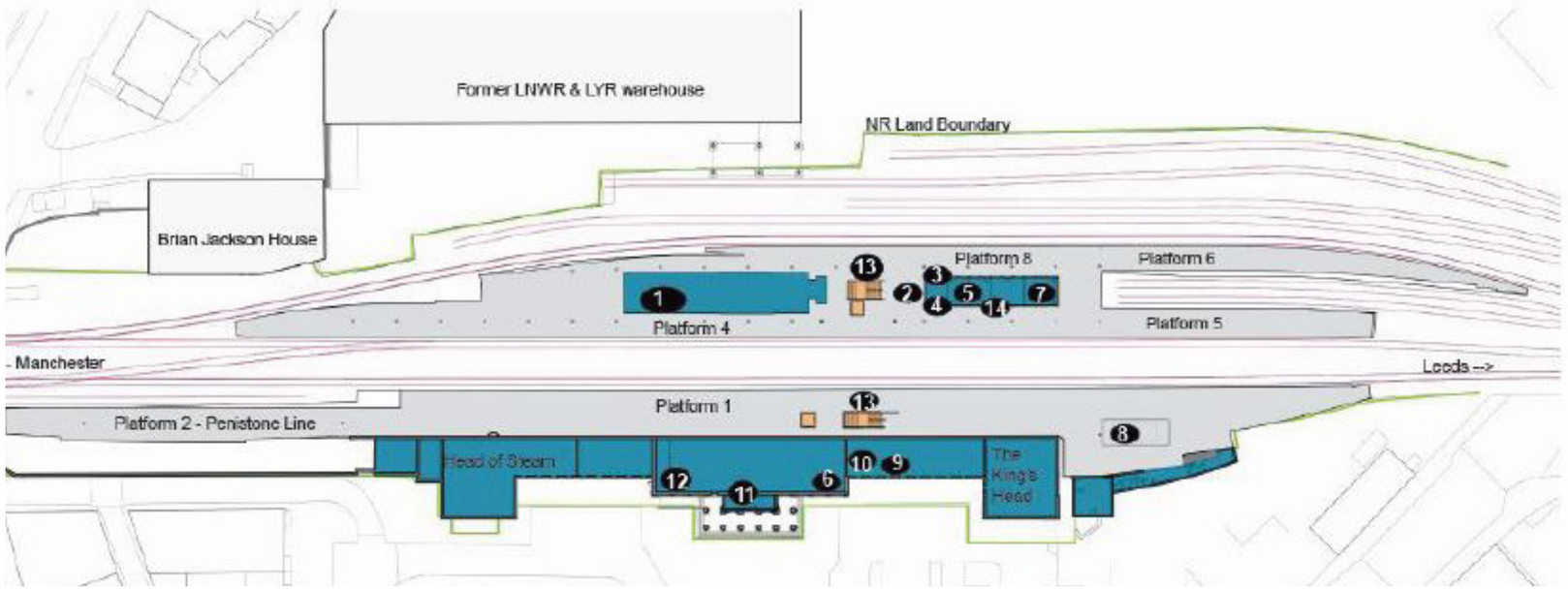
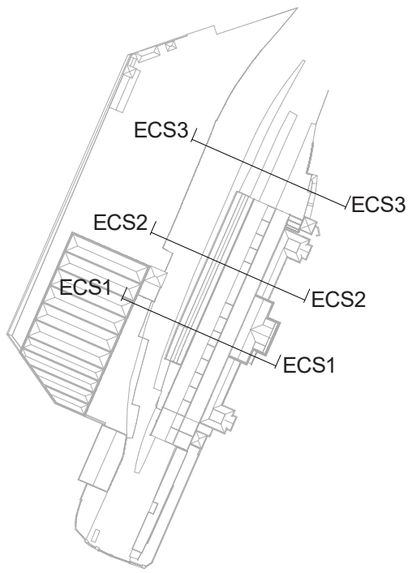
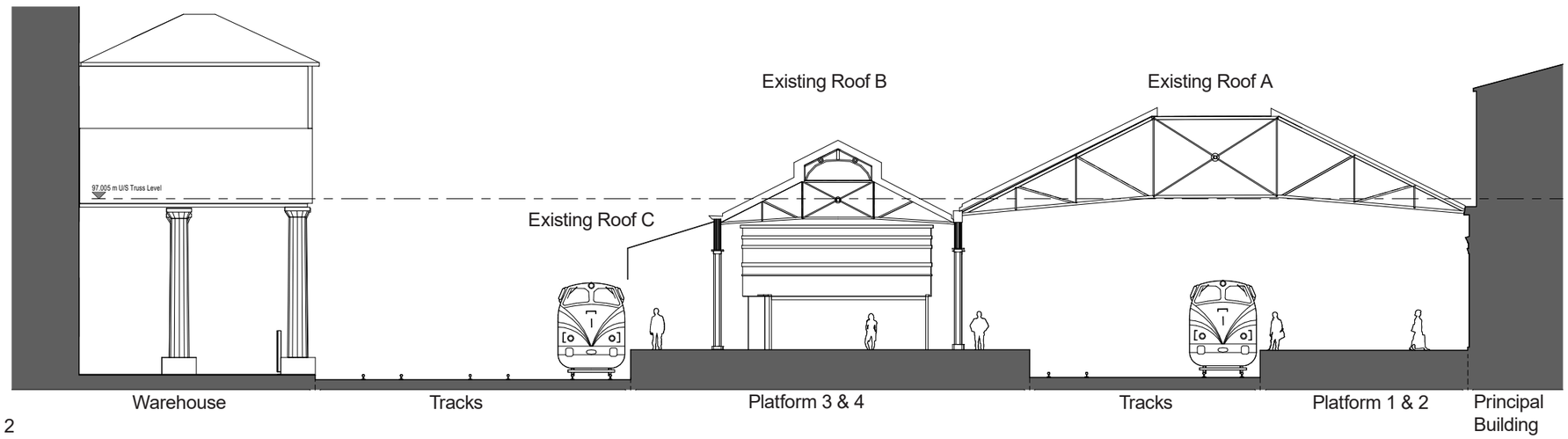



**Figure 3.2b: Existing station platform plan**

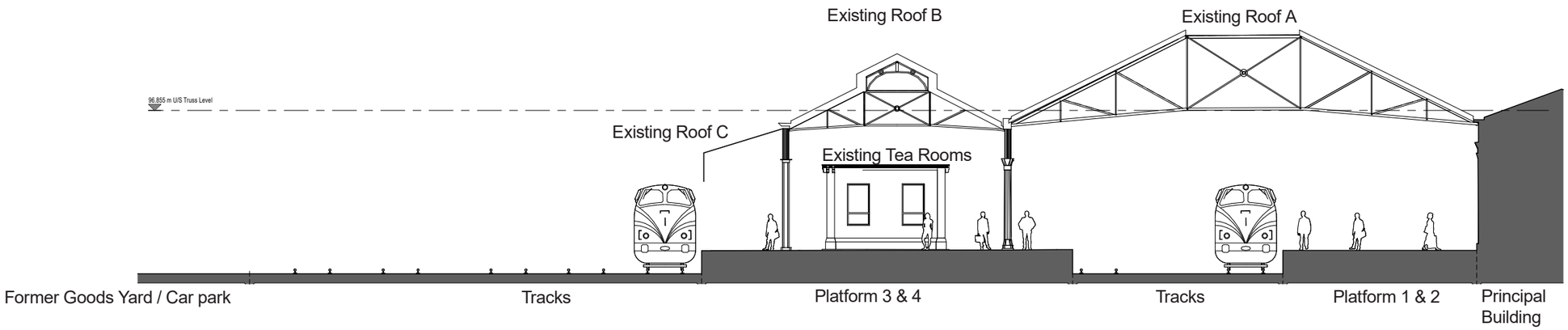



Key to existing sections

Existing section 1




Existing section 2




Existing section 3

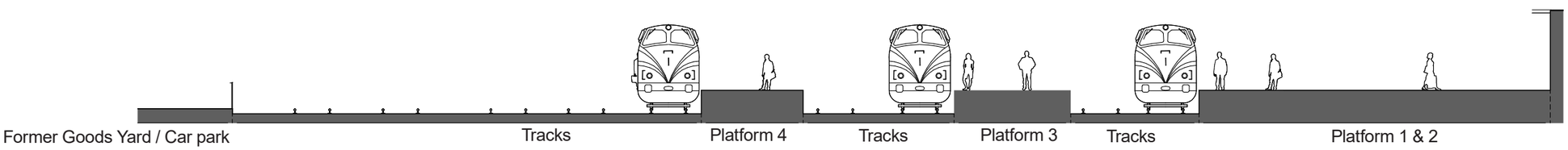



**Figure 3.2c: Existing sections**

### 3.2.1 History in brief

Huddersfield Station is a significant piece of architecture and engineering, reflecting the historic importance of the TransPennine rail line, the pioneering railway companies which constructed it and the high civic aspirations of the town of Huddersfield in the nineteenth century.

Huddersfield Station was originally constructed in the 1840s, with two railway companies – the London & North Western Railway (LNWR) and Lancashire & Yorkshire Railway (LYR) – both contributing to a joint development. The trainsheds were enlarged and an island platform added in the 1880s.

### 3.2.2 Principal Building

The main station building, referred to as the Principal Building, faces St. George's Square. It consists of a central range, faced in stone and dominated by a pedimented Corinthian portico, and two symmetrical arcaded wings with smaller end pavilions.

The main public entrance to the station ticket hall is through the central doors under the portico. On entry, the booking office is to the left; to the right are the train timetables and a newsagent. Passengers pass through ticket gates and leave the Principal Building, again on the central axis, onto Platform 1.

The two end pavilions are now public houses: the Head of Steam and the King's Head. Both pubs are also accessible from Platform 1, the latter for emergency egress only.

The Principal Building, with its magnificent façade, makes a very large contribution to the station's significance. It also derives significance from its relationship with St. George's Square and its role as a focal point for the town. The square was developed in response to the monumental Classicism of the station and remains a public space of memorable grandeur. Its continued civic importance is reflected in its contemporary use as a location for public events, celebrations and civic life.

**Figure 3.2.2a: St George's Square 1948 (The Examiner)**


**Figure 3.2.2b: St George's Square 1980 (The Examiner)**

### 3.2.3 Station roofs

The existing roof plan of the station (Fig.3.2) features a large roof consisting of two main spans. Roof A is the largest of the two, spanning between the rear of the Principal Building and a row of iron and steel columns on the main island platform. Roof B spans across the island platform. Roof C is a non-original additional cantilevering canopy which extends the side of Roof B to the edge of Platform 8.

Roofs A and B date back to the 1880s and are relatively rare surviving examples of large-span 'Euston Roofs'. Truss roofs of this type were a common choice of engineering for station roofs during the 19th century and were notably used by both the LNWR and LYR at various stations.

The existing roof at Huddersfield therefore evidences the engineering which characterised the period of station expansion during the 1880s. It also reflects the historic development of the station and the railway line during this period.

**Figure 3.2.3a: Trainsheds under construction 1886**


**Figure 3.2.3b: Inside trainshed, 1954 with Tea Rooms in distance (The Examiner)**

KEY

1. Inside trainshed (towards Leeds), 2018
2. Inside trainshed (towards Manchester), 2018
3. Penistone Line canopy, 2018
4. Trainshed gables from Leeds end, 2018
5. Rear of Principal Building from inside trainshed including view of cable gantry, 2019
6. Tea Rooms, 2018
7. Tea Rooms, 2018
8. Tea Rooms, 2018
9. Smaller roof span with former LNWR & LYR warehouse to rear of station, 2018
10. Former LNWR & LYR warehouse to rear of station, 2018
11. View towards former goods yard with Accumulator Tower, 2018
12. View over viaduct at Leeds end, 2018

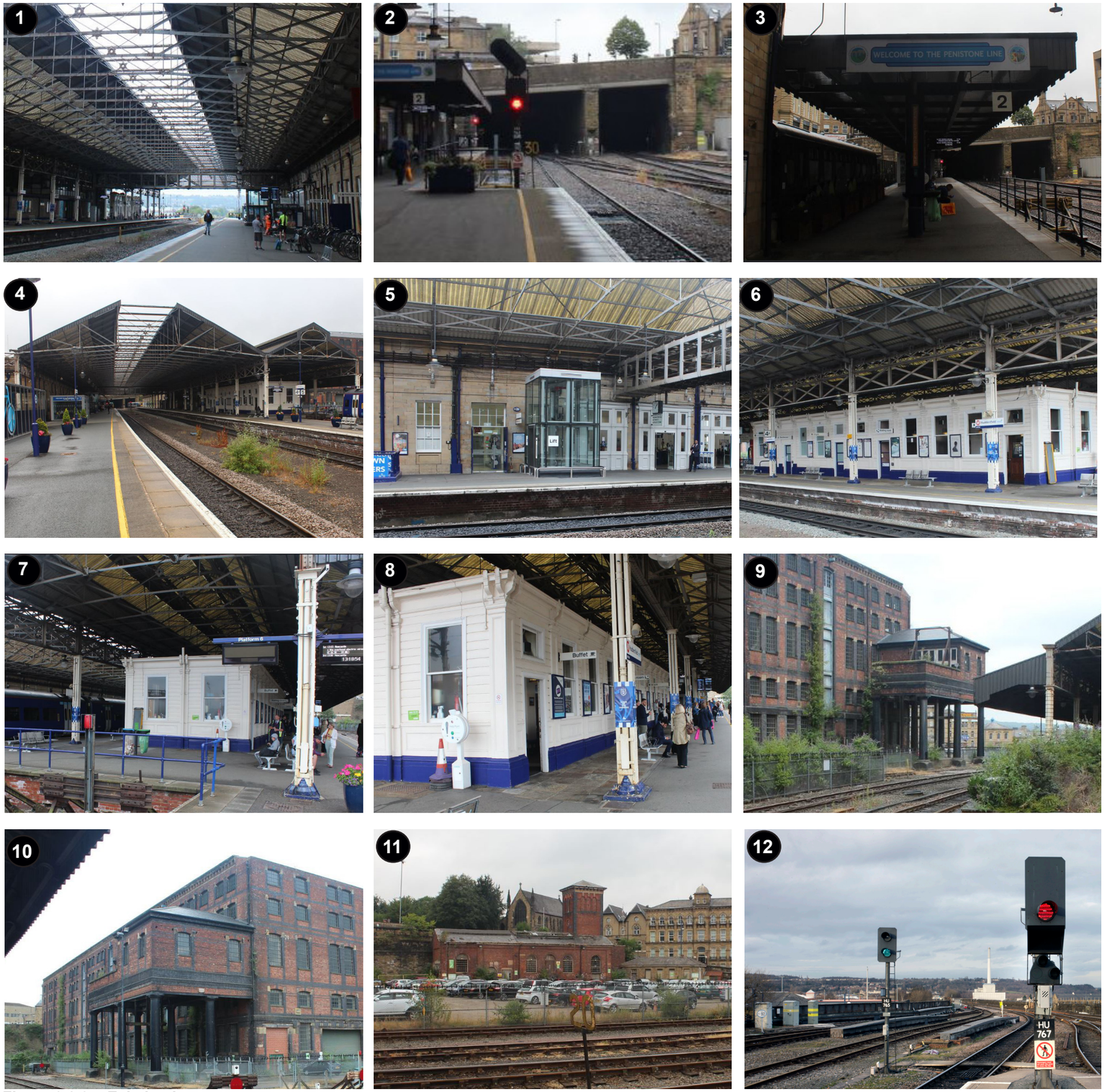



**Figure 3.2.3c: Existing images**

### 3.2.4 Tea Rooms

The Tea Rooms are a small rectangular timber building situated between Platforms 4 and 8 on the island platform. The building represents a common feature of expanding and improving station facilities during the 1880s, offering refreshments and waiting areas to passengers.

The building's position between the two platforms, with entrances on both sides, is of significance – as is its timber construction and some surviving elements.

Today the Tea Rooms contain passenger WC facilities, a waiting room, and a café area with significant surviving joinery around the servery and doorways.

**Figure 3.2.4a: Refurbished Tea Rooms**

### 3.2.5 Platforms

Platforms 1, 4 and 8 are the station's only through-platforms. Platform 2 is a bay platform serving the local line to Sheffield via Penistone and Barnsley. Platforms 5 and 6 are bay platforms located on the island.

Automated train announcements, customer help points and digital display screens provide train running information on all platforms.

### 3.2.6 Relay Room and cable gantry

The Relay Room, a single-storey brick building housing signalling equipment and other services, is situated opposite the exit from the ticket hall. A large steel cable gantry bridge spans across the tracks between the Relay Room and the Principal Building.

### 3.2.7 Passenger subway

The passenger subway was constructed in circa. 1885 and has undergone several modifications over the decades to meet the requirements for the station. The subway currently provides the only means for passenger access to Platforms 4-8. Access is provided through steps, with step free access via lifts.

### 3.2.8 Parcel subway

The Parcel subway was constructed in the 1890s and traverses under the two main through lines, from the Principal Building basement to the underside of the Tea Rooms on Platform 3 & 4 where it terminates. The subway was originally used to transfer postal mail and goods to the island platform. The subway is not accessible to the public.

The subway roof is a concrete slab cast on permanent troughed steel formwork. There is a large catchpit in the roof structure positioned between the two lines. The slab originally spanned between the brick subway walls, but steel strengthening works have been installed to reduce the span and increase its capacity.

# 4.0 GLOBAL DESIGN DRIVERS

## 4.1 TRACKS & PLATFORMS

### 4.1.1 Background

The TransPennine Route Upgrade Programme has been established to increase capacity and improve reliability and journey times on the route between Manchester Victoria and York, via Huddersfield and Leeds.

The programme will be delivered via a series of discrete interventions, of which Huddersfield Station is one. Route-wide signalling and electrification enhancements will also be implemented to support these interventions.

Work was undertaken in 2017 to identify, sift and select options within the Huddersfield to Ravensthorpe section of the route. It was agreed that these interventions should deliver an electrified four-track railway with a grade separated junction in the Ravensthorpe area. They should also provide a railway compliant to modern standards, and the major works should be constructed with proportionate disruption to the current operational railway and other third parties.

The primary focus of the Huddersfield to Ravensthorpe section of the route is to provide sufficient capacity and operational robustness to meet the remitted timetable. Additionally, they must also provide significant journey time improvements through line speed increases and by de-confliction of train services.

All train services on the line will stop at Huddersfield. Stopping services from Manchester will terminate and reverse here; similarly, stopping services from Leeds will do the same. Fast and semi-fast services will continue through to their respective destinations.

Huddersfield Station is the western fringe of the proposed four-track section of railway which extends to West Town just outside Dewsbury. Beyond Huddersfield the railway reverts to two tracks towards Manchester, with the single track of the Penistone Line diverging from the route at Springwood Junction.

### 4.1.2 Existing arrangement

The existing Huddersfield Station layout comprises three through platforms and two north-facing bay platforms. There is a dedicated south-facing bay platform for the Penistone Line services.

The existing layout is shown on Figs.4.1.2a & 4.1.2b.

Fig.4.1.2c illustrates the following key 'pinch points' which dictate the site boundary and limit the expansion of rail facilities on the site.

- The width of the tunnel portal opening to the south
- The proximity of the goods lift serving the former warehouse to the rear
- The width of the viaduct, and specifically the John William Street bridge

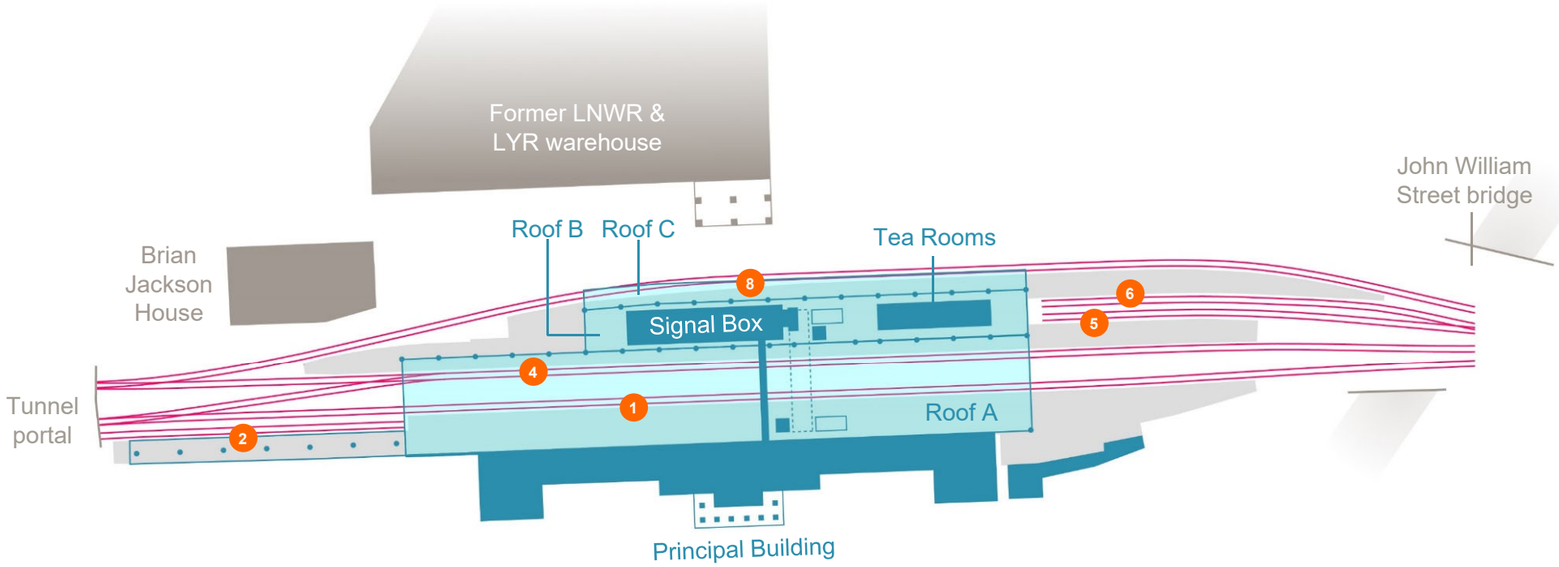



**Figure 4.1.2a: Existing station layout**

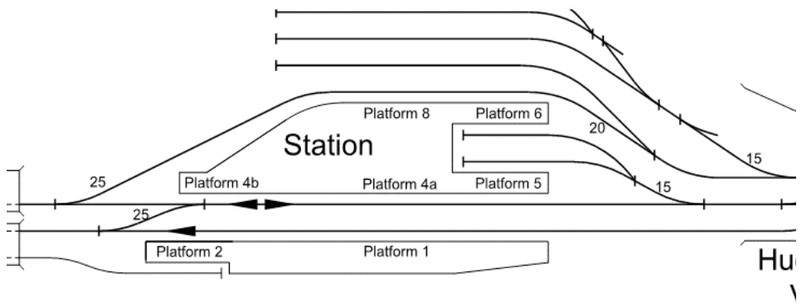



**Figure 4.1.2b: Existing track schematic**

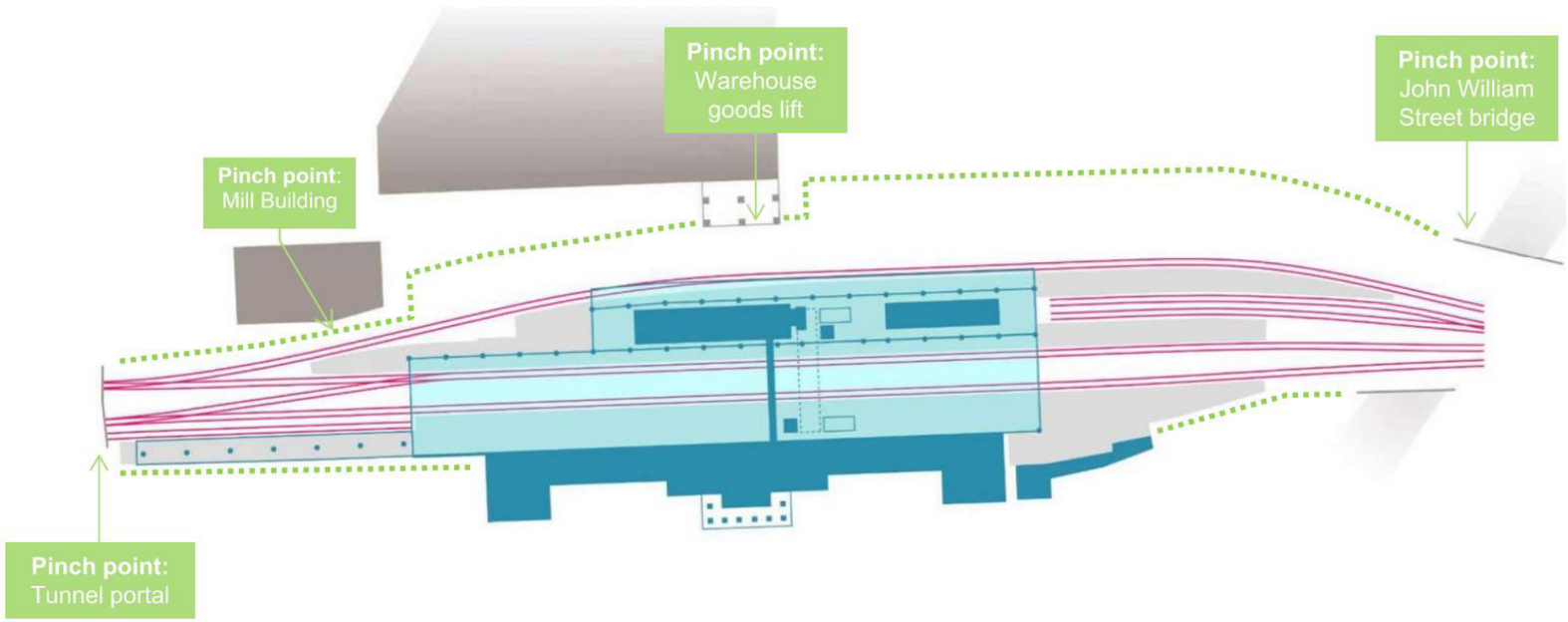



**Figure 4.1.2c: Site boundary with 'pinch points'**

### 4.1.3 Changes required for TRU

Operational modelling has shown that the proposed timetable can be supported with the greatest level of reliability with the following changes:

- four through-platforms of 200m length
- one west-facing bay platform of 200m length
- comprehensive junctions to allow train services to be sorted onto the correct platform and line at both ends of the station
- overhead line equipment (OLE) introduced above all tracks

Achieving these interventions between the 'pinch points' noted above will involve the following key changes, as indicated in Fig.4.1.3a.

- The current Platforms 4, 5, 6 and 8 will need to be replaced by two longer islands.
- The number and complexity of switches and crossings required to service the platforms (allowing trains to access multiple lines) cannot fit within the tunnel portal, so they must be located at the Manchester end of the station – effectively pushing the southern end of the platforms towards Leeds.
- The additional width of the new track layout will involve replacing the existing sidings close to the car park occupying the former goods yard, and running closer to the warehouse goods lift.
- The additional length of the platforms will involve extending the station further still towards the Leeds end, meaning that the bridge over John William Street will need to be widened.

Three principal options were explored to achieve this arrangement, as described in the following sections. Each has different implications for the structures within the station.

The Penistone Line platform is to be extended to accommodate longer trains.

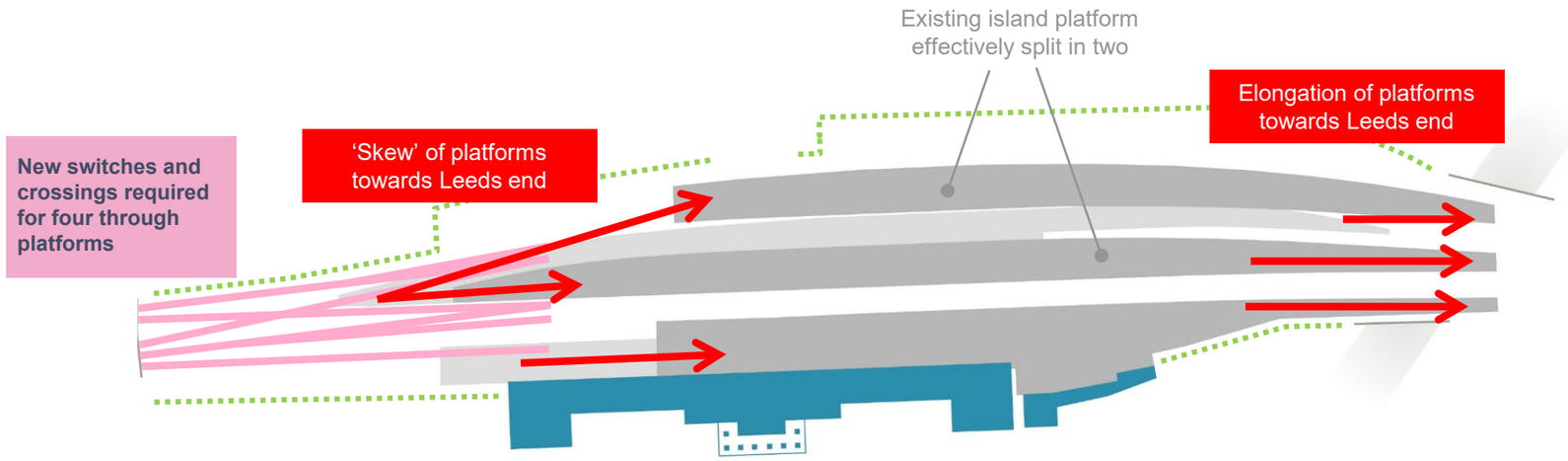



**Figure 4.1.3a: Basic implications of track and platform alterations**

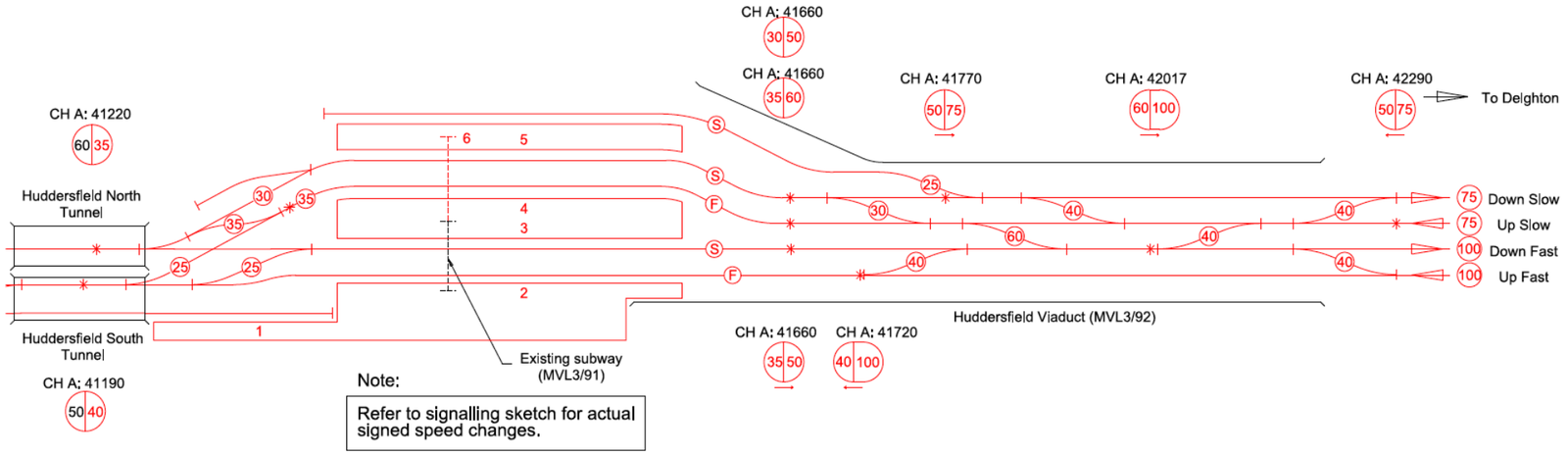



**Figure 4.1.3b: Proposed schematic layout**

### 4.1.4 Option 0

This option achieves a radius of >800m to the proposed Platform 4 edge, which improves signal sighting distance for drivers and reduces platform edge distance to train doors in comparison with the existing platform 8. This is a significant safety improvement on the existing station.

Stopping up the existing bay platforms 5 & 6, removing the existing rail sidings, and increasing the radius of existing Platform 8 reduces the width of the existing island platform. This provides space to the west, allowing the new 200m long island platforms 5 & 6 to be positioned to avoid the pinch point with the existing warehouse Goods Lift structure. It also opens land to the north of the Goods Lift for a future bay platform if required.

With this arrangement it will be possible to further expand the station by providing an additional bay platform in the future.

This option requires modification of the existing trainshed, removing two bays of Roof A from the Manchester end of the platform, and the removal of the smaller shed (Roof B) along with its cantilever span (Roof C). New coverage will be required to some of the extended platform areas.

The Tea Rooms may be retained on the central platform but must be relocated slightly to the north-east. The existing stair and lift on the central island platform will also require relocation. The Relay Room will need to be removed, along with the existing gable gantry.

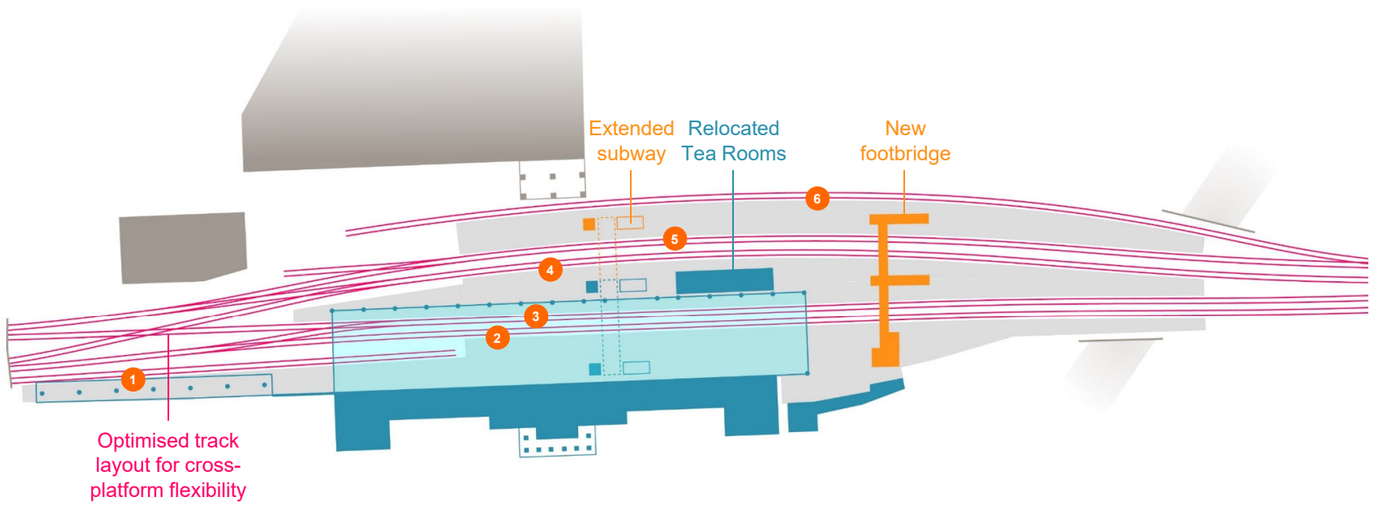



**Figure 4.1.4a: Option 0 - basic layout**

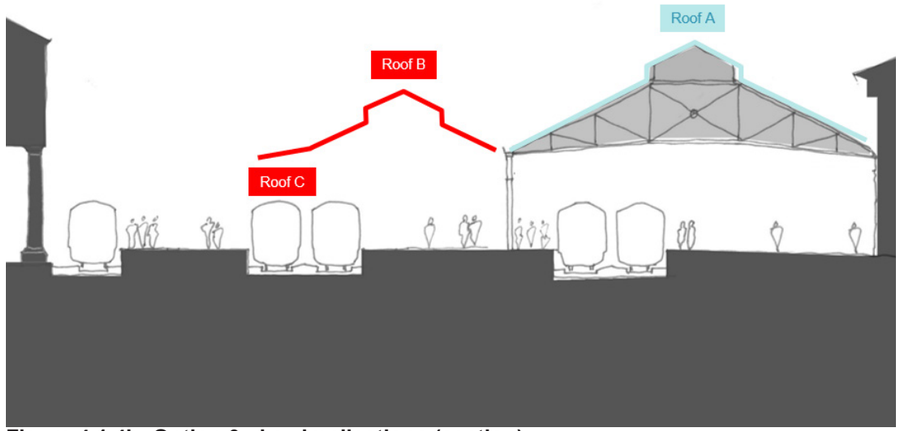



**Figure 4.1.4b: Option 0 - key implications (section)**

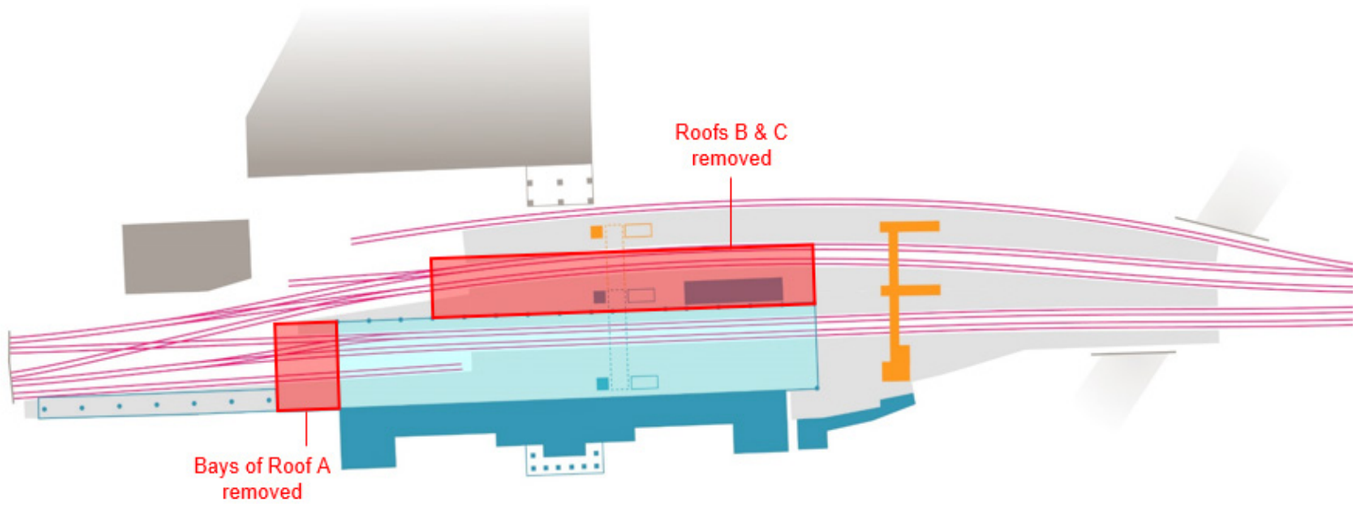



**Figure 4.1.4c: Option 0 - key implications (plan)**

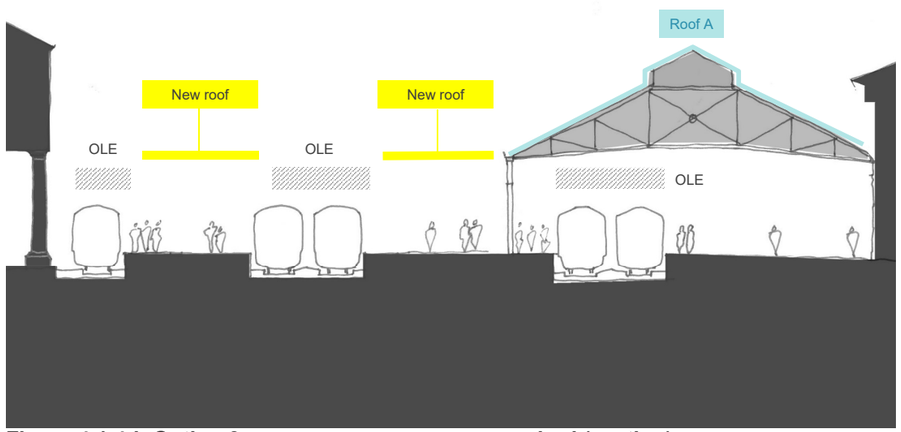



**Figure 4.1.4d: Option 0 - new canopy coverage required (section)**

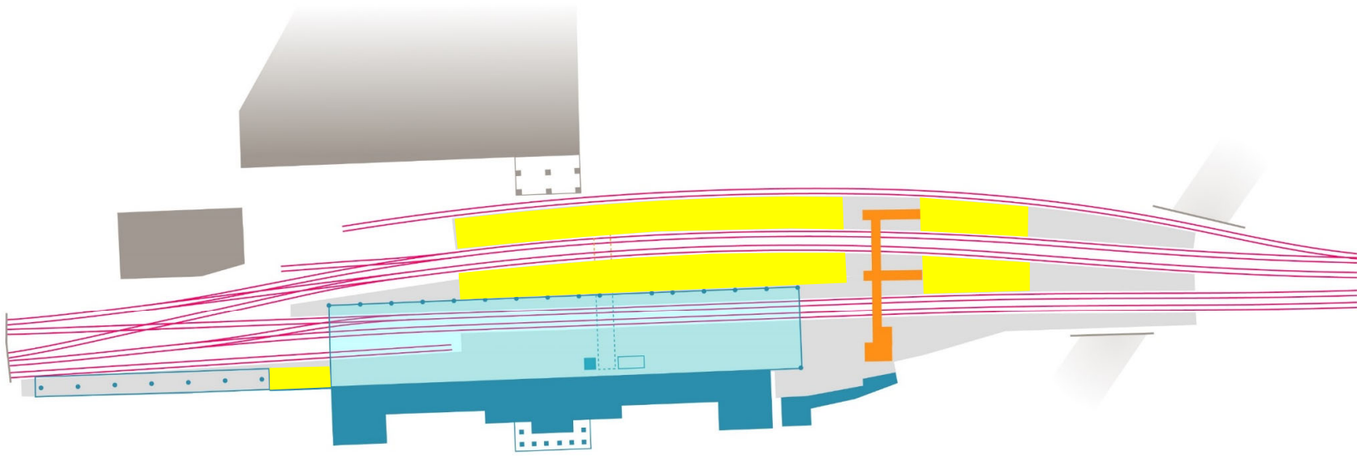


**Figure 4.1.4e: Option 0 - new canopy coverage required (plan)**

### 4.1.5 Option 1

In this option the edge of the proposed Platform 4 will be built out to make the island platform wider and preserve more of the platform structures. However, the platform edge radius of the proposed Platform 4 varies from 400 to 500m at the Manchester end and is less than 1000m over its entire length. The tightness of this curvature is a considerable safety concern. Not only would this introduce large distances between the platform edge and train doors, risking passengers' safety as they board or disembark trains, but the curvature would also reduce the signal sighting distances for train drivers through these platforms, providing a considerable safety issue in terms of visibility of both signals and also hazards, such as a person on the tracks.

Owing to the width of proposed Platforms 3 and 4, the proposed Platforms 5 and 6 are positioned slightly closer to the western site boundary than in Option 0.  As a result, the length of the new bay platform (proposed Platform 6) is limited to 150m by the physical constraint imposed by the warehouse goods lift.

The whole of Roof A is conserved. Two bays of Roof B will be removed, along with Roof C and both the Relay Room and the cable gantry. The Tea Rooms will remain in their original location.

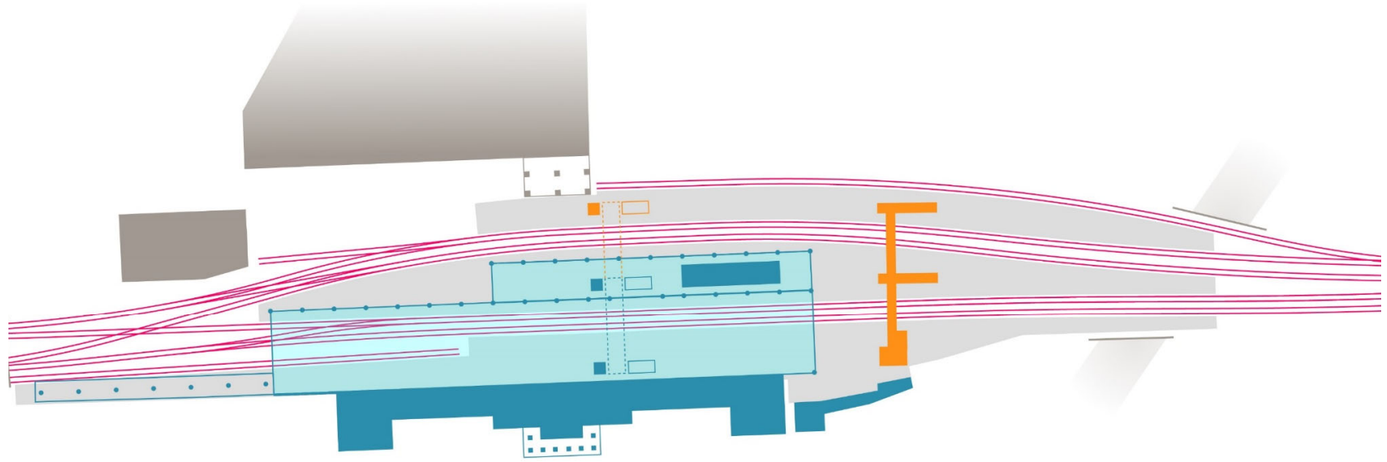


**Figure 4.1.5a: Option 1 - basic layout**

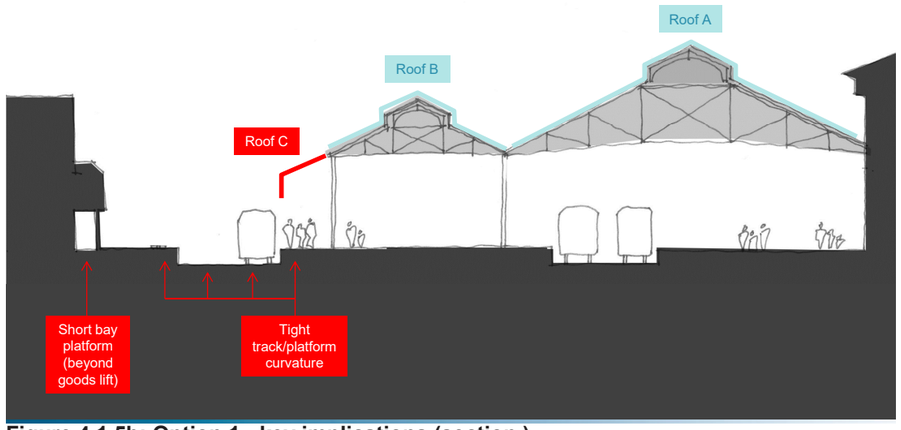



**Figure 4.1.5b: Option 1 - key implications (section )**

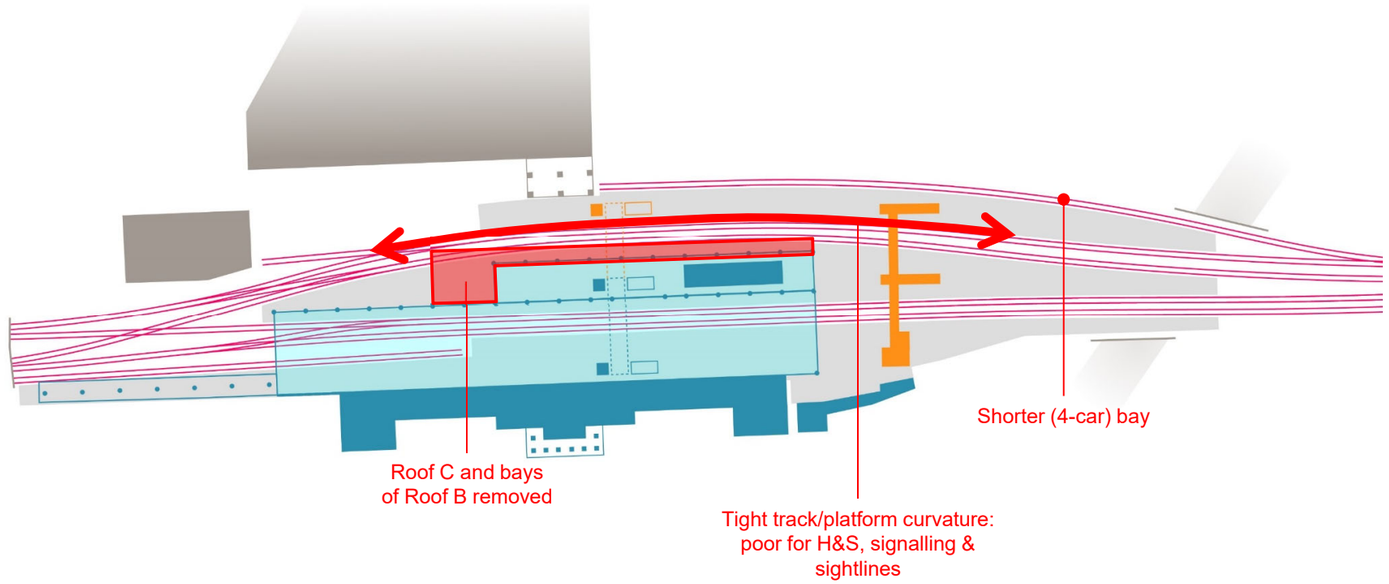



**Figure 4.1.5c: Option 1 - key implications (plan)**

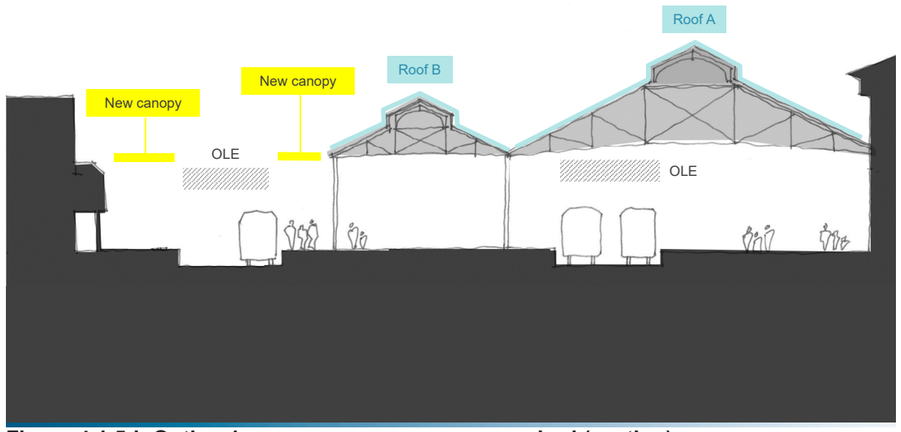



**Figure 4.1.5d: Option 1 - new canopy coverage required (section)**

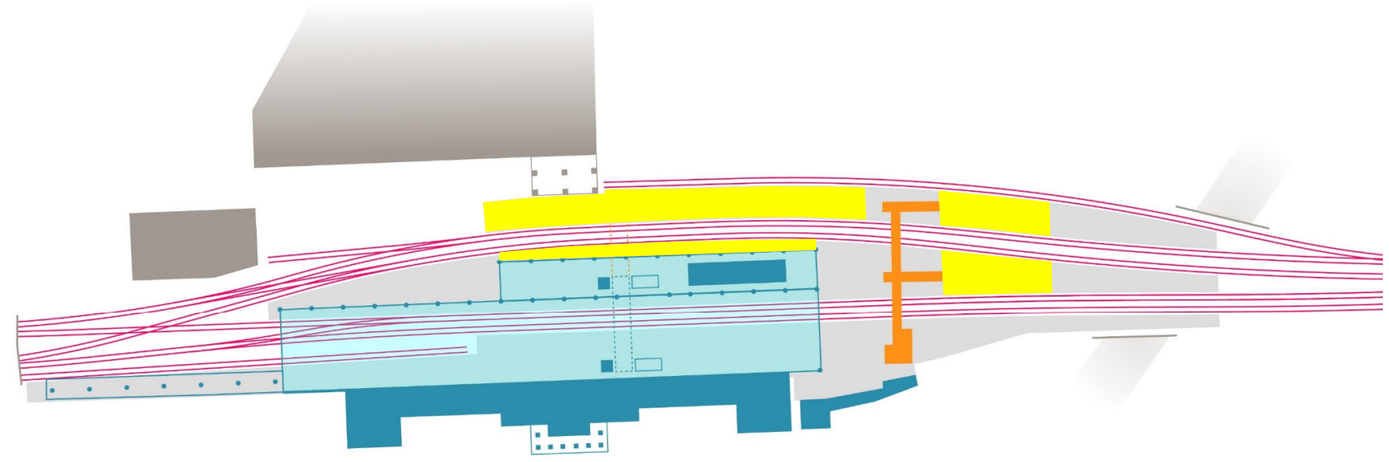


**Figure 4.1.5e: Option 1 - new canopy coverage required (plan)**

### 4.1.6 Option 2

This option seeks to minimise the impact on the existing shed structures by incorporating the Roof B columns between two sets of tracks. This concept will require the installation of impact protection around the columns. Such a design approach would result in a laddering effect on signal and person on line sighting from the retained columns, posing a significant safety concern.

The full length of the existing Platform 8 (proposed Platform 4) is remodelled to achieve a platform edge radius greater than 500m. This results in a narrowing of the existing island platform.

Reducing the width of the existing island platform means that the new island platform can allow the new 200m bay platform (proposed Platform 6) to run in front of the warehouse goods lift, as in Option 0.

Roof A is retained, with the exception of two bays removed from the Manchester end. Roof B is retained with the removal of only one bay, the cantilever canopy (Roof C) is removed. The relay room will require removal. The Tea Rooms require relocation to the southern platform. The cable gantry is removed.

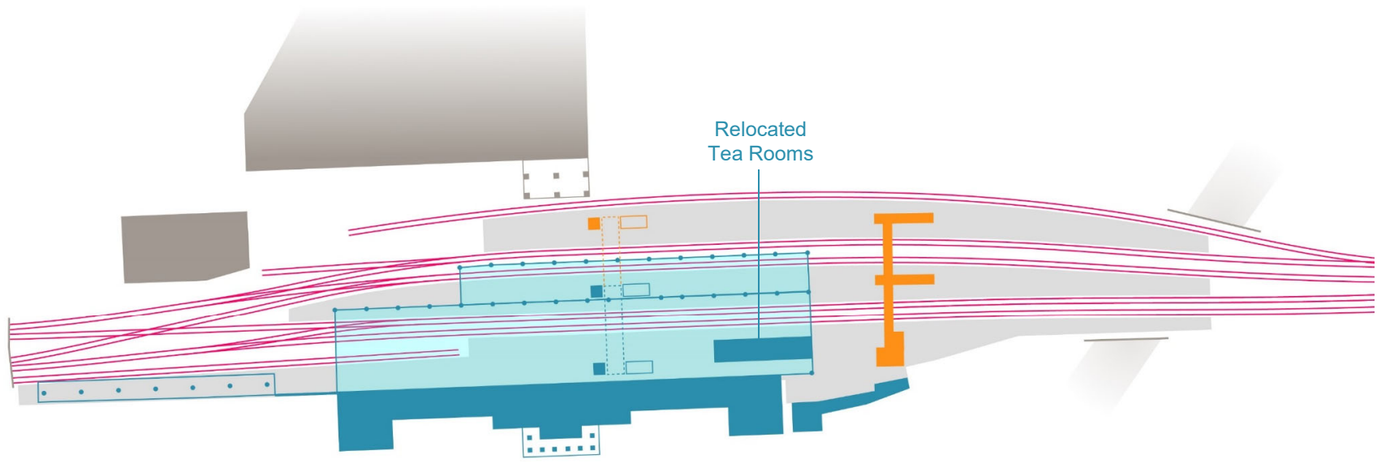



**Figure 4.1.6a: Option 2 - basic layout**

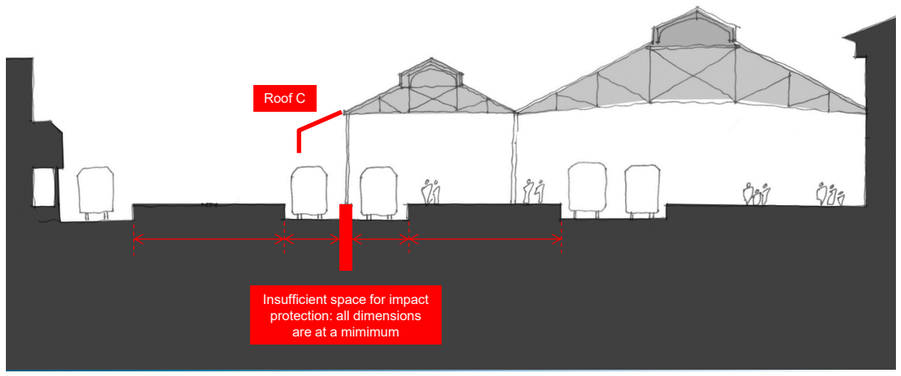



**Figure 4.1.6b: Option 2 - key implications (section )**

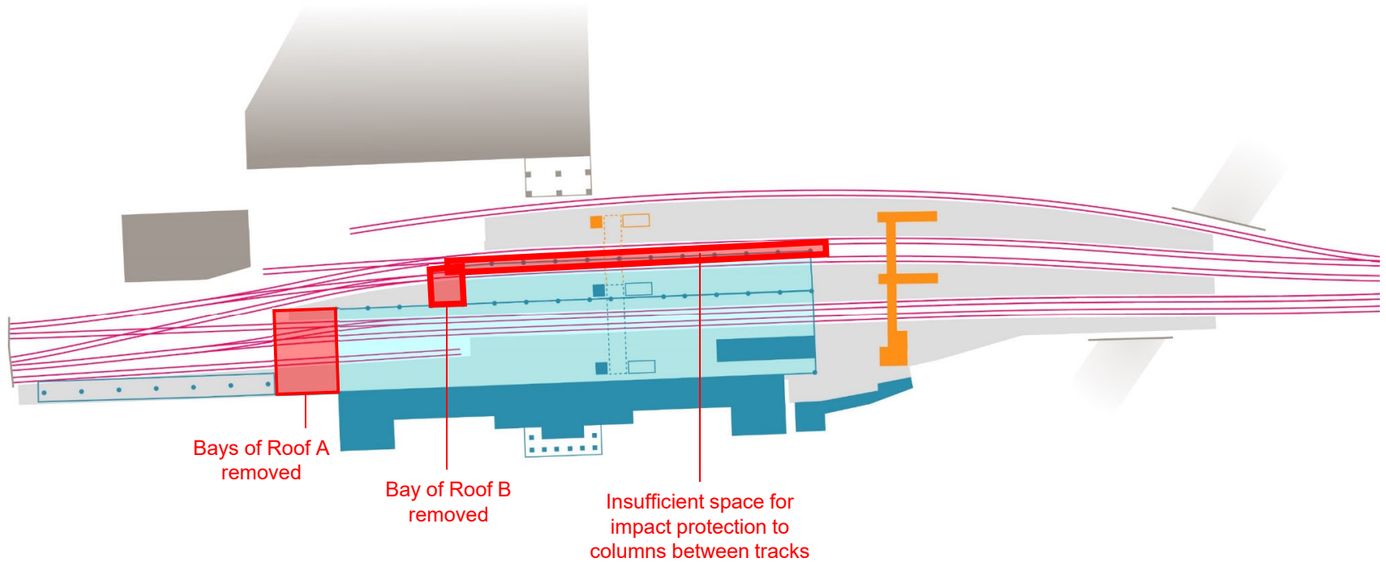



**Figure 4.1.6c: Option 2 - key implications (plan)**

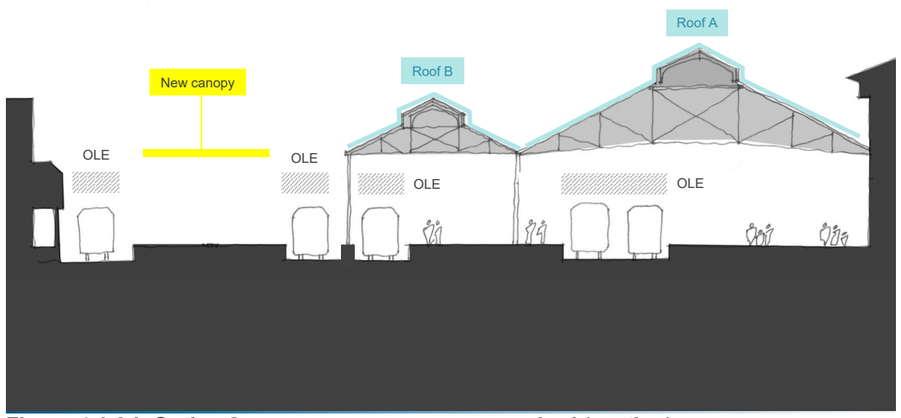



**Figure 4.1.6d: Option 2 - new canopy coverage required (section)**

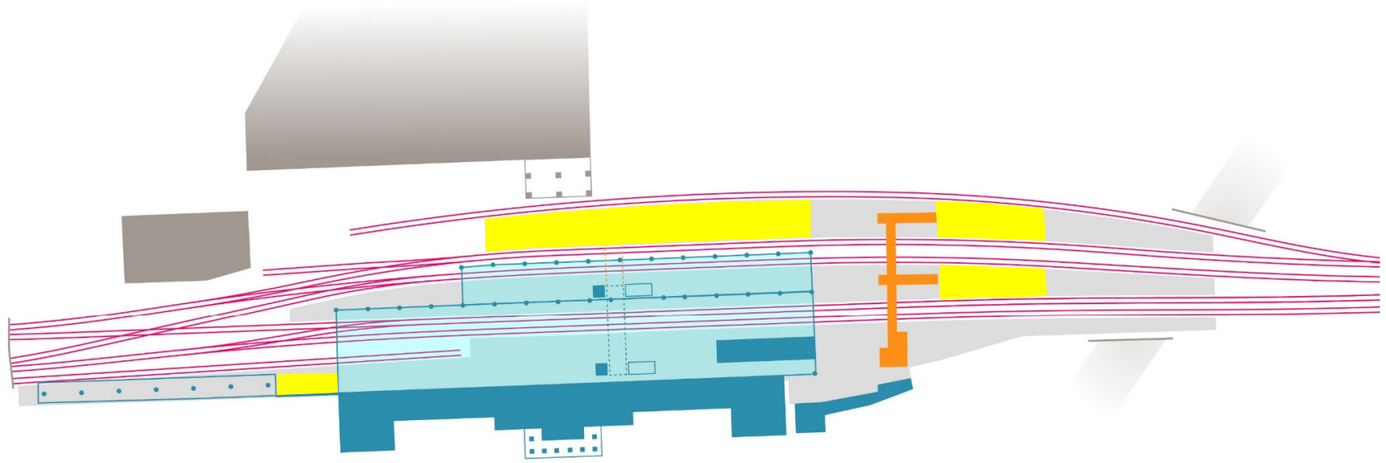


**Figure 4.1.6e: Option 2 - new canopy coverage required (plan)**

#### 4.1.7 Selected option

Following widespread consultation with heritage and railway stakeholders, Option 0 was selected as the optimal arrangement for platforms and tracks, delivering the greatest range of upgrades to Huddersfield Station.

Key design drivers this selection imposes on the design include the following:

- New roof or canopy structures to effectively replace the coverage provided by the existing Roofs B and C.
- A solution to relocating the Tea Rooms a short distance on the island platform.
- A new footbridge providing safe passenger egress from platforms extended toward the Leeds end.

## 4.2 PLATFORM COVERAGE

Basic coverage must be provided to the platform areas as indicated in the previous section. This must conform to Network Rail specification in terms of overall coverage.

Passenger coverage is based on providing a minimum of 0.65m2 per passenger for forecast numbers through to 2043. Ideally this coverage should be distributed as evenly as possible along the length of the trains in order to avoid passenger bunching.

Minimum coverage based on the above provision should not be less than the existing station.

## 4.3 HISTORIC SIGNIFICANCE

The Grade I listing of the station places exacting requirements on the design to avoid harming the historic buildings and their setting. To this end the design team has adopted the following set of general conservation principles, several of which are described in more detail in subsequent sections.

- Preserve/conserve as much original station fabric as possible.
- Where new canopy/roof structures are required, design them in harmony with the rhythm and geometry of the retained trainshed roofs. The emphasis of additional buildings should therefore be on clean lines and angular elements (as opposed to curving/organic shapes, for example).
- Where new canopy/roof structures are required, design them to be sympathetic but expressed clearly as modern. Minimal forms and simple detailing to help accentuate the distinctive characteristics of the existing shed roofs.
- ‘Open up’ the station to engage visually with its wider historic setting particularly the warehouses to the rear and surrounding landscape.
- Incorporate OLE elements neatly within the structure, reducing the number of extra OLE specific elements such as stanchions and portals which will detract from the historic station buildings.

## 4.4 SCALE

Given the significance of both the Principal Building and the retained Roof A, the scale of any new intervention should be such that the dominance of the historic station is celebrated and reinforced.

This will involve creating an architectural extension which emphasises the original core grouping of buildings and spaces. In effect it means replacing Roofs B and C with a structure of commensurate size, in an equivalent location.

This also means that coverage provided to the platforms extending away from the central axis of the station will be smaller in scale and more subservient in character.

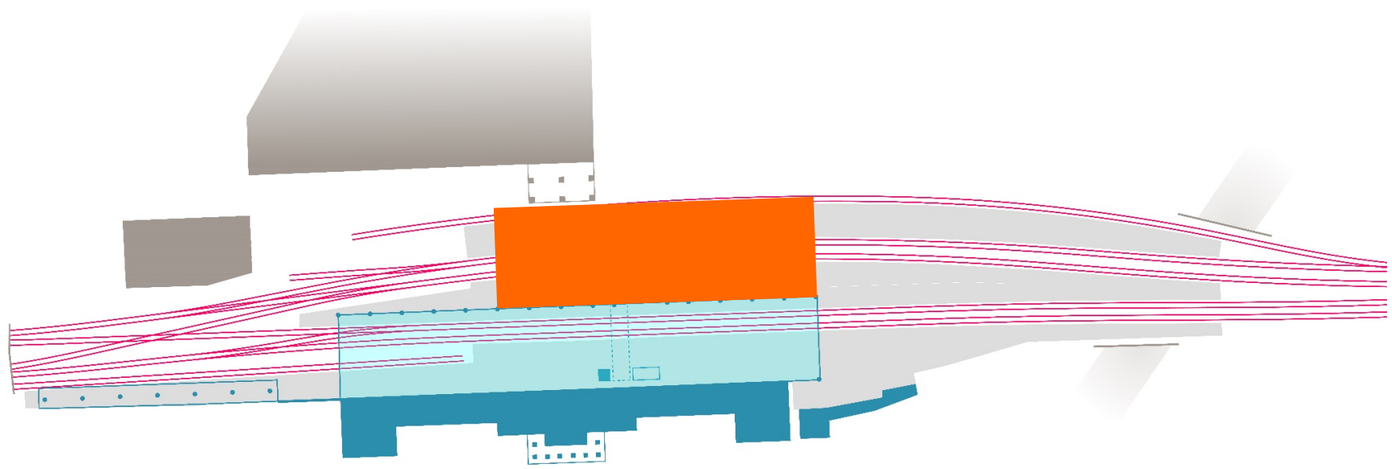


**Figure 4.4a: Celebrating and reinforcing the central area of the station**

## 4.5 BALANCE ON PLAN

New extensions added to the station should respect the significance of the Principal Building's strict central axis, along which passengers enter and leave the ticket hall. As noted, this axis also aligns with the monumental columns of the warehouse goods lift to the rear.

The consolidating effect of locating a large-scale extension on (or close to) this axis should be reinforced by emphasising each of the extended platform canopies as a smaller architectural 'finger' spreading away from the principal roof space. This will create a balance on plan, with passengers having the option to stay in the central space or move outwards on either side: left towards Platform 1 and the Penistone Line, or right towards the three newly-extended fingers at the Leeds end.

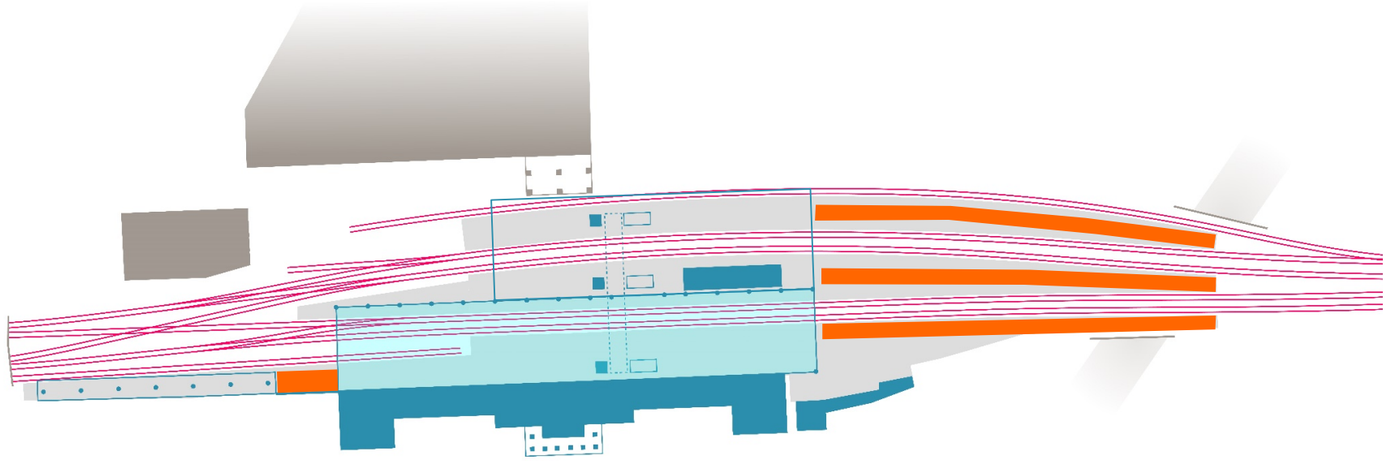


**Figure 4.5a: Balance on plan with consistent 'fingers' of canopies**

## 4.6 VIEWS

Although there is a loss of heritage fabric as a result of the removal of Roofs B & C, the scheme offers improvements through the removal of the Relay Room and the Cable Gantry. These changes present an opportunity to reconnect the station visually with the surrounding historic environment and the dramatic landscape it sits within.

Views towards the warehouses and goods yard at the rear of the station should be kept as clear of new structure as possible. There is also an opportunity to create enhanced views into Roof A, celebrating the appearance of the existing roof structure and the rear elevation of the Principal Building. For this reason views through from the new island platforms should also be as unobstructed as possible.

These two requirements create a set of view lines from which the form of new roofs or canopies may be defined – as indicated on Fig. 4.6a.

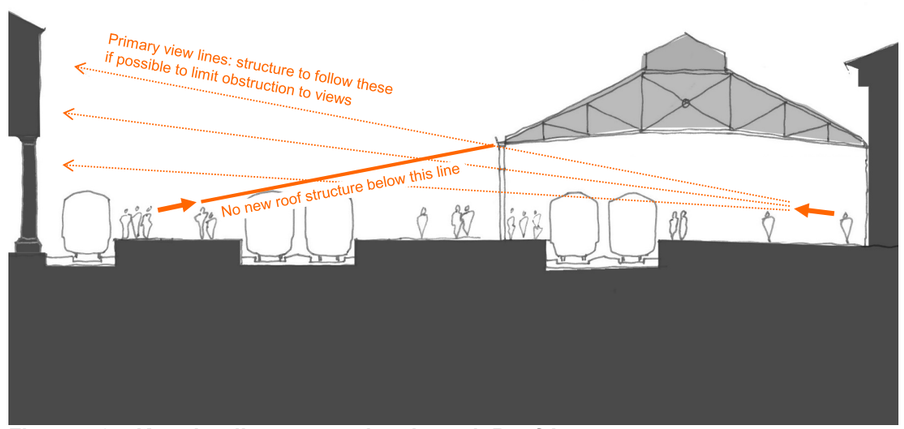



**Figure 4.6a: Key view lines on section through Roof A**

## 4.7 FORM AND STRUCTURE

New roof/canopy structures replacing Roofs B and C should draw geometrical cues from the strong lines of the retained Euston trusses. This includes using the setting-out indicated on Fig.4.7b, including the eaves line springing point of the Victorian roof, the inclined angle of the bottom Euston truss boom and the pitch of the roof finishes.

Repeating elements such as columns and transverse beams visible within a new structure should align with those of the retained Roof A. Where possible they should be oriented to be as slim as possible, when viewed from the Principal Building, in order to minimise their visual impact from that perspective.

The gables of Roof A, with the roof trusses so clearly visible, should be kept free of any obstructing structures (with the exception of a footbridge, from which the public should be able to enjoy views of the structure at relatively close quarters).

Columns supporting roofs and platform canopies should be aligned longitudinally on plan to limit visual clutter.

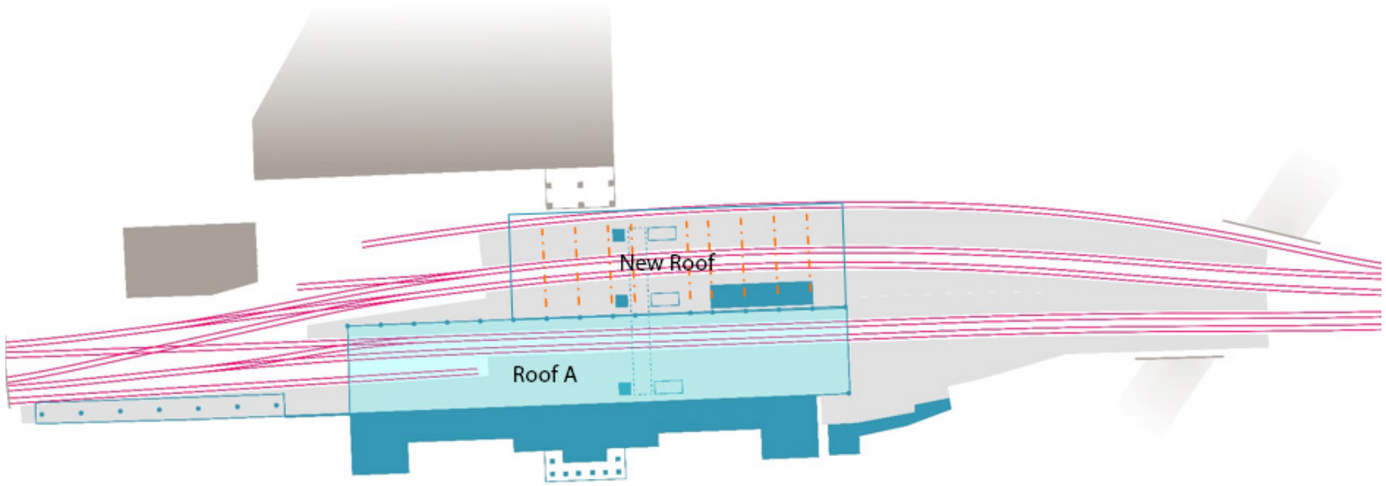



**Figure 4.7a: New roof / canopy columns aligned with those of Roof A**

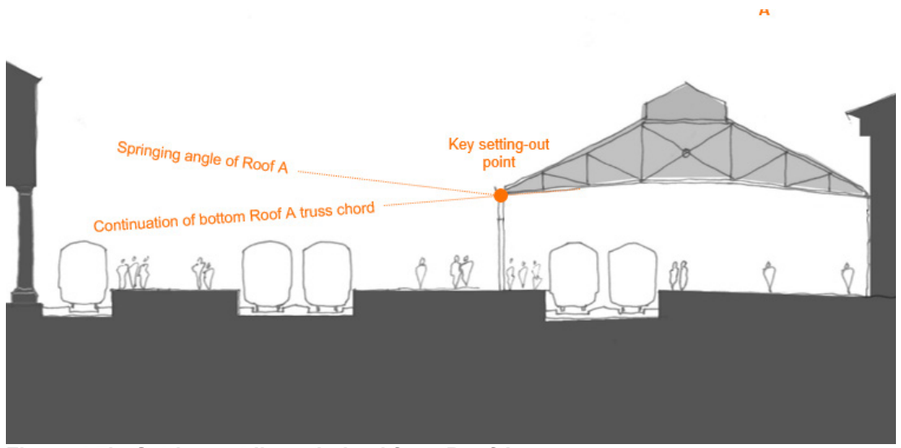



**Figure 4.7b: Setting out lines derived from Roof A**

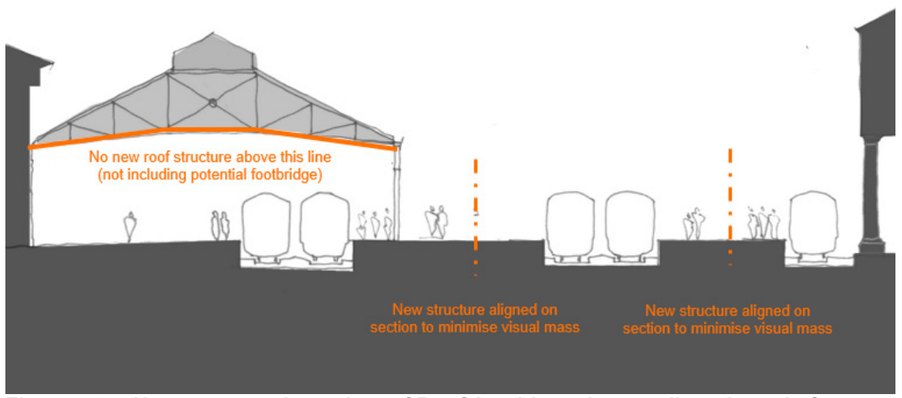



**Figure 4.7c: New structure kept clear of Roof A gable; columns aligned on platform**

## 4.8 STATION EXPERIENCE

The previous design drivers combine to create a requirement for a coherent environment within the central part of the station, with a scale and quality derived principally from the Principal Building and Roof A. Smaller modern canopies will lead away from this area on all sides, with a diminishing sense of scale and an increasingly open and transient character.

Passengers arriving onto Platform 2 through the ticket hall should feel like they have entered the 'heart' of the station. Views through to the former goods yard connect them visually to the wider historic setting. Clutter-free platforms, sensitive lighting, the careful use of colours and other elements all enhance the consistency of the architecture.

Fig.4.8a indicates several key components of the upgraded station experience.

1. Entrance on axis from St George's Square
2. Enhanced views through the station setting
3. 'Heart of the station' with an integrated and high-quality architectural environment
4. Sense of connection to wider heritage setting
5. Platform canopies balancing the design of the station.

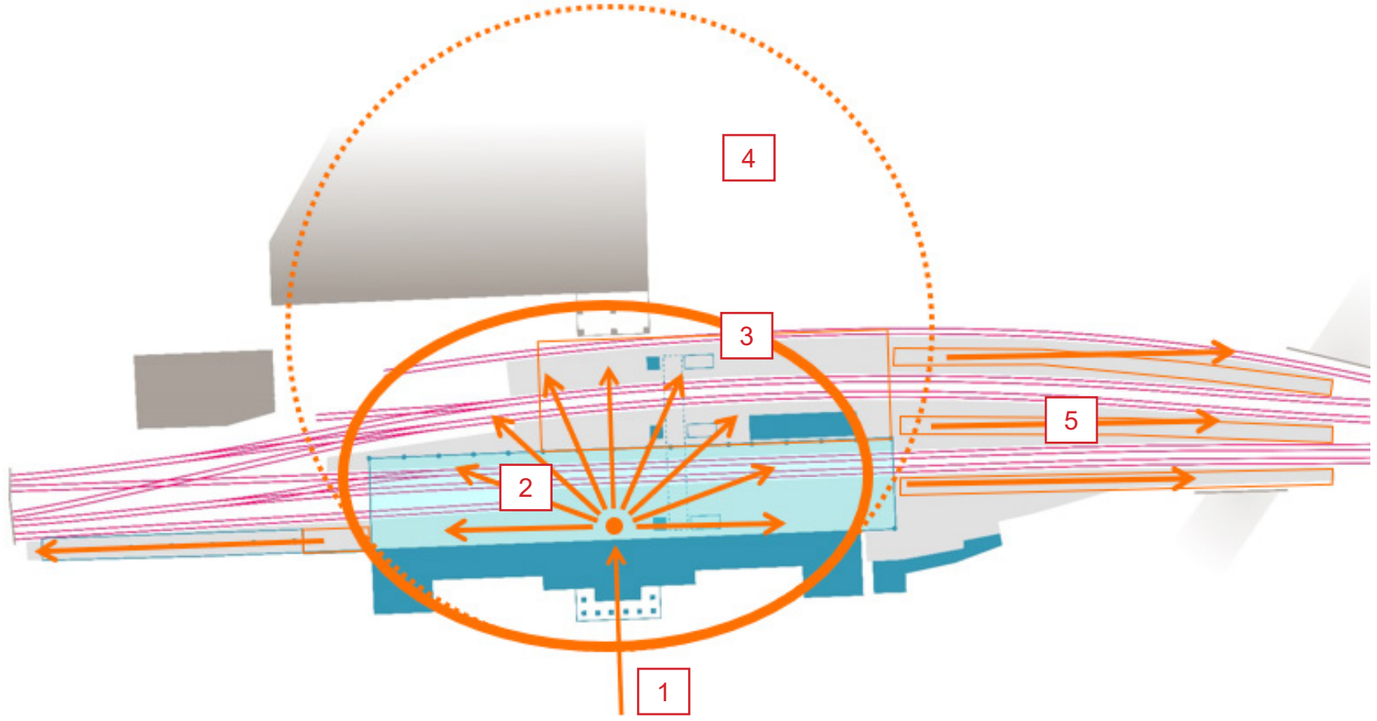



**Figure 4.8a: Key components of upgraded station experience**

## 4.9 OLE

Structures supporting OLE elements should fit neatly within the structure, with the number of obtrusive OLE-specific elements such as stanchions and portals kept to a minimum. The design of bespoke components may be required to avoid components which clash with the architecture of the station.

## 4.10 SIGNAL SIGHTING

The design of new roof/canopy structures must allow clear signal sighting along the new curved platforms. This will require a sufficient set-back from the platform edge, defined by a driver's-eye-view analysis (see Fig.4.10a).

## 4.11 PASSENGER CIRCULATION

The existing passenger subway is the sole means of passenger access to the existing and proposed island platforms.

In order to accommodate the forecast increase in passenger flows through the station to the target date of 2043, and to comply with emergency access/egress requirements, a second means of access is required to the proposed island platforms (Platforms 3-6).

To accommodate passenger flow from the longer 6-8 carriage trains, this alternative means of access is in the form of a footbridge located to the north of the proposed Roof A.

Emergency egress routes for passengers are also to be provided at ground level from the southern end of island Platforms 5-6, exiting on to the adjacent Mill land, and from Platforms 1 and 2 around the southern end of the "Platform 1" charity train, exiting into St George's Square.

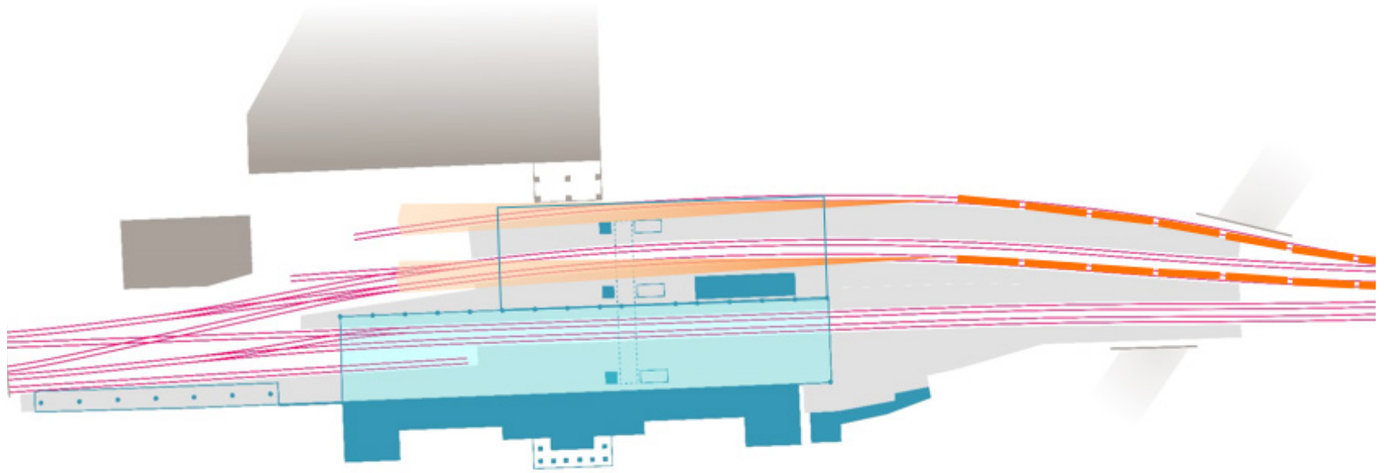


**Figure 4.10a: Indication of viewing corridors for adequate signal sighting**

## 4.12 LIGHTING

A new lighting scheme is proposed to achieve the following design objectives:

- Facilitate safe movement and orientation for a large number of users by defining entrances/exits.
- Identify hazards with local accent lighting such as level changes and platform edges for public and staff.
- Highlight public safety especially when near the platform edge.
- Navigate passengers efficiently around the station by using light as a wayfinding tool to highlight transitions and destination points.
- Achieve the safety and security requirements by providing sufficient illumination for facial recognition and CCTV camera detection.
- Provide a visually comfortable space and accessible environment.
- Incorporate a reliable, user-friendly lighting control system to maximise flexibility, daylight use and energy efficiency.
- Specify high quality LED light sources that will ensure consistent colour and a reduced maintenance cycle.

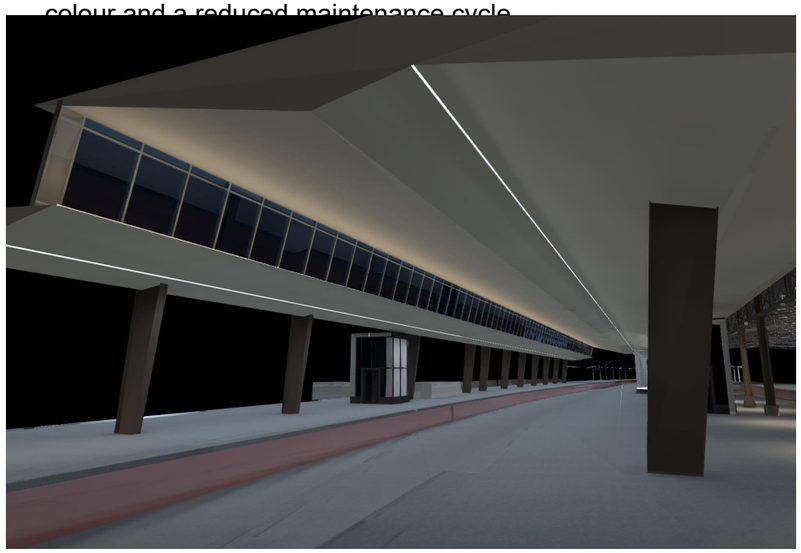


**Figure 4.12a: Proposed lighting scheme**

The lighting scheme within Retained Roof A has been designed in accordance with the following guides and standards:

- RIS-7702-INS Lighting at Stations
- RIS-7016-INS Interface between Station Platforms, Track, Trains and Buffer Stops
- BS EN 12464 Part 2: Outdoor Lighting
- BS EN 5489-1:2011 Road and Public Amenity Lighting
- BS EN 5266-1: Emergency Lighting
- BS EN 1838: Lighting Applications - Emergency Lighting
- CIBSE SLL LG15 Transport Buildings (2017)
- ILP GN01 Guidance Note for Reduction of Obtrusive Light

## 4.13 ACCESSIBILITY & INCLUSIVITY

The new elements of design have been developed in accordance with Part M of the building regulations, BS 8300: 2009- Design of buildings and their approaches to meet the needs of disabled people, the Department for Transport (DfT) Design Standards / Code of Practice (COP) for Accessible Railway Stations (2015) and the Technical Specifications for Interoperability (TSI) for PRM's (Person's of Reduced Mobility).

**Circulation around the station and platforms**
The new lifts are sized to Network Rail's standard 16 person lifts for wheelchair access, and designed as through lifts for ease of accessibility as explained in the footbridge section of the design statement. Lifts are provided to all platforms via the footbridge or the subway. The new stairs to the subway and the footbridge are designed for ambulant disabled use following the guidance stated within the above documentation.

**Horizontal circulation**
All obstacle-free routes, footbridges and subways will have a free width of a minimum of 160cm between handrails such as the stairs and width of the footbridge.

The first and last steps shall be indicated by a contrasting band and, as a minimum, tactile warning surface indicator shall be installed before the first descending step.

## 4.14 ACCESS AND MAINTENANCE

An Access & Maintenance Strategy is required for Huddersfield Station that not only provides safe access to areas above Overhead Line Equipment but also does not impact on the heritage value of the Grade I listed station elements.

## 4.15 SUSTAINABILITY

The Architectural design approach is to design upon an overarching sustainable strategy. We will provide creative and viable solutions that will introduce innovative and flexible ways for the station to operate in the future, driven by delivering value for operational and maintenance aspects of the station.

References have been made to current and emerging design standards and environmental assessment methods, ranging from familiar practices such as BREEAM, the Well Building Standard and biophilic design which focus on the impact of buildings on the human body and promotes high quality, healthy and inspiring internal environments for building users.

Network Rail has embraced a need to ensure it provides for a safer, more reliable railway, with greater capacity that contributes towards a low-carbon economy with better connections between people and jobs. Network Rail is one of the largest purchasers of energy in Great Britain and, as they continue their programme of electrification of the network, the requirement for more electricity will grow.

Network Rail recognises it has a responsibility to make a contribution to achieving government carbon reduction targets through a combination of energy efficiency and low carbon procurement strategies and this is set out in detail in the Network Rail Sustainable Development Strategy. This applies to both design of the track, associated infrastructure and stations.

The design seeks to maximise passive and active measures to achieve a sustainable design, for example, the availability of natural daylight in order to lower life cycle costs for the retained roof and the new roofs and canopies. Less energy consumption costs and maintenance costs for lighting result from intelligent passive design.

**Reduce energy demand**
As a starting point, the design aims to reduce demand and the design team will also continue to input into the design of the new station elements to ensure passive and active design principles are incorporated including:

Passive sustainable methods include:

- Platform canopies with open side façades facilitating natural cross ventilation.
- Façade optimisation including the provision of appropriate solar shading and solar control glass to limit the amount of solar thermal gain on the footbridge, reducing the need for mechanical cooling as well as controlling disability and discomfort glare to occupants.
- Rainwater recycling of the roof and canopies. There will be high usage for the station toilets, rain water can be used to flush the WC's in the station.

Active technologies in the design include:

- Use of low energy consumption light fittings including LEDS and efficient light distribution to minimise overall lighting energy.
- Integrated intelligent controls strategy relating to the ventilation of the Tea Rooms.
- Low water consumption design for new toilets and wash hand basins through the use of low flow fittings and intelligent control systems.
- Embodied energy addresses how sustainability should encompass the construction methodology, including the processes on site.
- Use of local materials, minimising embodied energy (including transportation)
- Demolitions should facilitate a strategy for recycling materials on site or other sites.
- Construction waste minimisation strategy – adopting core procedures that will reduce the amount of construction waste and waste to landfill including; prefabrication, modularisation, off site storage / delivery and waste take back schemes when looking at the procurement of the new roof, footbridge and canopy design.
- Any new paving to be permeable paving to aid the SuD's design.
- Inclusion of bicycle stores for sustainable travel.

**4.15.1 Sustainability assessment and assurance**
The sustainability performance of TRU is being assured and assessed using the CEEQUAL v6 infrastructure assessment methodology. CEEQUAL v6 offers the opportunity to innovate and challenge beyond what is considered 'business as usual' in terms of sustainability performance. The scheme gives the consistency, structure and built in assurance process required to drive sustainability objectives throughout the life-cycle of the programme, ultimately delivering a more sustainable railway. Implementing CEEQUAL v6 offers third party, globally recognised, certified assurance that provides lasting industry-wide improvement in the rail sector and beyond.

**4.15.2 Carbon reduction**
The Government has set a target to reduce carbon emission by 80% by 2050, compared to 1990 levels. Network Rail is committed to reducing energy consumption and carbon emissions across the rail network, as outlined in the Network Rail Energy and Carbon Policy. (https://safety.networkrail.co.uk/home-2/environment-and-sustainable-development/energy-and-carbon-management/energy-and-carbon-policy-and-strategy/)

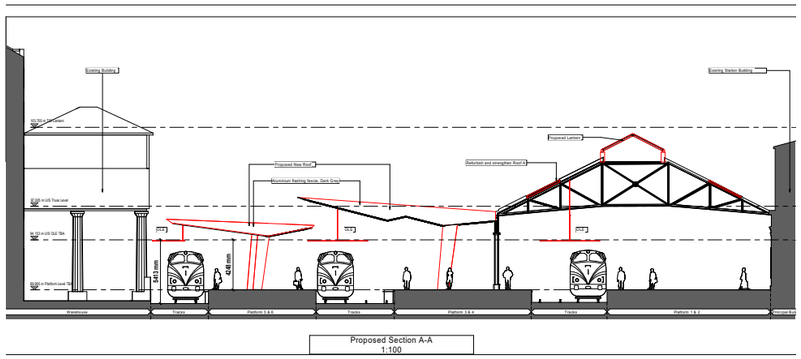
In order to achieve these objectives, the carbon reduction hierarchy (Build Nothing, Build, Less, Build Clever, Build Efficiently) outlined in the Publicly Available Specification PAS 2080:2016 (https://shop.bsigroup.com/ProductDetail?pid=000000000030323493) has been applied at key decision points throughout the option selection and development process.

## 4.16 REMOVE EXISTING STRUCTURES

**4.16.1 Removal of the services gantry**
The proposal includes the removal of the services gantry. This currently provides access to services between the main station platform and entrance and the opposite platforms. This is not part of the original scheme and will have been added to provide services intervening with the tracks.
The gantry is of detriment to the visual expanse of the station and will benefit being removed. Services will be connected underground.

**4.16.2 Removal of the signalling box building**
The signalling box building is not original to the railway station and was a later addition to provide more advanced and better access to the signals. Unfortunately this structure has blocked off a large portion of the visibility to the main station. The architecture is not in-keeping with the design intent and aesthetic and is proposed to be removed as part of the major works.  The removal of the signalling box will provide clear views from the main station building through to the opposite warehouse, which is reflective of the original design intent.

## 5.0 PROPOSALS

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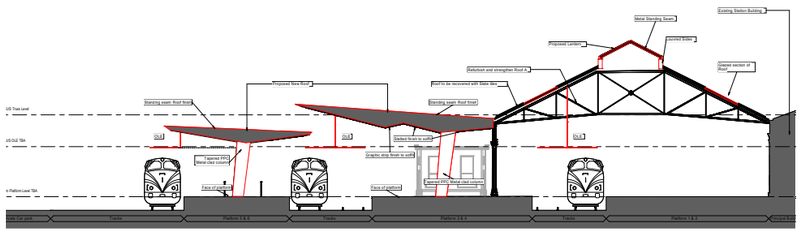
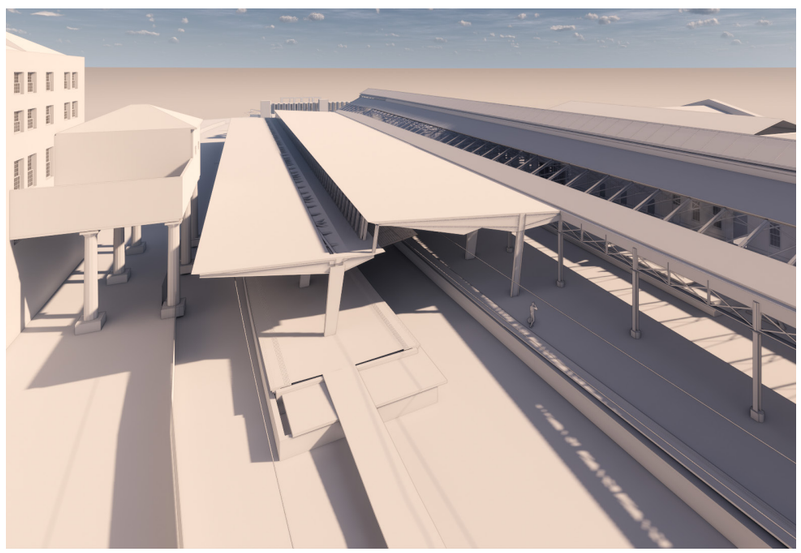
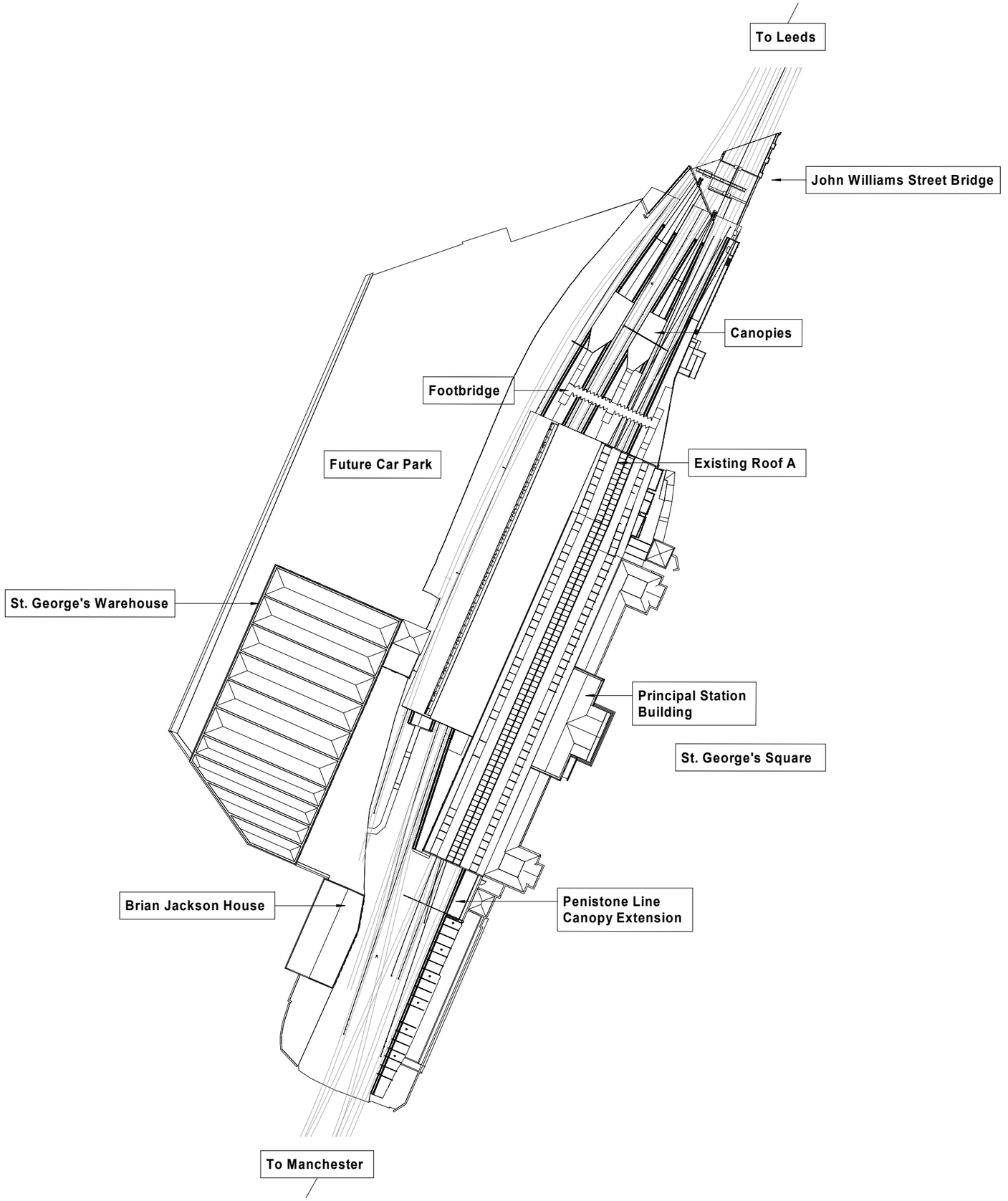




## 5.1 RETAINED ROOF A

### 5.1.1 Specific drivers

Roof A is part of the Grade I Listed Huddersfield Station and substantially contributes to its historic significance. It is one of the last surviving examples of a Euston truss roof on the railway network today. Through recognition in the Statement of Significance this has led to the retention of the structure, which will be strengthened and refurbished to meet modern standards with new roof covering and as much of the existing structure maintained.

### 5.1.2 Relocated bays

Due to the new track and platform alignment/extension, 2 bays (18m approx.) of Roof A will need to be removed at the Manchester end of the station. To rebalance the symmetry of the roof and to continue to provide adequate coverage for the new train stopping locations, 3 bays (27m approx.) are to be reintroduced at the Leeds end of the station.

The two bays of structure removed from the Manchester end cannot be reused at the Leeds end, as the span differs.

The Leeds end extension will be tapered in line with the last retained bay and will follow the path of the original 2 roof bays which were removed in the 1980s.

### 5.1.3 Lantern

The original design of Roof A included a lantern that sat atop the roof which would have acted as an exhaust to encourage the ventilation of the space below. It also would have provided continuous shelter from inclement weather. This was removed leaving a large opening along the length of the trainshed for much of its recent history. It is believed to have been removed sometime between the 1940s and 1950s and, as such, has remained in its present state for at least 70 years. There was a proposal put forward in the 1980s to reinstate a lantern but covered in corrugated polyester, but this was never completed.

As part of the refurbishment, it has been agreed there is an opportunity to reinstate this which will provide increased platform coverage from the elements, therefore improving passenger comfort and maintaining historic fabric.

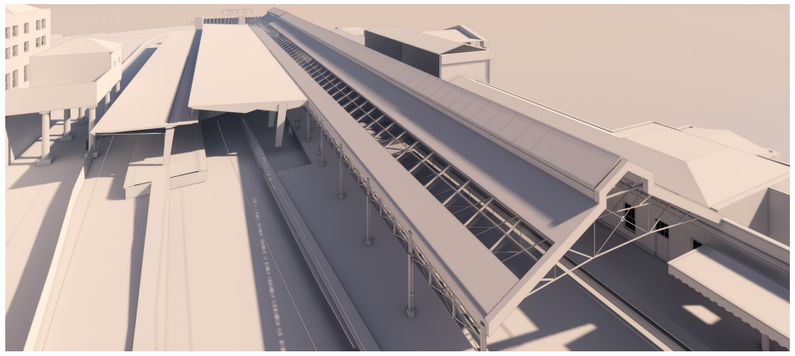


**Figure 5.1.3a: Roof A aerial veiw**

Different roof coverage approaches were explored from fully glazed to solid. These were reviewed with the following in mind:

- Historic narrative
- Daylight requirements
- Visual aesthetic
- Management and maintenance

A study was completed on the history of the roof with further research completed on the original design intentions of Roof A. It is still unknown as to why the lantern was removed but we reflected on the fact that the roof has been missing for longer than it was a part of Roof A and therefore it was important to find a way to celebrate all of the building's history.

Following an historic assessment which confirmed there was originally a lantern and it was glazed, a daylight study was completed to determine whether, for operational purposes, a replacement structure would also need to be glazed. An assessment was completed for lighting at different times of the day. It was determined  there would be little advantage to the overall daylighting within the space if the lantern was glazed instead of solid.

Visually the key design criterion was to ensure the lantern was reinstated and pitched. The ethos of the design process is to conserve the historic fabric and, where new intervention is required, that it is sensitive and in-keeping to the historic fabric, but also find a balance of honesty and complementary design. This led to considering something that created a balance of both.

The lantern will be situated above live OLE wires. This means that the OLE would need to be shut down if glass panels were to break and require replacement: a highly onerous condition for the operation of the railway.

For these reasons it is proposed that the new lantern roof would be finished in modern standing seam sheeting. The seams of the roof finish would mimic the glazing bars of the earlier patent glazing, and would match the finish of the other new roof elements proposed for the station (see subsequent sections). Maintenance for an opaque roof would require significantly less frequent maintenance than a glazed version.

At the gable ends the lantern will be open, which will reflect the same appearance as the lantern which will be removed as part of the original Roof B demolition.

Train diesel fumes will need to be ventilated from the roof space. This will be achieved by providing a sufficient area of fixed louvres in the short side walls of the lantern.

### 5.1.4 Materials

The roof will be re-clad with a mix of traditional and modern materials. The main roof covering will be slate as the original. There is a structural reason for this in that the additional load applied to the structure by the slates will combat any wind uplift.

The soffit of the recovered roof will be timber boarding running in parallel to the tracks in reference to the original cladding, drawing your eye along the roof helping to appreciate its expanse.

The covering for the lantern will be standing seam with metal louvres in a colour to match the slate.

The soffit of the retained Roof A shall consist of horizontally-laid sarking boards.

### 5.1.5 Colours

The colour selected for this will be a cream colour that will help create a warmer space which will serve as a light backdrop for the structural elements of the retained roof trusses.

The soffit for the lantern will be a metal slatted material with closed joints which will be a modern interpretation of the original boarding. This will also be the warm cream colour.

The transverse & longitudinal trusses, and the columns supporting them, will be painted in a grey tone that will make them stand out and be celebrated against the cream soffit.

### 5.1.6 Lighting

Retained Roof A provides the mounting framework for the luminaires required to illuminate the platforms below.

The existing lighting scheme shown in Fig.5.1.6a comprises a combination of suspended and wall-mounted luminaires to illuminate the platform. The luminaires distribute light onto the platform in a downward direction only without any upward illumination. By only having a downward distribution of light, the lit effect results in an oppressive, flat environment that also provides minimal enhancement to the highly decorative architectural elements of the roof. The downward illumination exaggerates the contrast between the light source and the dark roof and increases the perception of glare.

The existing lighting scheme and luminaire positions were modelled in lighting software alongside the proposed platform rearrangement. It was concluded that the existing luminaire positions are inadequate for safe illumination of the platform edge.

The lighting scheme was installed circa 1990s (Fig.5.1.6b), therefore the luminaires are at the end of their lifetime and hold no heritage significance.

Lighting options were explored to achieve the design objectives whilst considering the key viewpoints and user journeys around the platform. These options are listed below:

1. Suspended, decorative luminaires
2. Continuous linear luminaires positioned below the trusses
3. Discrete luminaires with strategically-placed light

**Figure 5.1.6a: Retained Roof A existing lighting scheme**

**Figure 5.1.6b: Retained Roof A lighting scheme in 1990s**

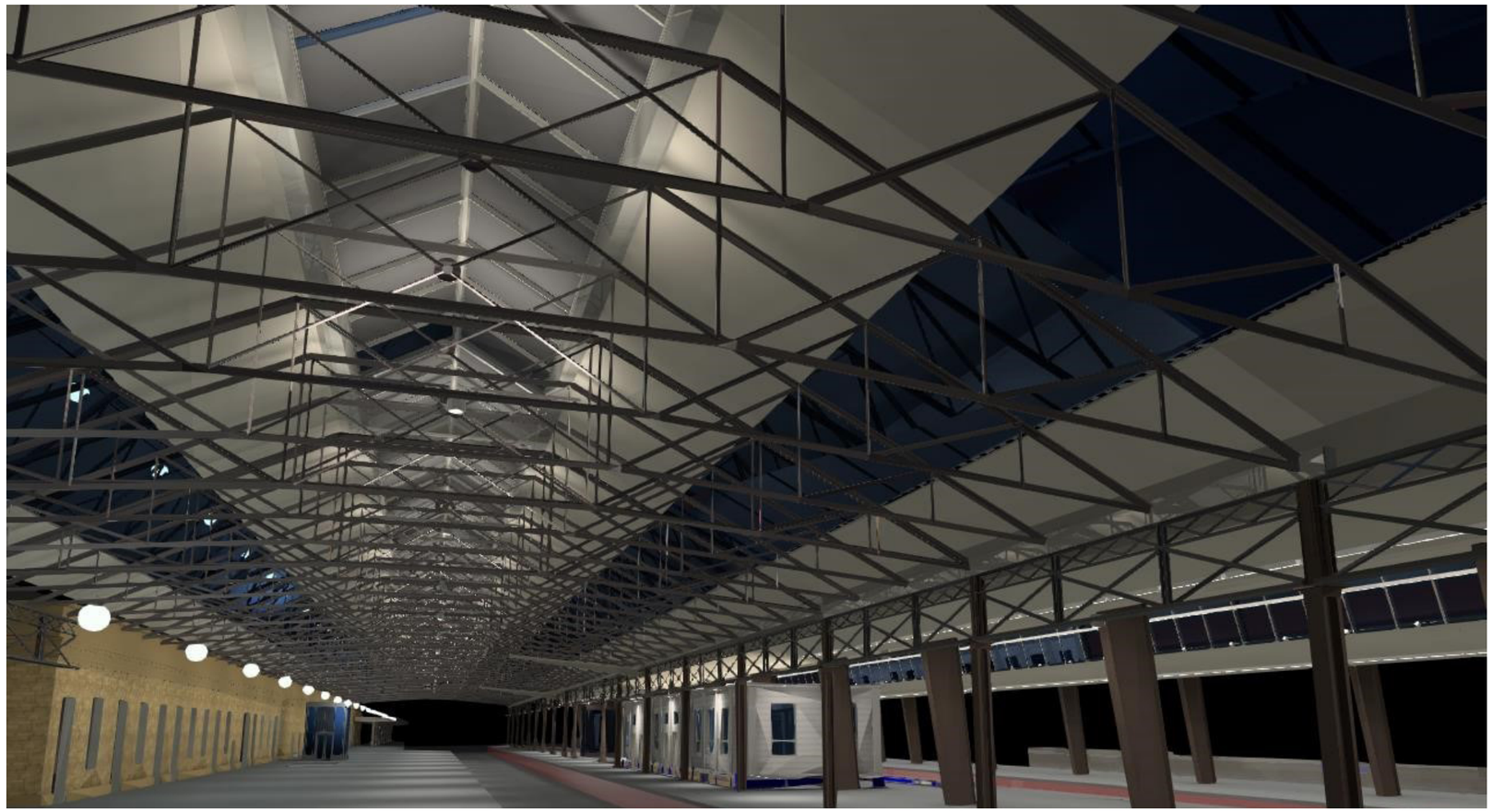


**Figure 5.1.6c: Proposed lighting scheme**

The preferred solution was a combination of option 1 and 3 as shown in Fig.5.1.6c. The discrete solution minimises the visual clutter within the space whilst illuminating key elements and surfaces.
The lighting scheme will comprise the following elements:

- Discrete downlights surface-mounted to the underside of the trusses to provide safe illumination at platform level. The downlights will be positioned in two rows; one row on the widest section of the platform closest to the station building and one row on the Tea Room platform.
- A row of suspended, decorative pendants will be mounted on the platform closest to the station building. These luminaires will provide safe illumination at platform level and will also distribute light into the roof void to create a welcoming, low contrast environment.
- A discrete, linear luminaire will be positioned on the topside of the trusses to illuminate the architecture and structure of Retained Roof A. The uplight element will provide a visually comfortable environment by minimising the contrast between light and dark in the evening.

### 5.1.7 OLE

Two cantilever frames per track from the UKMS design range will be used to support the OLE wires at each OLE support location through Platforms 2 & 3. There are four OLE support locations under the main trainshed. The cantilever frames will be supported on vertical drop tubes suspended from the existing roof. A minimum of 3.5m electrical clearance measured from the platform standing surface to the OLE will be achieved in accordance with GL/RT1210.

### 5.1.8 Maintenance access

The eastern section of Roof A will be accessed in the same manner as it is now. Access is provided through the Principal Building onto a walkway at the interface between Roof A and the Principal Building façade or parapet. This access and walkway will be replaced and upgraded.

The walkway will stop short of the Leeds end of Roof A in order to minimise its visual impact; this section will be accessed from below via a mobile platform.

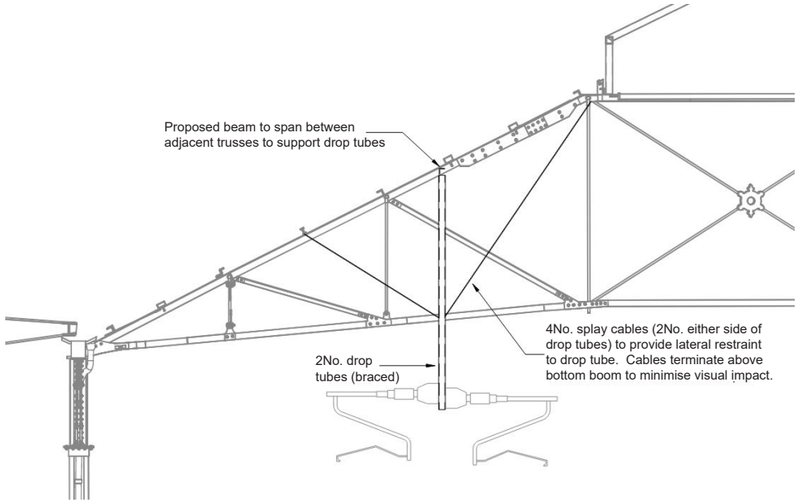



**Figure 5.1.7a: Proposed OLE installation**

Permanent stepped access will be provided on both sides of Roof A, allowing safe access up to the new lantern. A continuous rail will be positioned at the highest point of the roof slope on each side, onto which maintenance operatives may fasten a small rolling trolley. By attaching fixed-length lanyards to this trolley they may walk safely along the roof to maintain the lantern louvres and abseil down the roof slope to reach the glass rooflights. The rail will stop 2500mm from the end of Roof A to prevent operatives from falling over the roof edge.

Access to the western side of the roof will be via a permanent access ladder which will pop up from one of the back of house spaces in the Tea Room up onto Roof B. From here there will be a permanent stepped access again up to a rail that will run the length of the lantern for access to the louvres. There will be a walkway on the standing seam with a man-safe system that will allow access to the valley gutter between roof A and B and the glazing on Roof A. Where Roof B finishes, access will be from a mobile platform along Platform 3/4 at the Manchester end.

The access and maintenance is indicative at this stage and would be subject of a condition attached to the grant of consent.

### 5.1.9 Structural considerations

The existing trainshed roof trusses are formed from a series of tees, flats, bars compound I-section connected with rivets, bolts and wedge details. The roof has undergone a number of structural interventions throughout its history including the removal of the original lantern and strengthening works in the 1980's and again in 2013.

A number of further interventions are required as part of this scheme. This section summarises the structural design for each of these.

#### *5.1.9.1 Design approach*

The principles followed in the development of the structural design are as follows:

- Conservation to be the first assumption
- If conservation is not possible in place, then repairs and strengthening works will be applied
- Repairs are not to replicate the effects of ageing
- Modern elements are to be expressed as modern

Following the conclusion of GRIP3, a number of surveys have been undertaken to develop a detailed understanding of the geometry, condition and material properties of the structure.

The results of tests on the material composition concluded that the original roof is formed from early poor-quality mild steel. The only exception to this are the two cast-iron columns adjacent to the subway on the existing island platform.

The dimensional survey results were incorporated into structural design models of the roof. The behaviour of the roof has been considered under a range of load conditions including roof finishes, access, wind, snow, and the reinstatement of the lantern.

Adjusting the load allowance for roof finishes gave scope to influence the behaviour of the roof. By increasing the roof finishes, design issues associated with wind uplift has been minimised.

*5.1.9.2 Strengthening works*
The results of the design models showed that a number of elements across the length of Roof A require strengthening for the roof to be safely retained.

The proposed strengthening details typically involve bolting additional mild steel plates to the existing sections to increase capacity. This approach minimises the visual impact of the works and follows similar approaches taken for previous interventions.

The diagonal elements on Fig.5.1.9.2a are to be strengthened across the entire length of the roof. Flat plates will be bolted to either side of the web and to the top of the flange of the tee section in order to achieve the required capacity.

The first 6No. retained trusses at the Manchester end of the roof are subject to wind uplift. The effects of the wind uplift have been minimised through the use of roof finishes, however, given the slender nature of the bottom boom, this causes a buckling issue in the current condition. As well as strengthening the central section by bolting flat plates to either side, plan bracing will be provided between the first two trusses with ties provided to the subsequent four. This is required to limit the effective length of the bottom boom. Where the Principal Building projects above the eaves of the roof, snow drifting causes the top boom adjacent to the building to become over-utilised. In this location it is not possible to attach flat plates to the existing elements to achieve the required strength due to roof coverings. In this instance angle sections will be bolted to the section to create an I-section.

*5.1.9.3 Lantern reinstatement*
The lantern structure will be formed as a portal frame from mild steel sections following the proposed profile. The frames, spanning the existing opening to the centre of Roof A, will be located on each truss line.

Eaves and ridge beams will span between each frame to tie them together.

The structure will be stabilised in the longitudinal direction by bracing to the end bays at either end. The bracing will be formed from steel bars.

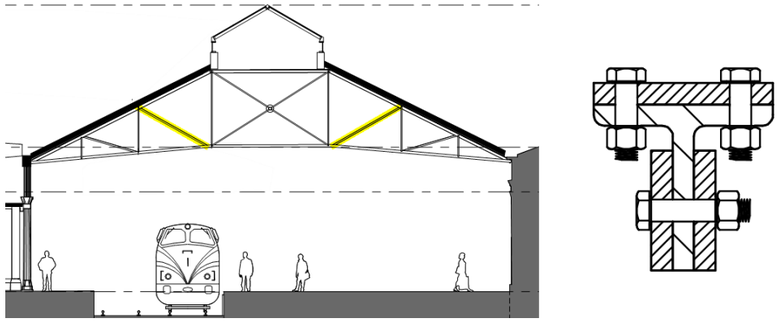


**Figure 5.1.9.2a: Strengthening detail to diagonal elements**

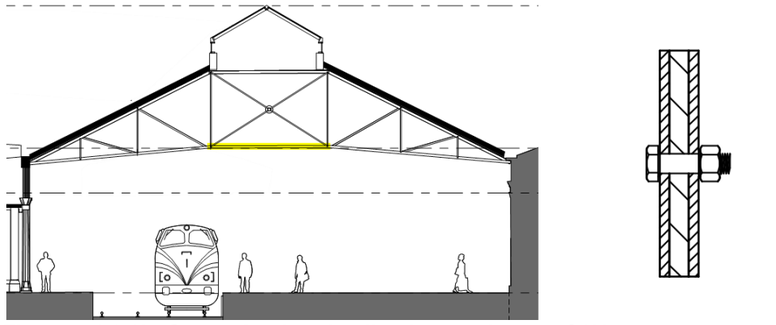


**Figure 5.1.9.2b: Strengthening detail to bottom boom of 6No. trusses at Manchester end of Roof A**

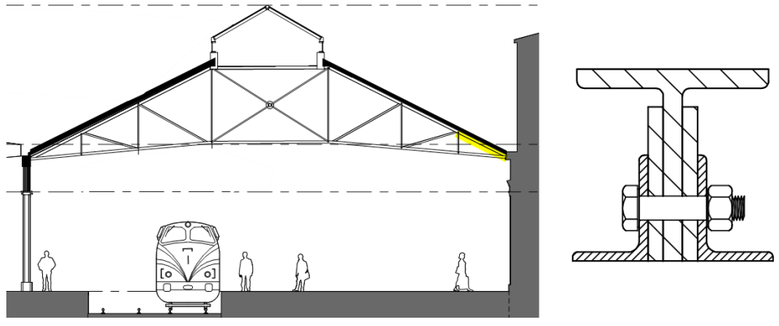


**Figure 5.1.9.2c: Strengthening detail to top boom**

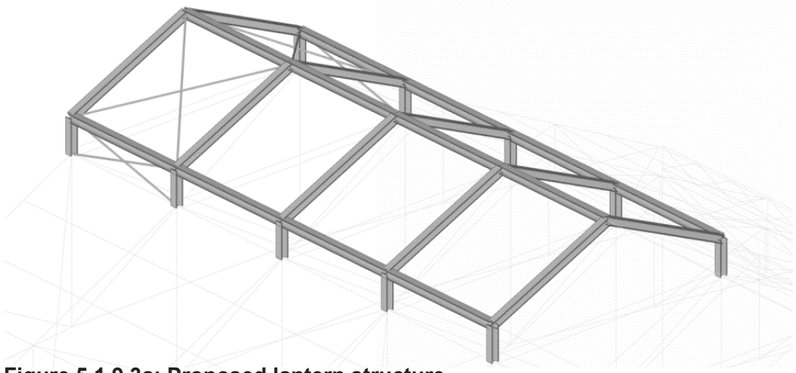


**Figure 5.1.9.3a: Proposed lantern structure**

*5.1.9.4 OLE support structure*
OLE is to be supported at up to four locations within the existing roof. The support structure will be formed of vertical drop tubes with restraining cables splayed to limit movements to within satisfactory limits for the operation of the OLE. The structure will be supported from beams spanning between the top booms of the existing trainshed roof.

*5.1.9.5 Removal of Roofs B & C*
To facilitate the proposed P-way to the west of the station, the existing Roofs B & C are to be removed. A full historic recording of Roofs B & C will be carried out prior to demolition. The design of Roof A considered the impact of this loss of structure. It was concluded that Roofs B & C provide no lateral stability to the retained Roof A and, as such, it is structurally acceptable for them to be removed.

The Contractor will be required to approach the demolition of Roof B & C with caution to ensure that no damage is caused to the retained roof, particularly when working on the shared column line between Roof A and Roof B.

## 5.2 NEW ROOF

### 5.2.1 Specific design drivers

The main drivers for the location, scale and form of the new roof are outlined in section 3.0. More specific design drivers include the following:

- to respect and celebrate the geometry of the adjacent Victorian structure;
- to provide a high-quality, bespoke architectural environment befitting the Grade I station;
- to provide suitable shelter from adverse weather, given that the prevailing wind will blow into the open western side of the station.

In order to better understand the last of these drivers, a microclimate study has been carried out to establish the effects of wind and wind-blown rain on a range of proposed roof forms. The results of this study pushed the design towards a closed roof form spanning between the new platforms 4 and 5.

### 5.2.2 Proposed form

The proposed roof form consists of two large ‘blades’, both straight and parallel on plan. The form of the blades has been drawn from the geometrical cues outlined in section 4.7. They are designed to be complementary to, and respectful, of the Victorian structure: for this reason they decrease in span, height and angle of inclination as they move away from it.

The blades are linked with a continuous glazed clerestory. This has been designed to allow the structure to span over the tracks while allowing clear views through to the large warehouse behind the station. Linking the two blades in this way will mitigate the effects of adverse weather as far as possible. It will also protect the Tea Rooms.

The soffit of the larger blade has been facetted to break up a large clear expanse of ceiling cladding. This will provide visual interest and an additional geometrical link back to the adjacent Roof A. Recessed shadow-gap joints in the cladding align with the Roof A trusses.

The columns supporting the new roof on platform 4 are arranged in a straight line, aligned with those of Roof A. The columns on the new island platform (platforms 5 and 6) are arranged on a curve, matching the curve of the platform itself. The interplay between straight and curved lines generates a second sophisticated soffit form above the island platform.

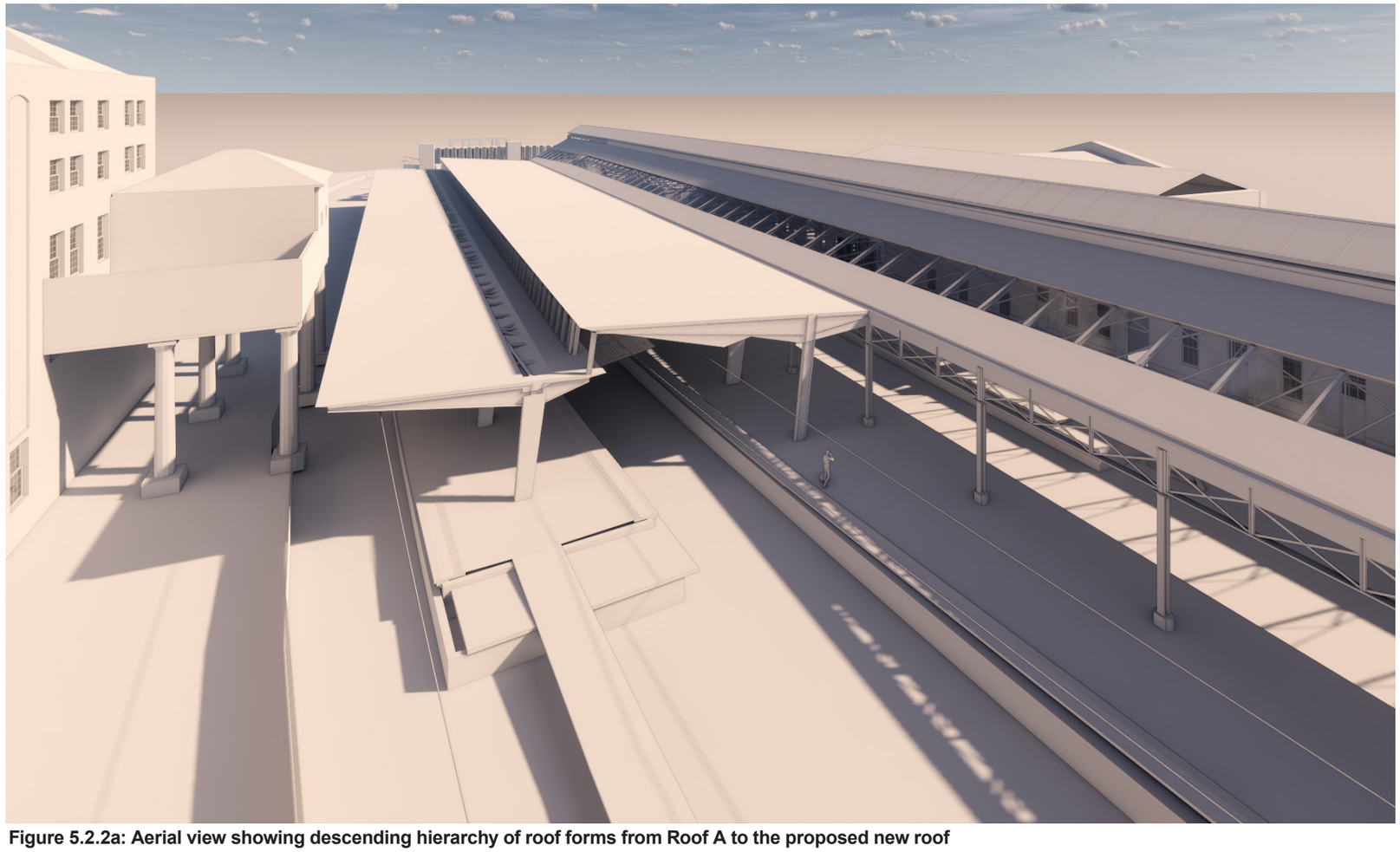


**Figure 5.2.2a: Aerial view showing descending hierarchy of roof forms from Roof A to the proposed new roof**

### 5.2.3 Materials

Through our study of Roof A we have determined a colour and tonal scheme that will best complement and express the Euston Truss and trainshed volume.

The columns will be encased in a coloured grey metal cladding so they tie in with the roof A structure.

The soffit will be clad in a white metal slatted panel with open joints which will make a visual reference to the Roof A soffit but will also help with acoustic reverberation in the space. These will run in parallel with the tracks but a larger joint adjacent to this will be expressed to emphasise the structural grid that relates back to Roof A.

Finally, the gable ends will be clad with a metal soffit panel of a slightly darker grey composition that will emphasise the roof plane and tie into the slate material and standing seam of the other roof.

The roof covering for the new roof will be a standing seam, coloured to match the existing.

### 5.2.4 Colours

To make the New Roof relate further to the original, we have kept the essence of the Roof A colour scheme and evolved it, thus further representing another progression in the ongoing story at Huddersfield Station.

### 5.2.5 Artwork

It is proposed that one of the faceted soffit planes above platform 4 is filled with a large-scale site-specific artwork running the length of the platform. This would be printed onto metal cladding panels.

This colourful plane is intended to break up the large blank expanse of the roof soffit. It would accentuate the cranked form of the roof, and add visual interest and a high-quality bespoke element to the platform environment. It is anticipated that the final design could be subject to a separate competition.

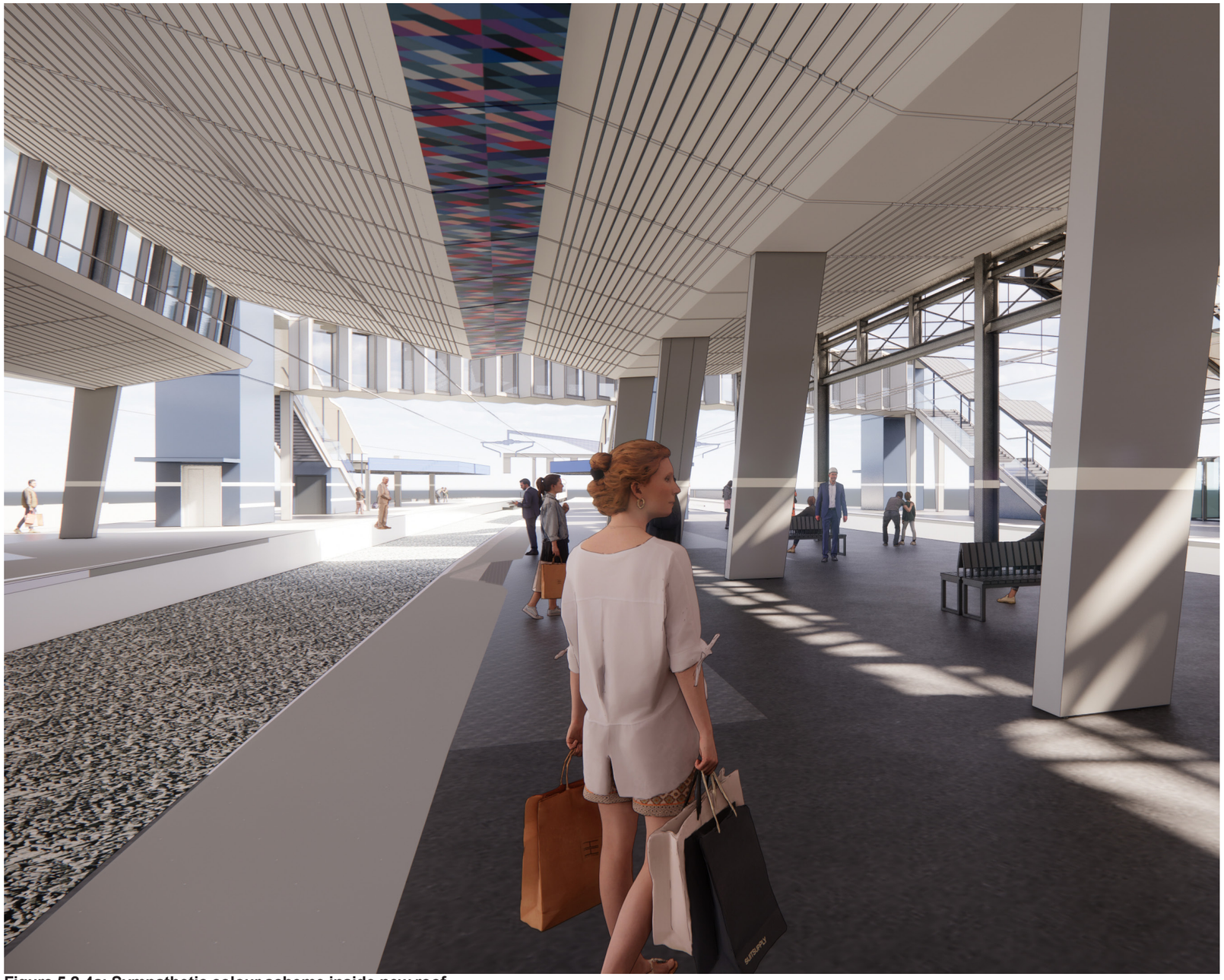


**Figure 5.2.4a: Sympathetic colour scheme inside new roof**

### 5.2.6 Lighting

Lighting options were explored to achieve the design objectives whilst considering the key viewpoints and journeys around the platform and coordination with the lighting scheme in Retained Roof A.

These options are listed below:

1. Discrete lighting solution with surface-mounted downlights
2. Suspended, decorative luminaires
3. Continuous linear luminaires
4. Illumination of the structural columns
5. Uplight of the roof soffit

The preferred solution was a combination of option 3 and 5 and this is shown in Fig.5.2.5a. The continuous linear luminaires will accentuate the architectural form and the angular nature of the roof. The uplighting element will highlight the roof and harmonise with the lighting treatment in Retained Roof A.

The lighting scheme will comprise the following elements:

- Continuous linear luminaires running parallel to the platform lengths to provide safe illumination levels at platform level. The linear luminaires assist with providing a uniform distribution of light and are an effective method for assisting with navigation around the station.
- Concealed luminaires will be positioned along a channel at high level and provide a gentle wash of light across the roof. Illumination of the roof surface will ensure a visually comfortable environment by minimising the contrast.

### 5.2.7 OLE

The OLE will be situated at several locations along the span of the new Roof B. This will be fixed back to the roof structure and the drop rods will be coordinated so that they fit seamlessly into the new soffit cladding.

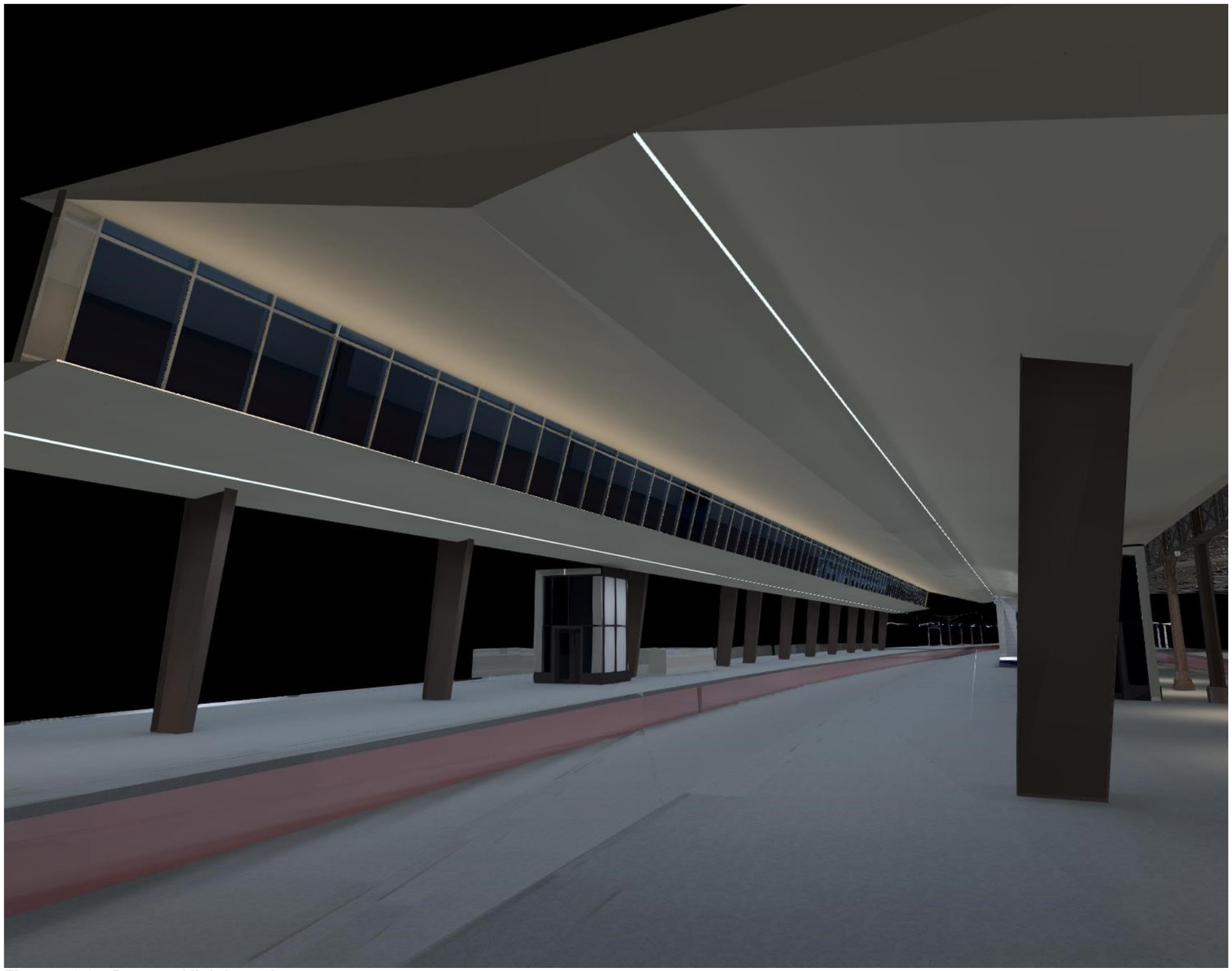


**Figure 5.2.6a: Proposed lighting scheme**

### 5.2.8 Maintenance access

Roof B will also be access through the permanent ladder through the Tea Room. As mentioned previously there is a permanent walkway clipped to the standing seam that will provide access to the valley gutter. The top section of Roof B is only 4° so most this roof can be accessed using a clip in fall arrest system and we only use walkways to traverse the standing seam to avoid any trip hazard.

There will be a man-safe wire that leads to a permanent set of steps that will provide access to the lower section of Roof B that is 3° in pitch so again access is only by fall arrest system. There will be a secondary point of access from Platform 5/6 up into the lower section to Roof B through a platform store.

The access and maintenance is indicative at this stage and would be subject of a condition attached to the grant of consent.

### 5.2.9 Structural considerations

The structural framing of the new roof has been designed to follow the envelope of the architectural design set out above. The new roof will support the loads applied including snow, wind and OLE.

The design adopts a repetitive structure as far as reasonably possible in order to provide a cost-effective design for fabrication and speed of installation. The roof has been designed so that the majority of the structure can be fabricated off-site, minimising the on-site construction time.

Columns are standard sizes but are inclined and clad to create a tapered profile to the architectural intent. They are typically spaced at c.9m to match the existing structural column grid of the retained trainshed roof. The spacing changes to c.12m centres local to the subway and lifts shafts. This is to ensure that clear access is maintained to the stairs and lifts and the subway is not overloaded. To enable this column spacing, the new roof above the stairs is supported by a pair of columns, rather than a single column, supported off the walls on either side of the stairs.

The roof is typically formed with fabricated sections to suit the architectural envelope.

At column lines, they form a portal frame which steps in section at the clerestory line (shown in Fig.5.2.8b) between platforms. The vertical element of the frame through the clerestory is minimised to limit the visual impact of the structure whilst maintaining stability.

At intermediate locations, the sections cantilever from trusses spanning along the platforms between columns. The sections taper in profile away from their supports to meet the architectural intent. The tip of the cantilevers from Platform 3/4 are propped off the back-span cantilevers on Platform 5/6. The props, along with horizontal beams between the cantilevers, form Vierendeel trusses on the clerestory line. This provides additional stiffness to the structure whilst avoiding bracing which would obstruct views.

Secondary framing will be placed within the depth of the structure to support the roof finishes and cladding. The final profile of the roof will be expressed through the finishes and cladding.

Based on the initial ground desk study and an assessment of the loads, it is envisaged that the roof will be founded on piles.

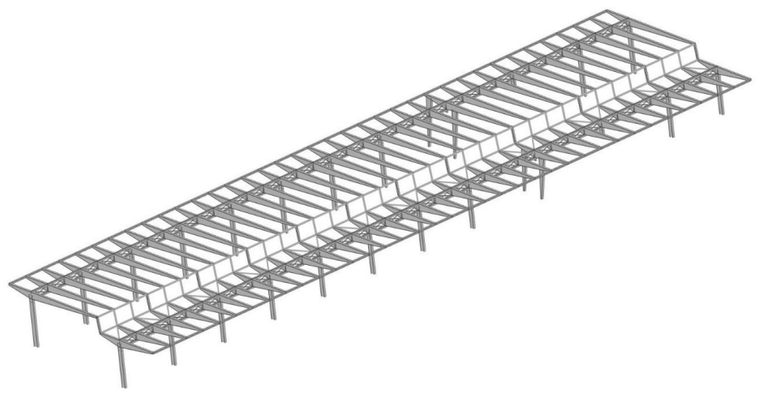


**Figure 5.2.9a: Structural framing of the new roof (view from the North-West)**

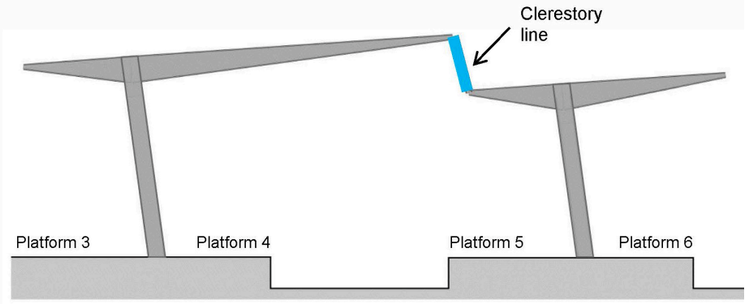



**Figure 5.2.9b: Sectional view of the new roof at a column line**

## 5.3 FOOTBRIDGE

### 5.3.1 Specific design drivers

Network Rail standards dictate the geometry of the footbridge to a large degree. These include minimum distances from platform edges, minimum heights above OLE wires, minimum balustrade dimensions above OLE wires, etc.

The materials of the footbridge must all be easily maintainable without disabling the OLE system. This has important implications for glazing, for example, which cannot easily be cleaned unless it is accessed from the floor deck of the bridge itself without having reach beyond it.

To enable a safe and comfortable passenger experience throughout the station, continuous shelter should be provided from Roof A to the new platform canopies. This means that the footbridge will require a roof.

Given its large size and prominent location close to Roof A, the bridge should be as transparent as possible: both to limit its visual mass and to allow impressive views towards the retained roof structure at close quarters.

Balustrades on open-sided bridges are required to be opaque to a height of 1800mm above OLE wires.

A glass-sided bridge must be designed to minimise reflected glare.

This is particularly important on the south facing side of the bridge, where the bridge may reflect the sun into the eyes of train drivers in the station below.

As a fully-accessible route through the station, the footbridge must include elevator access for people with reduced mobility, preferably using through-lifts to avoid having to rotate within the elevator cars. Lifts should also be given equal visual prominence to the stepped access.

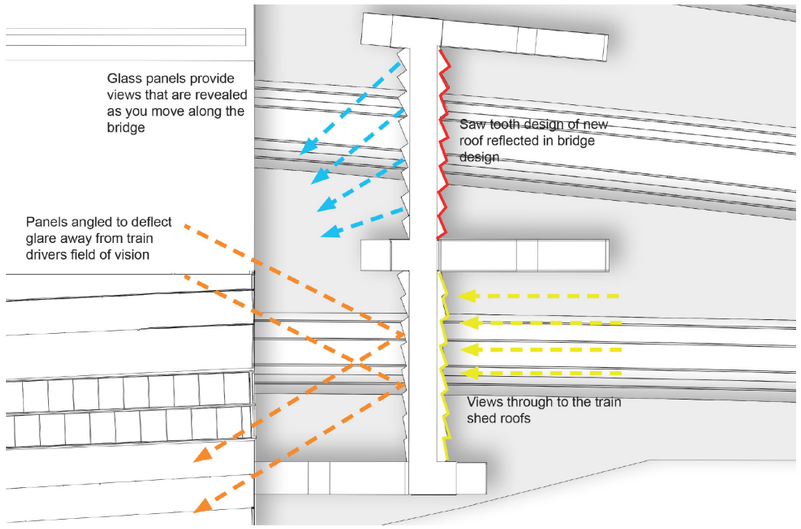



**Figure 5.3.1a: Proposed footbridge design drivers**

### 5.3.2 Proposed form

The proposed bridge features full-height glass panels on both sides, minimising its visual impact. A unique sawtooth form has been developed in order to complement the facetted forms of the new roof structures. This arrangement has been optimised to the site's geometry, using sun-path analysis to minimise the extent of glare reflected towards the tracks.

Fig.5.3.2a shows the glare study of the footbridge from the driver's perspective. The rainbow colours indicate when sunlight is shining into the driver's eye; black indicates no glare.

Fig.5.3.2b shows the glare study of the footbridge with reflected sun-paths (in red) at different times of the day, superimposed for multiple times in a year. Each image shows a plan view of the platforms and tracks beneath Roof A at the Leeds end. The five top images show the analysis for a bridge with flat glass walls; the bottom set illustrates the same situation with a sawtooth design.

### 5.3.3 Accessibility and inclusivity

The proposed footbridge features staircases and through-lifts on each platform. The staircase on Platform 2 has been positioned to run below the gable of Roof A. All routes are covered to allow a continuous sheltered walkway. Restrictions due to narrow platforms mean that it is not possible to position lifts and staircases side-by-side with equal visual prominence from both angles of approach.

### 5.3.4 Materials

The roof of the bridge will be a standing seam on the stair that will tie in to the new elements of the lantern and Roof B. The bridge span will be a mix of laminated glass and metal cladding that will need to be matte in texture and colour so as not to create any new glare issues. The lift cores and undercroft areas will be clad in a hard-wearing vitreous enamel.

### 5.3.5 Colours

For the colour scheme, we will be relating back to the colour schemes determined for Roof A, B, the Penistone Line and Platform Canopies. We will be using the same grey as the Roof A and B structure to articulate the bridge structure, the bridge span will be a similar grey which will emphasise the horizontal element while the lift shafts will be a subtle shade of blue which will include feature banding that will break up the façade. The blue will relate back to the blue elements of the Penistone Line and Platform Canopies.

### 5.3.6 Artwork

It is proposed that the underside of the bridge features a large-scale site-specific artwork to accompany the similar strip under the new shed roof. As with that strip it would be printed onto metal panels and add colour, detail and a bespoke contemporary edge to views through the station.

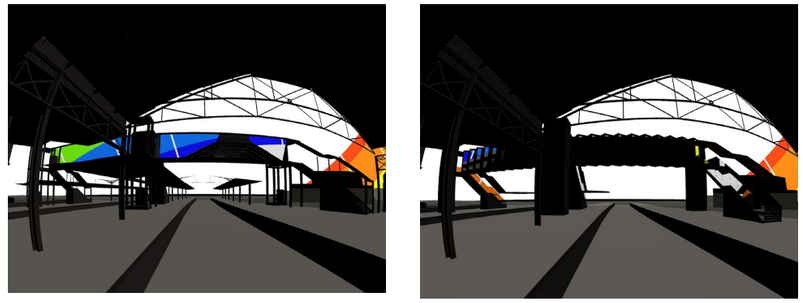


**Figure 5.3.2a: Glare study - flat glass (left) -v- sawtooth design (right)**

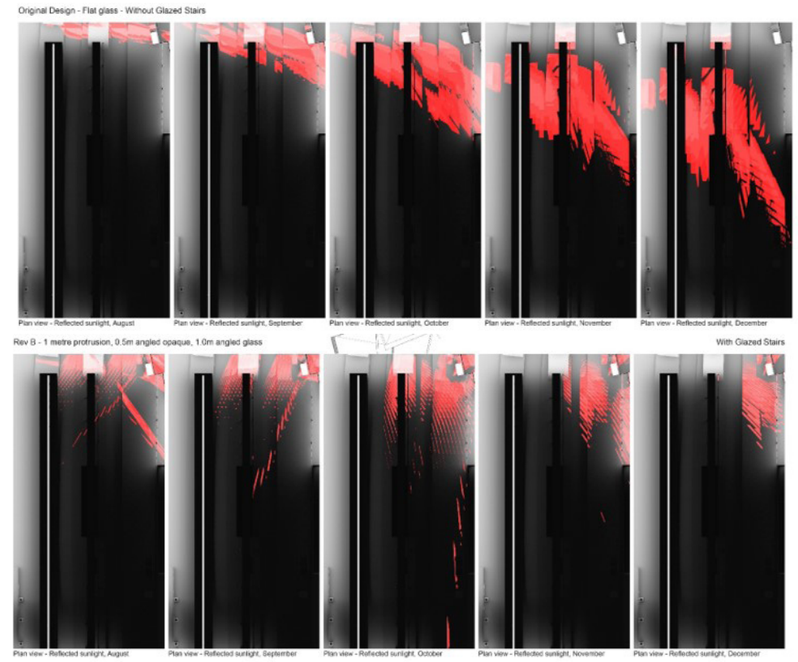



**Figure 5.3.2b: Sun path study - flat glass (top) -v- sawtooth design (bottom)**

### 5.3.7 Lighting

Lighting options were explored to achieve the design objectives required for the footbridge and adjoining stairways. These options are listed below:

1. Circular downlights
2. Linear luminaire variations
3. Wall-grazing in the vertical and horizontal orientation for the footbridge only
4. Handrail lighting for the stairways only

Option 4 was preferred for the stairways and option 2 within the footbridge and these are shown in Figs.5.3.6a and 5.3.6b.

The lighting scheme will comprise the following elements:

- Linear lighting integrated within the handrails to provide uniform illumination of the stair risers and treads to ensure safe transitions. Handrail lighting will be a discrete, robust way of achieving the lighting requirements whilst ensuring a comfortable, low glare solution.
- The angular architectural arrangement of the window reveals will be accentuated when travelling within the footbridge and from platform level by using linear luminaires connecting each window joint. Coordination of the luminaires with the architecture will provide the lighting requirements whilst also creating a unique experience for users. The option to incorporate carefully-selected coloured light within the luminaires will be explored.

### 5.3.8 OLE

It is not anticipated that the OLE will require attaching to the footbridge, it will be free-running.

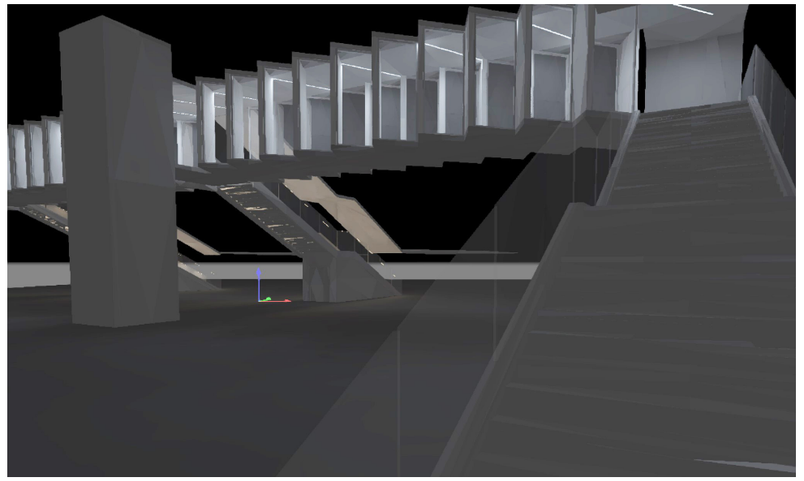


**Figure 5.3.7a: Lighting scheme from stairways**

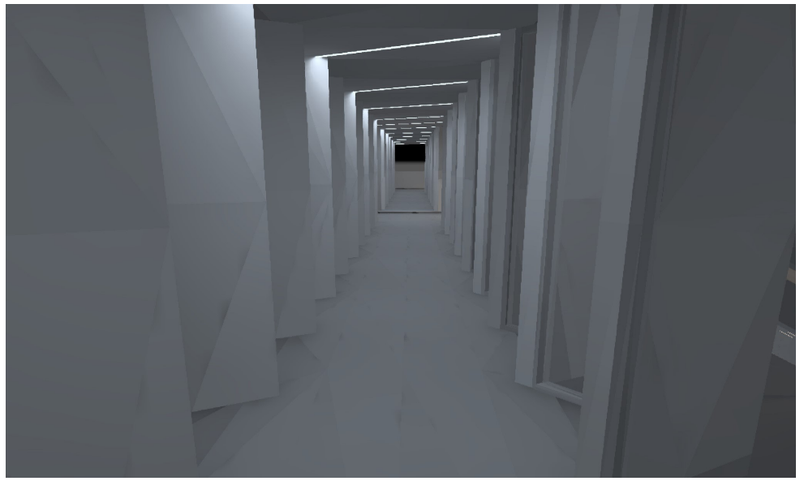


**Figure 5.3.7b: Proposed lighting scheme within footbridge**

### 5.3.9 Maintenance access

The footbridge roof will have access from a temporary ladder and access hatch at the top of the Platform 2 stair. Once on the roof there will be 2 fall arrest systems to clip in to simultaneously to prevent falling from the sides of the footbridge. Internally the glazing will pivot inwards and the operative will secure themselves to an anchor point at high level on the opposite side of the glazing to enable safe cleaning of the glazing internally.

The access and maintenance is indicative at this stage and would be subject of a condition attached to the grant of consent.

### 5.3.10 Structural considerations

The new footbridge consists of a steel frame supported off concrete foundations. The structural members are closed steel sections and provides an unrestricted walkway for passengers to access the platforms. To allow unobstructed views through the windows, the structural elements are all within the façade of the footbridge. The steel column supports are aligned with the staircase and lift shafts to maintain the clear platforms. The footbridge is accessed through via staircases with lift providing step free access.

The steel frame construction of the footbridge permits off site fabrication, with assembly and installation undertaken on site to reduce disruptions to the station operations.

## 5.4 PLATFORMS

### 5.4.1 Proposed form

Proposed platforms positions and lengths are driven by the track and signalling layouts, refer to section 4.1 for details. A usable platform length of 200m is mandated in the TRU head specification for through platforms at Huddersfield Station.

A clear distance of 3.3m is required from platform edge to any platform obstruction such as lift shafts, stairs, columns, seating, waiting areas, etc. This provides sufficient space for station staff to position a boarding ramp and turn a wheelchair at any point along the platforms.

A passenger refuge area is proposed at the Leeds end of Platforms 3-4 and 5-6 to provide a safe area for persons of reduced mobility in the event of a train fire. Fire escape routes are provided at the end of the remaining platforms.

### 5.4.2 Accessibility and inclusivity

The platforms have been designed to meet the requirements of BS 8300: Design of an accessible and inclusive built environment, The Department of Transport Design for Accessible Railways Stations and the relevant TSI for Persons with Reduced Mobility. The platforms provide an anti-slip surface with falls between 1:80 to 1:40. Tactile paving and visual platform warning markings are provided to demarcate platform edge. Platform lighting shall be provided as per the standards in section 5.2.5. Platforms shall be covered by CCTV with Help Points located on platforms.

#### *5.4.2.1 Obstacle free routes*

Obstacle free routes will be provided that interconnect the following public areas of the station:

- accessible entrances and exits
- information desks
- visual and audible information systems
- ticketing facilities
- customer assistance
- waiting areas
- toilet facilities
- platforms

Obstacle-free route floor surfaces and ground surfaces will have low reflecting properties to aid with visual contrast.

### 5.4.3 Facilities within the station

Disabled WC provision with wheelchair access is provided within the station itself on Platform 1, and new facilities are to be located on Platform 3 & 4. Baby changing facilities are currently provided on Platform 1, accessible to both men and women and this location will remain unchanged.

### 5.4.4 Signage

The entrances to the station are clearly signed from St George's Square. Wayfinding and directional signage to each platform will be clearly designed and provide intuitive and easy wayfinding. Emergency escape signs will be designed and specified to comply with the relevant signage guides in BS8300 and Railway Standards.

### 5.4.5 Materials

The existing platforms will have their existing asphalt finishes maintained. The platform riser walls will be pre-cast concrete and the new platform finish will also be asphalt.

There will be a feature band of existing sandstone paviours around the Tea Room and subway entrance on Platform 3 and 4.

**Figure 5.4.5a: Platform view from main entrance**

### 5.4.6 Furniture

Platform furniture and structure is to be located centrally on the platforms and include a 3.3m clearance from platform edge to allow for the placing of wheelchair threshold ramps to the train doors. This requirement has been driven by the Technical Specifications for Interoperability (TSI) for PRM's. Seating will be placed at 50m intervals to allow PRM's to rest at 50m intervals to meet the requirements of BS8300 and the Department for Transport (DfT) Design Standards / Code of Practice (COP) for Accessible Railway Stations (2015).

Any items of furniture to the new platforms and free-standing devices at stations shall contrast with their background and have rounded edges.

### 5.4.7 Structural considerations

The new platforms and extensions consist of L-shaped concrete riser walls with solid back fill to form the platforms surface. The riser walls shall support the pre-cast concrete coper, with a tactile paving behind the coper. The platform height to edge of the coper shall be 930mm from the rail and offset 730mm from the nearest rail. Provision of a recess beneath the platform edge is provided. The recess shall be 480mm high with a minimum width of 300mm from the rail level.

### 5.4.8 Drainage

*5.4.8.1 Existing station drainage*

The basis of the drainage system for the existing station is as old as the station itself and is shown in Fig,5.4.8.1a. The key features are two large stone culverts.

The first of these, referred to as the Station Culvert, originates at the tunnel portals to the south of the station and provides the main drainage outfall for these tunnels. It runs northwards along the side of the station building, the rear of Platform 1. It is located deep enough to pass under the pedestrian subway. It then crosses the car park to the north of the station and discharges into the sewer in John William Street. Along the way it collects most of the storm water from the existing station area. The trainshed roofs drain down rainwater pipes within their support columns, which are collected in platform storm water drainage systems. These generally flow to a central point of the station where a drain crosses under the railways to discharge into the Station Culvert. There are also drainage systems for the railways to the north and south of the trainshed, these too discharge into the Station Culvert. The eastern side of the trainshed roof is supported off the station building, there is a gutter along this edge of the station which collects roof water from the trainshed and station roof, discharging it into the Station Culvert. This culvert also collects storm water from the car park areas to the north of the station. There are no restrictions on the quantity or flow-rates of the storm water discharging from the existing station drainage system.

The other existing culvert is located to the north of the station and can be accessed from a grid in the retaining wall under John William Street Bridge. This is referred to as the John William Street Culvert, see Fig.5.4.8.1b. Its purpose is unknown and it appears to have been blocked off, it may have been part of a wider watercourse diversion prior to the construction of the station. It does not appear to carry storm water, but it probably acts as a land drainage outfall for the northern elevated part of the station which is surrounded by retaining walls.

The main foul drainage for the station building passes northwards along a cellar walkway under the rear of Platform 1, collecting internal station connections as it proceeds, see Fig.5.4.8.1c. There is a foul drain from Platforms 3&4 which carries discharge from the Tea Rooms and operational building, this passes under the railway to connect into the main foul drain. This too passes across the car park to the north of the station to discharge into the John William Street sewer.

*5.4.8.2 Proposed station drainage*

The proposal is to keep significant parts of the existing drainage system operating unaltered, but supplement these with all-new drainage systems to service the remodelled parts of the station. The proposed drainage scheme is shown in Fig.5.4.8.2a. For new drainage systems, there are stringent criteria governing the discharge of storm water to reduce the risk of flooding within Huddersfield. These criteria do not apply to existing unaltered drainage systems.

These criteria include the following:

- reduction in the storm water runoff peak flow rate to the surrounding sewers of 30%.
- within the drainage models, simulated storm rainfall intensities to be increased by 40% to allow for future climate change.
- this restriction requires storm water to be held within the station in a new attenuation tank with a flow control.
- the design will demonstrate compliance with these criteria for the storm return period of 1 in 100 years for the station as a whole and for 1 in 200 years for the specific railway infrastructure.

The existing culverts will remain largely unaltered. The Station Culvert will remain a storm water outfall for the station, although with reduced flows. New connections will be required to this culvert and the upstream end which passes under the railway will be diverted clear of the works. There are no works planned to the John William Street culvert.

For the southern half of the station area, the existing drainage principles will remain. Tunnel and railway track drainage systems will be provided, discharging into this culvert. The Platform 2 and canopy drainage will also discharge into it, along with the eastern side of the trainshed roof, part of the station building roof and the northern car park, as existing. However other existing flows will be removed to new drainage system, resulting in an overall reduction in discharge from this culvert to the John William Street sewer.

The station platforms and shed roofs are to be largely re-modelled, therefore a new drainage system will be required complying with the above criteria. Two options for the arrangement of this drainage system were assessed, either a new connection into the sewer in Fitzwilliam Street or a new connection back into the Station Culvert in the car park area. This assessment indicated cost and risk reduction with the former option. The proposed arrangement provides a drainage system within the new Platforms 3&4 and 5&6 which will collect storm water from the platforms, shed roof and new canopies. This will flow north to a cross-drain under the railway beyond the pedestrian bridge. A separate track drainage system will be provided, also flowing north to a similar cross-drain. These will both discharge into a new storm water attenuation tank, to be

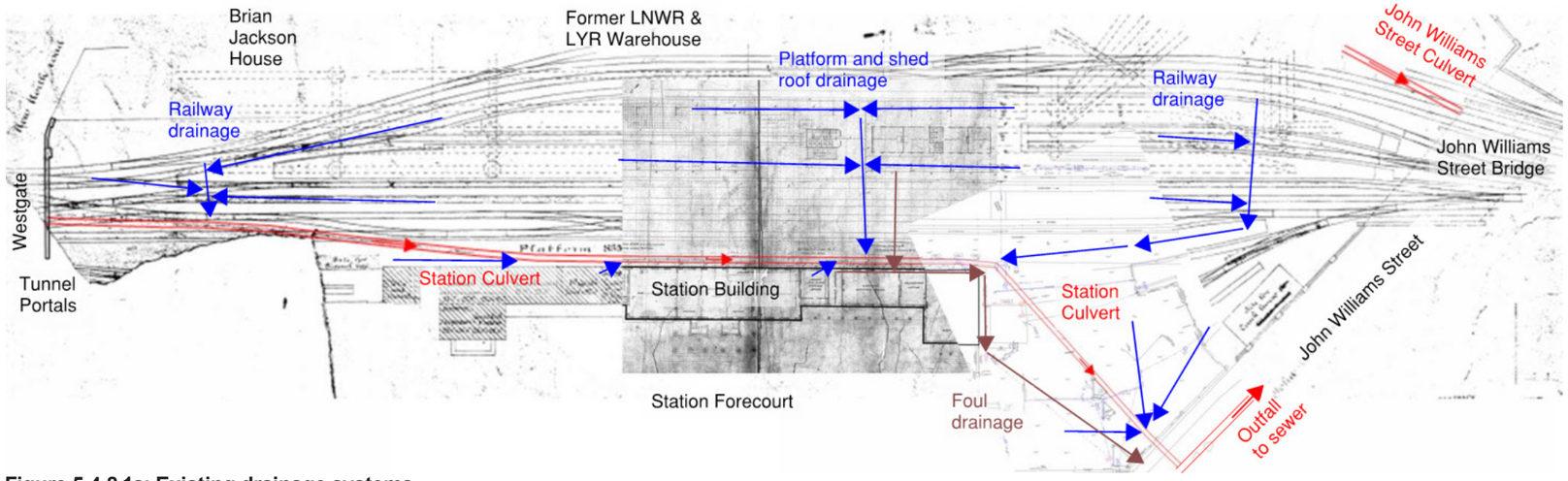



**Figure 5.4.8.1a: Existing drainage systems**

**Figure 5.4.8.1b: John William Street culvert**

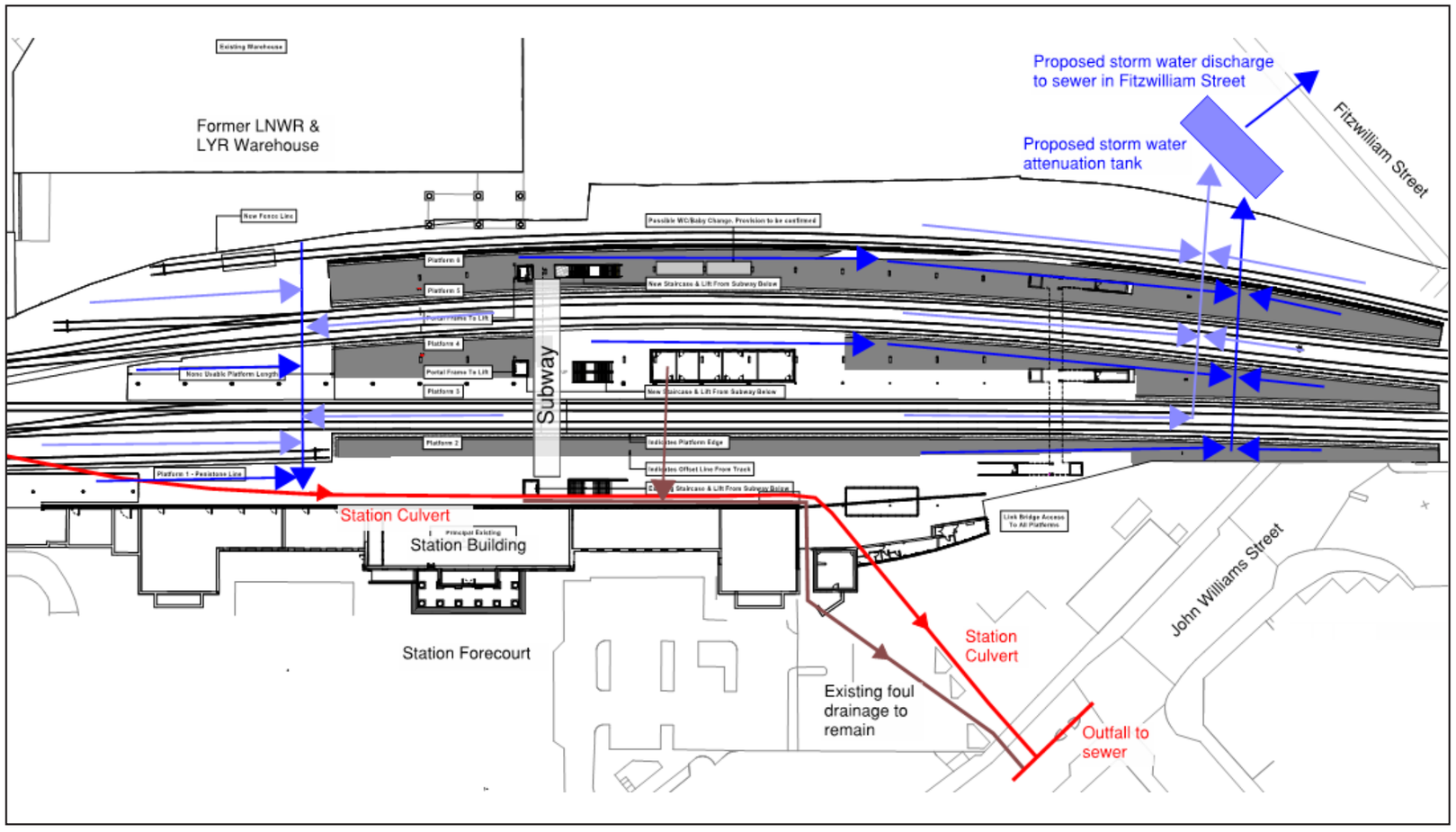



**Figure 5.4.8.2a: Proposed drainage systems**

**Figure 5.4.8.1c: Foul and roof water drainage within station cellar walkway**

located within the depot site adjacent to Fitzwilliam Street. Flows from the tank will be restricted with a vortex flow control unit, prior to discharge into the Fitzwilliam Street sewer.

In principle the foul drainage system will remain as existing. The primary drain will be in the cellar walkway, draining the station building. The pipe from the Tea Rooms on Platform 3&4 will remain. Some modification will be essential due to changes in the surrounding infrastructure, however these will be minimised as far as possible. The existing outfall to the John William Street sewer will remain and flow rates should not significantly change.

## 5.5 PLATFORM CANOPIES

### 5.5.1 Penistone Line (Platform 1)

*5.5.1.1 Removal of bays*

Two bays of the existing trainshed roof (Roof A) have been removed at the Manchester end of the station to make way for new P-way alignment, this leaves a gap of approximately 18m between the existing Penistone Line canopy and the gable end at the end of Roof A. There is a requirement for extra platform coverage for passengers using the Penistone Line platform to fill the gap between the existing canopy and the retained extent of Roof A.

*5.5.1.2 Proposed reinstatement*

It is proposed that the new infill adopts the same scale as the existing Penistone line canopy, with daggerboarding to match. The structure of the new section will be similar to the existing canopy, with matching daggerboarding.

The Penistone line historically has its own identity within the station and is the home to a number of community based projects. As such, the colour scheme will be designed to reflect this so that it ties into the themes of the main station roofs but has its own distinct identity. The colour scheme will have slightly darker tones of greys and blues that relate back to the current TPE colour scheme, the soffit colour will be the lighter shade which ties back to Roof A. The darker elements will also help in terms of maintenance in that they will disguise some of the wear attributed to the stopping of diesel trains on the Penistone line. The dagger boarding will be blue painted timber relating back to the TPE blue.

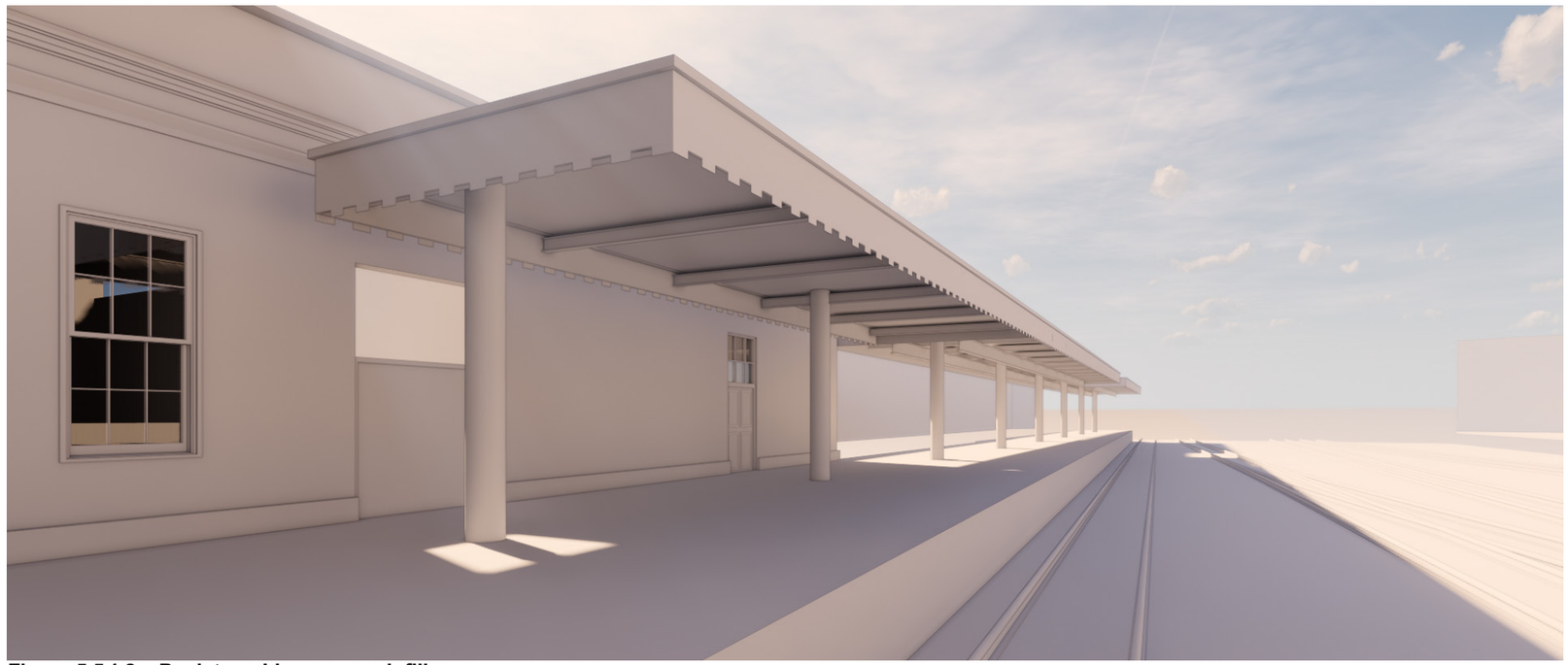


**Figure 5.5.1.2a: Penistone Line canopy infill**

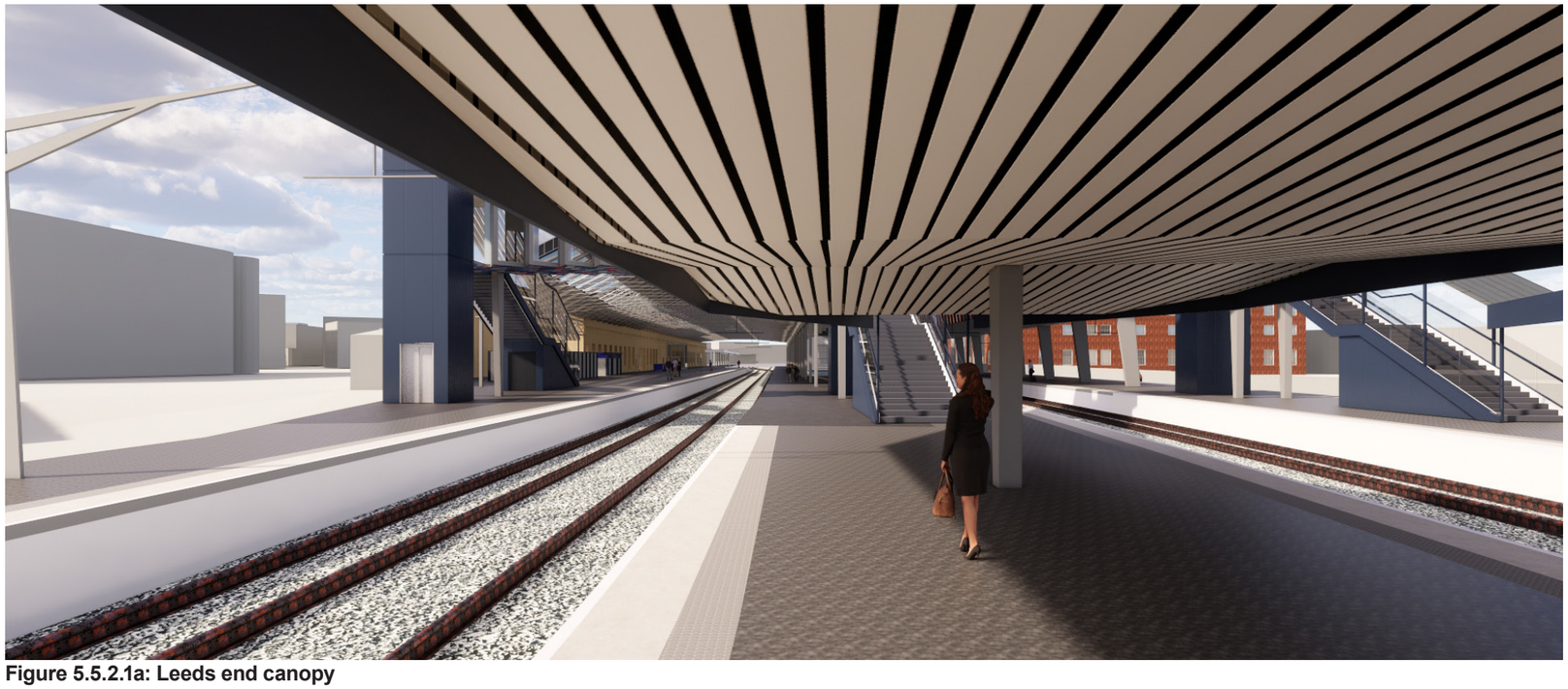


**Figure 5.5.2.1a: Leeds end canopy**

*5.5.1.3 Maintenance access*
Removing 2 bays from Roof A has also exposed elements of the existing Station Building façade that was not previously exposed to the elements, as such this will require maintenance and inspection where it didn't before. The rear edge of the canopy will be set 1m from the leading edge of the façade to allow for a maintenance zone that can be used to maintain the façade and the rear of the canopy. This can be accessed by a mobile platform or temporary ladder. There is no OLE or platform edges in the area that will need to be maintained. Access and Maintenance of the original canopy will be as per the existing strategy.

The access and maintenance is indicative at this stage and would be subject of a condition attached to the grant of consent.

### 5.5.2 Leeds end canopies

*5.5.2.1 Proposed form*
Due to the new track alignment and platform extension towards the Leeds end of the station, there is now a requirement for platform coverage. The intention is to provide coverage for the full width of the platforms to a length suitable to provide adequate coverage for passengers queuing to enter the footbridge after alighting trains.

The Leeds end platform canopies are similar in scale to the Penistone Line canopy and will therefore be designed so the two sets of canopies will bookend Roof A and Roof B. This will mean the new canopies will be visually unobtrusive and will not detract from the gable end view of Roof A and Roof B. The soffit for the canopies will be undulated in a similar style to the new soffit in Roof B this further tying the design together.

This will be enclosed with a new modern interpretation of the Penistone dagger boarding. The undulations will be positioned so that guttering can be installed adjacent to the tracks in the low points of troughs away from the OLE. It is important from a heritage perspective that these canopies impact on the gable end view of the trainshed and new roof as little as possible.

**Figure 5.5.2.4a: Lighting scheme on Penistone Line canopy**

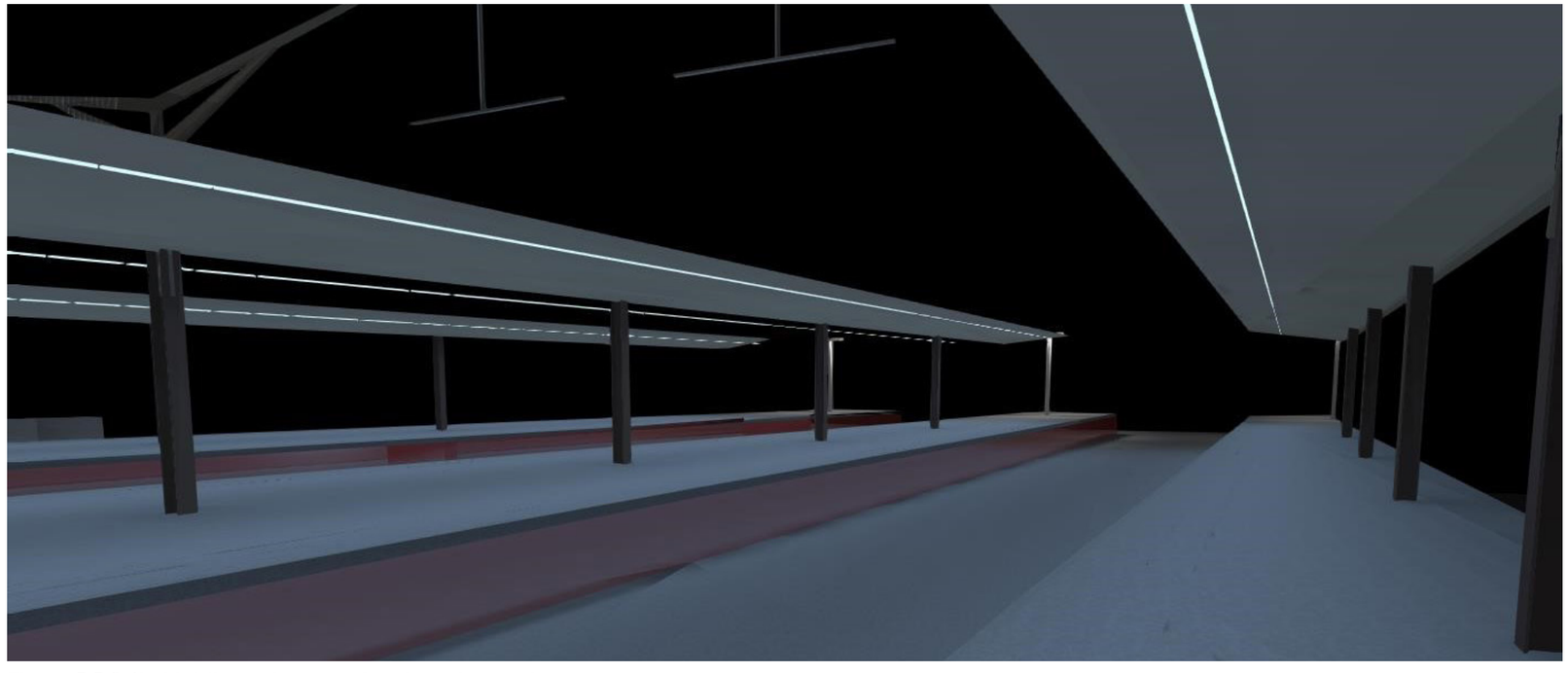


**Figure 5.5.2.4b: Lighting scheme on Leeds end canopies**

*5.5.2.2 Materials*
The Leeds end platform canopies will be designed to tie in with the new roof elements regarding the Penistone Line canopy which serves as the other book end. The undulating soffit will be the metal slated cladding of Roof B. The commonality of material in the new sections will further tie them together but will also aid with orientation and wayfinding around the station. The fascia material will be a metal cladding.

*5.5.2.3 Colours*
The colour scheme for the canopies will take queues from the Penistone line canopy. The fascia boarding will be a subtle blue tying into the Penistone Line and some of the elements on the footbridge. The column cladding will be light grey tying into the Penistone Line columns and the Roof A and B structure.

Finally, the colour scheme for the soffit material will reflect the off white of Roof B which in turn ties back to Roof A.

*5.5.2.4 Lighting*
The lighting scheme within the platform canopies has been designed in accordance with the following guides and standards:

- RIS-7702-INS Lighting at Stations
- RIS-7016-INS Interface between Station Platforms, Track, Trains and Buffer Stops
- GI/GN750 Guidance on Lighting of Railway Premises
- BS EN 12464 Part 2: Outdoor Lighting
- BS EN 5489-1:2011
- BS EN 5266-1: Emergency Lighting
- BS EN 1838: Lighting Applications - Emergency Lighting
- CIBSE SLL LG6 The Exterior Environment (2016)
- CIBSE SLL LG15 Transport Buildings (2017)
- ILP GN01 Guidance Note for Reduction of Obtrusive Light

As the Penistone Line Canopy is an existing and extended canopy that will follow the same line as Retained Roof A platform, the same lighting scheme will continue from Roof A into this canopy. A smaller version of the suspended luminaires will be mounted to illuminate the platform. The distribution of light from the suspended luminaire will also create a soft-glow of illumination on the canopy roof. This is shown in Fig.5.5.2.4a.

The Leeds end canopies will continue the same linear luminaire theme as the New Roof lighting (Fig.5.5.2.4b). Continuous linear luminaires will be positioned to run parallel to the platforms and integrated within the architectural ceiling. The linear luminaires will provide a uniform lighting level which clearly defines the platform edge.

*5.5.2.5 OLE*
There will be a requirement to interface overhead line equipment into the canopies. Due to the lower height of the canopies, it will need to be situated on top. It will sit on the column locations and cantilever out over the track. Visually the OLE masts will be designed so they reference the geometry of the new roof which is derived from the Euston Truss.

*5.5.2.6 Maintenance access*
The platform canopies will be accessed from hatches on the underside. The gutters for drainage will be situated at the low points of the undulations away from the OLE. There will be a single fall arrest system line running along the centre of each canopy to allow inspection along the length.

The access and maintenance is indicative at this stage and would be subject of a condition attached to the grant of consent.

## 5.6 TEA ROOMS

### 5.6.1 Specific design drivers
Adopting Option 0 as the proposed track and platform layout for the station, results in a reduction in the width of the island Platforms 3-4. A consequence of this is that the clear distance from the Tea Rooms to the edge of Platform 4 is reduced to below the 3.3m required minimum. It is not possible to mitigate this by repositioning Track 4, therefore the Tea Rooms have to be relocated towards Platform 3. The existing wrought iron columns supporting the retained Euston Roof on Platform 3 require a clear space around them for future inspection and maintenance. The Tea Rooms have been repositioned to provide the minimum 3.3m clear distance to Platform 4 edge and provide approximately 400mm clear distance to the columns. They have also been positioned such that the columns do not clash with doors.

The Tea Rooms is a 140 year old structure. Relocating the building might potentially be achieved either by moving it whole, or by dismantling and reassembling it.

Since the structure lacks robustness, it would be necessary to install a full steel bracing frame to encapsulate and stiffen it before attempting to move it as a whole. Slide beams and vertical jacks would then need to be inserted below the stiffened structure, which would be raised and horizontally moved in two orthogonal directions to its relocated position.

A successful localised trial was carried out to explore whether it would be possible to fully dismantle, catalogue and store the structure, and reassemble it in a different location. The findings of the trial were positive: the timberwork was found to be in reasonable condition and could be deconstructed without causing undue damage.

Both options have been discussed with specialist contractors, with a conclusion that dismantling and reassembling the structure presents a significantly lower risk of permanent damage to the historic fabric than the installation of steel frames and jacking process.

**Figure 5.6.1a: Tea Rooms within new Roof B**

### 5.6.2 Adjacent franchise kiosk
As a result of relocating the Tea Rooms, repositioning the Passenger Subway stairs and aligning the columns supporting the new roof over Platforms 3-4, it is not possible to retain the Pumpkin kiosk in its current location.  A suitable location for it is to be agreed with the station operator.

### 5.6.3 Relocation and rotation
Relocating the Tea Rooms offers the opportunity to enhance its setting and operation.. At present the servery is at the furthest point on the island platform. A modern tea kiosk is immediately in front of the south elevation and at direct eye level as you enter the island from the subway.

It was agreed the servery should retain a prominent part of the reconfiguration and by rotating the whole building 180 degrees the servery would be at the closest point to the subway entrance and exit. Due to the revised layout there is not room for the modern tea kiosk in its existing location. This would encourage users to use the historic servery and enable more users of the station to appreciate the building.

The rotation also assists with lining up the new columns that penetrate the building and abut existing walls, thus preventing significant impact on the original character of the Tea Room.

**Figure 5.6.1b: Refurbished Tea Rooms**

### 5.6.4 Accessibility and inclusivity
Access from the main station building is via the subway either using the stairs or lift.

### 5.6.5 New roof columns
As part of the new roof there will be three columns which will directly penetrate the building. To minimise the impact of this intervention, the building has been lined up to ensure the columns do not visually detract from the interior. The columns will be boxed out in a timber frame and plasterboard and line up with existing walls.

An access ladder to the Shed roof will run up the side of one of the new Shed roof support columns and through the Tea Room roof.

### 5.6.6 Foundations
There will need to be new foundations for both the new columns penetrating the building but also the Tea Room structure itself. Indicative foundations have been presented which show the extent that will be required.

There is an existing beer cellar/ basement and parcel subway that will be required to be infilled to take the new foundations. Part of the structure to both underground structures will be lost to make way for the new foundations. Although the basement is historic, it is inaccessible to the public. By preparing a record and photographic survey this will provide an understanding of its history whilst enabling it to be infilled to support new foundations for both the relocated Tea Room building and the new columns.

The benefits to the station and enhancement of the Tea Room building outweighs the impact of the loss of the below ground structures.

### 5.6.7 Doors and windows
The doors and windows will be retained. To enhance thermal performance, the doors and windows will be refurbished and upgraded with draught proofing. This and the refurbishment will provide a longevity and energy efficiency.

### 5.6.8 Colours
The current colour scheme is a soft cream with rich navy blue. These are the current TOC TransPennine Express colours. These can be seen at some other stations on the line as well.

The current decoration is in reasonable condition although the colours are detrimental to the architectural aesthetic. None of the detailed features are celebrated or prominent and from the principle platform it is difficult to determine its aesthetic value.

As mentioned in the Heritage Assessment, research has been completed both on historic colour schemes to the station and the historic franchises. However, the authenticity of reusing an old colour scheme is tenuous, given that the station is being refurbished and expanded for a new chapter of its history. For this reason it is proposed that a new decorative scheme draws from the existing palette - cream and navy blue - but is applied in a slightly more decorative design.

The proposal put forward is to retain a softer cream façade with the architectural details celebrated with a combination of navy in different tones. Emphasising the Tea Room's more ornate features will allow this small building to be better appreciated as a picturesque human-scale structure in the context of the large columns and roof planes around it.

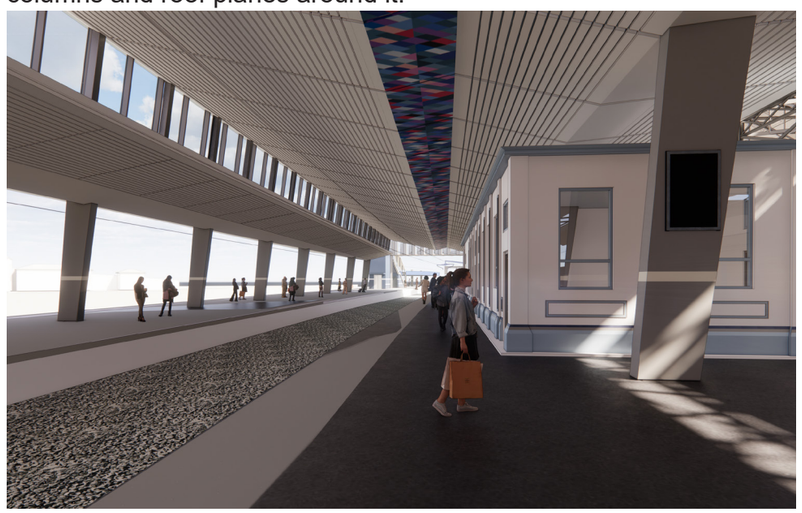


**Figure 5.6.5a: New roof structure in relation to Tea Rooms**

### 5.6.9 Lighting
The lighting is of heritage value, although not the original lighting within the servery they do provide a historic aesthetic which enhances the space. These will be restored and reinstated.

### 5.6.10 Servery area
The servery unit and glazed screens are of architectural merit and heritage value. It is essential that these items are retained as part of the building's reinstatement. As part of the proposal we are recommending the servery unit be rotated sideways. Currently the glazed screens and the location of the servery prevent views into the room so you cannot easily see if the space is occupied.

By rotating the unit there will be a clear view into the room from all entrances. This will all also give more space and enable you to appreciate the delicate design of the unit, enhancing its setting.

### 5.6.11 Removal of chimney stacks
In the building there are two chimney stacks internally that are all that remain of the original fireplaces. It appears at some point the external stacks have been removed, this may have happened when it was re-roofed.

The stacks are in awkward places within the building, with one sitting in the centre of the servery making it difficult for visibility and providing enough seating. It is a tight space and difficult for those in wheelchairs, buggies and prams.

As the fireplaces and the full stacks are no longer present, the majority of their heritage value has been lost. To provide an open and accessible space that can be accessible for all will really benefit the space and the visibility of the historic servery unit.

### 5.6.12 Fire upgrades
As the building is being taken down and reinstated, this provides an opportunity to provide some fire upgrades. These fire upgrades have been considered and ensure minimal impact to the historic fabric whilst also enhancing the building to a better standard of fire safety:

1. New electrics throughout
2. Compartmentalising the structure into three compartments. These are done on existing walls but will include new plasterboard
3. New internal fire doors to the compartment walls
4. Additional fire safe doors to the electrics inlet

By compartmentalising there is also the greater chance of retaining historic fabric should there be a fire.

## 5.7 SUBWAYS

### 5.7.1 Passenger subway

*5.7.1.1 Specific design drivers*
The alignment of the new tracks and the provision of Platform 5 and 6 require changes to the layout of the existing passenger subway. The existing staircase and lift shaft to Platform 2 shall remain as will the existing wrought iron trough deck with brick arches supported off brick abutments carrying the tracks, which extends to Platform 3. An additional reinforced concrete slab shall be provided at track level to span over the subway for a direct fix rail system to address the inadequate ballast depth issues.

*5.7.1.2 Proposed form*
The narrowing of Platform 4 requires the reconfiguration of the platform layout to maintain the required minimum platform width and to prevent pinch points along the platform. The existing staircase, balustrade, lift shaft and sections of the subway roof supporting platform are to be removed from Platform 3/4. A new staircase and lift shaft are provided centrally on the reconfigured platforms. The existing balustrades will be reused on the new stair where possible.

The subway is to be extended by approximately 12.5m to provide access to the new Platforms 5 and 6. Access to the Platform 5 and 6 will be via a staircase with a lift shaft providing step free access. The subway extension is constructed from reinforced concrete with internal finishes. The subway extension will match the existing subway in terms of width and height to meet the predicted pedestrian flows.

*5.7.1.3 Accessibility and inclusivity*
The access to the existing remaining section of the subway shall remain unchanged, which is through the existing staircase and lift providing step free access. The modifications to Platform 3/4 and subway extension for Platform 5/6 shall be accessed via staircases with through lifts providing step free access. The subway extension surfacing shall be anti-slip surface, with a nominal ramp in accordance BS8300, to connect to the existing subway surface.

*5.7.1.4 Materials*
Given the station is Grade I listed, the materiality and finishes proposed to the subway is to continue the existing architectural language.

*5.7.1.5 Colours*
The walls are of a light tone colour and the floor finish is paving stones. The new extension to the subway will continue this theme with paving stone applied to the new floor and the walls finished in a light tonal colour to match.

*5.7.1.6 Lighting*
The existing lighting scheme (Fig.5.7.1.6a) to the subway comprises surface-mounted linear luminaires in the centre of the corridor and luminaires mounted at the end of the corridor to graze the wall.

The existing lighting layout is likely to provide the required horizontal illumination levels on the ground. However, the luminaires are an unshielded and an intense light source which results in discomfort glare for passengers when navigating the subway, in particular this could create difficulties for the visually impaired and affect the performance of the CCTV cameras. The scheme is oppressive with minimal lighting to the walls and ceiling. This contrast can create difficulty in visual recognition of passengers approaching which can reduce the perception of safety.

The proposed lighting scheme to the subway will achieve the following design objectives:

- Facilitate safe movement and orientation for a large number of users .
- Achieve the safety and security requirements by providing sufficient illumination for facial recognition and CCTV camera detection and minimise shadows.
- Highlight intersections such as lifts, stairways, exits and entrances.
- Provide a visually comfortable space and accessible environment for all.
- Ensure a robust scheme that prevents any tampering by users.
- Incorporate a reliable, user-friendly lighting control system to maximise flexibility, daylight and energy efficiency.
- Specify high quality LED light sources that will ensure consistent colour and reduced maintenance.

The lighting scheme within the subway has been designed in accordance with the following guides and standards:

- RIS-7702-INS Lighting at Stations
- GI/GN750 Guidance on Lighting of Railway Premises
- BS EN 8300: Design of an accessible and inclusive built environment
- BS EN 5266-1: Emergency Lighting
- BS EN 1838: Lighting Applications - Emergency Lighting
- CIBSE SLL LG15 Transport Buildings (2017)

Lighting options were explored to achieve the design objectives required for the subway. These options are listed below:

1. Linear luminaires
2. Wall-mounted luminaires
3. Uplight variations
4. Wall-washing installation

Linear luminaires were selected as the most preferential option and these are shown in Fig.5.7.1.6b. The lighting scheme will comprise the following elements:

- Where there are exposed beams, continuous linear luminaires mounted either side of the subway will graze light down the walls to increase the vertical illuminance and provide safe lighting of the walkway.
- In sections of the subway without exposed beams, a continuous linear luminaire will be mounted in the centre of the space to provide the required walkway illumination.
- On both ends of the subway, the wall will be illuminated with a linear wall-washer to provide an ‘exit’ focus which will enhance the user’s perception of safety and security.

*5.7.1.7 Structural considerations*

The existing subway roof carrying the tracks is to remain with minimal intervention taking place within the subway. The subway extension considered the construction constraints within the location of Platform 3/4, where the existing staircase and lift shaft are to be replaced, whilst minimising station operation disruptions. Consideration was given to off-site fabrication of pre-cast reinforced concrete modular elements for the staircases, lift shafts and subway. The pre-cast units are to be delivered and installed on completion of the extension excavation.

Initial desk top studies on the ground profile indicate rock may be at a shallow level towards Platform 5/6, which may need to be broken out to accommodate the subway extension. It is envisaged the subway extension will be a ground bearing structure.

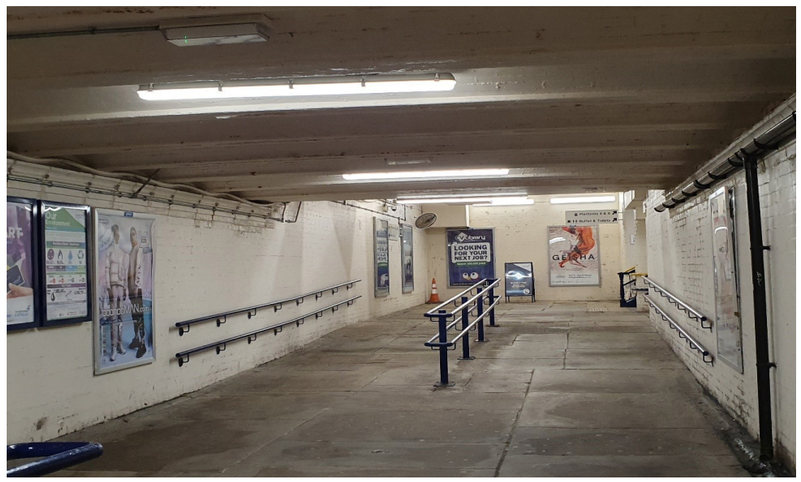


**Figure 5.7.1.6a: Existing lighting scheme within the subway**

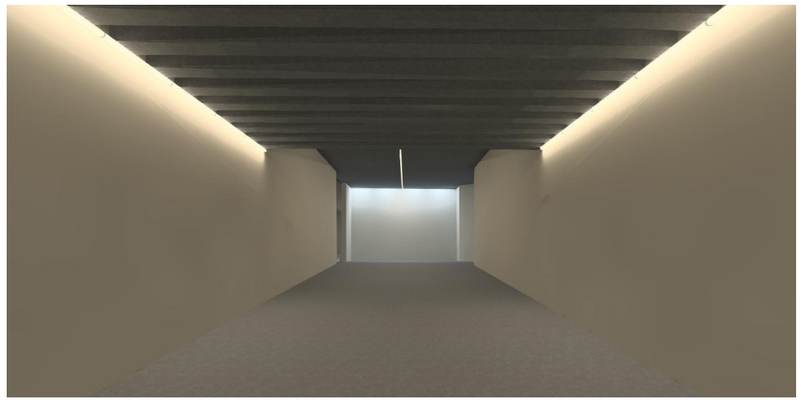


**Figure 5.7.1.6b: Proposed lighting scheme within the subway**

### 5.7.2 Parcel subway

*5.7.2.1 Specific design drivers*
The subway has been disused as postal mail and goods corridor for several decades but still functions as service utilities route. During this time the subway deteriorated with structural strengthening repairs undertaken in 1998. The strengthening works, which consisted of steel beams propping the trough decks have reduced the internal space within the subway making it unsuitable for pedestrian usage due to inadequate headroom (1.8m high) and width (1.4m wide).

*5.7.2.2 Proposed form*
The alignment of the UP and Down tracks has resulted in both tracks supported off a single trough deck with one track partially over a trackside opening to the subway. The single deck is not structural suitable to support two tracks. Relocation of the Tea Room closer to Platform 3, results in the Tea Room's foundations located over the subway.

The resulting interventions requires the parcel subway to be modified to support the track alignment and Tea Rooms location. The subway is to be partly infilled with lightweight concrete to provide the required structural integrity to support the tracks and integrate with the Tea Rooms foundations. The subway infill will extend from Platform 2 towards Platform 3 where the subway terminates. The redundant trough deck adjacent to Platform 3 shall be removed to provide adequate ballast depths for track maintenance. The trough deck under Platform 2 shall remain.

The subway shall continue to be used as a service utility route with additional ducts provided within the remaining subway and through the infill, to service the island platforms and other rail interfaces.

# 6.0 ACCESS AND EGRESS

## 6.1 VEHICULAR APPROACHES TO THE SITE

Emergency vehicular access to the station remains unchanged from the existing station approach from Railway Street to the short stay car park, where dedicated disabled car parking spaces are provided.

## 6.2 PEDESTRIAN APPROACHES TO THE BUILDING

There are no proposed changes to the existing passenger approach to the main station building from St Georges Square. Accessible entrances for wheelchair access is currently provided and this remains unchanged.

## 6.3 EMERGENCY ESCAPES AND REFUGES

As a result of the proposed extension to the island platforms, an additional means of escape is required at the Leeds end of the station. Crossing the tracks from Platform 2 to the island platforms can be achieved by going under the tracks via a subway, or over the tracks via a footbridge.

A detailed study of the benefits & challenges associated with these two options has been carried out, categorised under the following headings:

- Passenger performance
- Impact on Cultural Heritage
- Structural solution
- Ground engineering & substructure
- Construction - engineering, access, & programme
- Operational considerations
- Environmental impact
- Cost

The key considerations from the study are summarised as follows:

1. Passengers feel more comfortable using a footbridge than a subway.
2. A reflective south facing footbridge facade such as glazing would reflect sunlight back into the northern end of the station shed, potentially causing glare problems for Leeds-bound train drivers parked on Platforms 2-6. This would need to be mitigated in the footbridge design.
3. A subway has minimal impact on cultural heritage.
4. A footbridge is visually intrusive but offers the opportunity to present high level views of the historic Euston roof and along the viaduct. A high percentage of wall glazing can partly mitigate the intrusiveness.
5. A subway would act as a barrier to the Leeds end platform & track drainage system.
6. Local ground conditions are challenging and variable, with made ground overlying low coal seams and mudstone. The made ground was placed in the late 19th century and is unlikely to be engineered material. Open cut in the fill material will be extensive, and driving piles into the mudstone is unlikely to be effective. Bored temporary works or foundations would be effective.
7. A subway would sit partly in the mudstone and partly in the made ground.
8. Access to construct the crossing between Platform 2 and island Platforms 3-4 is limited to short possessions. Tracks 2 & 3 must be returned to operation at the end of the blockade. This places limitations on the work that can take place during this period.
9. Footbridge foundations & installation have a very limited impact on Tracks 2 & 3, and can be accommodated in the blockade.
10. The subway structure would consist of pre-cast box-culvert sections, which could be positioned rapidly. However an open cut, or the temporary works required to form the trench to place the box-culvert is significant & complex. This creates a high risk of the work overrunning the blockade period.
11. An excavated trench across tracks 2 & 3 would badly interfere with other works which must take place during the blockade period, such as the replacement of John William Street bridge.
12. Subway maintenance is minimal, whereas maintenance & cleaning of the outer surface of a footbridge above OHLE lines would need to be planned.
13. High level embodied carbon calculations indicate that a subway has a higher whole-life CO2 content than a footbridge by approximately 7%.
14. Subway construction is more costly than a footbridge.

In consideration of the above points, a decision was taken by TRU to progress with the footbridge option and engage with both Historic England and Kirklees Metropolitan Borough Council in development of the solution.

Emergency egress will be through the existing building as per the existing fire strategy. The main route between platforms is through the existing subway which serves Platforms 2 to 4 and will be extended to include Platforms 5 and 6. There will be an alternative means of escape at Leeds end of the platform in the form of a new footbridge.

From the Penistone Line platform (Platform 1) there will be an alternative means of escape from far end which will provide a route through to St George's Street. At the Leeds end of the station on the extended platforms there will be disabled refuges should a train be on fire between the extreme ends of the platform and the footbridge.

## 7.0 SUMMARY

We have worked to retain as much of the listed asset as possible while working with the constraints of the track and platform requirements.

We believe that this has been achieved as follows:

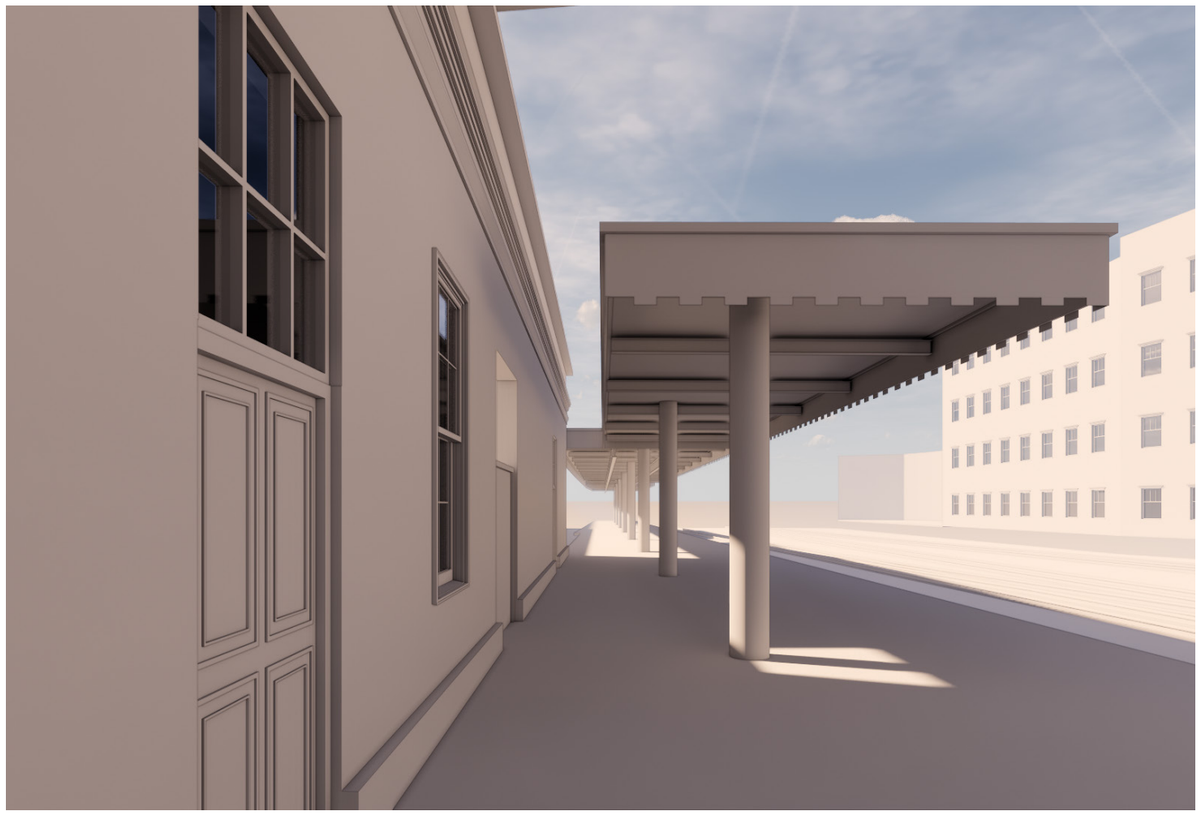
- Through the refurbishment and restoration of a large proportion of Roof A.
- Two structural bays of the original roof have been removed at the Manchester end of the station but three new bays have been reinstated at the Leeds end.
- The lantern has been reinstated in Roof A.
- The current polycarbonate roof lights will be removed and replaced with glazing.
- The roof A soffit will be reclad in timber similar to how it was originally intended.
- The Platforms are largely retained or extended with the exception of Platform 8 which has been cut back.
- Original Roof B and C are to be removed to make way for the new platform and track alignment but a new Roof B will be reinstated that is symbiotic with Roof A.
- The original Penistone Line canopy will be extended.
- The passenger subway will be refurbished and extended.
- A new footbridge will be introduced to provide greater connectivity in the station.

## 8.0 VIEWS

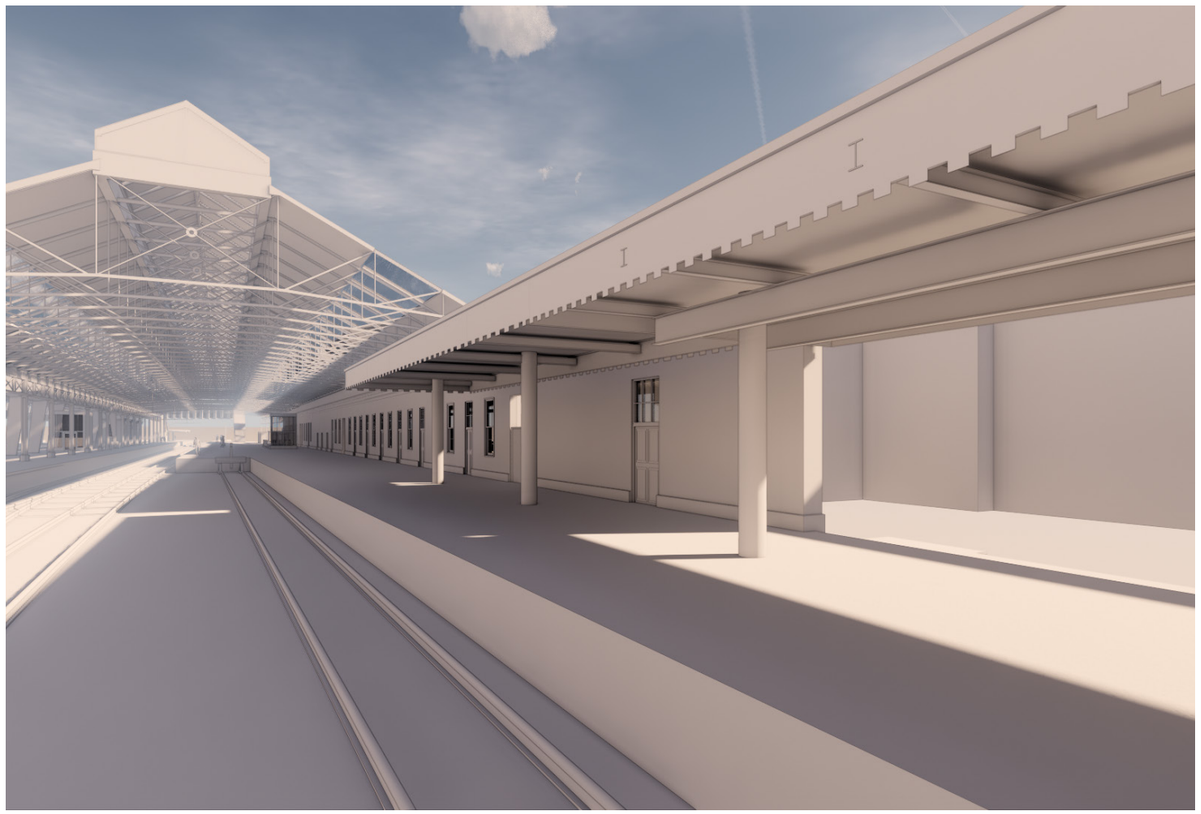
**View through existing Roof A - Southbound**

**Views through existing Roof A with Tea Room**

**Views through new Roof B with Tea Room**

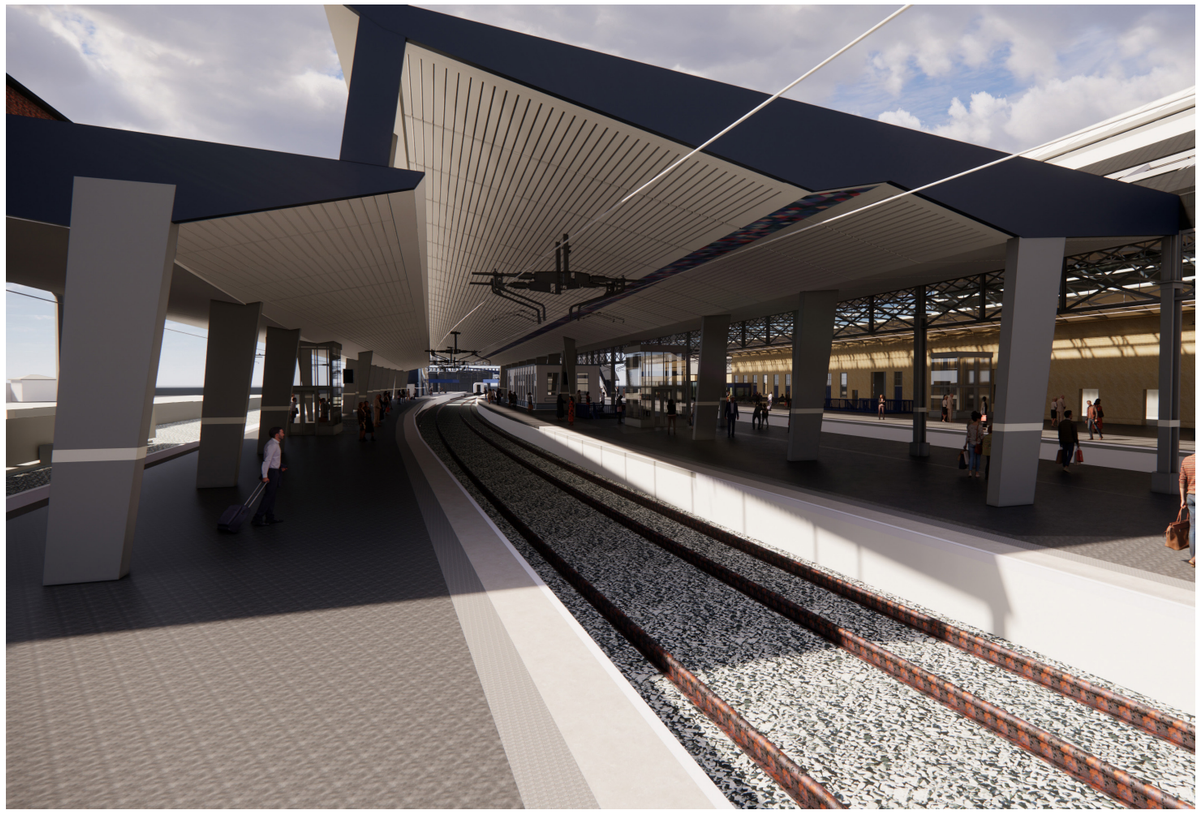


**Penistone Line platform canopies**

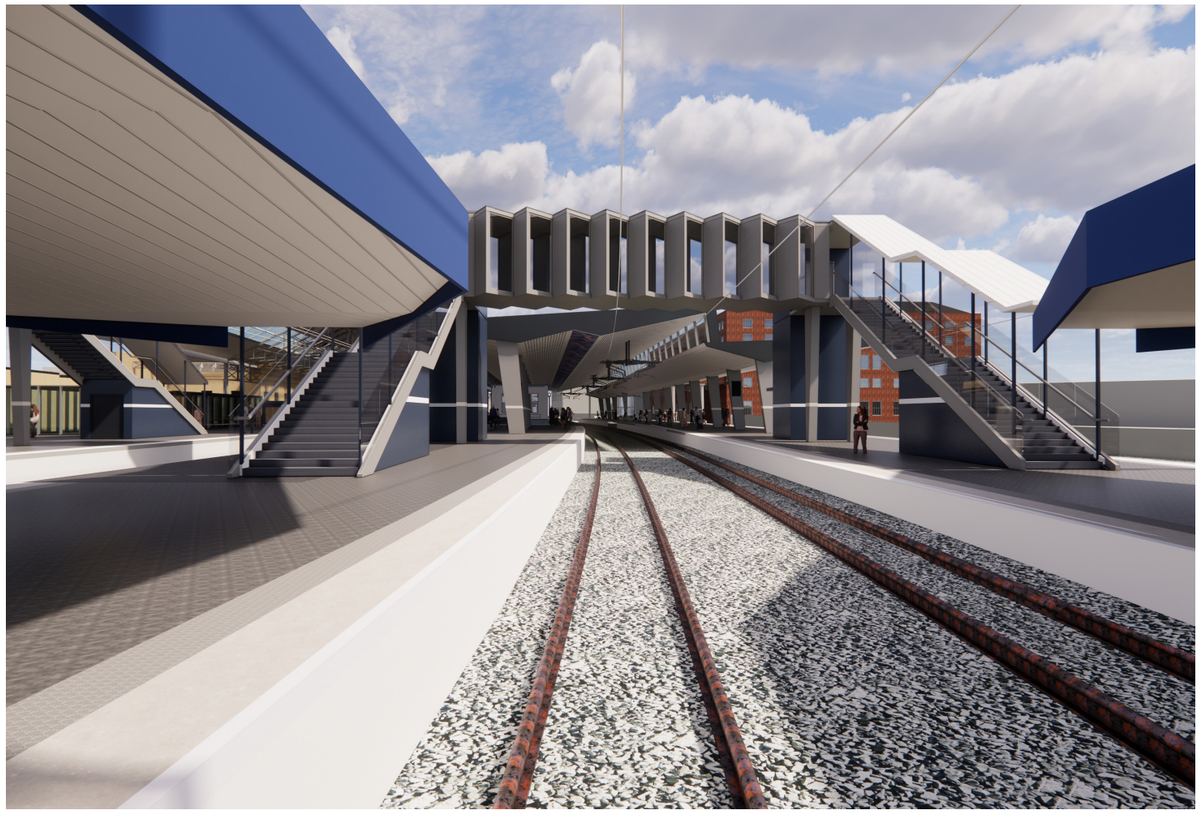


**Internal perspective views of new Roof B**

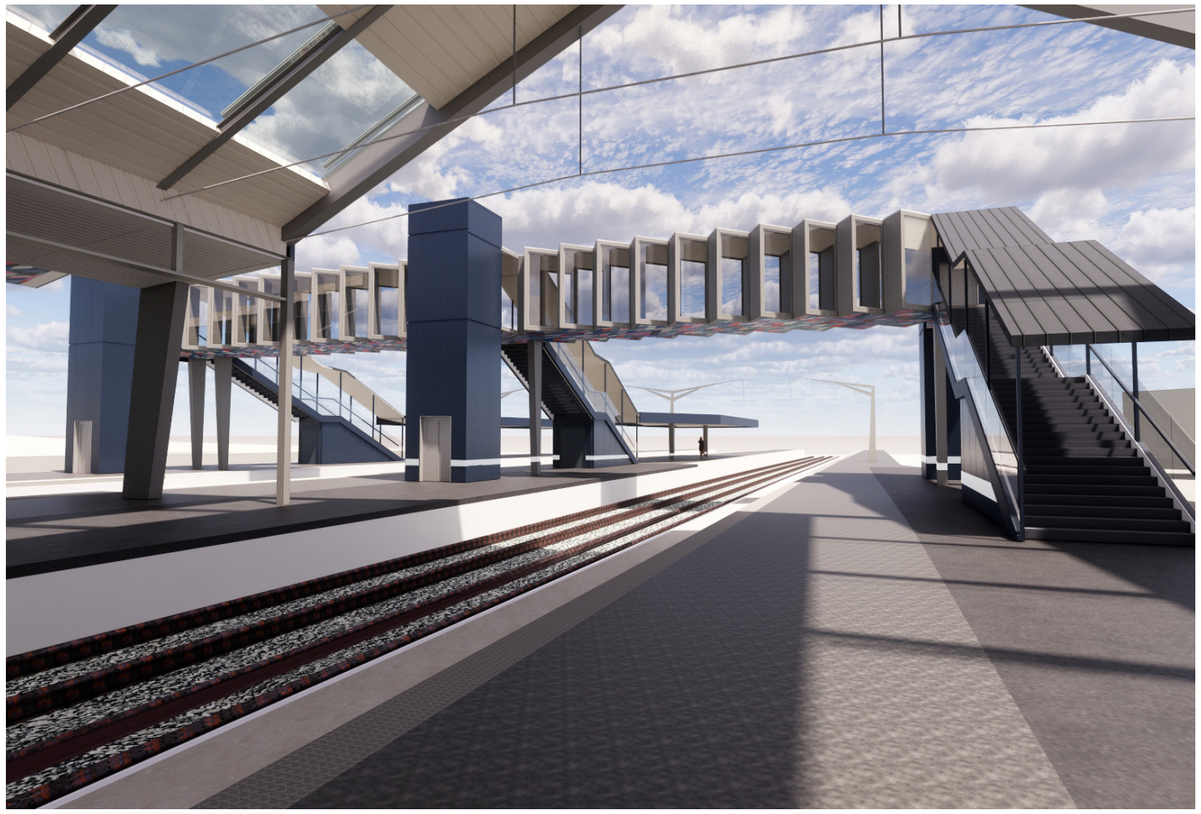
**Internal perspective views of new Roof B**

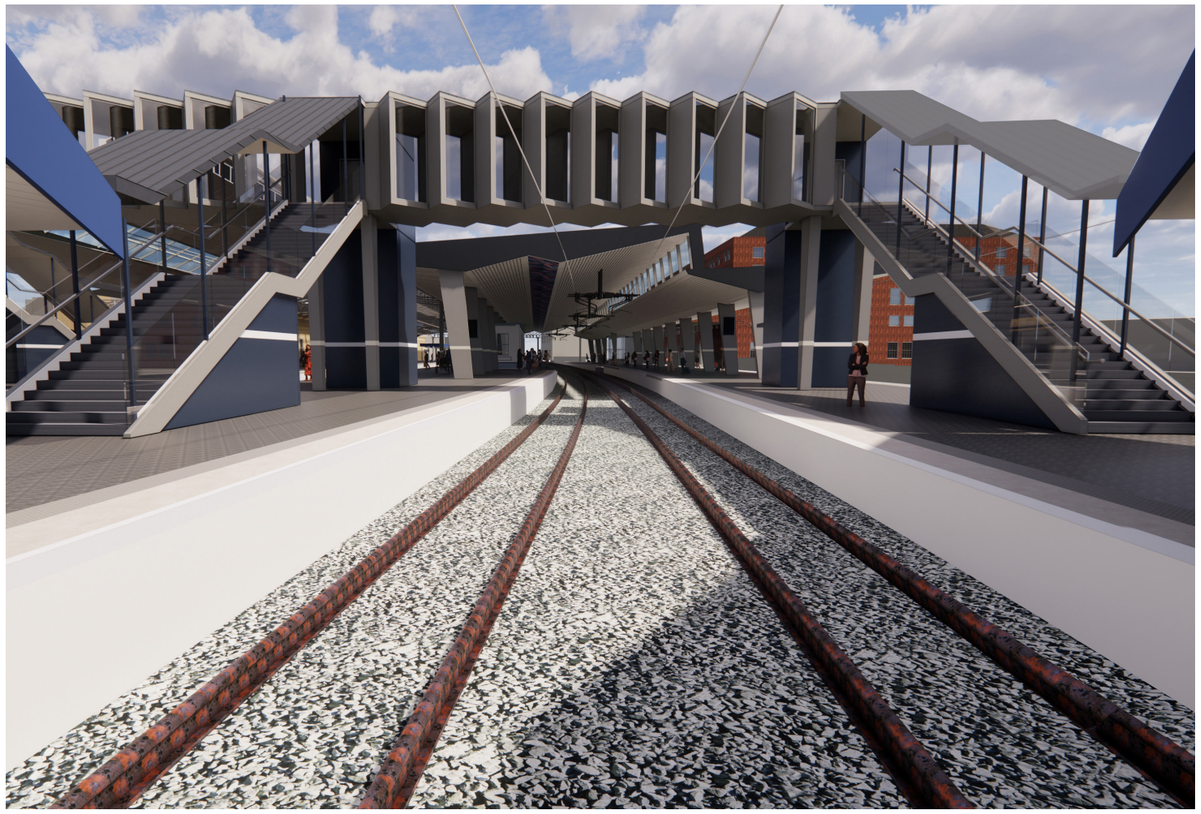


**Manchester end perspective view of new Roof B and existing Roof A**



**Footbridge perspective**

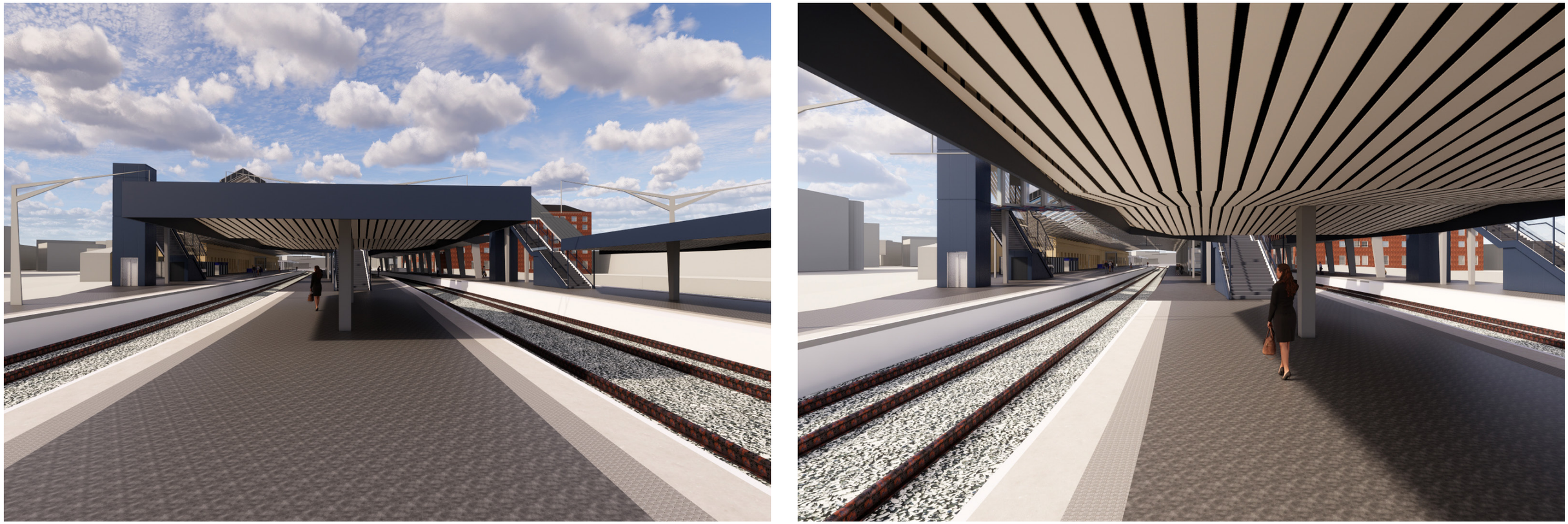




**Footbridge perspective**

**Internal perspective views**

**Internal perspective views**



**Leeds end platform canopies**

**Manchester end perspective view of new Roof B and existing Roof A**

**Internal perspective views of new Roof B**