



CREWE HUB STATION CAMPUS DESIGN AND MASTERPLAN

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CAMPUS DESIGN AND MASTERPLAN OPTIONS REPORT

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1.0 - INTRODUCTION

This 'Royal Institute of British Architects (RIBA) Stage Two - Options Report' presents the output from the second stage of the integrated study work which has been undertaken by Mott MacDonald, Grimshaw, CBRE and KPMG (the "design team") on behalf of Cheshire East Council (CEC) and Network Rail (NR) to develop proposals for a transformational station masterplan and enhanced station design at Crewe Hub Campus.

The design teams work documented here has been developed to a broadly 50% concept (RIBA II) stage level design and in the context of this early stage of design development, this report is considered interim for review and preliminary comment. It is anticipated that the station design will be further developed in the subsequent 'Solutions' stage of work to follow.

This Crewe Hub Station Campus Integrated Project (the "Project") was initiated in October 2017. CEC has commissioned a number of workstreams to assess the planning and design of Crewe Station and its surrounding area, and to identify how preferred options can be funded, financed, and delivered. The three workstreams are:

Crewe Hub Station Campus Design and Masterplan –

This is the subject of this report. Led by Network Rail Infrastructure Projects, with Mott MacDonald and Grimshaw: development of masterplan, station design and associated public realm and infrastructure design for the Crewe Campus area.

Crewe Hub Station Campus Business Case and Revenues –

Not the subject of this report. Led by Mott MacDonald with CBRE: assessing a range of potential funding options for the project, including rail user revenues, station commercial revenues and land value capture.

Crewe Hub Station Funding and Financing Strategy –

Not the subject of this report. Led by KPMG: developing a financial model and assessing financing and delivery strategies for the Crewe Campus project. Mott MacDonald is also providing an integration role across the three workstreams.

The anticipated outputs of the 'Options Stage' (RIBA stage 2 - 50% concept) 'Crewe Hub Station Campus Design and Masterplan' are detailed below:

- **Development of masterplan design including:** green spaces, anchor international attractor buildings, Crewe Alexandra football stadium relocation, and quantum analysis.
- **Development of station design including:** interaction with station intermodal facilities at forecourts, structural form progression, unassured station costings (not presented in this report), canopy development, and transfer deck design due to change request.

The initial basis for the masterplan work undertaken here draws upon and further develops the June 2017 'Crewe HS2 Hub Framework & Masterplan Scenario Report v1.0' ("the CEC study"), which was further developed by the previous CEC Campus Design and Masterplan Feasibility Report P04!

Station and Masterplan – Shared objectives

The objective of this study is to develop the work produced at the previous Feasibility stage design, and aid the selection of station components for development at the future Solutions stage. The Option stage also attempts to develop, in parallel, a funding and finance strategy to give confidence to funding the station and masterplan.

1.1 - EXECUTIVE SUMMARY

Crewe station is a key transport hub in the north west of England, providing connectivity for passengers to other areas of the UK. Crewe is also one of the largest stations in the North West and a major interchange station on the West Coast Main Line. It currently has a direct service to London Euston, Edinburgh, Cardiff, Liverpool, Manchester, Birmingham, Glasgow, Derby, Stoke-on-Trent, Chester, Wrexham and Holyhead for the ferry connections to Dublin Port. Many other towns and cities also have railway connections to Crewe.

The arrival of HS2 in Crewe, supported by regional rail improvements, will help create great opportunities for investment and transformational regeneration around the station, the rest of Crewe and the wider region.

In October 2017, CEC published the 'Crewe HS2 Hub Draft Masterplan Vision' consultation document for the draft masterplan vision for Crewe HS2 Hub. This ambitious document sets the agenda for transformational growth for the town of Crewe. In November 2017, the Constellation Partnership submitted a draft Growth Strategy to Government setting out transformational plans for South Cheshire and North Staffordshire and how it will support the growth of the North West, West Midlands and North Wales.

The arrival of HS2 train services to Crewe in 2027 provides the catalyst for significant and lasting change for the region. The vision for such a transformational masterplan is to provide lasting legacy outcomes which can unlock future capacities for the growth of jobs, homes and commercial space within the town. Commercially, the project seeks to develop total Gross Value Added figures of £2.9bn by 2043.

CEC believe that in order to facilitate this unprecedented growth, the design of the Crewe Campus masterplan must be founded on an HS2 train service strategy of 5-7 trains per hour on each side of the route with high speed services to London, Birmingham and Manchester. Without this rail service capacity, Crewe will not be able to achieve the unprecedented growth this once in a lifetime opportunity presents.

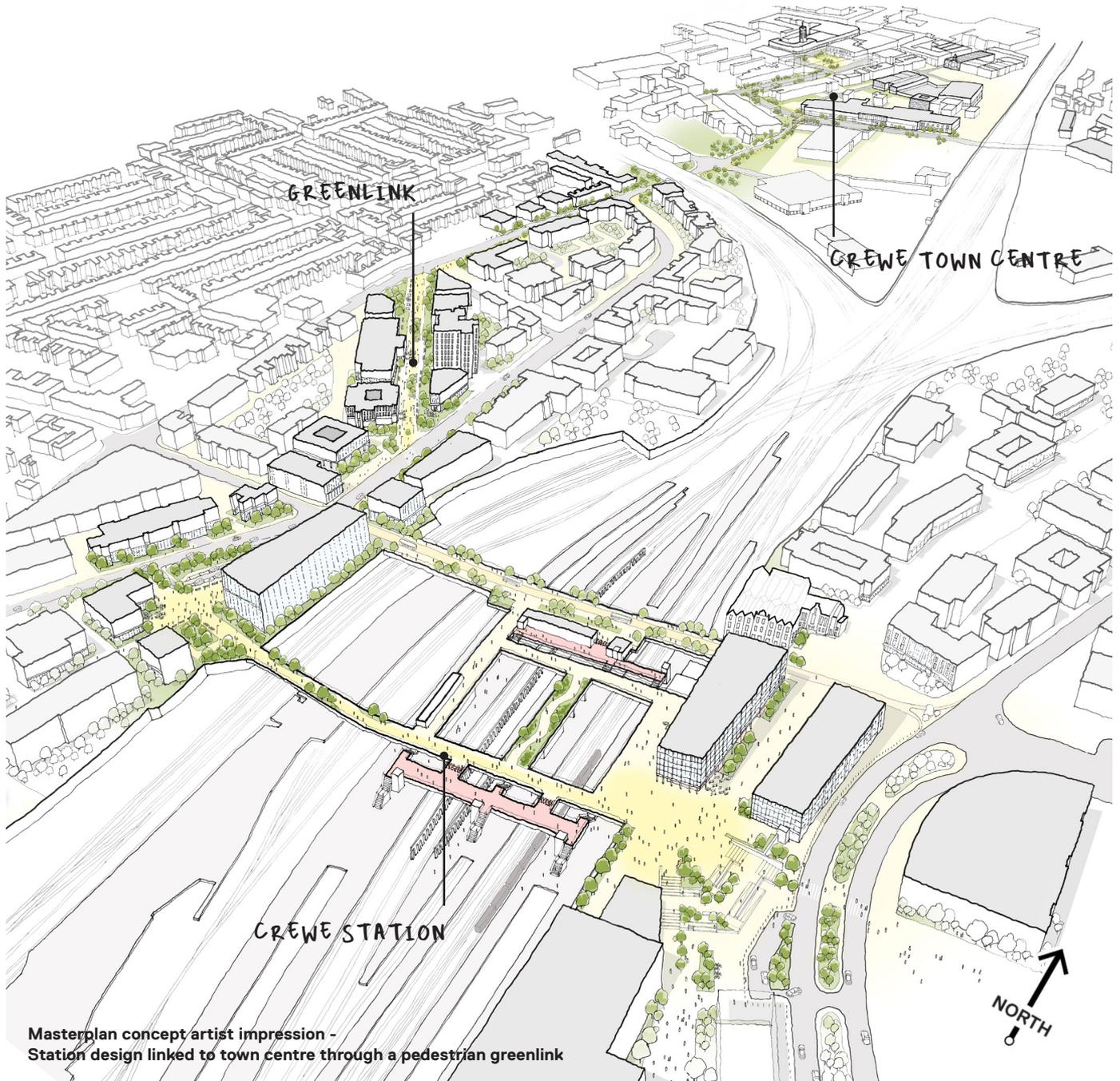
The conclusion of this 50% concept stage of work is a series of station and masterplan options that should aid the decision making to select a single station option to be taken into the next stage of design. The following elements have been considered in this study to enable an option selection:

- **Masterplan Quantum Analysis** - presentation of four quantum options that vary the amount of development, and the size of the red-line to test different concepts.
- **Masterplan Design** - development into masterplan components to increase level of detail to include attractors, stadium relocation, greenlink, and station to town centre link.
- **Station Design** - progression of the station design options to consider mezzanine extensions, gateline incorporation into transfer deck, heritage relationship, southern canopy and forecourt design.

Whilst this study presents the architectural design, an accompanying Funding and Financing (F&F) workstream also exists in parallel. This workstream is not to be considered separate as the F&F developments should directly feed into the station components. The station will be funded in part by the economic benefit generated by the wider red-line, and therefore progression and forecasts in this study give confidence, to a degree, to the amount of development that will occur in the station.

The work documented in this report illustrates the concept of what could be achieved by the transformational masterplan design, which is directly driven by an aspirational station design. The study lays the foundations for the next stage of work, which will develop the themes presented in this report to develop a single option design.

Figure 1.1 - Key outputs of the campus design and masterplan report



Masterplan concept artist impression - Station design linked to town centre through a pedestrian greenlink



Station concept artist impression - Transfer deck with mezzanine extensions

1.2- THE PROCESS

The Options stage was divided into three key stakeholder workshops, which were split into three separate focus groups: masterplan, station design, and funding & financing. Work was presented at each workshop for both the station design and masterplan. During this iterative process, comment was invited from the room and feedback was recorded, which was used as a basis of refining the work for the next workshop.

At each workshop the masterplan and station gained more clarity and detail along with a more developed transport and funding strategy through an option selection process. Whilst the most optimal solution has been sought throughout each of the Workshops, it is anticipated that the design will continue to develop in the future stage as it responds to further comments. The following elements were discussed at the three Options stage workshops:

- **Workshop 04** - Three final masterplans from the Feasibility stage were broken down into seven key areas with a decision made on each of these areas to 'freeze' the masterplan land use. During the workshop, a 'live' undeveloped masterplan was constructed to visualise the land use choice to give confidence to the final composite masterplan design. This process enabled further development on a single land use, but it is not to say that this land use was completely fixed.
- **Workshop 05** – Using the comments and feedback recorded at Workshop 4, the masterplan gained greater clarity enabling a greater level of design optioneering on other masterplan components including: international attractors, football stadium location, masterplan quantum, street design, car parking, greenlink, and southern link bridge. The station design elements were also progressed sharing an update on the mezzanine extensions, heritage, and structural developments.
- **Workshop 06** – Using the comments and feedback recorded at Workshop 5, the masterplan was sufficiently developed, allowing focus on the station design. The workshop presented an update on: gateline incorporation following the change request, transfer deck 'peak' geometry updates, southern and northern canopy progression, forecourt design, architectural phasing, and unassured station costings.
- **Post Workshop 06** – Following workshop 6 coordination and developments were made: aligning masterplan design with F&F commercial hub developments, transport planning coordination, updated unassured station costing, and construction phasing development.

This study will present the body of work produced through the Options stage, and outline the decisions that have been made. This will be achieved by presenting each of the considered options with benefits and constraints commentary and a preferred option will be highlighted by a green box, as seen opposite.

It is expected that a single station design will be developed from 50% concept to 100% concept during the next Solutions stage using commentary from the Option stage.

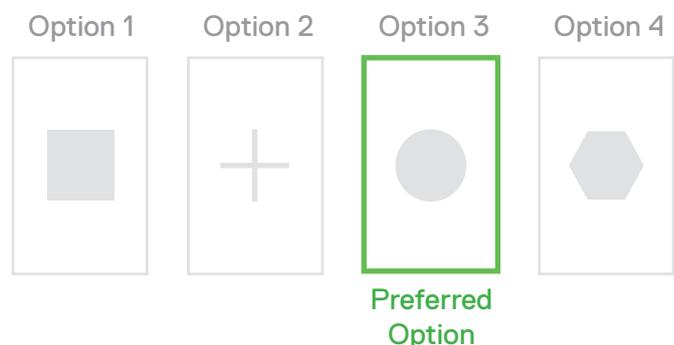
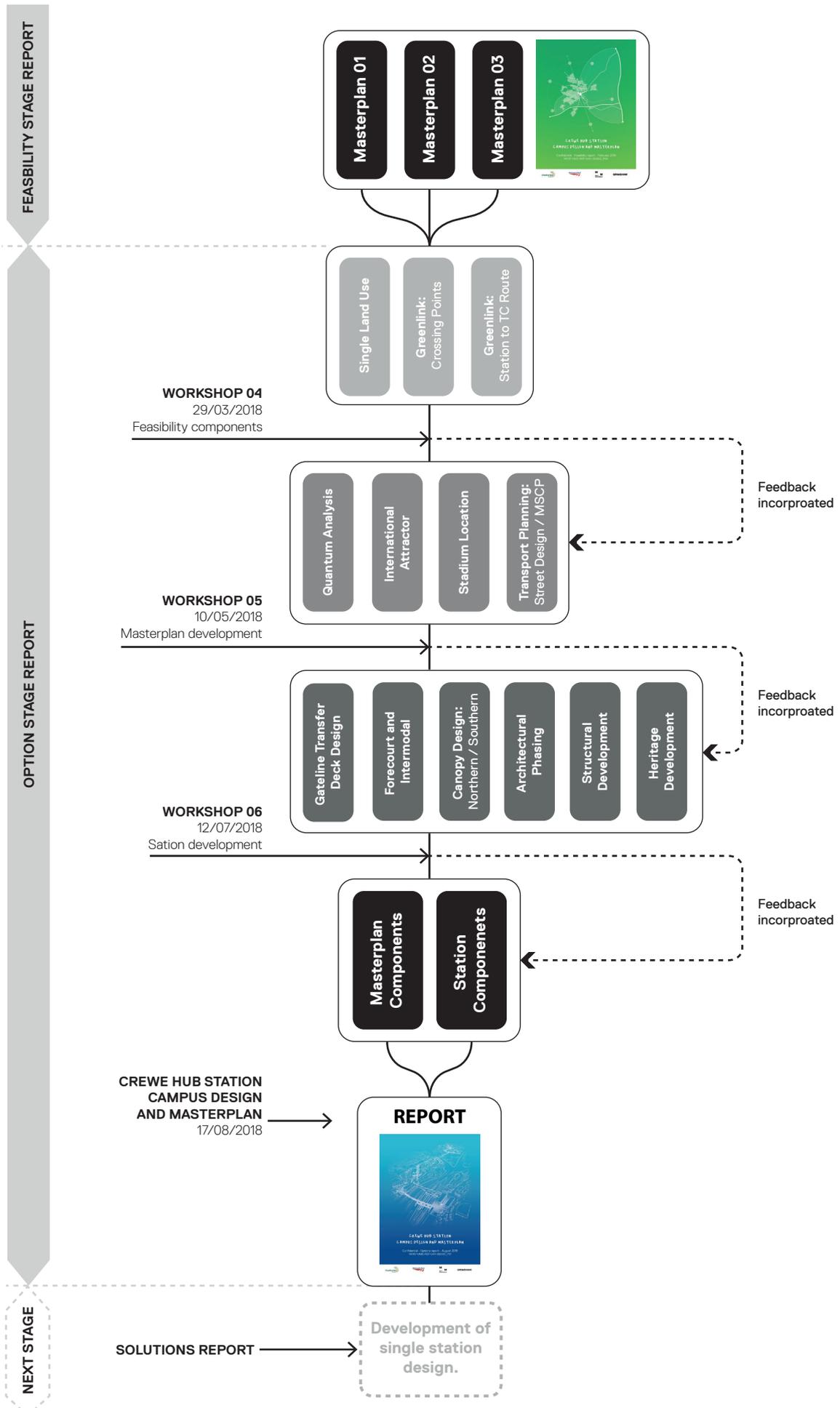


Figure 1.2 - Options stage workshop process



1.3- CEC REQUIREMENTS

The work undertaken to date has outlined the following specific requirements as received by CEC and NR. Together with the key assumptions (section 1.4), these form the basis of the brief as defined by CEC to meet their principal objectives. It should be noted that the requirements have not greatly changed since the Feasibility stage design, with one exception: the joint sponsor board's decision to include ticket gatelines. Whilst this requirement has not nullified the concepts presented in the previous stage, it does require a reconfiguration of various station elements, such as the transfer deck, canopy and entrance arrangements. A further integration piece will be required to align these elements in the next stage.

This integrated and collaborative study has meant that an iterative design process has been followed. Options have been presented at workshops, with feedback recorded and integrated into the designs. It is hoped that in the coming Solutions stage a confirmed set of requirements can be developed to enable a single option design.

Section 1.6 outlines how the development quantum has been derived from the basis of the 2017 CEC study. The initial work undertaken has been based on the following key assumptions:

- 5-7 trains per hour each side of the HS2 route
- High growth scenario, informed by the Constellation Partnership work is to be incorporated
- The 2017 CEC Local Plan should be incorporated
- Ticket barriers are required, as per change request number: CR88 - Design of Ticket Lines (code reference: 384387CR88).
- The new deck should be publicly accessible and span east to west across the rail corridor
- The station should be designed to be phased and delivered in sections
- The larger regional entrance is to be located on the east (Weston Road side) with the local entrance on the west (Gresty Road side)
- The 'Crewe HS2 Hub Framework & Masterplan Scenario Report_V10' should be referenced as a baseline.

Figure 1.3 - CEC requirements	
The station enhancement shall be complete by 2027 in line with the completion of phase 2a.	Green
The station leisure and retail offering shall not compete with the town centre	Yellow
The station shall give consideration to community space and offering. Not required in the form intended i.e. childcare, start-up etc as competing with town centre	Yellow
The station campus shall provide a soft link from east to west between the two sides of the town and through to the town centre.	Green
The station will provide permeability from east to west during station operation hours 00:06-06:00	Green
The station will give credence to the External Entrance Space (passenger arrival) with statement architecture as means to link to the town centre. Arrival is the priority for station experience but the ambience must also extend into the station	Green
The station East entrance shall link in with traffic flows into the station as a natural link from the A500 and have a functional nature. Both entrances must allow for vehicular and pedestrian entrance. It is practical to have direct vehicle access to the east entrance.	Green
The station west entrance shall lend itself more to pedestrian flows into the town centre and football ground and have a more intimate nature, acting as a pull into the town centre.	Green
Without prejudice to the core station requirements, car parking shall be provided to the South side of the station to ensure parity with traffic flows from the south side of the town.	Green
The station and campus shall give due consideration to small retail leisure amenities as the start of a coherent link to the town centre.	Green
The station and campus area should have clear wayfinding fitting of the nature of the area as described in above requirements.	Green

1.4- KEY DESIGN ASSUMPTIONS

In addition to the CEC requirements, some key design assumptions have been used to enable design progression at the current 50% concept stage:

Masterplan Assumptions

- Southern Link Bridge is likely to be required in a final masterplan solution, and in this case Nantwich Road can be repurposed. In this instance, Nantwich Road will be repurposed as a pedestrian and public transport link only.
- Alignment for the Southern Link Bridge affects the layout of the masterplan, should this alignment be altered in future stages the masterplan may need adjustment to suit.
- Road junction points are fixed but not the road layout or the road hierarchy.
- Car parking figures are assumed based on F&F masterplan areas. Currently, multi-storey car parks are indicatively drawn to illustrate provisional locations to serve both the station and commercial land use requirements, and do not include other land use types. i.e. residential and hotel land uses.
- Reduced red-lines are to be confirmed and developed in future work stages by F&F teams to ensure viability in future ITSS years.
- Mill Street / Pedley Street are expected to provide a key link between the existing town and station. Additional information is required with regards to linking the Mill street north to the existing town via the northern railway viaduct.
- The station design and the 'common elements' will be influenced by the chosen track layout. Currently 3 layouts are being tested for affordability and considered by the DfT: Crewe Hub Options G1 has been used for the basis of this report.
- No new survey information is available for the station and surrounding area, levels and geometry are assumed. Current designs are based on OS Maps and LEC4 information.
- All dimensions, and areas presented in this study are considered approximate, subject to updated survey information (masterplan and station design).

Station Design Assumptions

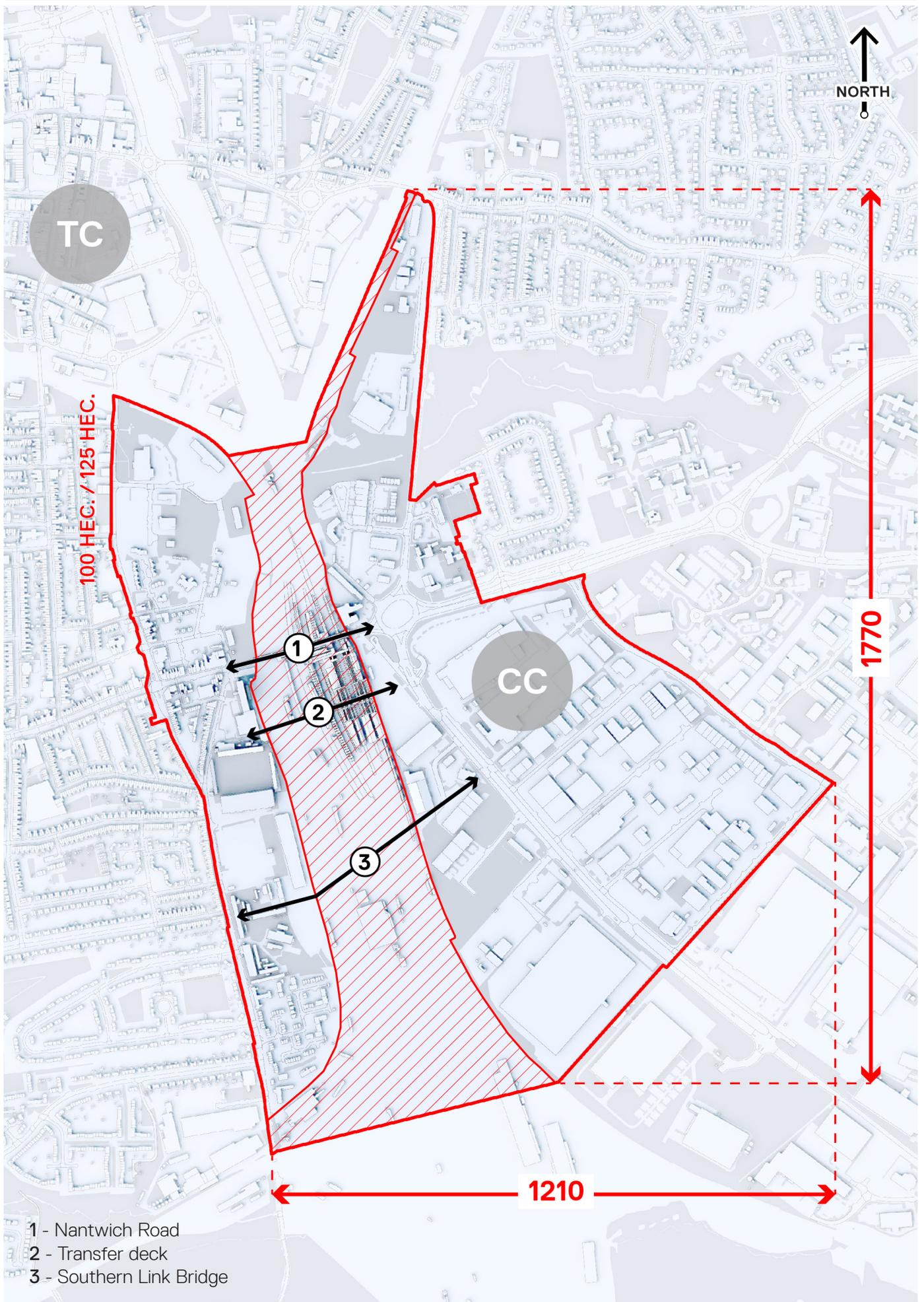
- The Station is considered to be the catalyst of the masterplan.
- Heritage information is taken from Crewe Hub GRIP 2/3, and CEC Feasibility stage report.
- As per GRIP 3, a single parking space is considered to require approximately 18.75m² of space.
- The dimensions of transfer bridge are assumed using GRIP 3B data. The width is assumed as 8m for the unpaid deck, and 8m for a paid deck.
- As per GRIP 3B it is assumed that 14 ticket gates are required per option with at least 1 Wide Aisle Gate (WAG) per gateline.
- No manual gates, vehicle gates, Gateline Attendant's Points (GLAP), Station Control Units (SCU), or luggage ports have been shown. Further development is required to understand specific station requirements.
- Passengers should be able to interchange without exit and re-entry of ticket gateline.
- It is assumed that a minimum clear headroom of 3.0m is maintained above staircases.
- As per GRIP 3B design there will be no escalators used for vertical circulation between platform and mezzanine.
- The current design is based on OS data and LEC4 survey. No survey information has been used in the creation of this work, and is due in November 2018.
- No consultant information for fire, security, or pedestrian flow modelling has been conducted at the current stage of design.

1.5- MASTERPLAN BOUNDARY

The boundary of the study was defined prior to the commencement of the Feasibility study and was captured in two zones, a red-line boundary and a green-line boundary. This Options report looks at the wider red-line in more detail to ascertain its viability against the F&F stream of work. The study tests a series of quantum options with different agendas to challenge the aims of the masterplan.

The red-line boundary constitutes a 125 hectare site centred on the station at the heart of Crewe. The red-line borders, but does not include, the existing town centre. However, the red-line boundary does include the railway corridor this is currently not being considered for over site development. Removing this land from the total, results in approximately 100 hectares of developable land within the red-line.

Image 1.4 - Red-line masterplan boundary



- 1 - Nantwich Road
- 2 - Transfer deck
- 3 - Southern Link Bridge

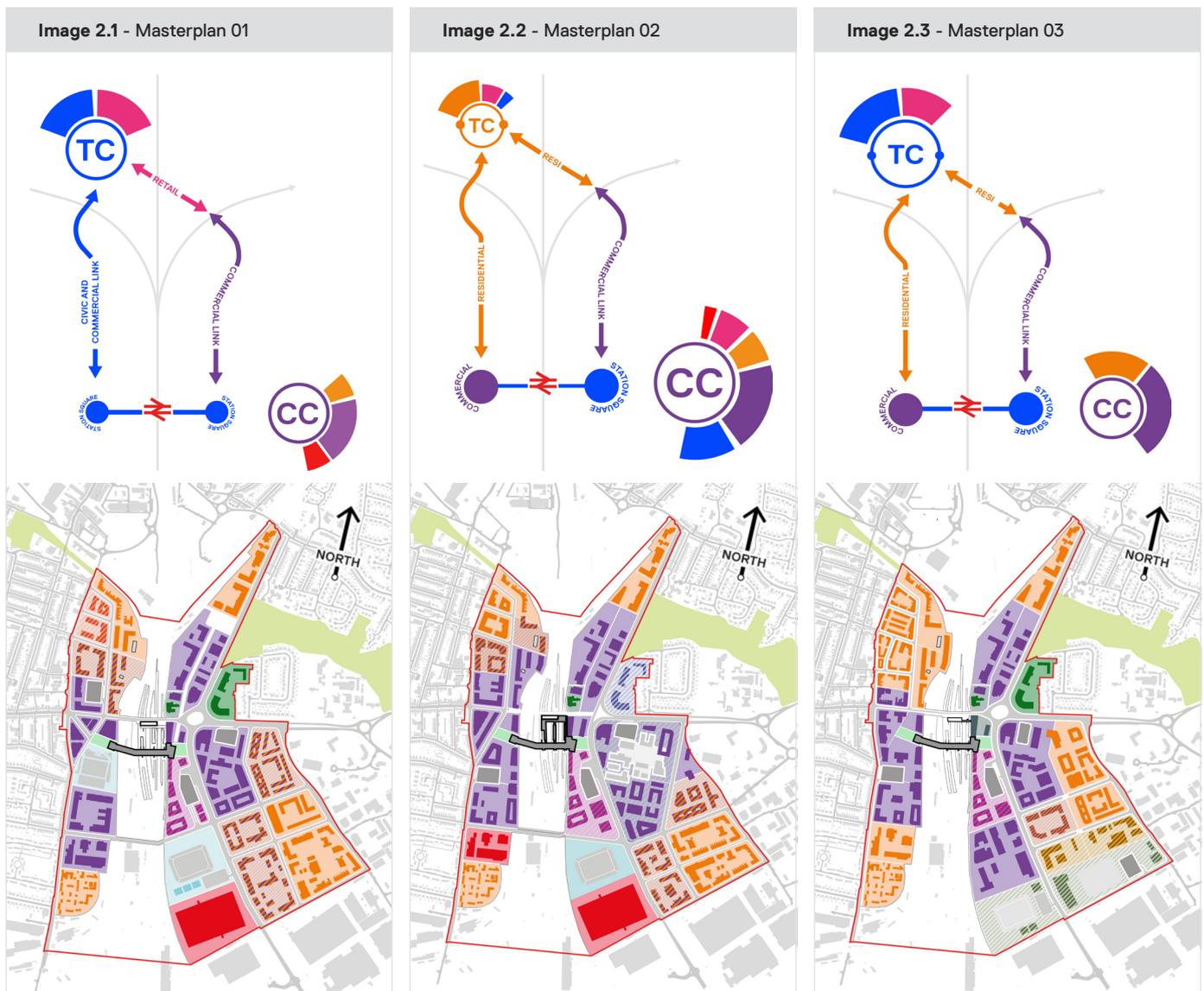
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2.0 - FEASIBILITY DEVELOPMENT

In the previous Feasibility stage, three masterplan options were presented which each had their own design core concepts. This was presented through a series of red-line, greenline and core concept diagrams (fig 2.1.-2.3). A decision was requested by the design team on the core components to enable design progression in the current study.

It was clear that a single option selection from those presented at the previous Feasibility stage would be unlikely, and it would be more likely that specific components from each scheme would be preferred. The fourth workshop, the first of the Options stage, therefore presented the previous masterplan designs as a series of broken down components. Each element part was considered to create a single preferred scheme which ultimately froze the masterplan design. This process was conducted in order to produce a single preferred option to enable a greater level of design resolution during this optioneering phase, although this is not to say that alterations and changes would not occur to the composite masterplan, only that it gave the design team a basis to progress the single option design throughout this stage of work.

The following chapter outlines this process, and the decisions made.



2.1 - CORE CONCEPTS: OPTION SELECTION

Masterplan 01

- Two centres that are complimentary
- Mill Street used as primary connection into the existing town centre
- Crewe Campus linked to town centre with new civic and commercial areas and a high amenity green loop
- Football Stadium remains as a draw to the south
- New southern link bridge provides an alternative east/west vehicle route

Masterplan 02

- Existing town centre densifies residential and local retail uses
- Shift in gravity to Crewe Campus
- Crewe campus to include civic, retail and some high density residential functions
- New southern link bridge provides primary east/west vehicle route
- Nantwich road retained and incorporated into the green loop allowing pedestrians and public transport to cross
- Football stadium relocated out of town retail

Masterplan 03

- Recognises polarised functions and operates as two independent centres
- Football Stadium is relocated to the east of the railway corridor to provide attractor within Crewe Campus
- Nantwich Road remains but wider strategic moves are used to alleviate congestion and the towns reliance on this crossing point

Core Concept Outcomes

Masterplan 01's 'two linked centres' was selected as the preferred core concept as it best met the ambitions of CEC's Key vision moves. This decision set a key principal in future masterplan designs to consider the station to town link as a core concept.

Figure 2.4 - Masterplan 01: Two linked centres

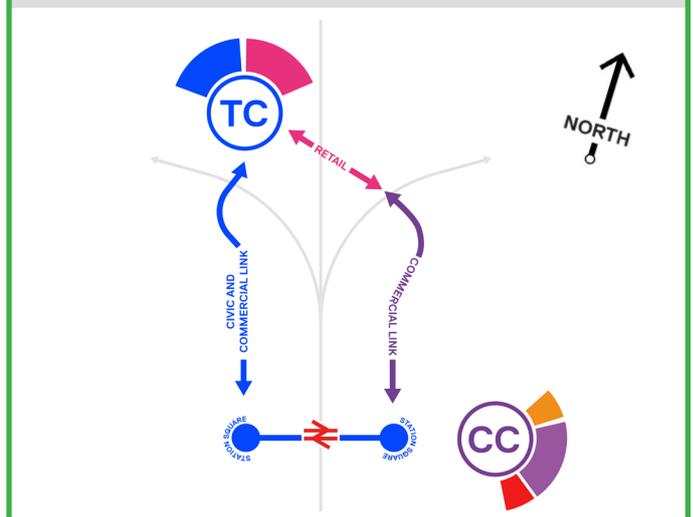


Figure 2.5 - Masterplan 02: New town centre

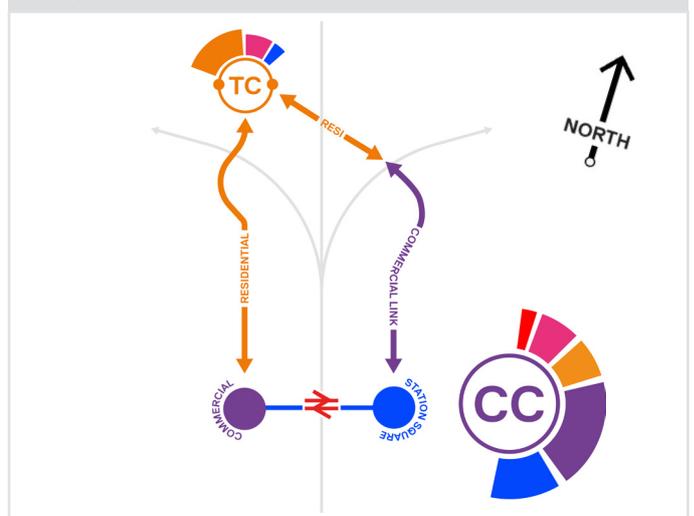
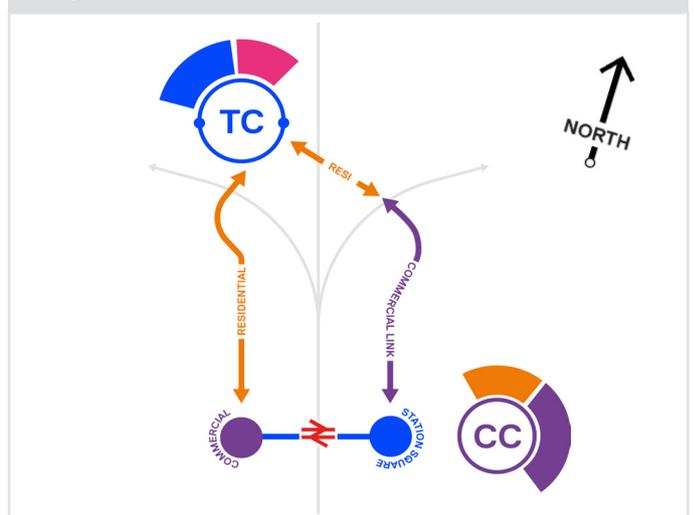


Figure 2.6 - Masterplan 03: Two independent centres



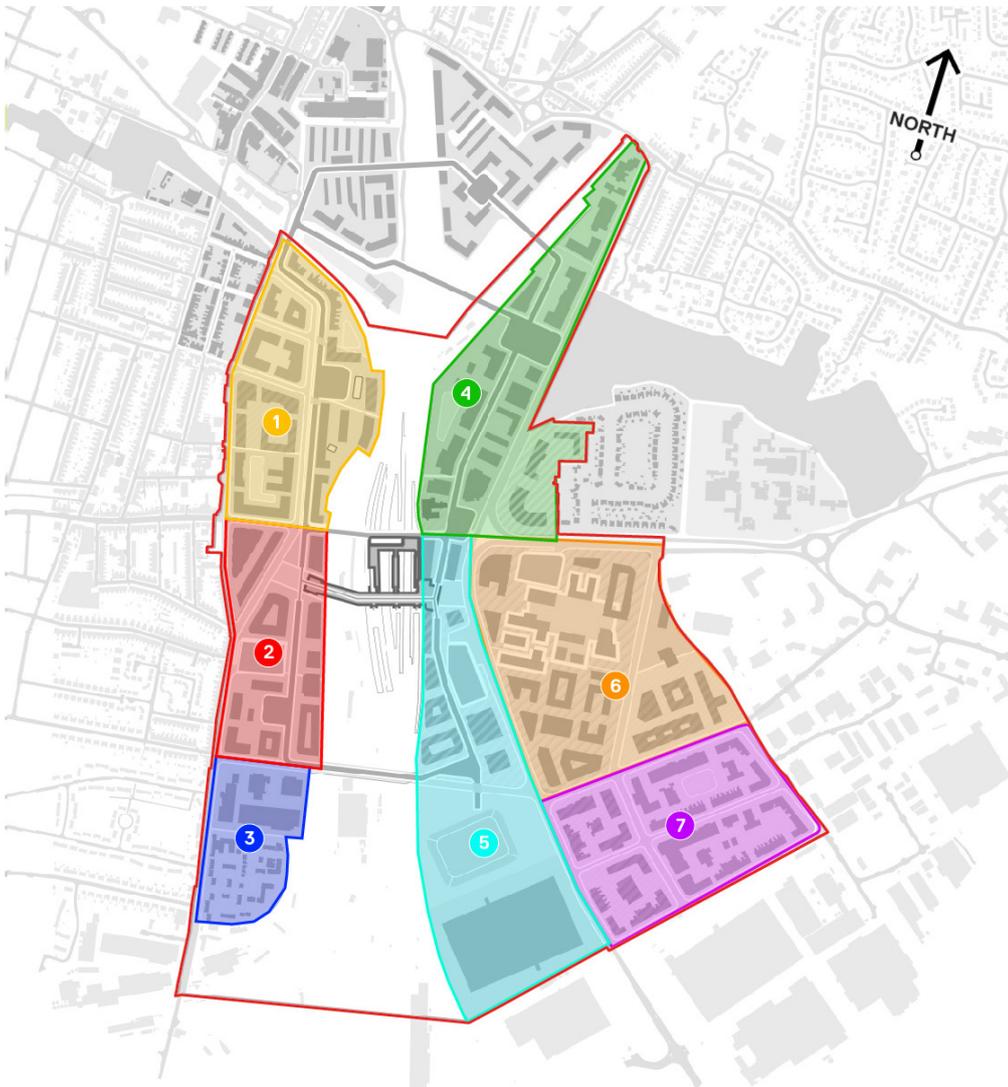
2.2 - LAND USE AREAS

In a similar manner to the core concepts, the masterplan land use was to be frozen to enable design progression. To facilitate this, the three Feasibility options were broken down into seven key land use areas (fig 2.7):

- 1. Northwest
- 2. Western
- 3. Southwestern
- 4. Northeastern
- 5. Central
- 6. Eastern
- 7. Southeastern

Through this process a single composite masterplan was constructed live, during workshop four. It was agreed with the client team at this workshop that the existing land ownerships should not be considered an overriding constraint on the preparation of land use options and creative design thinking during this initial piece of work.

Image 2.7 - Red-line land use areas

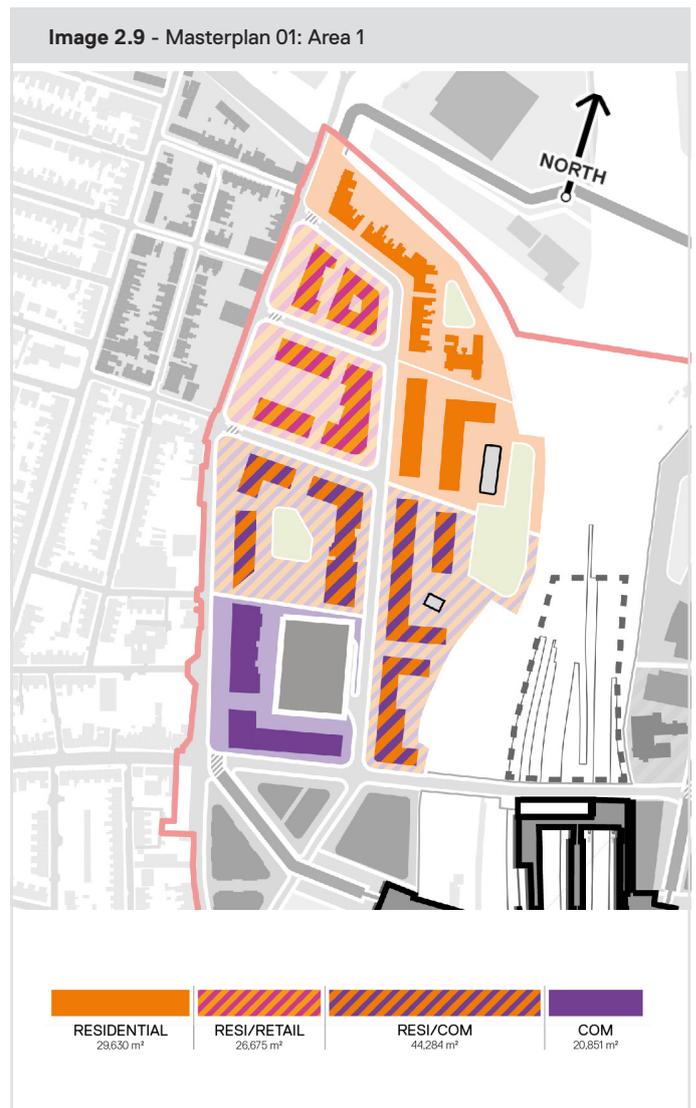
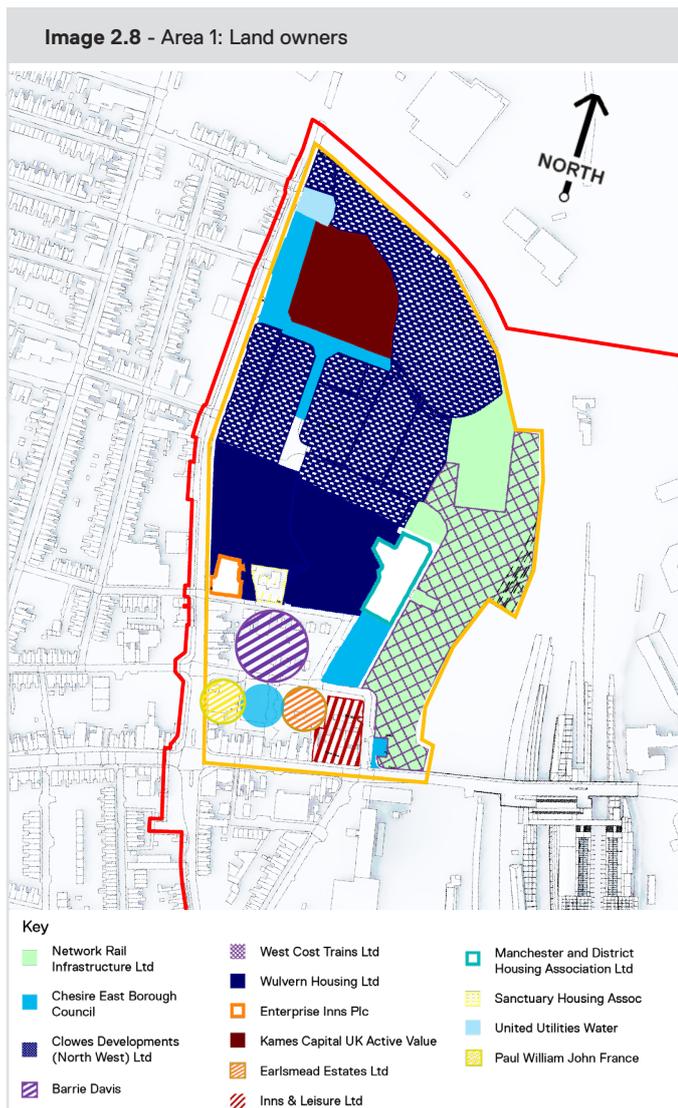


2.2 - LAND USE: AREA 1

Following the core concept decision in section 2.1, land use area 1 forms a crucial part of the masterplan brief as this area provides a pedestrian link between the station and the existing town centre. All land use options attempt to locate a mixture of commercial and residential land use, however they all do so with different effect. 'Option 2' was selected due to its balanced mix of commercial and residential land, with an active frontage of commercial along Nantwich Road. Residential land is located to the north which links to the existing residential land to the west, and Crewe town centre to the north.

Masterplan 01:

- Concept provides a wide mix of land uses with partial commercial frontage facing Nantwich Road.
- Clear link is created between station and town with incorporation of mixed use developments driving footfall towards the town from the station.
- Lacks a strong commercial frontage along the entire length of Nantwich Road next to station.

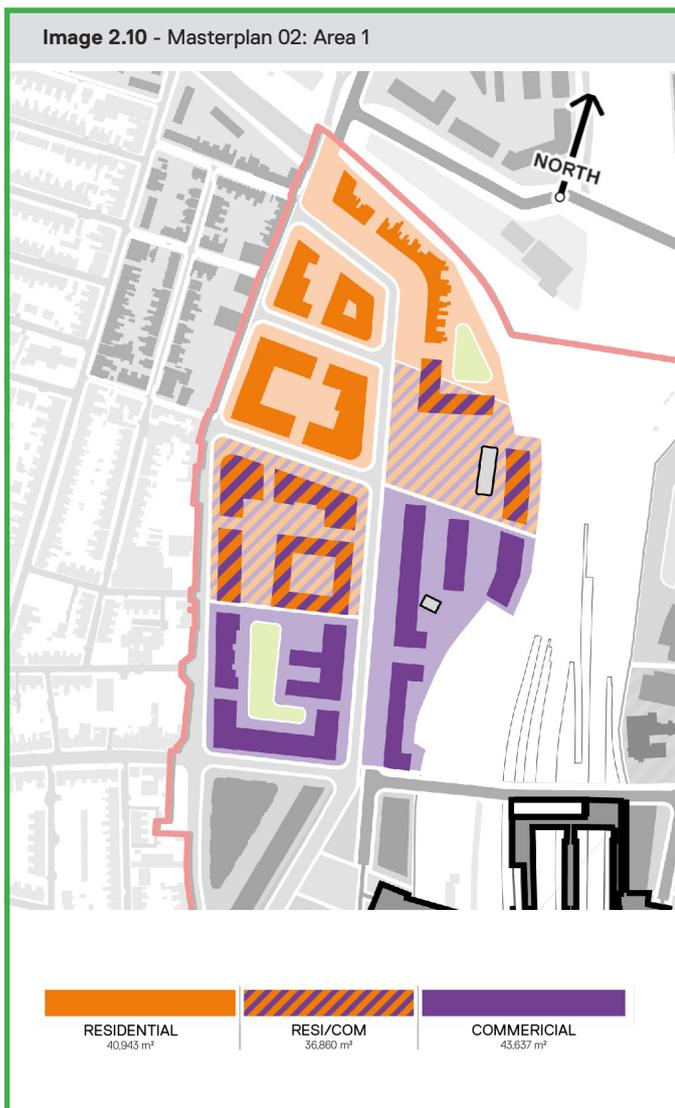


Masterplan 02:

- Concept provides a mix of land uses with a full frontage of commercial facing Nantwich Road. To the north a residential land use intermediates with the existing town centre.
- Transition from a strong commercial frontage along Nantwich Road next to station with Residential/ancillary retail area immediately behind with lower density residential to the north is supported from property development perspective.

Masterplan 03:

- Concept provides a majority of residential land use with a partial frontage of commercial land facing Nantwich Road.
- The proposal for a residential land use extends the already strong existing residential presence to the northwest area.
- Some ancillary retail is probably required. Residential site coverage appears low to the east, and commercial area is probably too small.

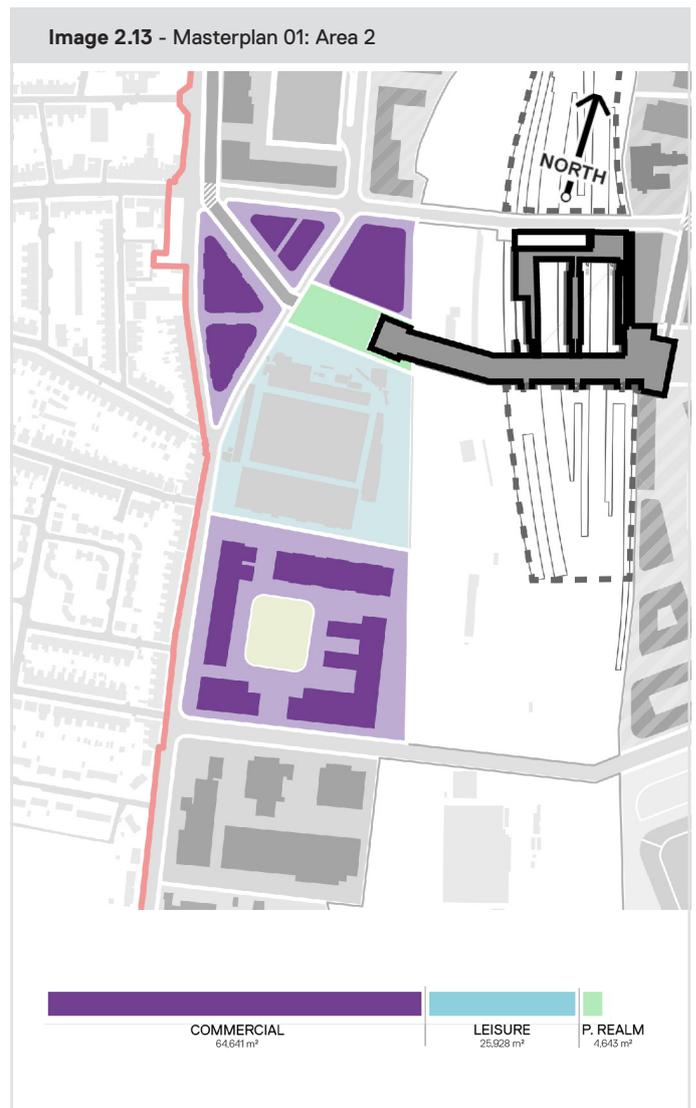
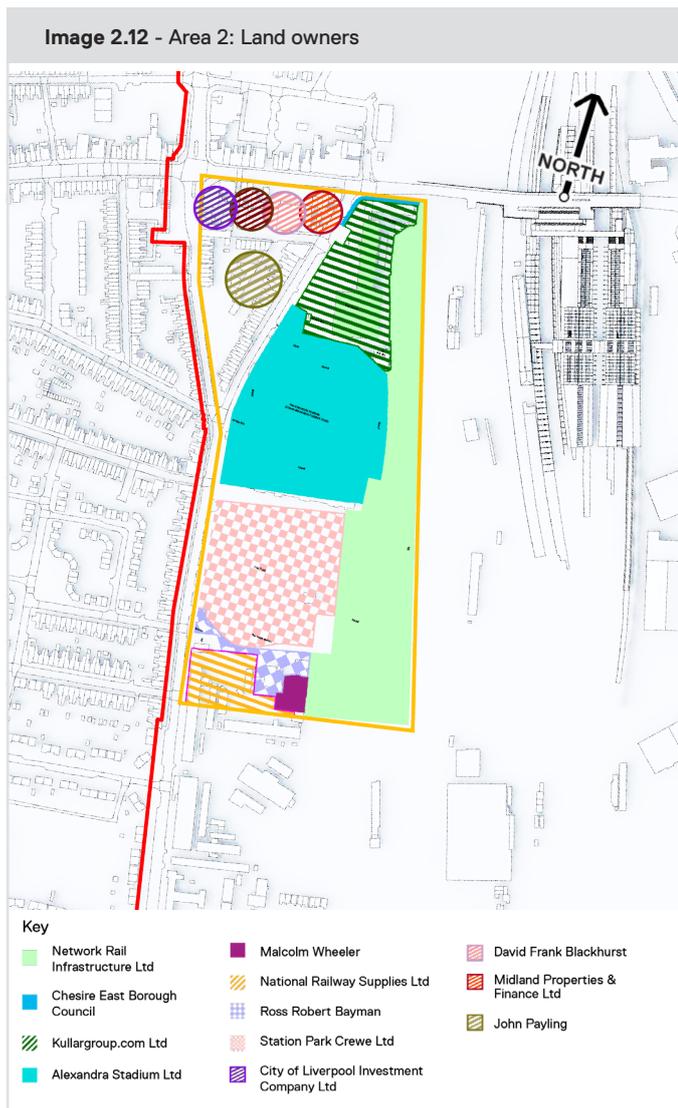


2.2 - LAND USE: AREA 2

Land use area 2 is directly linked to the western station entrance making it a high value land plot within the red-line masterplan. Its position and potential value lends itself to commercial land use. Differences can be seen in their approach to dividing the land use through the positioning of roads. 'Masterplan 01' breaks the small triangular block and retains Gresty Road, whereas 'Masterplan 02' retains the triangular block with the Gresty Road link, and 'Masterplan 03' removes all roads to create a single plot. 'Masterplan 02' was chosen for its ability to bring vehicles closer to the station entrance, without requiring alteration to the small triangular plot, which is complex due to its multiple land owners.

Masterplan 01:

- Gresty Road land parcel is split to provide two smaller commercial plots with a link to Mill Street. Unlocks ability to locate a larger tower on the northeast land parcel.
- Concept provides a focus on commercial land use.
- Retention of the Stadium on Gresty Road limits the market attractiveness of the commercial plot to the south.



Masterplan 02:

- Land parcels enable provision for public transport only route at the north of Gresty Road.
- Concept provides a focus on commercial land use.
- The relocation of the stadium from its present location would provide an opportunity to create a larger development opportunity on a site which has a direct link into the station and consequently drive more value from the scheme.



Masterplan 03:

- Concept provides a focus on commercial land use.
- The relocation of the stadium from its present location would provide an opportunity to create a larger development opportunity on a site which has a direct link into the station and consequently drive more value from the scheme.
- Lacks ability to located intermodal facilities close to the station entrance.

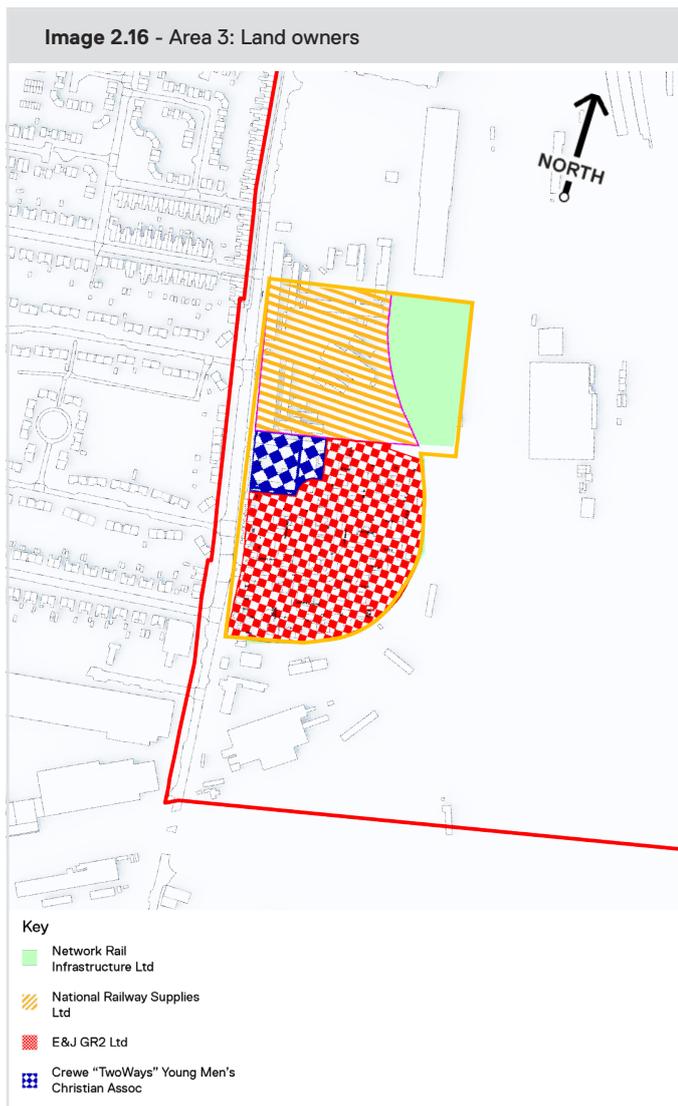


2.2 - LAND USE: AREA 3

Land use area 3 is located to the southwest of the masterplan area. This area is located within an existing residential area. The three masterplan options propose a different land use approach, but all retain an existing residential southern land use. 'Masterplan 03' was selected due to its contextual relationship to the existing residential land. Commercial land use is better located elsewhere in the masterplan, and light industrial land was not seen to be viable in this location. Residential was therefore most fitting to this location.

Masterplan 01:

- Concept provides a mixture of commercial and residential land use.
- In options where southern link bridge is proposed, commercial land provides a mediator between road and residential land.
- Commercial not likely to be viable – better sites to the immediate north; residential compatible with adjacent land use.

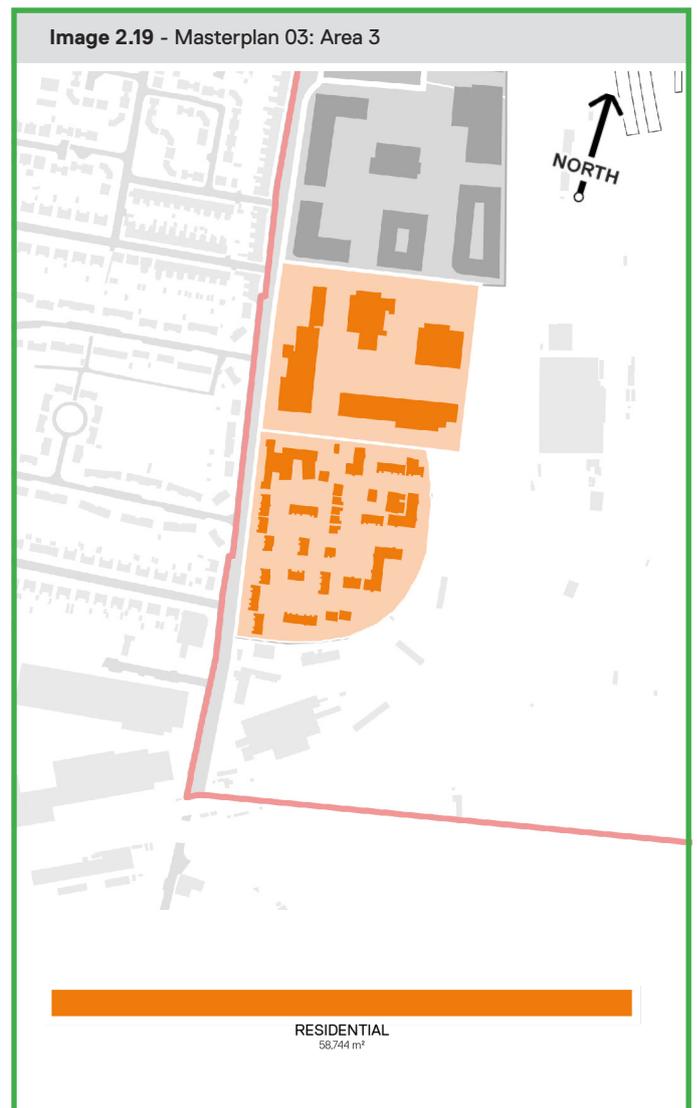
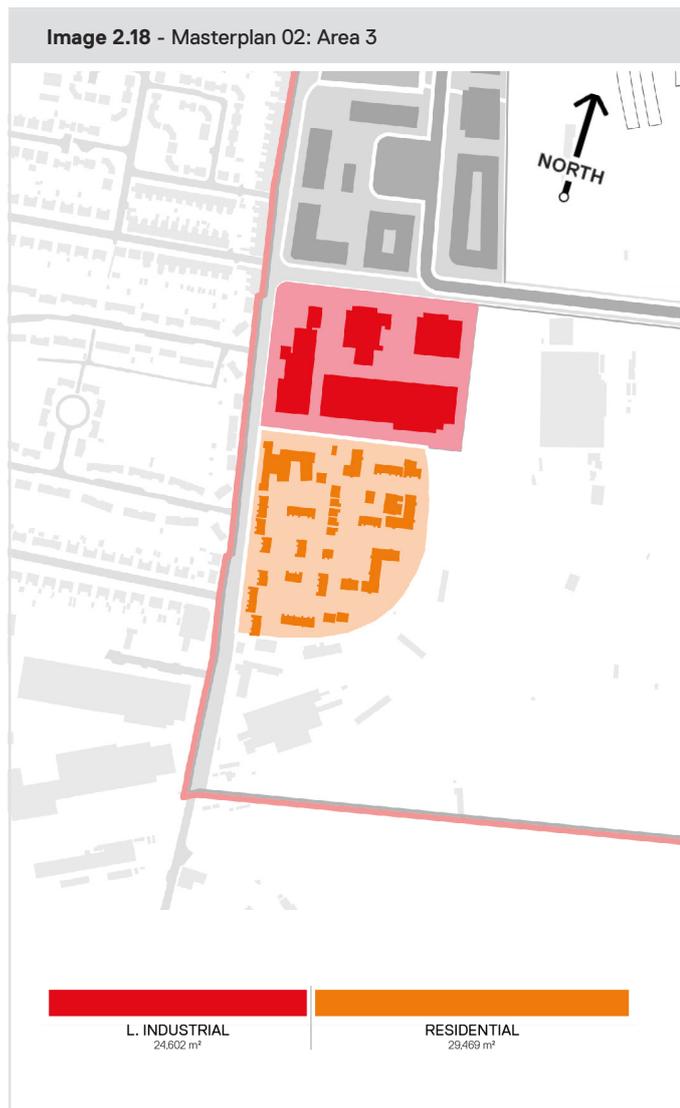


Masterplan 02:

- Concept provides a mixture of light industrial and residential land use.
- In options where southern link bridge is proposed, light industrial land provides a mediator between road and residential land.
- Redevelopment for light industrial unlikely to be viable and incompatible with adjacent residential use.

Masterplan 03:

- Concept provides a purely residential land use which is compatible with adjacent land use.
- The proposal for a residential land use extends the already strong existing residential presence.
- Meets ambitions of the Local Plan Strategic aim of delivering 40 dwellings per hectare of land, and unlocking other land use elsewhere in the masterplan.



2.2 - LAND USE: AREA 4

Land use area 4 is located in the northeast area of the masterplan and currently provides commercial land, with residential properties located to the north of Macon Way. Each of the three masterplan options propose residential land to the north with a commercial land to the south. This provides a transition between the existing northern residential land and the proposed commercial hub east of the station.

Hotel land use is located to the southeast as a complimentary land use to the commercial land, close proximity to the commercial hub. 'Masterplan 03' was selected due to its offering of hotel land use.

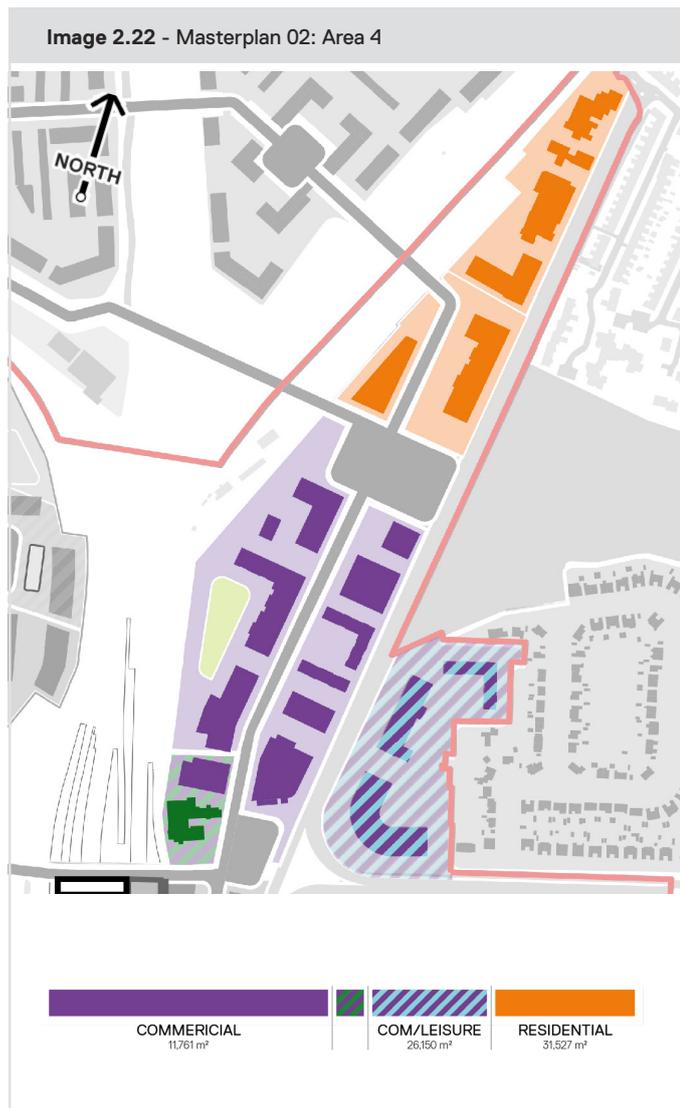
Masterplan 01:

- Concept provides a mixture of residential, commercial and hotel land use.
- The hotel land use provides a clear sight of the station, whilst being positioned to serve both the Crewe Campus centre and the Town centre.
- The land use encourages landmark development through commercial land use (not retail) up to the town centre link.



Masterplan 02:

- Concept provides a mixture of residential, commercial and leisure land use.
- Leisure land use located close to the station, Crewe Campus, and Crewe Town provides good connection to the masterplan.
- Leisure land use does drive the best value from this key site.
- Land use meets the local plan for providing a nationally significant economic centre,



Masterplan 03:

- Concept provides a mixture of residential, commercial and hotel land use.
- The hotel land use provides a clear sight of the station, whilst being positioned to serve both the Crewe Campus centre and the Town centre.
- The land use encourages landmark development through commercial land use (not retail) up to the town centre link.

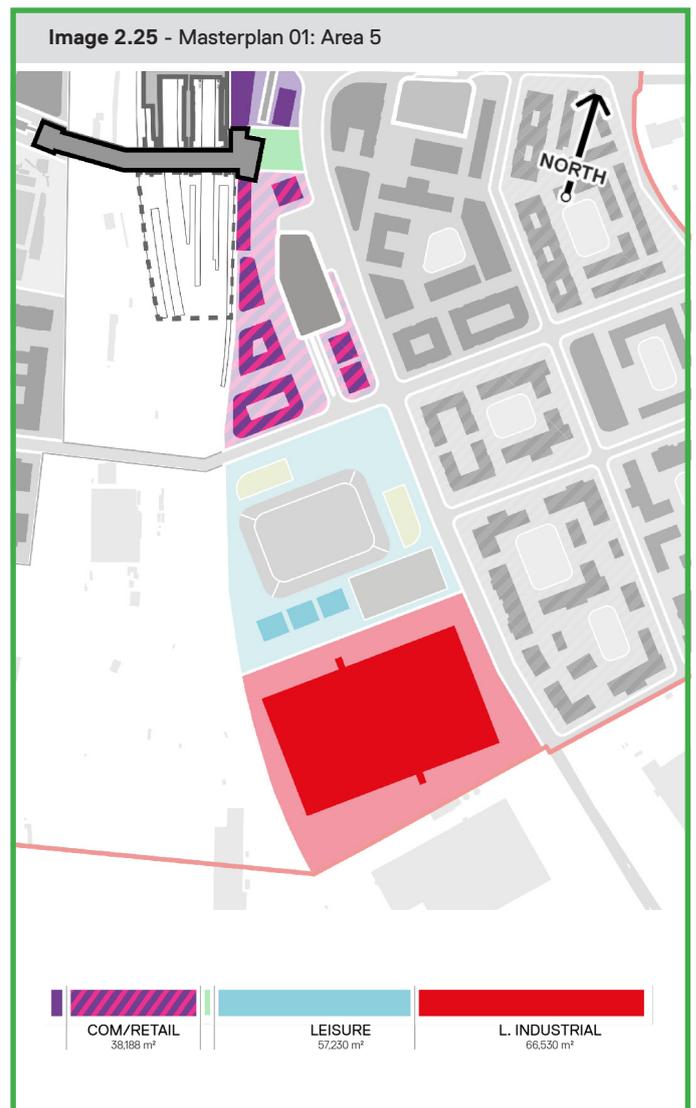


2.2 - LAND USE: AREA 5

Land use area 5 is located at the centre of the masterplan and is importantly located on the eastern entrance of the station. 'Masterplan 01' was selected because of its offering of retail and commercial space in close proximity to the station entrance. It also provides a leisure space within walking distance of the station, making it a suitable space for a key anchor building. Although concerns over the provision of light industrial land use within the red-line were raised. It was discussed that it may be more suitable to locate residential or commercial land use to drive a higher value on the site.

Masterplan 01:

- Commercial and retail land use activate pedestrian link between the station and southern leisure space. Light industrial land use is located to the far south.
- Key site at station entrance owned by council – opportunity for a landmark commercial development.
- Commercial with ground floor retail at the station entrance will drive values for this site.

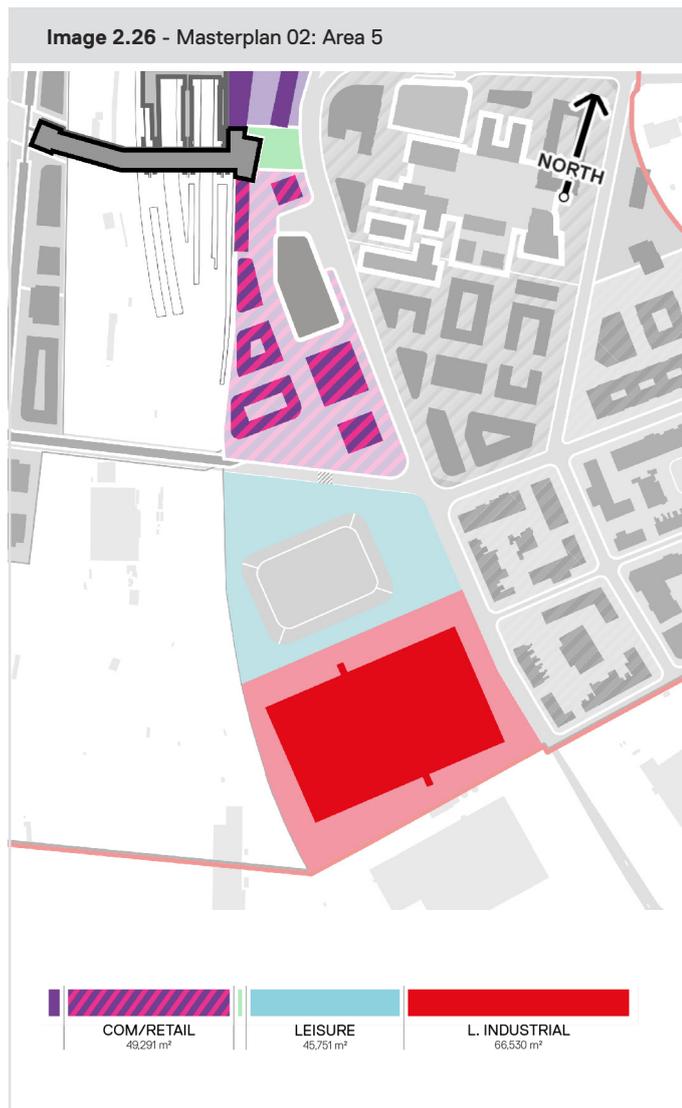


Masterplan 02:

- Commercial and retail land use activate pedestrian link between the station and southern leisure space. Light industrial land use is located to the far south.
- Key site at station entrance owned by council – opportunity for a landmark commercial development.
- Commercial with ground floor retail at the station entrance will drive values for this site.

Masterplan 03:

- Commercial and retail land use activate pedestrian link between the station and southern leisure space. Leisure space is located further south to increase commercial land use. Leisure space creates additional footfall to the out of town retail land use that surrounds it.
- Commercial will drive additional value when compared to option 1 & 2.



2.2 - LAND USE: AREA 6

Land use area 6 is located to the east of the masterplan and is the key location of the 'Commercial Hub'. All options propose a mixed land use, with 'Masterplan 02' mixing commercial with hotel, and retail land use. 'Masterplan 01' was selected due to its higher amount of commercial land use, although comments suggested this area should contain even more commercial land use, and less residential to strengthen its position as the core 'Commercial Hub'. The central road creates a connected urban block, but it was also considered a potential point of severance within the commercial hub. Development towards a land form similar to 'Masterplan 03' was suggested.

Masterplan 01:

- Concept provides a mixture of residential and commercial land use. Commercial land is focused close to the station, where as residential land is located towards the southeast.
- Commercial development on key corner site with residential including ancillary retail - works well from a property development perspective.
- Grid layout good for 'human feel'.



Masterplan 02:

- Concept provides a mixture of residential and commercial land use. Commercial land is focused close to the station, where as residential land is located towards the southeast.
- Potentially awkward junction geometry at SLB/Weston Road.
- Large B&Q occupying key corner site where commercial development is planned.
- Need to relocate MSCP away from Crewe Road.

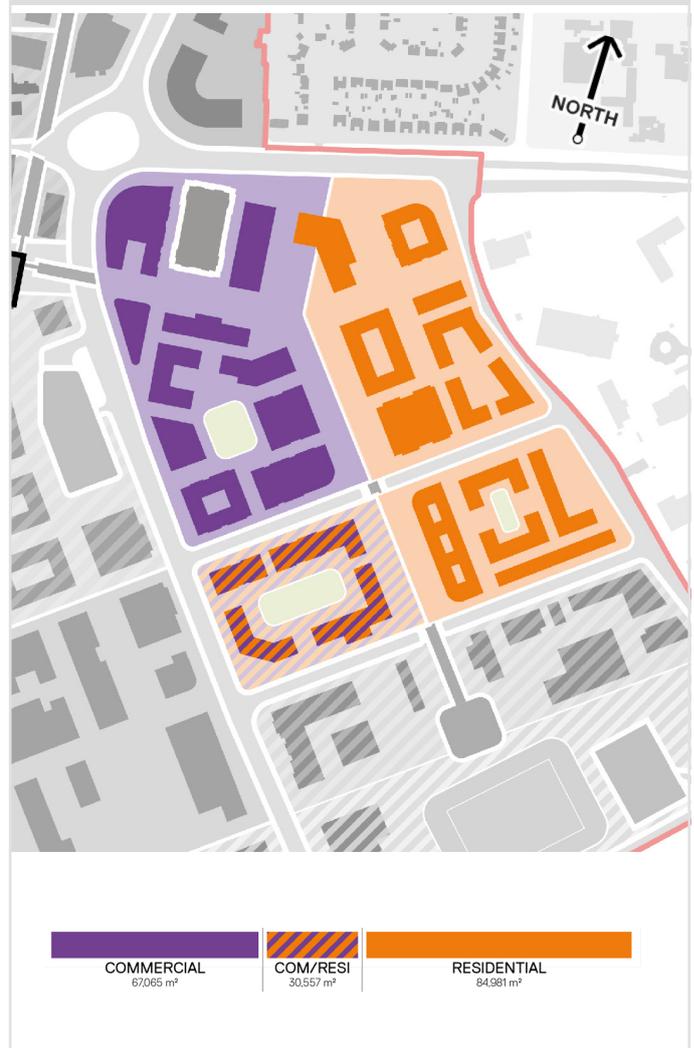
Masterplan 03:

- Concept provides a mixture of residential and commercial land use. Commercial land is focused close to the station, where as residential land is located towards the southeast.
- Commercial development on key corner site with residential including ancillary retail - works well from a property development perspective.
- Need to relocate MSCP away from Crewe Road.

Image 2.30 - Masterplan 02: Area 6



Image 2.31 - Masterplan 03: Area 6

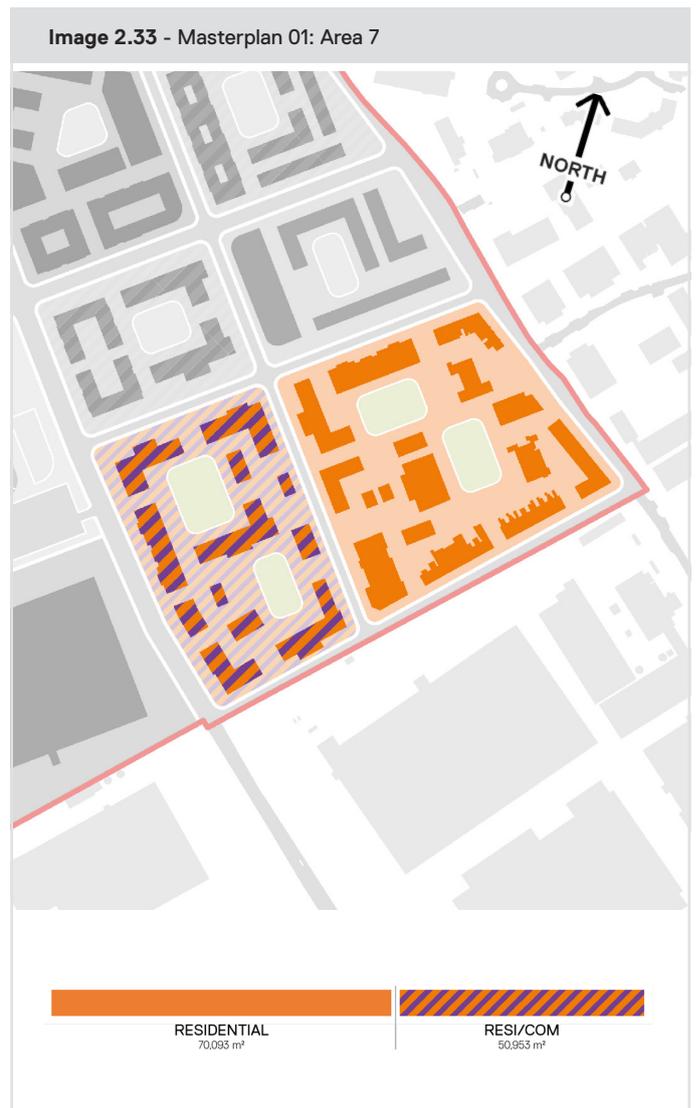


2.2 - LAND USE: AREA 7

Land use area 7 is located in the southeast of the masterplan. This area is complex due to its position between the commercial hub to the north, and the existing industrial land to the south. It also contains multiple land owners that may create a complex acquisition strategy. Residential land was proposed to meet the baseline quantum of development. 'Masterplan 03' was selected as the most suitable land use as the location of the football stadium created a mediator between the residential land use and the existing industrial. Further development is required in this area to ensure viability of residential land. Alternative solutions will be presented in section 3 of this study.

Masterplan 01:

- Concept provides a focus on residential land use. Partial mixed commercial land is focused close to the station to mediate between pure commercial to the north and pure residential land towards the southeast.
- Residential including ancillary retail works well from a property development perspective.
- New residential development assists the promotion of connections between railway and the southeast.

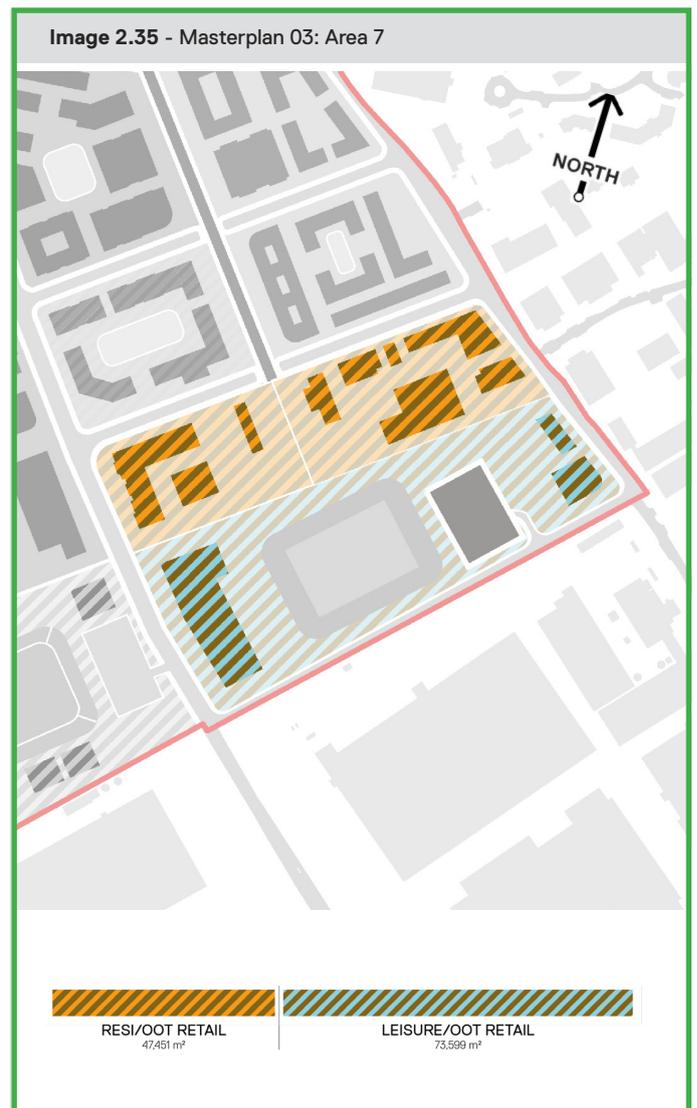


Masterplan 02:

- Concept provides a mixture of residential and commercial land use. Commercial land is focused close to the station, where as residential land is located towards the southeast.
- Residential including ancillary retail works well from a property development perspective.
- New residential development assists the promotion of connections between railway and the southeast.

Masterplan 03:

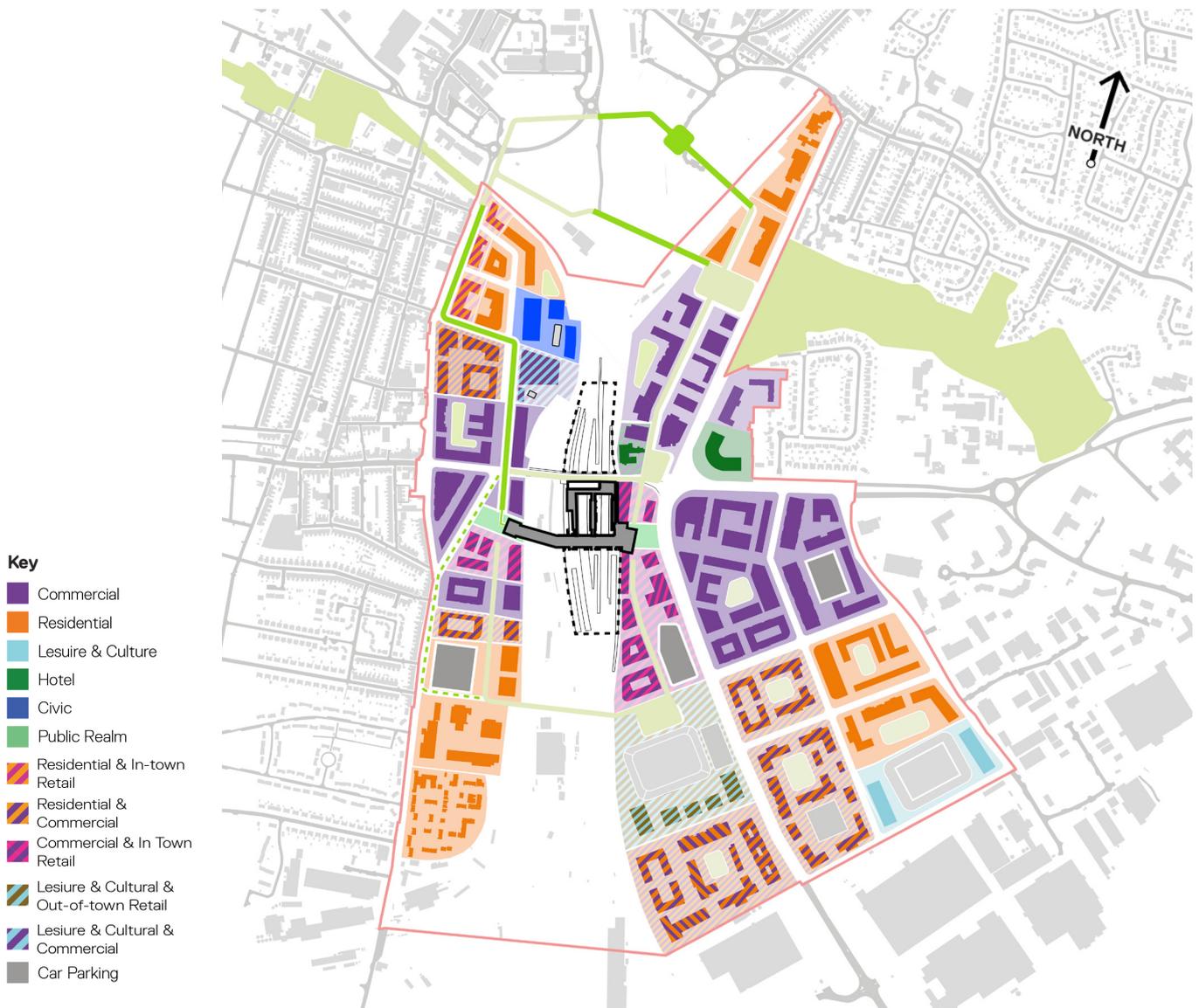
- Concept provides a mixture of residential, retail and leisure land use. High quality residential developments are activated by its leisure and retail surroundings.
- Stadium relocation site preferable to existing location but a relocation further away is also be viable.
- New residential development assists the promotion of connections between railway and the southeast.



2.3 - UNDEVELOPED COMPOSITE MASTERPLAN

A decision on each of the seven individual land areas was made during Workshop 4. During this workshop the design team built a live masterplan which was labelled the 'undeveloped masterplan' (fig 2.36). The undeveloped masterplan did not suggest that the land use outcome from Workshop 4 was fixed, but attempted to freeze general themes to enable further development by the consultant team. The freeze allowed the funding and finance, transport planning and architectural design to progress with a 'skeleton' masterplan in place.

Image 2.36 - 'Undeveloped' red-line masterplan



3

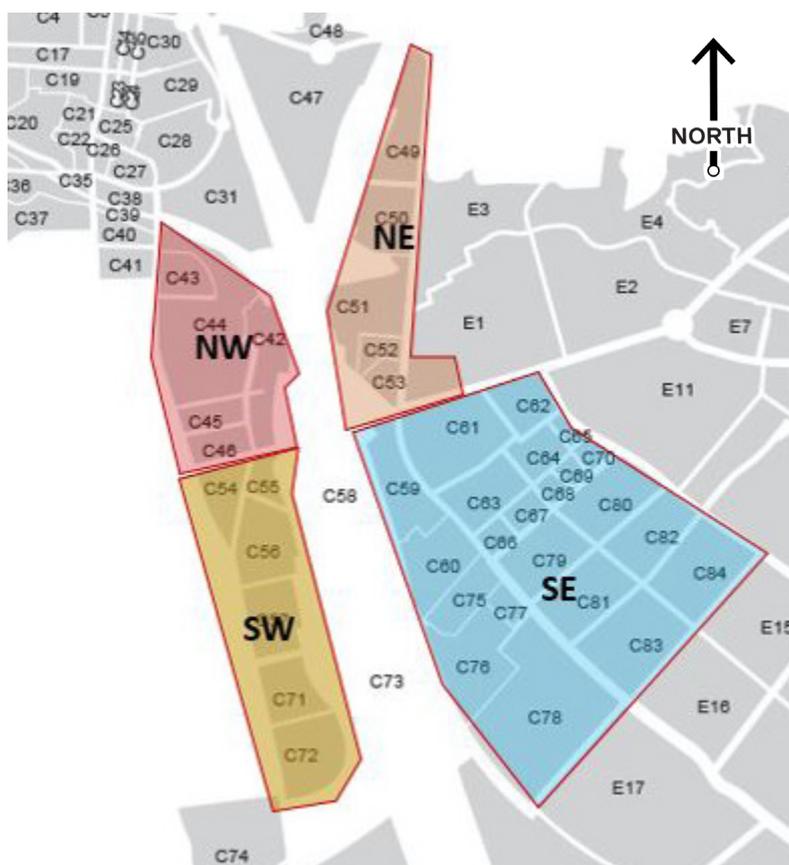
3.0 - MASTERPLAN QUANTUM DEVELOPMENT

With the land use largely fixed, the study considered four massing options to test the amount of feasible development within the red-line. This analysis builds on the 'undeveloped' masterplan design by extruding building footprints and totalling their Gross External Areas (GEA's) to create a total masterplan quantum of development.

A baseline development quantum was established in the previous CEC Feasibility study. This was created by aligning the 'central masterplan area' (CMA) and the 'Crewe Campus red-line boundary'. This was achieved by selecting the parcels of land that are common to both scopes as shown in figure 3.1. The table adjacent details the gross development quantum for each development type. These figures are considered a baseline and are tested within this study.

The following study should be considered illustrative as means of testing massing concepts. F&F workstreams should present a market led delivery approach ascertaining the final quantum required. The architectural design will respond to the market led information produced by others.

Figure 3.1 - 'Baseline' development quantum conversion



Land Use Type	Crewe Campus
Commercial	335,795
Residential	248,005
Retail	54,863
Light industrial	5,985
Green space	23,076
Car parking land	50,251
Total	717,060

3.1 - MASTERPLAN CORE CONCEPTS

The main commercial area was outlined by the F&F teams as being the area between Nantwich Road to First Avenue, and along Cowley Way on the eastern side (fig 3.2) - known as the 'Commercial Hub'. This area provides most of the commercial land use within the red-line masterplan. This location was selected as it is easily accessed from the station, which increases its attractiveness to potential businesses (fig 3.3) and is considered to contain high value plots.

Surrounding the core commercial space is a secondary commercial area located to the north, which acts as an intermediate buffer between the taller commercial hub building area and the northern residential land (fig 3.4).

Residential land can be seen towards the edges of the masterplan and attempt to mediate between the proposed and existing residential locations.

Following Workshop 4, the key area for consideration was identified as the southeast of the masterplan. Its location is between the new commercial hub to the north, and the existing industrial land use to the south created a challenging area. This was because it was not considered prime commercial space due to its longer walking distance to the station, and the masterplan already contained sufficient commercial land within the main commercial hub to meet the baseline requirements. The options that follow attempt to address this area, and provide new options for the level of development.

Image 3.2 - 'Core Commercial Hub' existing zone



Image 3.3 - 'Core Commercial Hub' zone

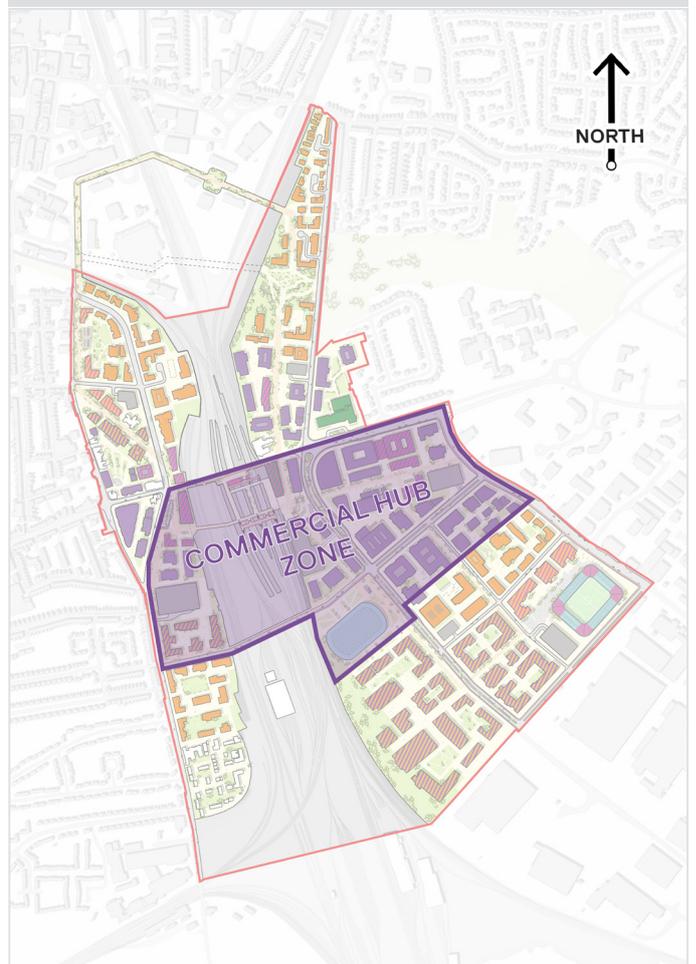


Image 3.4 - Secondary commercial zone

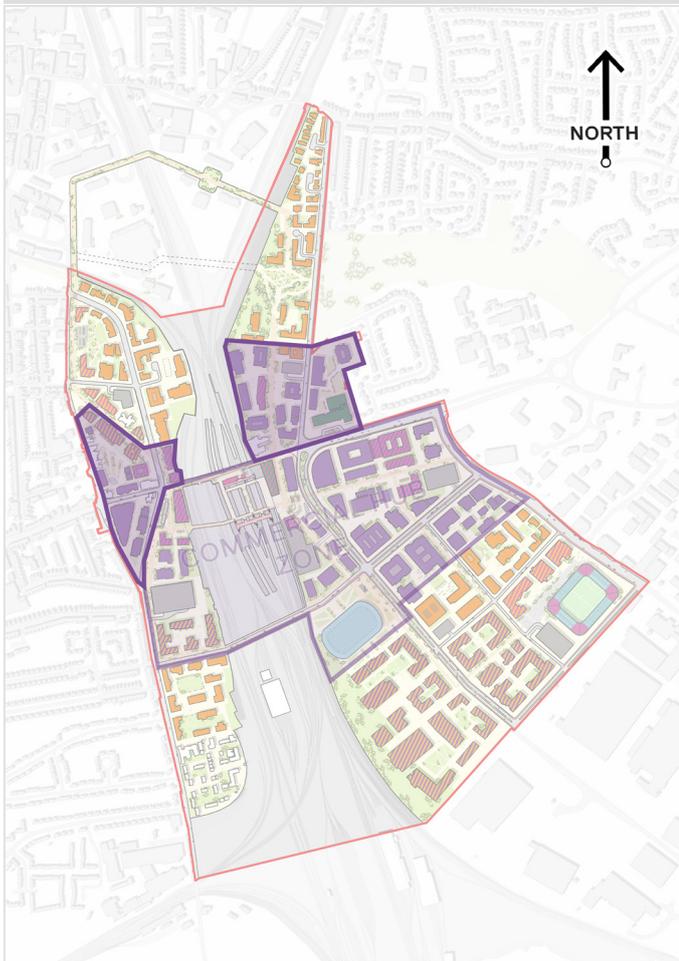
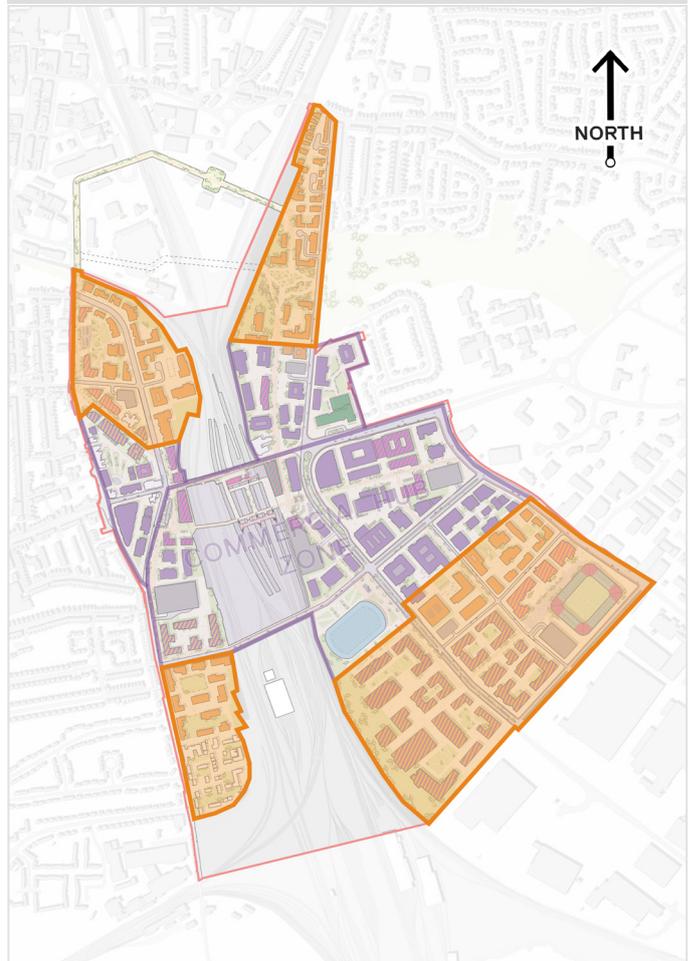


Image 3.5 - Residential edges



3.2 - QUANTUM CONCEPTS

The Feasibility stage proposed three masterplan options using a consistent baseline. This approach was taken to minimise the amount of masterplan options and focus decision making on the concept of land use type instead of the quantum of development. However, with the land use frozen in Workshop 4 the opportunity arose to develop a series of massing options and test previous land area assumptions.

Four different approaches were taken, which not only explored whether the quantum of development was suitable for the red-line but also whether the red-line was the correct size. These options can be seen in the diagrams below (fig. 3.6-9).

Image 3.6 - Option 1: Baseline

The baseline retains the quantum presented in the 2017 'CEC study' within the 125 hectare red-line site. Buildings are sized to meet these development figures, but do not propose to exceed them.

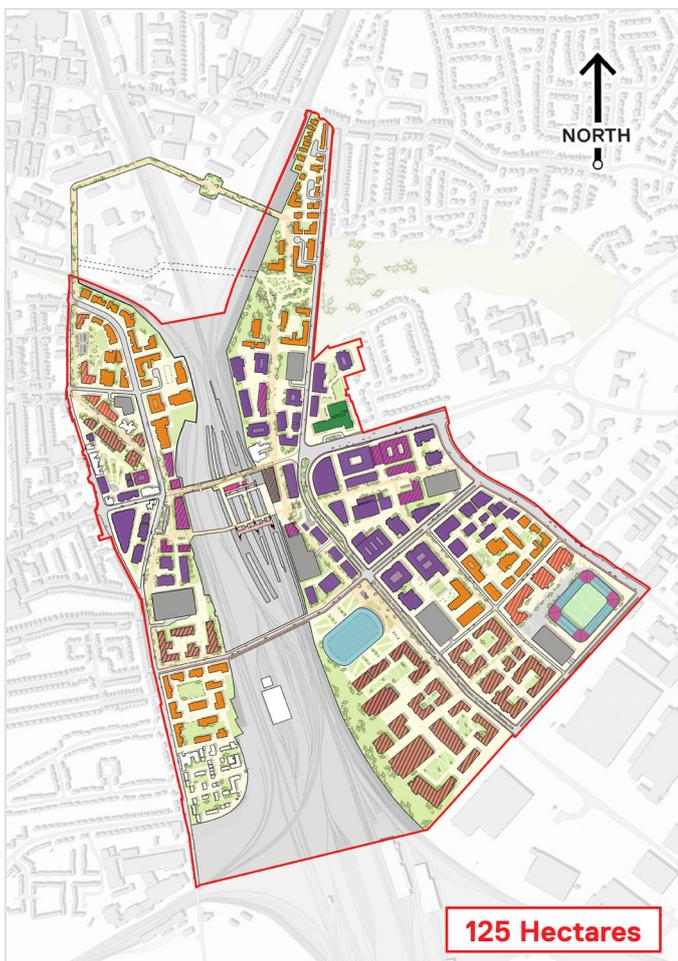


Image 3.7 - Option 2: Masterplan led

This option utilises the same land use and size as 'Option 1', however it proposes architectural building heights (not influenced by F&F) to provide a masterplan which meets the aspirations of creating transformational change in the area. It achieves significantly higher levels of development as a result.

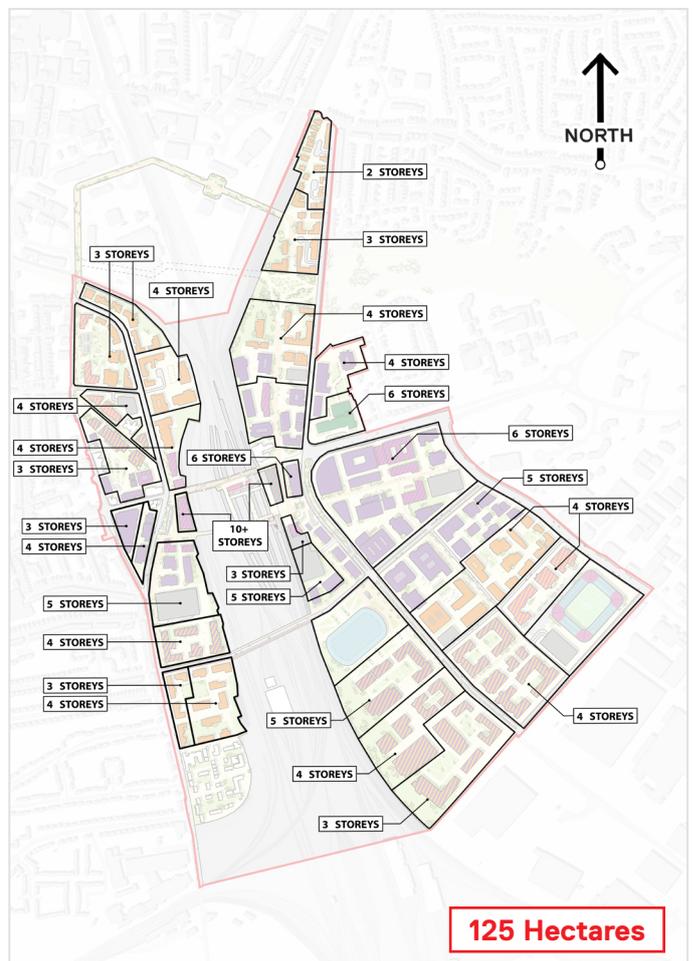


Image 3.8 - Option 3: Commercially reduced red-line

This option compresses the red-line to an area similar in size to the Feasibility greenline, although as highlighted earlier in this study, it also includes a town centre link to meet the core objectives of the design. The option meets the commercial figures, but lacks other land use such as residential or leisure.

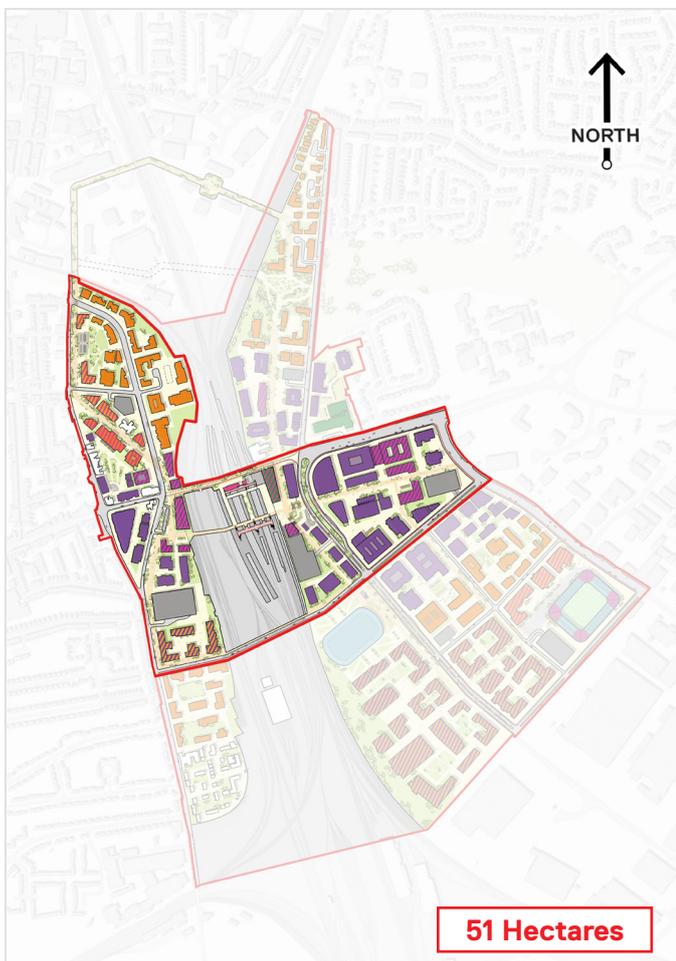
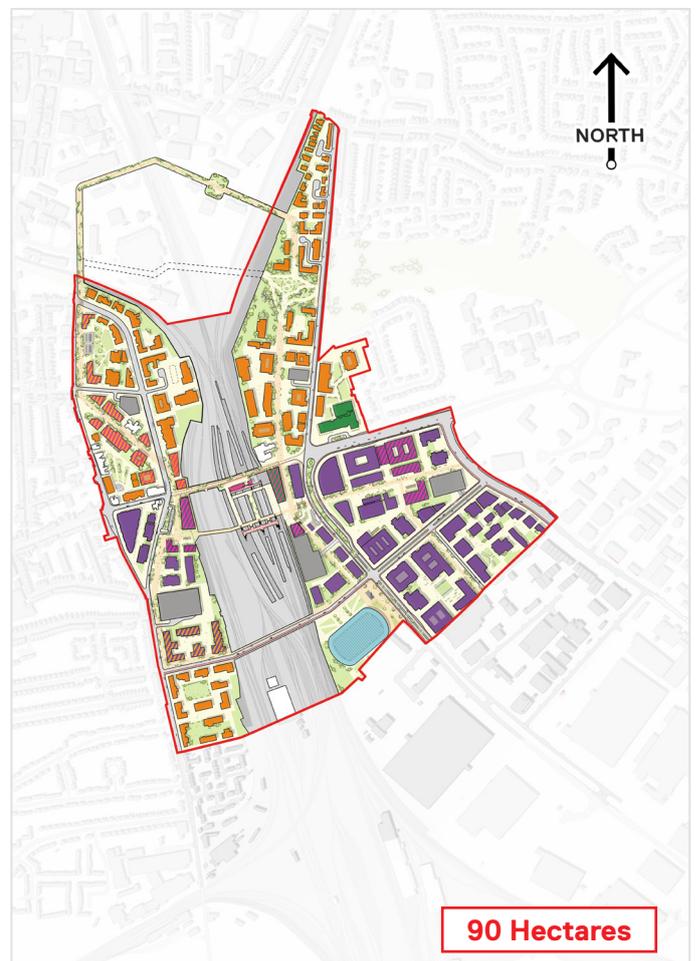


Image 3.9 - Option 4: Baseline reduced red-line

This option also compresses the red-line, but manages to maintain the baseline quantum development figures. This option is effectively a hybrid between Options 1 & 2, and achieves the quantum by proposing taller baseline blocks within a tighter red-line.



3.3 - OPTION 1: BASELINE

The 'Baseline' option utilises the entire red-line site (125 hectares, with 100 hectares of developable land). The baseline figures derive from taking a proportion of the 'CEC study', as explained in section 3.0. The option was created by:

1. Each building footprint area was calculated in m².
2. Each buildings land use were grouped into 'Land Use Types'.
3. Their footprints were combined to create a total 'Masterplan Building Footprint'.
4. Total footprint was divided by the total Baseline quantum figure to give the required 'Storey Height' per land use type.

This option has revealed that the red-line was capable of meeting the CEC study figures with relatively low building heights. This questioned whether the quantum is too low for the red-line boundary, or if the red-line boundary was too large.

Image 3.10 - Baseline high-level quantum figures

Land Use Type	Baseline GEA (m ²)	Total GEA (m ²)	Storey Height
Commercial	335,795	313,200	3
Residential	248,005	233,549	2-3
Retail	54,863	50,000	2
Light industrial	5,985	0	-
Green space	23,076	35,000	-
Car parking	50,251	215,900	4-5
Leisure	0	29,500	-
Hotel	0	5,500	-
Total	665,749	665,749	

Additional reduction is required for provision of schools, health clinics, police stations, etc. Car parking is based on Transport Planning information prior to Jacobs Data, and is based on a maximum scenario commercial land and station use required parking figures. Car parking is therefore not included in the total GEA as the figures differ being based on different set of requirements.

Image 3.11 - Baseline quantum massing

KEY

- 2 Storeys
- 3 Storeys
- 4 Storeys
- 5 Storeys
- 6+ Storeys

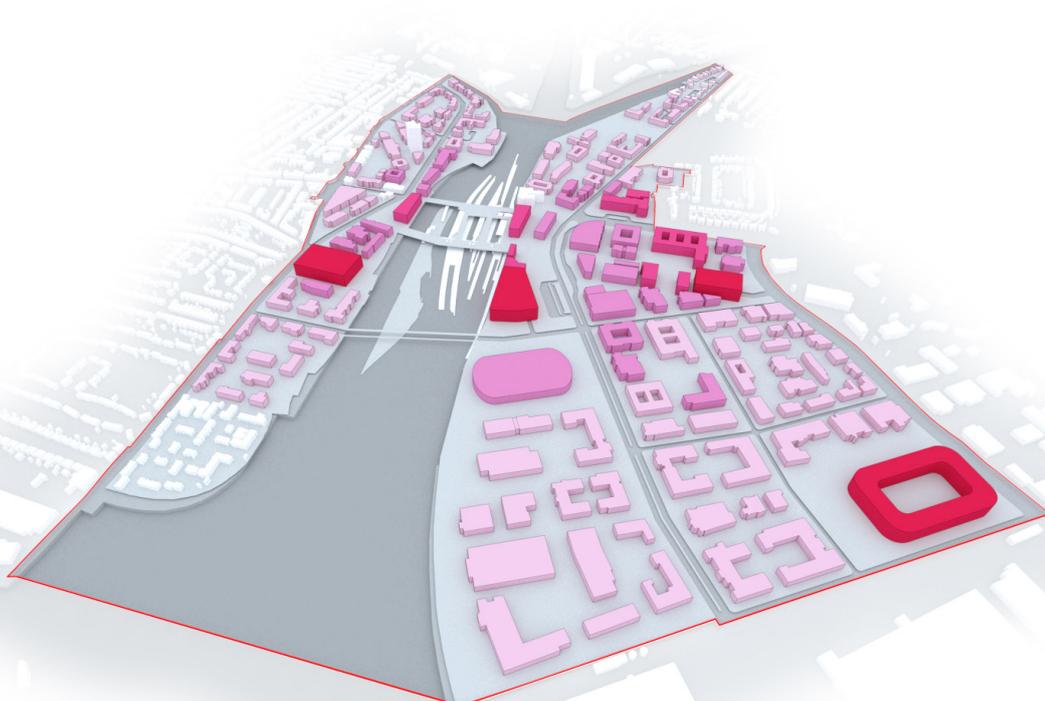
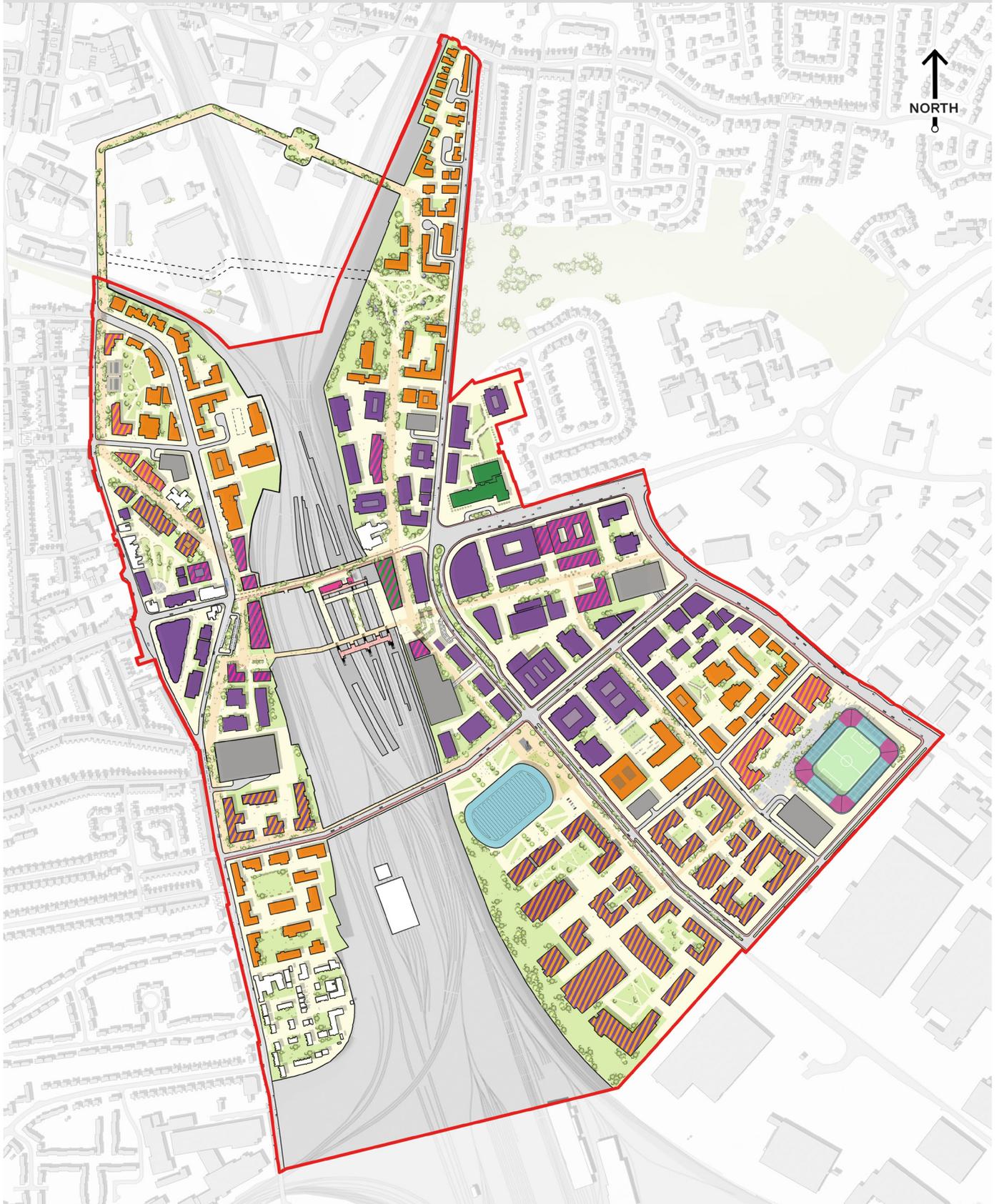


Image 3.12 - Baseline red-line



3.4 - OPTION 2: MASTERPLAN LED

The 'Masterplan Led' option utilises the entire red-line site (125 hectares, with 100 hectares of developable land). It tests the potential capacity of the red-line by exceeding the GEA proposed by the Baseline.

The option was created by assigning architecturally led building height 'zones' which consider both contextual impacts and value driven plots.

Once the building massing was generated a total GEA was calculated per land use type which was compared against the Baseline.

It became obvious that the red-line was potentially capable of achieving higher figures than the Baseline, although the exact massing and GEA requirements are to be developed by a market led funding and financing approach.

Hypothetically, the scope of the red-line is either: capable of delivering more GEA than the baseline, or too large and as such can meet the baseline figures within a compressed red-line area.

Image 3.13 - Masterplan led high-level quantum figures

Land Use Type	Baseline GEA (m ²)	Total GEA (m ²)	Percentage of Baseline (%)
Commercial	335,795	468,500	140%
Residential	248,005	393,000	158%
Retail	54,863	25,000	48%
Light industrial	5,985	0	-
Green space	23,076	35,000	-
Car parking	50,251	215,900	-
Leisure	0	29,500	-
Hotel	0	46,000	-
Total	665,749	997,000	

Additional reduction is required for provision of schools, health clinics, police stations, etc. Car parking is based on Transport Planning information prior to Jacobs Data, and is based on a maximum scenario commercial land and station use required parking figures. Car parking is therefore not included in the total GEA as the figures differ being based on different set of requirements.

Image 3.14 - Masterplan led quantum massing

- KEY**
- 2 Storeys
 - 3 Storeys
 - 4 Storeys
 - 5 Storeys
 - 6+ Storeys



3.5 - OPTION 3: 'COMMERCIAL REDUCED' REDLINE

The 'Commercial Reduced' option envisages a reduced red-line of approximately 51 hectares of land. The red-line responds to the previous Feasibility stage and suggests a 'Greenline Plus' by taking a similar greenline size, plus a link towards the Town Centre which is the core concept of the masterplan.

This compressed commercial red-line is unable to deliver the required amount of residential land required in the CEC study, achieving only 90,000m² of the baseline 248,005m². It also requires substantially taller commercial building heights of approximately 8 stories to meet the baseline commercial GEA of 335,795m².

An option that compresses the red-line to this extent was not considered viable.

Image 3.16 - Reduced commercial high-level quantum figures

Land Use Type	Baseline GEA (m ²)	Total GEA (m ²)	Storey Height
Commercial	335,795	335,500	8
Residential	248,005	90,000	2-3
Retail	54,863	23,000	1
Car parking	50,251	141,800	4-5
Total	665,749	448,500	

Additional reduction is required for provision of schools, health clinics, police stations, etc. Car parking is based on Transport Planning information prior to Jacobs Data, and is based on a maximum scenario commercial land and station use required parking figures. Car parking is therefore not included in the total GEA as the figures differ being based on different set of requirements.

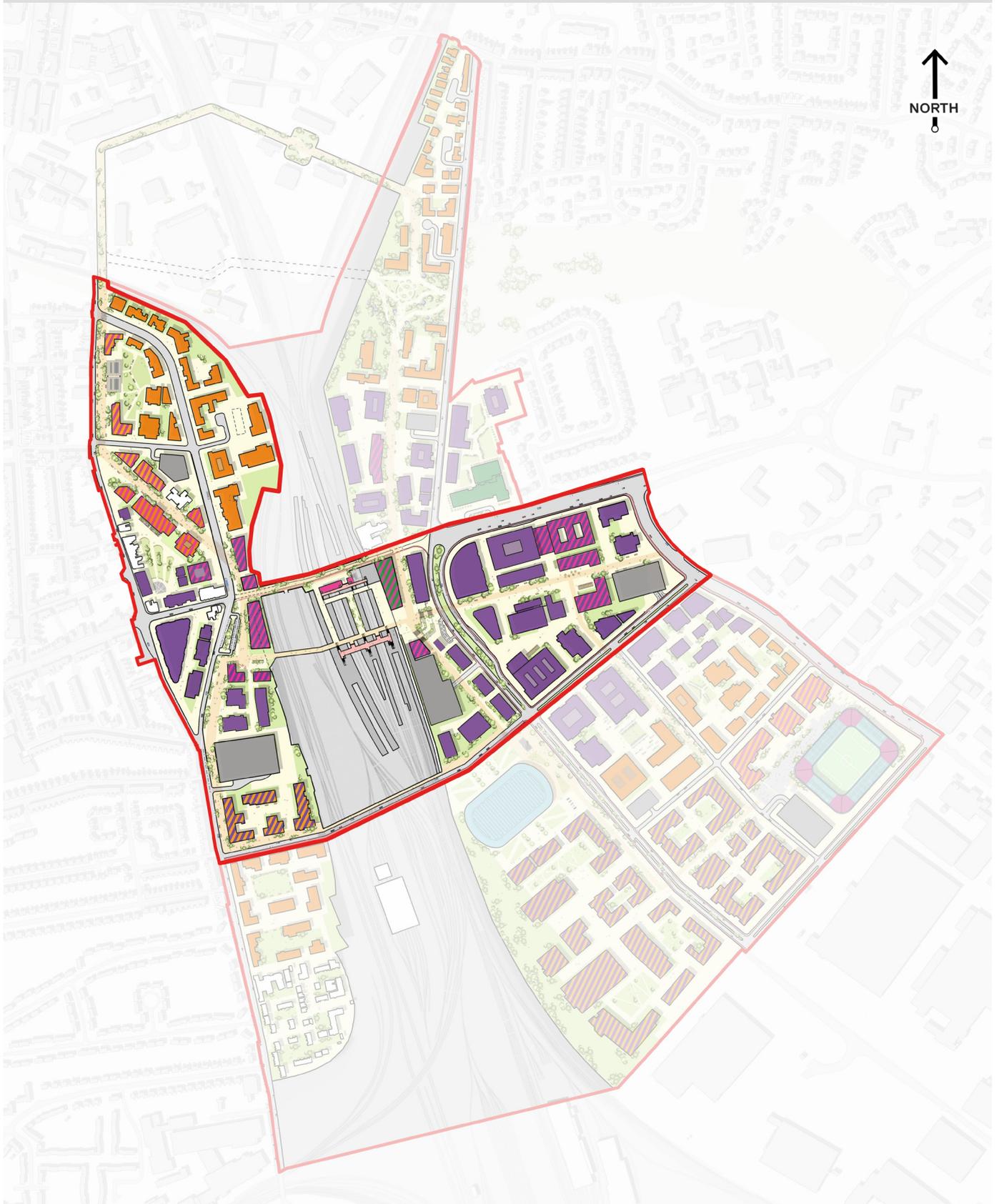
Image 3.17 - Reduced commercial red-line quantum massing

KEY

- 2 Storeys
- 3 Storeys
- 4 Storeys
- 5 Storeys
- 6+ Storeys



Image 3.18 - Reduced commercial red-line



3.6 - OPTION 4: 'BASELINE REDUCED' REDLINE

The 'Baseline Reduced' option proposes a reduced 'Option 1' red-line of approximately 90 hectares with 75 hectares of land area. The option maintains the total CEC study GEA development areas, whilst compressing the red-line as much as possible to reduce the land required.

It proposes a more architecturally led approach to building heights that would inspire transformational change, suggesting buildings should be sized between 4 - 6 stories. Proposing taller blocks in a smaller area provides less GEA than the ambitious 'Option 2', but should provide enough development to meet the baseline CEC study figures.

This option is also beneficial as it offers a potential solution to the complex southeastern land use challenge. The option ideally locates residential land to the north where it ties in with the existing residential land, and creates a transition to the existing industrial southern land use by lining it with commercial land use in the central hub area.

Image 3.19 - Reduced red-line high-level quantum figures

Land Use Type	Baseline GEA (m ²)	Total GEA (m ²)	Storey Height
Commercial	335,795	346,749	5-6
Residential	248,005	224,000	3-4
Retail	54,863	25,000	1
Light industrial	5,985	0	-
Green space	23,076	35,000	-
Car parking	50,251	215,900	4-5
Leisure	0	29,500	-
Hotel	0	5,500	-
Total	665,749	665,749	

Additional reduction is required for provision of schools, health clinics, police stations, etc. Car parking is based on Transport Planning information prior to Jacobs Data, and is based on a maximum scenario commercial land and station use required parking figures. Car parking is therefore not included in the total GEA as the figures differ being based on different set of requirements.

Image 3.20 - Reduced baseline red-line quantum massing

- KEY**
- 2 Storeys
 - 3 Storeys
 - 4 Storeys
 - 5 Storeys
 - 6+ Storeys

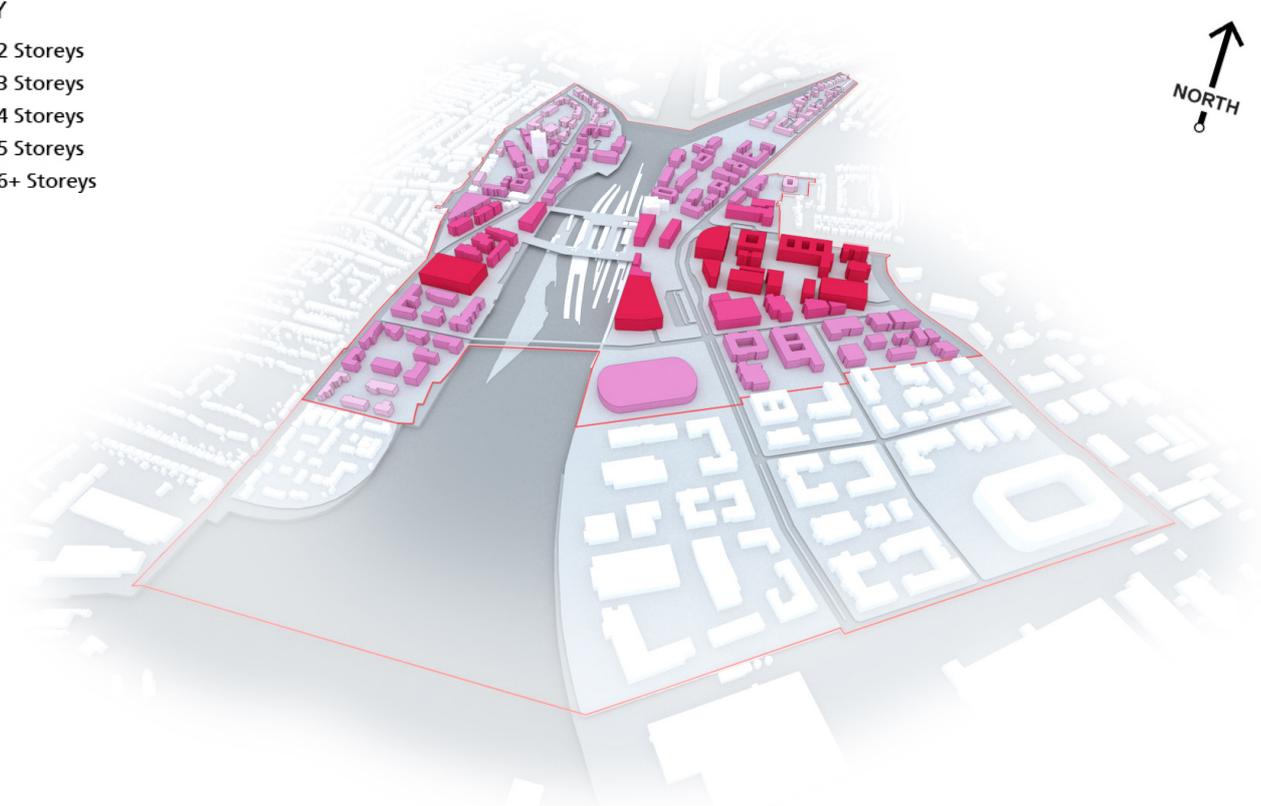
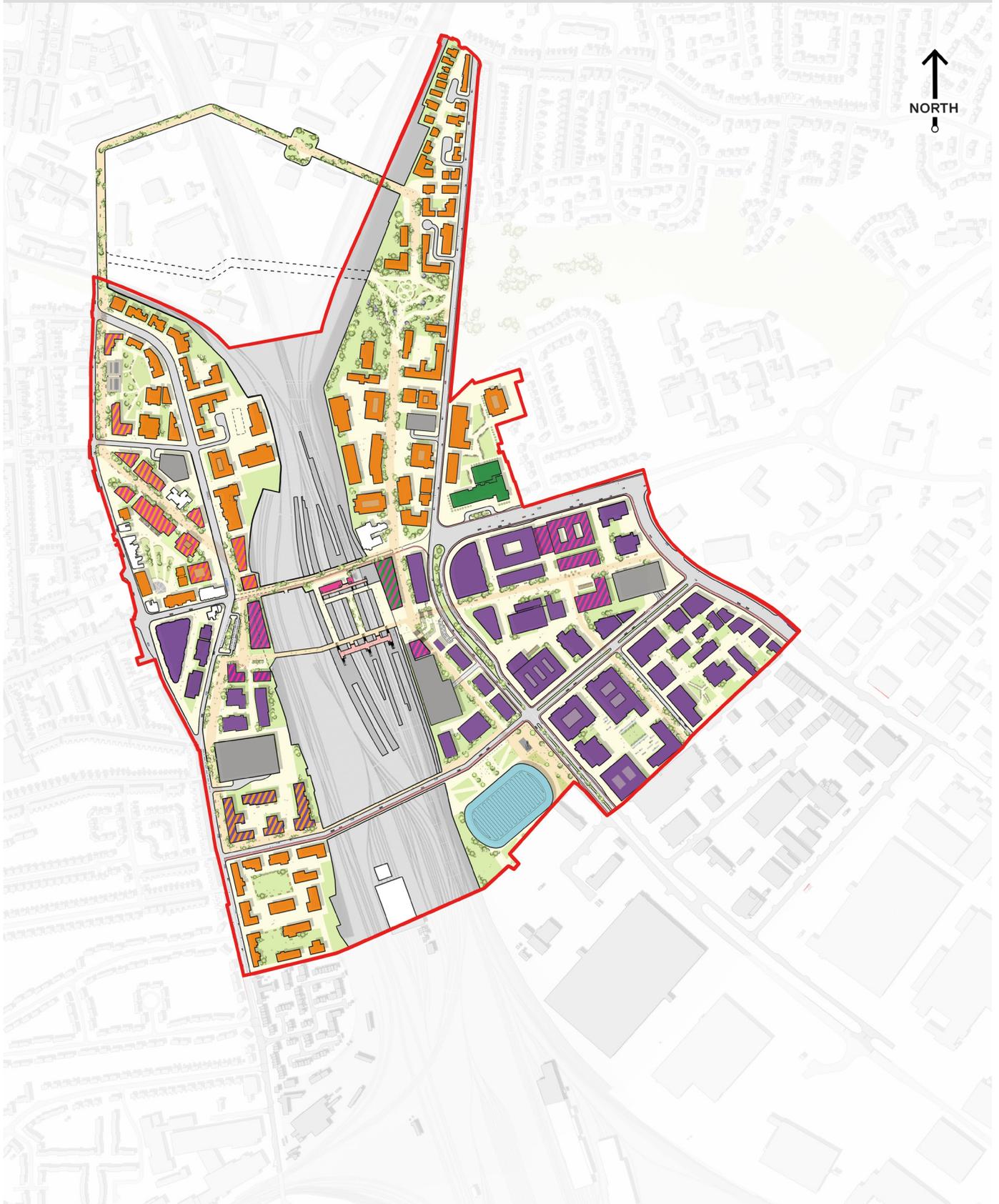


Image 3.21 - Reduced baseline red-line



3.7 - QUANTUM OUTCOMES

The quantum study produced many interesting conclusions which had been previously unexplored:

- The baseline figures are either: not transformational enough, or the red-line is too large.
- The amount of quantum within the red-line could be higher than the original CEC study suggested.
- The red-line could, in theory, be reduced in area whilst maintaining a similar amount of development as the baseline.

Feedback from CEC during Workshop 5 suggested that the larger red-line could form a part of an Area Action Plan (AAP) submission, with a tighter focus on a reduced red-line masterplan for the Crewe Campus workstream. In this way two options were preferred: Option 2 & 4.

Should the masterplan be developed in the future Solutions stage a decision on the area for consideration (full or reduced) should be decided upon prior to starting the study.

Image 3.22 - Baseline masterplan massing

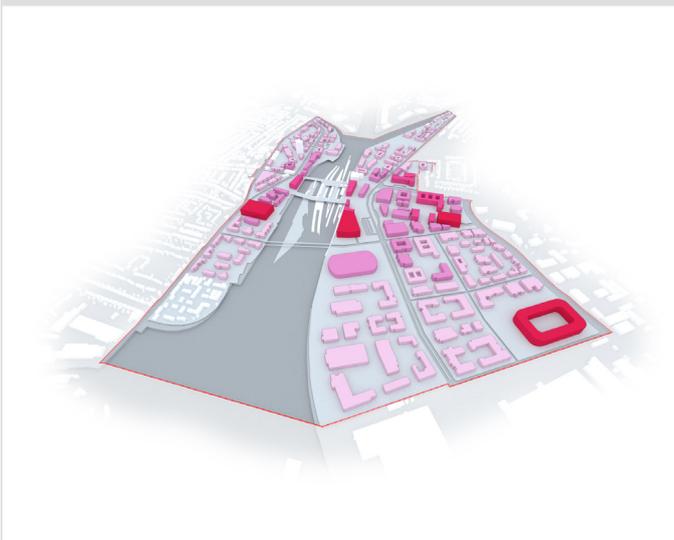


Image 3.23 - Masterplan led massing

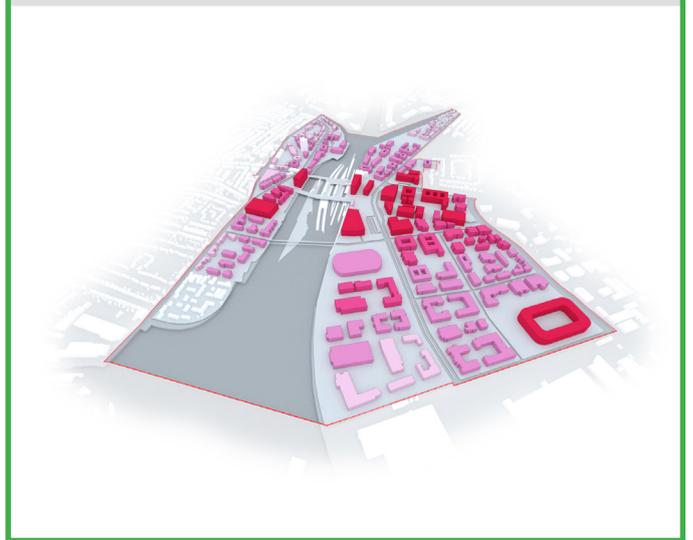


Image 3.24 - Reduced commercial massing

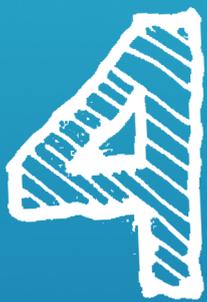


Image 3.25 - Reduced baseline massing



Image 3.26 - Data comparison from quantum analysis





4.0 - MASTERPLAN COMPONENTS

In order to develop the design of the masterplan, design options were generated focusing on more specific components. The following elements are presented in the following chapter and include (fig.4.1):

4.2 - Greenlink: Look and feel

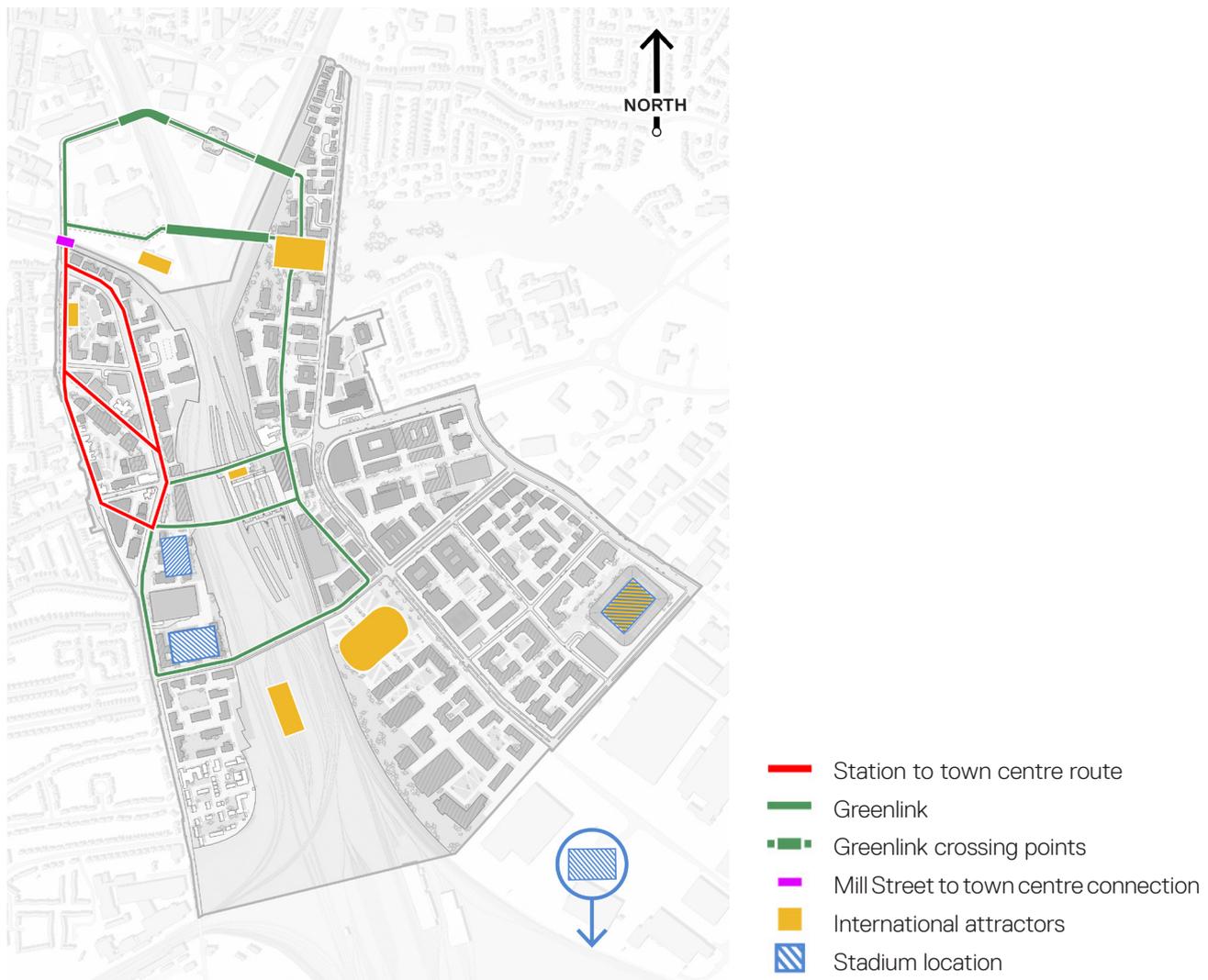
4.3 - Greenlink: Crossing points

4.4 - Greenlink: Station to Town Centre link

4.5 - International attractors

4.6 - Stadium location

Figure 4.1 - Masterplan elements



4.1 - DEVELOPED MASTERPLAN

The 'developed masterplan' is a progression of the 'undeveloped composite' land use masterplan which incorporates comments from Workshops 4 & 5, and aligns its approach with other design disciplines. Specifically it has developed its design to include:

- Alignment with transport planning to update the road layout to include cycle routes, dual carriage ways, and intermodal stopping points.
- Aligned multi-storey car parking strategy to show multiple car parks that serve both the station and commercial development (currently not including other masterplan land use types).
- Existing land owner alignment to ensure that building footprints do not extend unnecessarily over existing land owners (section 2.3) with current land use data at hand. Some plots require confirmation.
- Reintegrate original concepts of linked public squares along a green pedestrian network around the masterplan (fig 4.2).
- Introduce key anchor international attractor buildings as mechanisms of bringing new visitors to Crewe and improving the area as an economic centre (section 4.5).
- The station design reflects updates to the scope to include a paid gateline (section 5.2).
- The stadium has been relocated to unlock higher western land values, and a closer multi-storey car park location (section 4.6).

Image 4.2 - Greenlink and linked squares

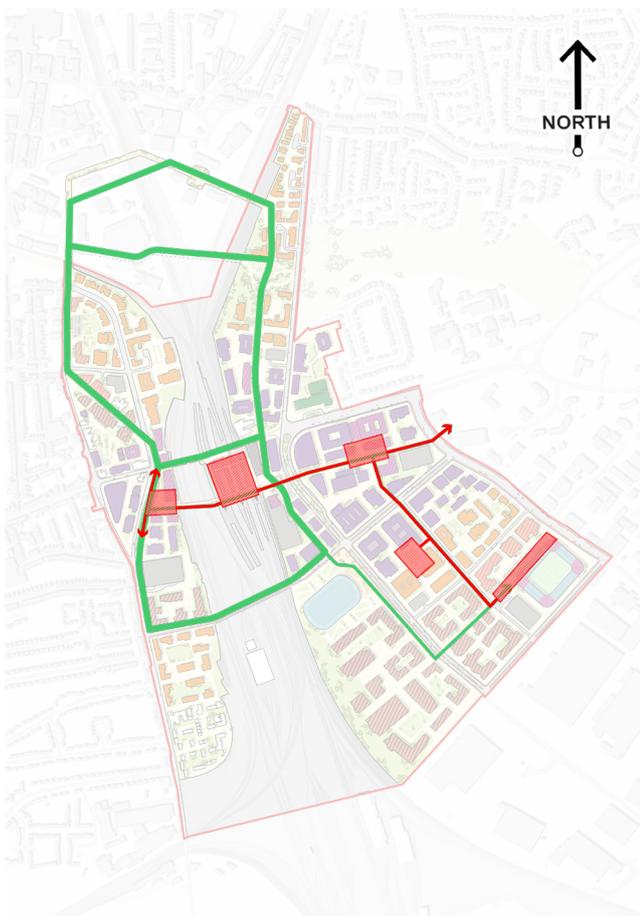
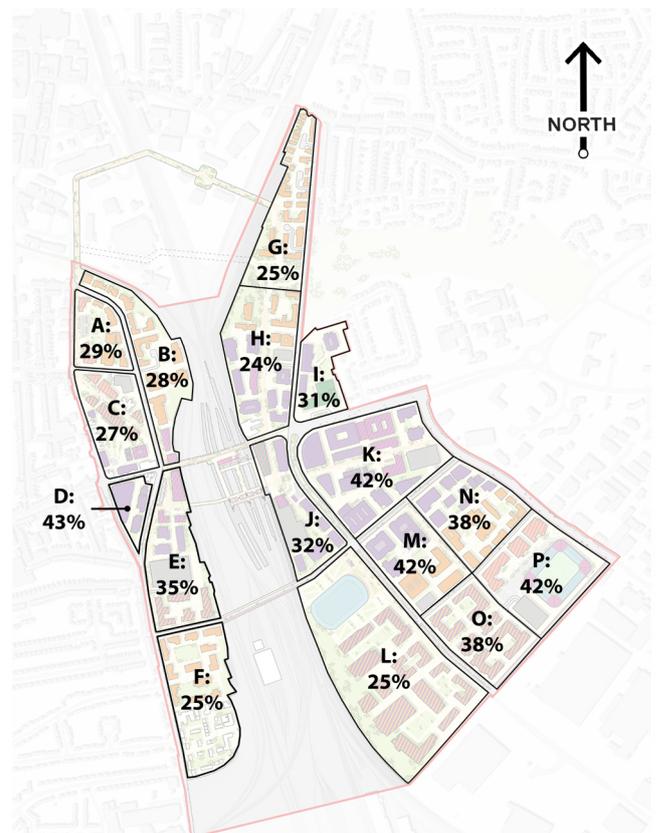
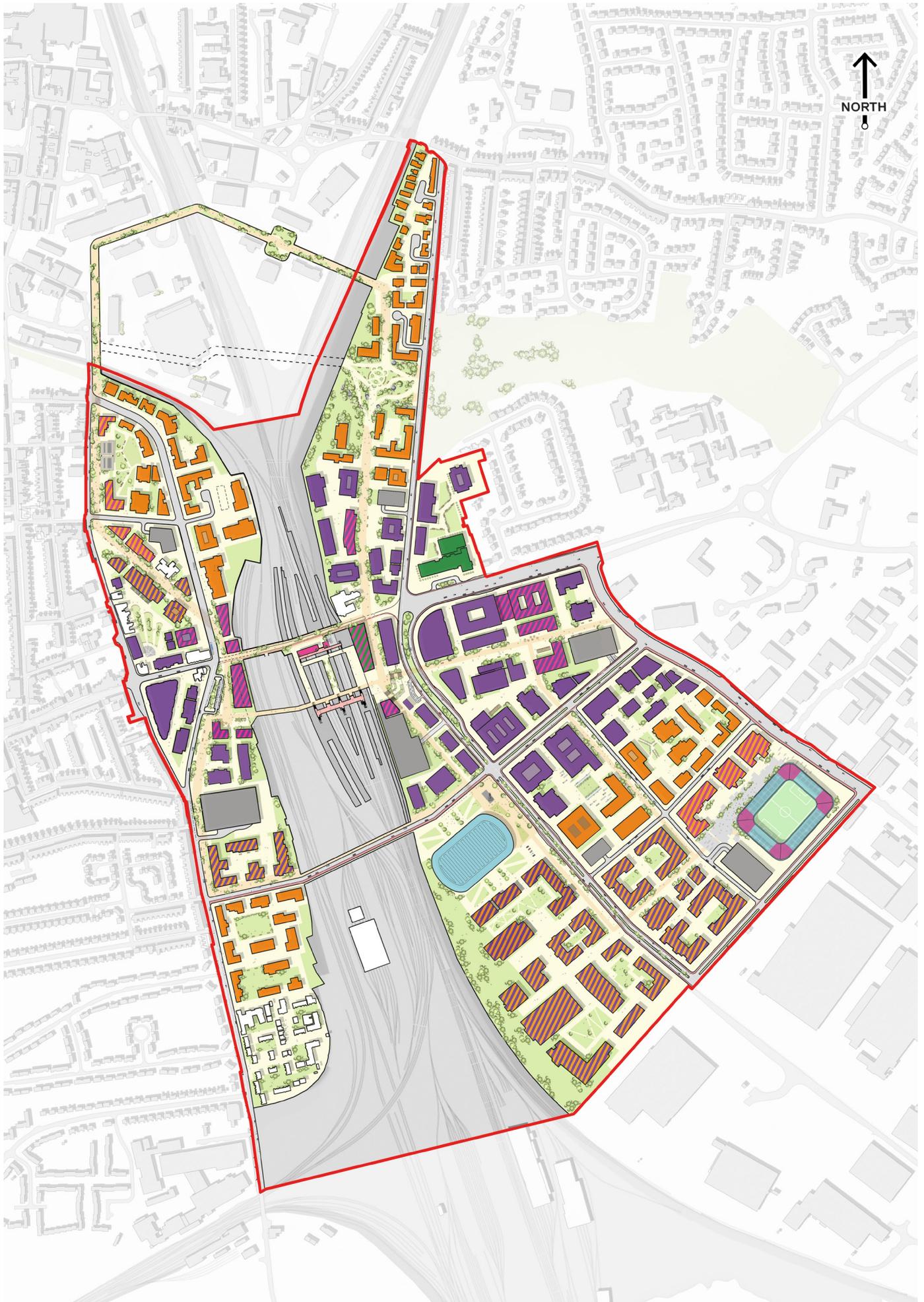


Image 4.3 - Masterplan area densities per area



* illustrative density calculated by: $\text{total building footprint per area} / \text{total land area} \times 100 = \text{density}$

Image 4.4 - Developed masterplan



4.2 - GREENLINK: LOOK AND FEEL

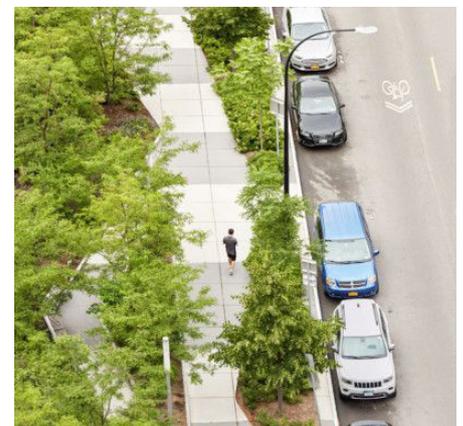
The 'Greenlink' has been a prominent feature of the design development and offers pedestrians better overall experience of Crewe. The greenlink is essentially a widened path that offers resting points, cycle ways, and green spaces through a mixture of tactile paving and landscaping. This offering is a direct response to CEC's seven key vision moves as per the 'Crewe HS2 Hub Draft Masterplan Vision (2017)':

- **Key vision move 4:** Improve permeability of the rail corridors.
- **Key vision move 6:** Link neighbourhoods, assets & centres via an integrated green network.
- **Key vision move 7:** Unify the station & town with the Cheshire landscape.

The greenlink itself will maintain a holistic look-and-feel along its route and will connect the different masterplan areas together. Along the link are a series of public spaces and squares that should be designed to reflect to character of the space (fig 4.5):

- **Residential Square:** reflects the requirements of the residential area by offering local facilities and public space with a softer feel. Play and relaxation spaces through parks could be considered to meet the requirements of CEC's 'Green Space Strategy' (2013)
- **Commercial Square:** constructed from harder landscaping to offer a different kind of space that caters to the requirements of its commercial users. The space may be configured to encourage seating during lunch periods and may be of a tighter urban scale that directs movement towards retail Hub spaces.
- **Retail Street:** spaces may require increased width to allow for seating and dwell space for restaurant and cafe use. Such streets could be pedestrianised to enable free and unrestricted movement, and may be linked to a dedicated cycle route. Such examples could be envisaged between the station and town centre.

Image 4.5 - Green link look and feel



'Green Link' holistic feel maintains a familiar connection around entire masterplan



Residential



Commercial



Retail

4.2 - GREENLINK: CROSSING POINTS

The green route also consists of a series of pedestrian crossing points in the north of the masterplan. These links not only attempt to improve pedestrian movement by reducing severance across the railway corridor, but also offer potentially higher land values to currently unconnected land parcels. The existing Grand Junction Retail Park is connected by a narrow road bridge, which is not in keeping with the vision of the masterplan. The proposed links could be constructed from cost effective construction solution such as a girder edge beam with a high quality tactile surface.

Three bridges were proposed: **A, B, & C** (fig 4.7). In theory, 'A' and 'B' can be delivered independently, although their value is best seen when delivered together to enable complete cross movements. 'C' is the longest and most expensive of the crossing points and utilises the tip of the retail park to locate a structural pier to reduce the construction span.

Feedback at workshop 5 suggested that 'A' and 'B' should be within the design, with 'C' as a 'nice to have' pending further financial analysis. All bridges aid the reduction of severance of the urban fabric caused by the railway cutting and therefore all re of value, but should affordability be an issue 'C' should be removed.

Image 4.6 - Illustrative bridge sketch

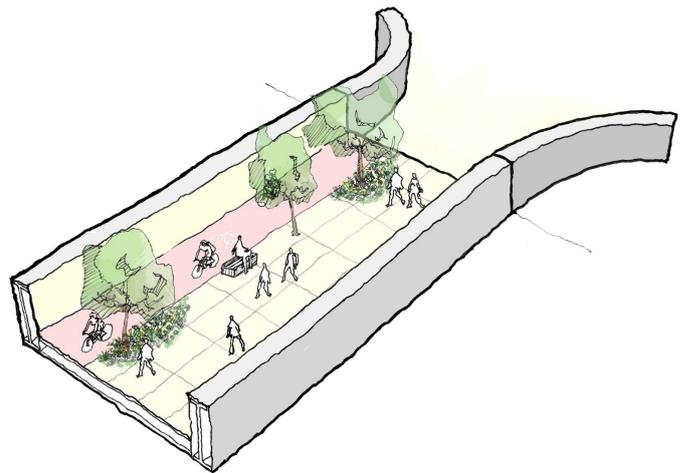
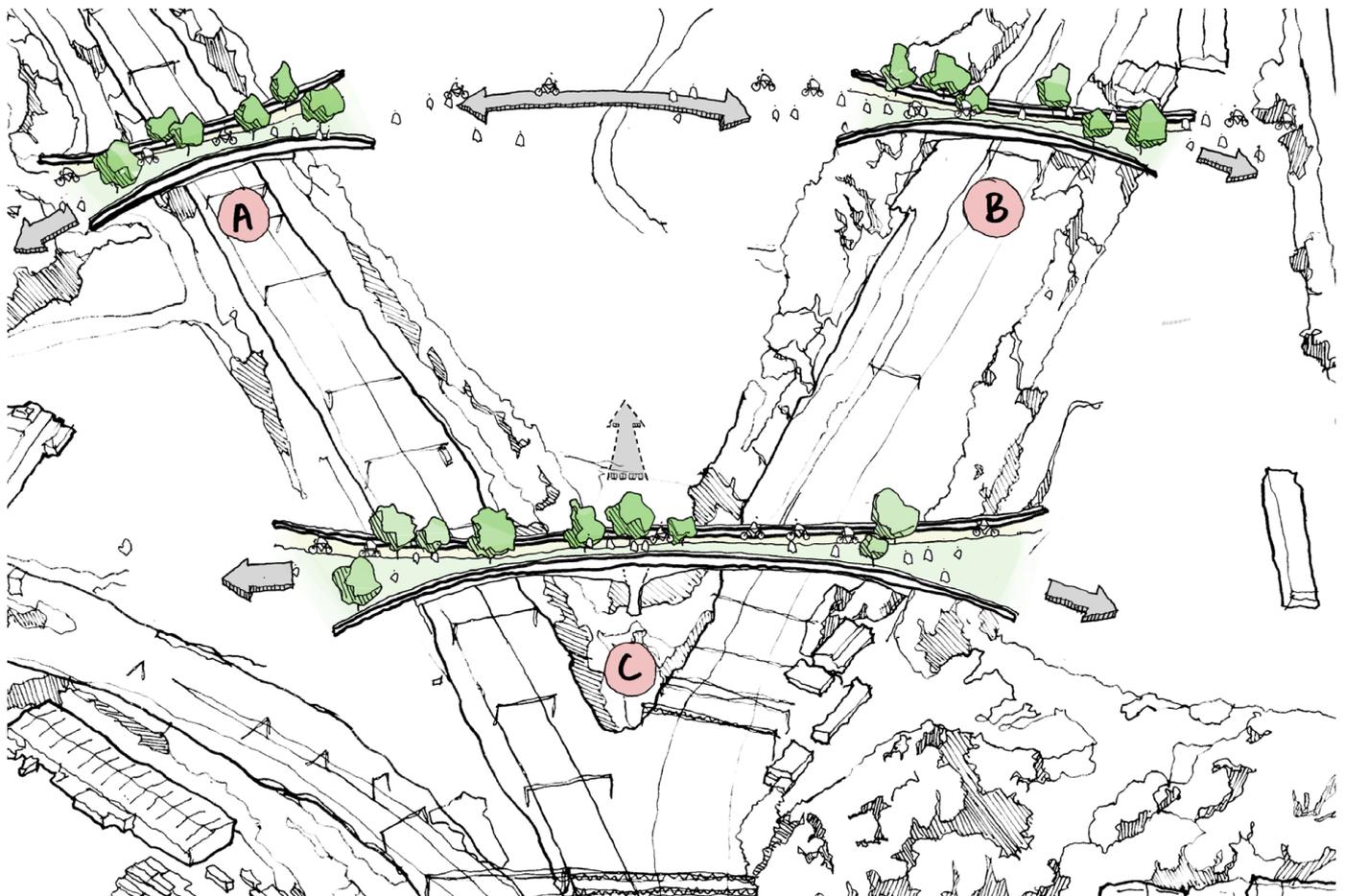


Image 4.7 - Crossing points



4.2 - GREENLINK: STATION TO CENTRE ROUTE

Following earlier decisions presented in section 2.1, a core concept of the masterplan design is to provide an inviting and direct link between the railway station and the existing town centre. This is in response to CEC's multiple key vision moves:

- **Key vision move 2:** Reinvigorate the town centre.
- **Key vision move 5:** Create clear links between town and station.

It is therefore envisaged that ensuring an inviting and *activated* pedestrian link between the station and town is directly linked to the success of the existing town.

Options were generated to explore the most suitable route and were compared against their ability to meet criteria from CEC's Key Vision Moves, Local Plan, and 'The Green Infrastructure Action Plan for Crewe' (2012).

To begin the study, the existing area was analysed to understand the current constraints of Mill Street as a viable route between town and station. The current street is home to a mixture of different business and accommodates a wide and generous space to the north.

Southern Mill Street suffers from a lack of width which poses potential issues to constructing a wide pedestrian greenlink.

Illustrative street sections in figure 4.9 outline the relative widths at various points along Mill Street, as indicated on the Plan. Towards the north widths of between 30m - 130m give adequate space for a wide greenlink. However, the narrow street widths to the south of Mill Street would not enable a wide greenlink. Therefore the southern side would require substantial alteration to many businesses and character buildings.

Image 4.8 - Mill Street constraints plan

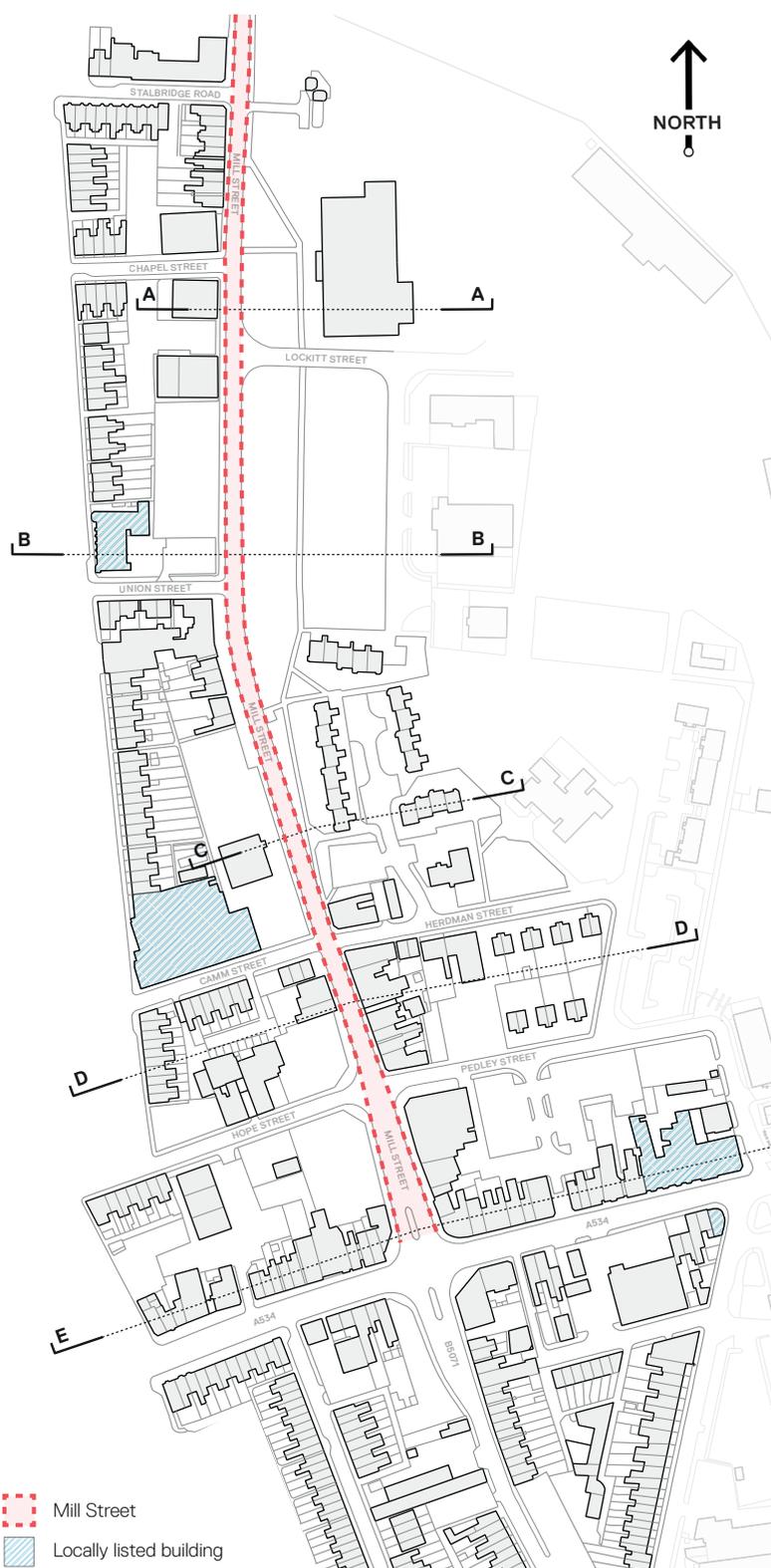
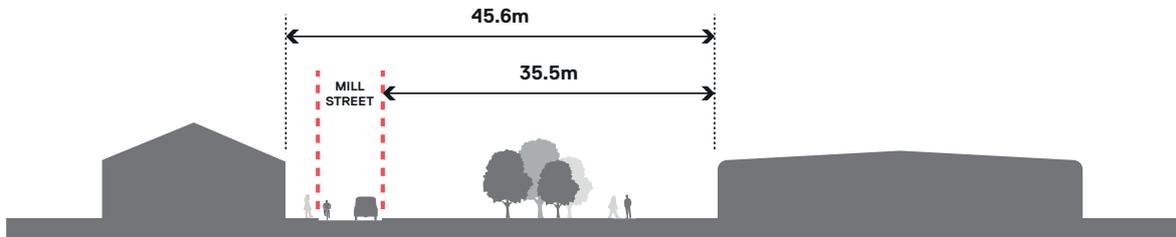
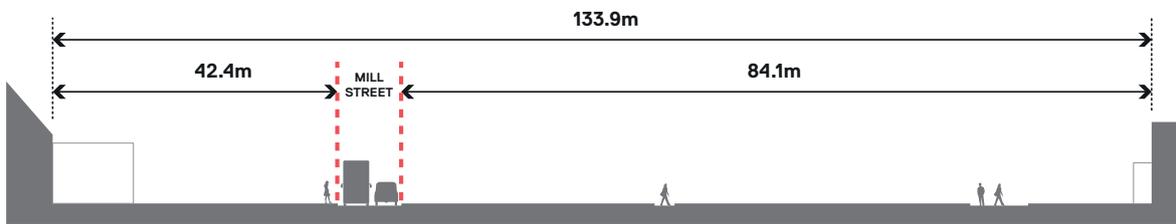


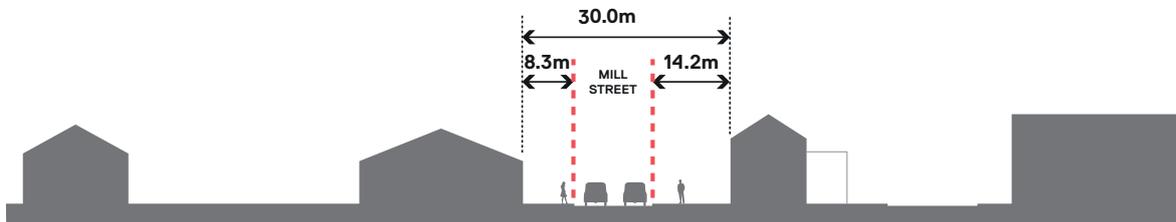
Image 4.9 - Mill Street illustrative sections



A



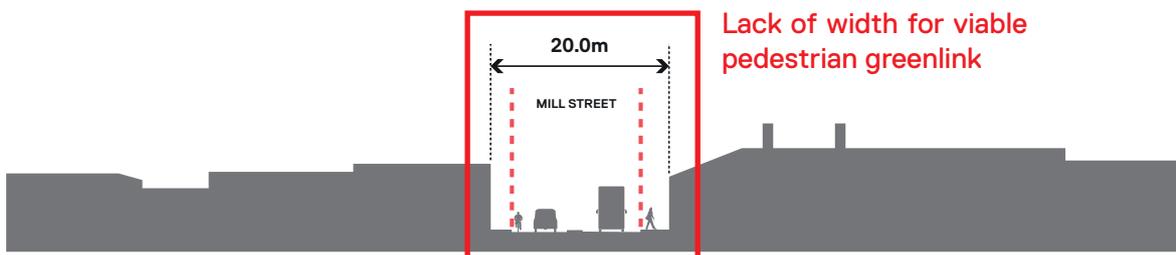
B



C



D



E

Dimensions are approximate, subject to survey.

4.2 - GREENLINK: STATION TO CENTRE ROUTE

Three station to town routes were explored:

Option 1: Mill Street: provides a direct link between the station western entrance and Mill Street by breaking through the existing residential triangular land block to integrate with southern Mill Street.

This option requires substantial removal of existing buildings to facilitate the route and enable a wide pedestrian greenlink. It beneficially uses the entire length of Mill Street, but at the expense of disturbance to many local businesses and homes.

Option 2: Pedley Street: creates a link between station and town using largely unused land along the western train corridor bank. This option is mainly located on stakeholder land and enables a potential split of vehicular and pedestrian movements on separate streets. It requires minimal building removal, but does challenge existing Mill Street business owners.

Option 3: Hybrid: mediates between options 1 & 2 by suggesting it avoids the complexities of southern Mill Street, but utilises the northern width. This route also requires minimal building removal but has an additional benefit of maximising the reuse of Mill Street to encourage pedestrians to use existing businesses.

Option Outcome

The 'Hybrid route' (option 3) is preferred due to its ability to connect the station to the existing town with the least effect on existing businesses and homeowners at the south of Mill Street.

The proposed route proposes a widened greenlink which is activated by shops, restaurants, commercial and residential buildings to provide activity.

Option 1: Mill Street Route

1 - Mill Street encourages a straighter deck alignment, creating a straighter sightline within the station.

2 - Mill Street provides a clear sightline from the station to Crewe Town meeting CEC's key visions.

3 - Generous width to the North of Mill Street allows a viable Green Link without building removal.

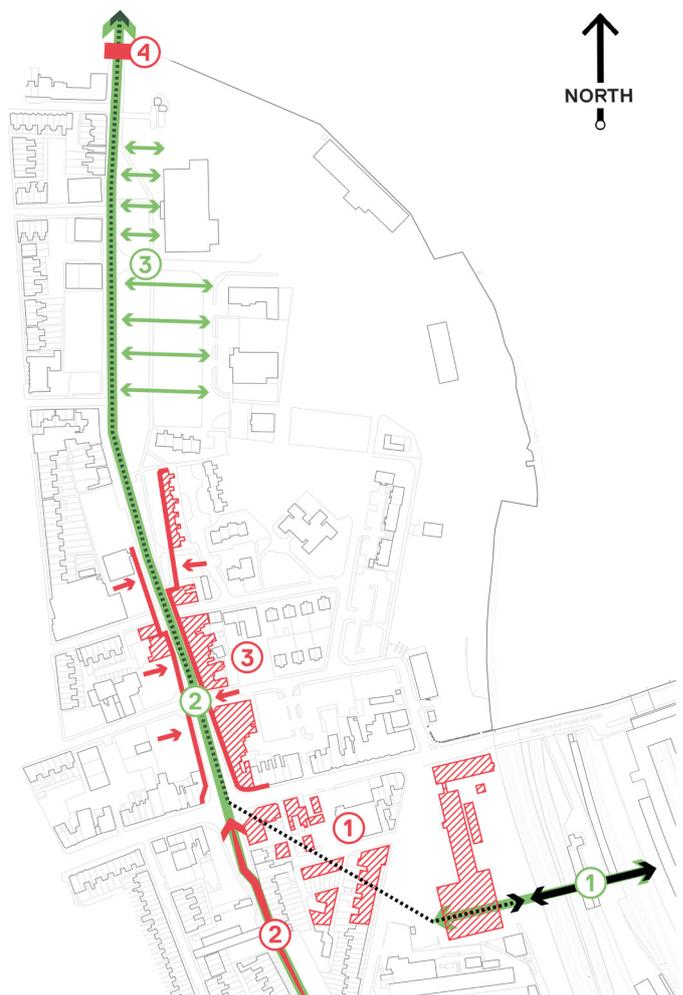
1 - Alignment to Mill Street requires significant removal of residential properties on Gresty Road.

2 - Location of Western station entrance will create increased traffic, which may require improved infrastructure.

3 - Width of Mill Street South is limited. Road will require widening to enable a viable Green Link and road width.

4 - The route is aligned with using the constrained underpass as primary town link.

Image 4.10 - Mill Street route



Option 2: Pedley Street Route

- 1 - Route utilises largely unused land requiring substantially less disruption of local buildings.
 - 2 - Pedley Street provides a clear sightline from the station to Crewe Town meeting CEC's key visions.
 - 3 - Majority of link is located on project stakeholders land.
 - 4 - Green Link is separated from Mill Street giving a potentially segregated route for vehicles and pedestrians.
- 1 - Deck angle changes to direct pedestrians towards Pedley Street creating a northern bias.
 - 2 - Rail House removal required to enable Green Link.
 - 3 - Removes a proportion of footfall from existing businesses on Mill Street.
 - 4 - The route is aligned with using the constrained underpass as primary town link.

Option 3: Hybrid Route

- 1 - Route utilises largely unused land requiring substantially less disruption of local buildings.
 - 2 - Majority of link is located on project stakeholders land.
 - 3 - Route utilises Mill Street North where widths are generous.
- 1 - Deck angle changes to direct pedestrians towards Pedley Street creating a northern bias.
 - 2 - Rail House removal required to enable Green Link.
 - 3 - Building removal for route alignment.
 - 4 - The route is aligned with using the constrained underpass as primary town link.

Image 4.11 - Pedley Street route

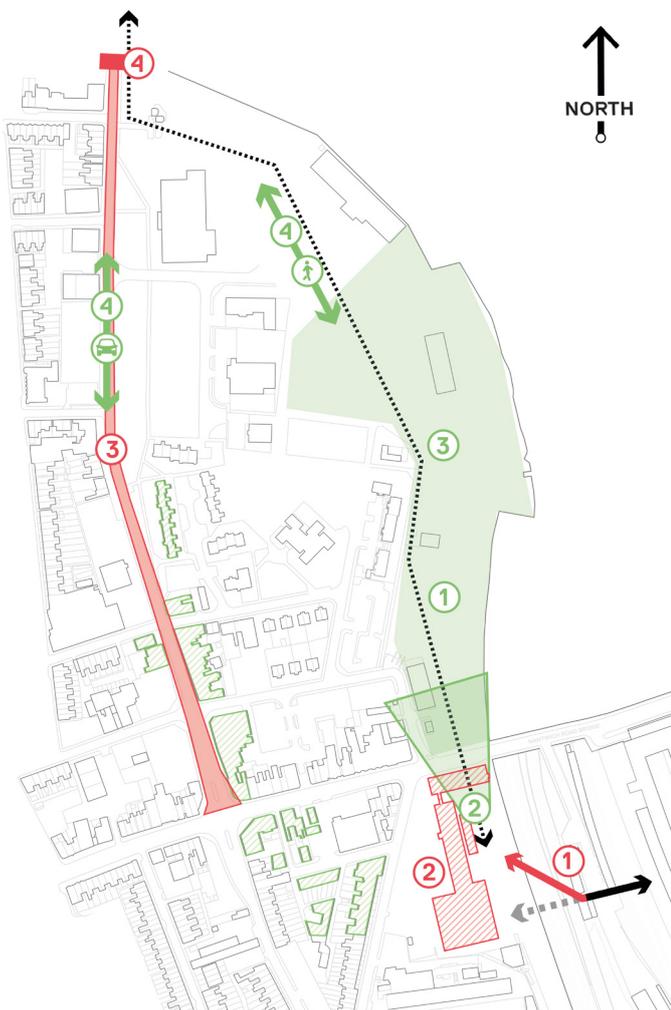
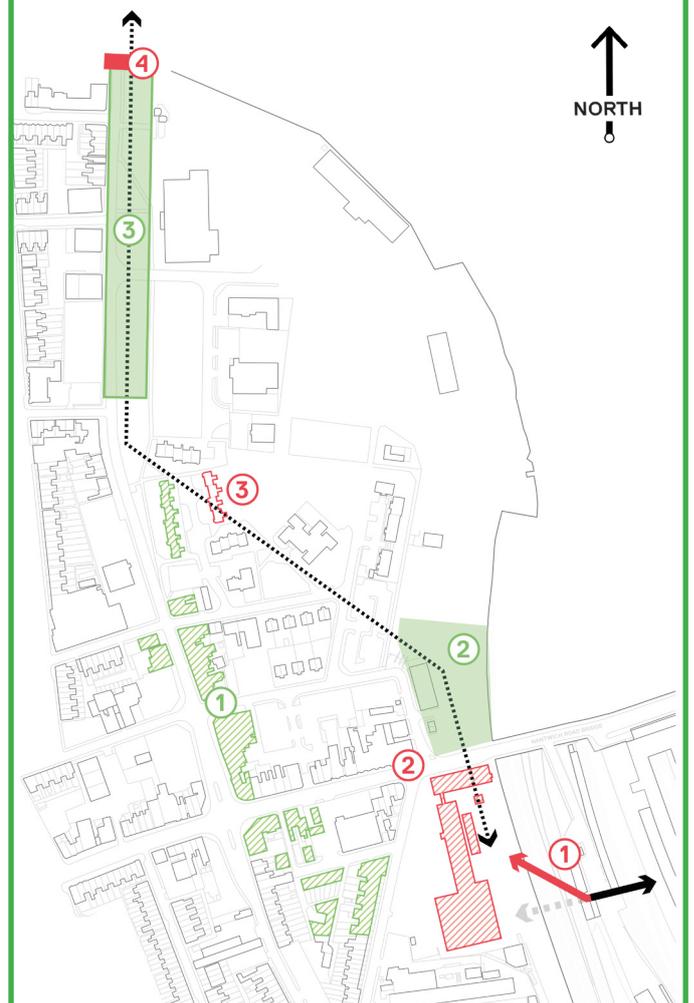


Image 4.12 - Hybrid route



4.2 - GREENLINK: STATION TO CENTRE ROUTE

A common constraint for all three of the previous station to town route options is near the intersection of Mill Street and Brook Street, at the northern train viaduct. The existing viaduct access provides a dual direction vehicular, and two single width pedestrian access, but the existing width is not sufficient to deliver an aspirational wide pedestrian route (fig 4.13).

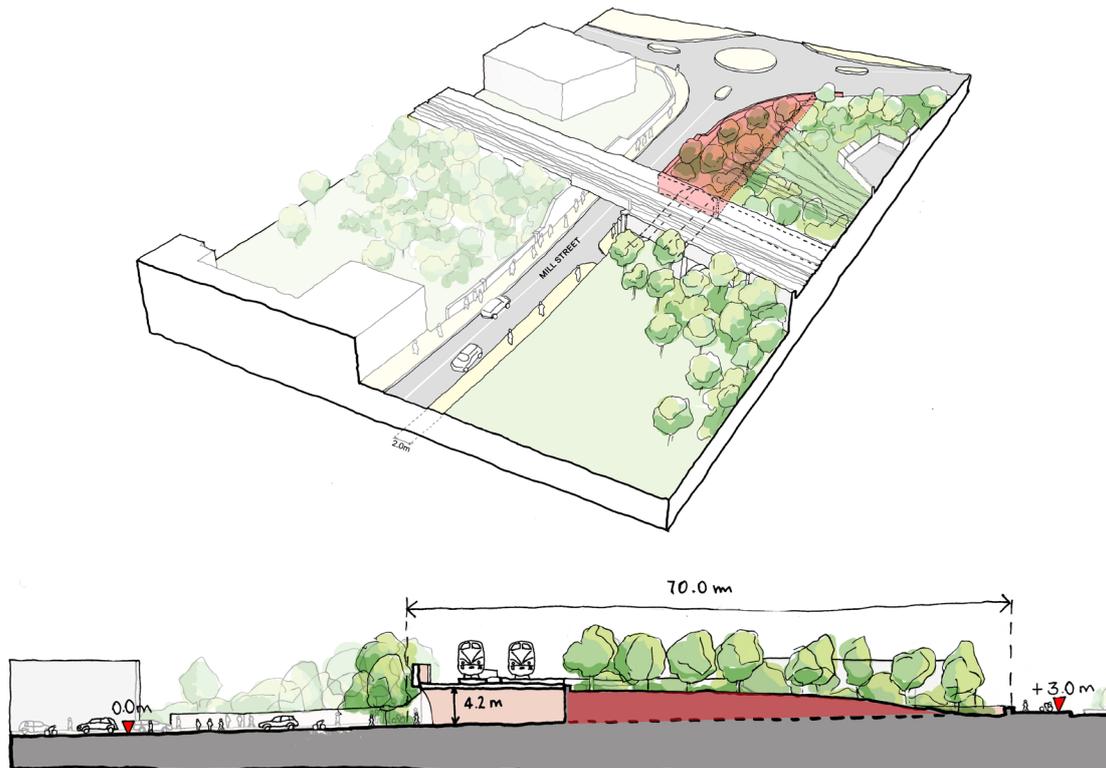
It is thought that there is an adjacent viaduct opening which sits behind the advertising board seen in figure 4.13. It is currently difficult to see the viaduct opening, but it is thought that this viaduct may have been filled with rubble and it could be possible to break through and link Mill Street to the town centre as per figure 4.14. As well as breaking through, it may require ground removal to create a level passage.

This may offer the opportunity to maintain the current road access, but provide an additional pedestrian access alongside linked to Mill Street.

Image 4.13 - Mill Street viaduct in 2017 ¹



Image 4.14 - Existing Mill Street viaduct sketch



1 - Source: Google Maps. Street view.

Imagery from 2009 suggests that the viaduct is present as it can just be seen to the east of the advertising board in figure 4.15. Providing that the viaduct is present, is structurally viable, given approval from NR, and is a cost effective solution, it may offer a viable pedestrian link from Mill Street into the town centre. The width of the viaduct would enable a generous route that would be in keeping with the rest of the greenlink.

Further development is required to confirm the route is possible. Specific areas of concern are:

- Headroom may not be compliant with applicable building regulations as the viaduct narrows on the northern side (as seen in the section sketch in figure 4.14).
- That it is possible to level the northern bank to provide a level access. The floor level on the northern side is currently higher than the road level and will need reconfiguring.
- That the bridge is structurally capable of this kind of work. Further structural assessments will be required to test the stability of the existing viaduct, at the approval of NR.

Image 4.15 - Mill Street viaduct in 2009 ²

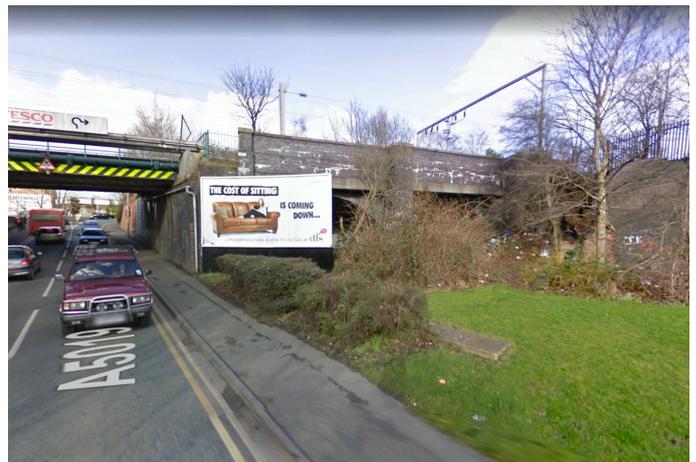
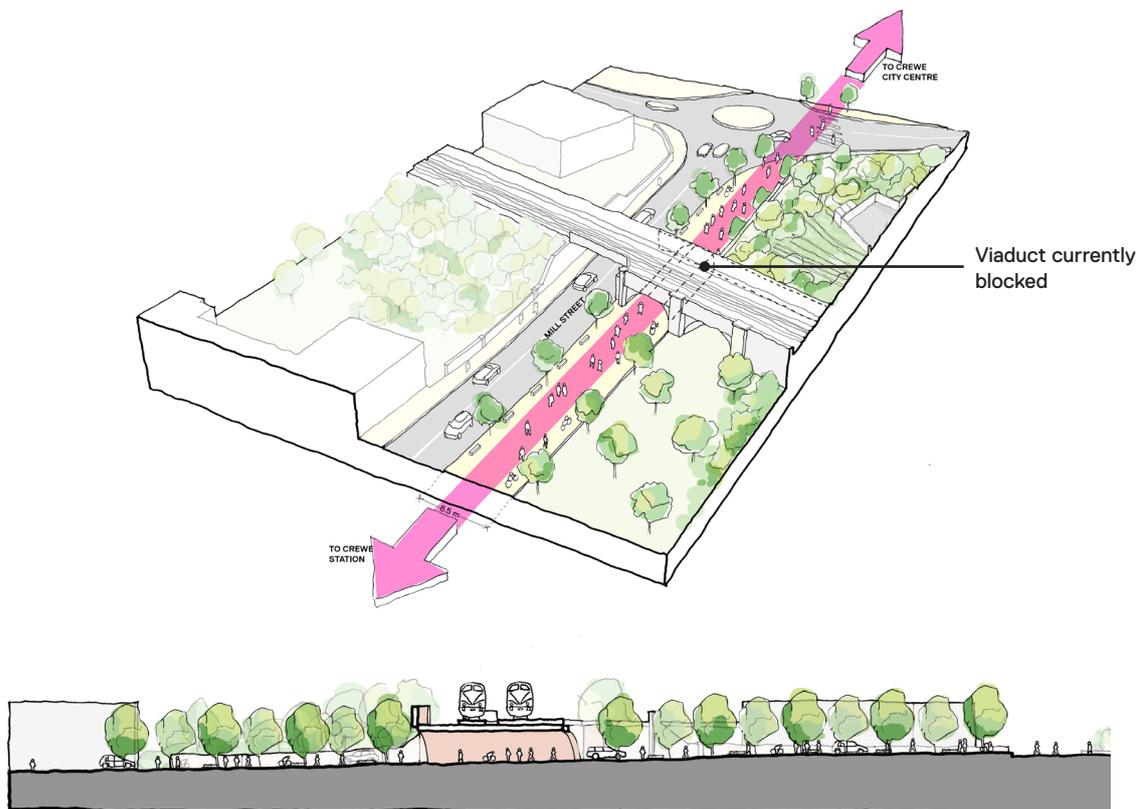


Image 4.16 - Proposed Mill Street viaduct option



2 - Source: Google Maps. Street view.

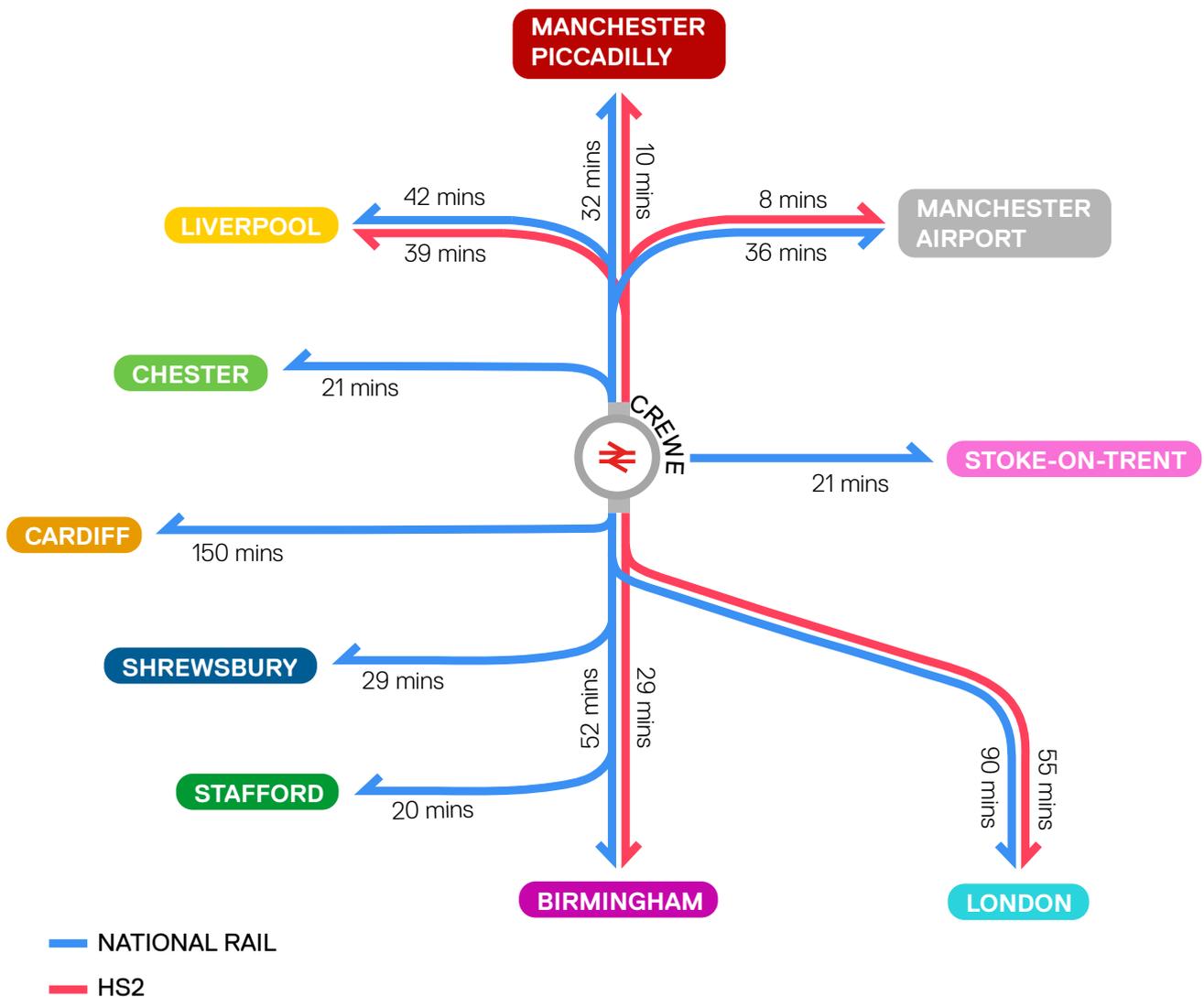
4.3 - INTERNATIONAL ATTRACTORS

Crewe is a key interchange station on the west coast mainline (fig 4.17). Its geographic position on the railway network enables it to take advantage of its links to other cities and towns to not only benefit from the economy of interchanging passengers, but to encourage visitors to travel to Crewe as a destination in its own right.

High speed trains (HS2) will be arriving at Crewe in 2027, which will provide quick access to Crewe from a range of locations in the UK. By providing a unique offering that is only available in Crewe, the masterplan can encourage visitors to travel to Crewe using its fast and wide spread connections. Precedent examples (fig 4.18) prove that providing a unique attraction can bring visitors to an area, for example: the Winter Gardens in Sheffield attract around 2,000,000 per year, whereas the transport museum in Glasgow attracts 1,133,000 visitors per year.

This kind of visitor attractor is not only beneficial to the attraction in question, but also to the wider masterplan.

Image 4.17 - Crewe connectivity ³



³ - Source: HS2 journey times and frequencies document (July 2013) & National Rail journey times (2018).

As the amount of visitors increases, the footfall within the masterplan and town also increases, which can create economic growth within the whole of Crewe. Strategically locating an attractor can also create a sense of place that may otherwise remain inactivated. A local attractor within the 'Commercial Hub' can ensure that multi-storey car parks are utilised on weekends and that businesses are used when the commercial week finishes.

The attractor options do not suggest that a single type or location of attractor is preferred, but recognises the benefits in locating attractors around the masterplan. The attractors presented are linked using the green network as a means of circulating visitors on a pedestrian route, and all attractors attempt to be 'Crewe-centric' by having a link to the town's history. More detailed analysis will be needed to be undertaken as part of the business case to test the deliverability of these uses/activities, in discussion with the Council, potential occupiers and developer/investor interest.

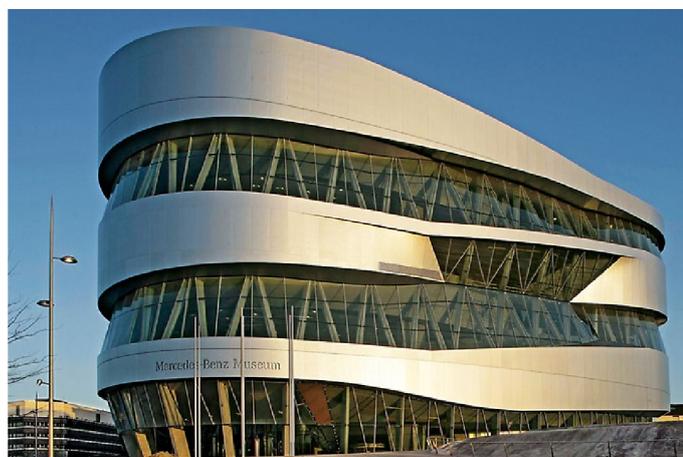
Image 4.18 - Attractor precedents



Bentley Motors - Crewe, UK ⁴
Size: 166,930 sqm **Cost:** £115m approx.
Visitor Figures (per annum): 2,880 (2014)



Winter Gardens - Sheffield, UK ⁵
Size: 1,570 sqm **Cost:** £5.5m approx.
Visitor Figures (per annum): 2,000,000 (2016)



Mercedes-Benz Museum - Stuttgart, Germany ⁶
Size: 16,500 sqm **Cost:** £33m approx.
Visitor Figures (per annum): 7,000,000 (since 2007)



Riverside Transport Museum - Glasgow, UK ⁷
Size: 11,300 sqm **Cost:** £74m approx.
Visitor Figures (per annum): 1,355,359 (2018)

4 - Source: Bentley Motors. Factory visits, the Bentley Experience.

5 - Source: DHL.ac.uk. Materializing Sheffield, visitor profile.

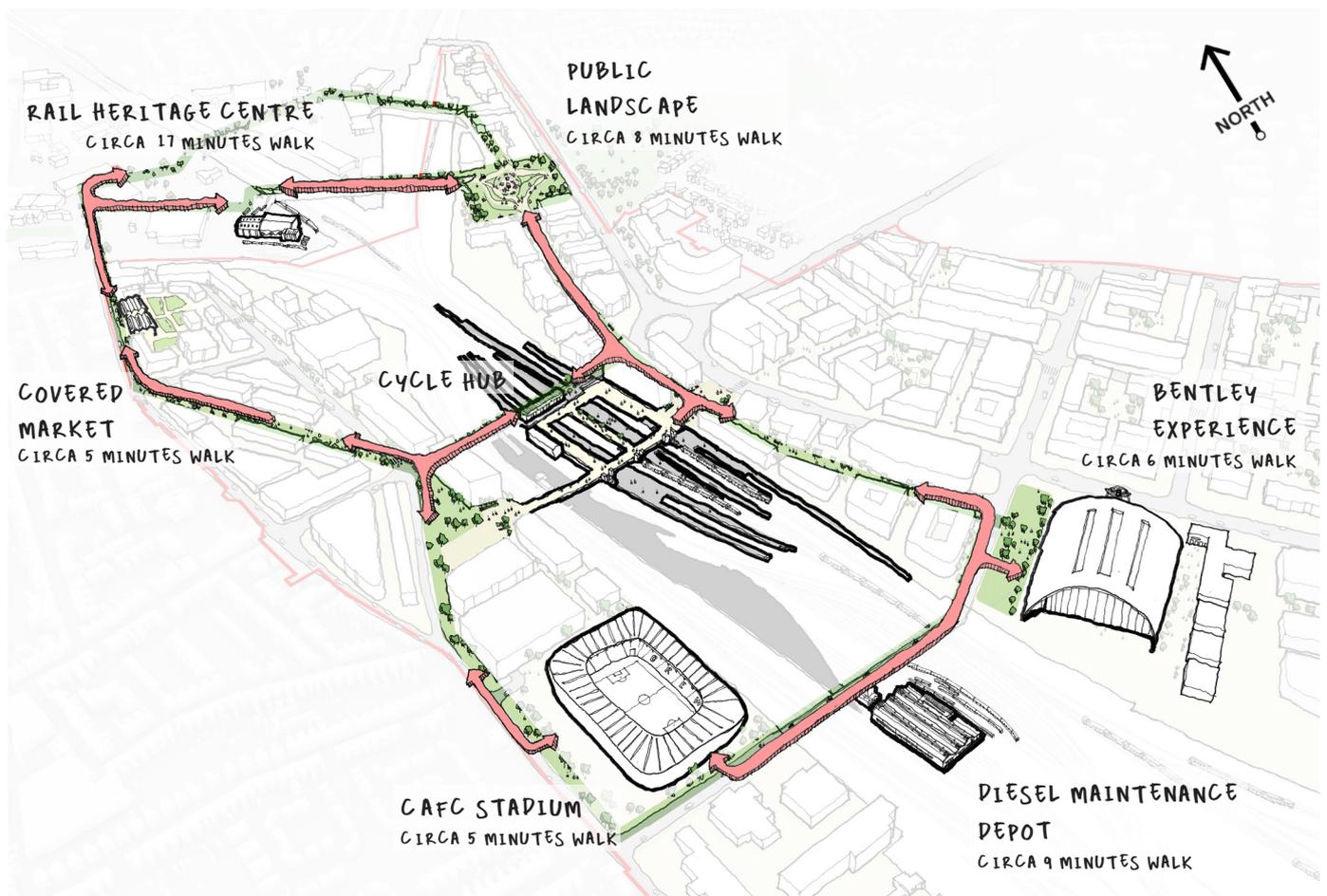
6 - Source: Daimler. Key figures.

7 - Source: BBC. Record attendance for Scottish visitor attraction

4.3 - INTERNATIONAL ATTRACTORS

- **Rail Heritage Centre:** an existing attraction which displays Crewe's rail past through a series of full size and model trains which could attract railway enthusiasts.
- **Public Landscape:** a landscaped public garden home to local species of plants that could attract schools, and local visitors. The park could link to the existing Cheshire landscape to the east and west.
- **Covered Market:** a market along Mill Street could provide an attractor between the town and station prompting movement from visitors towards the existing town centre. Such a facility could represent Crewe's heritage by incorporating the removed station heritage canopies to provide a market space for weekdays and weekends. A link to the existing town Lyceum theatre could be utilised by showing performances from the local community.
- **Cycle Hub:** an attractor directly linked to the station could offer a space for bike rentals and a bike workshop space to encourage cycling on the proposed greenlink network.
- **Crewe Alexandra Football Stadium:** the stadium could be located on the green network to encourage sports fans to visit the stadium. Possibility of providing a museum attraction in a redeveloped stadium to exhibit club memorabilia.
- **Diesel Maintenance Depot:** an existing building could be linked to an observation deck on the southern link bridge to allow visitors to witness the reconditioning of vintage trains outside the depot.
- **Bentley / Automotive Experience:** Bentley could provide a museum or experience centre in the heart of the campus. Visitors from the UK or abroad can easily access it as a destination via the new station. Crewe's links to Manchester and Birmingham enable international airport visitors, whilst the rail line provides links to UK visitors as far as London.

Image 4.19 - International attractors



4.4 - STADIUM LOCATION

The existing Crewe Alexandra Football Stadium is located to the west of Crewe Station. Although, its existing location does not prohibit an enhanced station vision of providing an east to west public link, it does create multiple constraints:

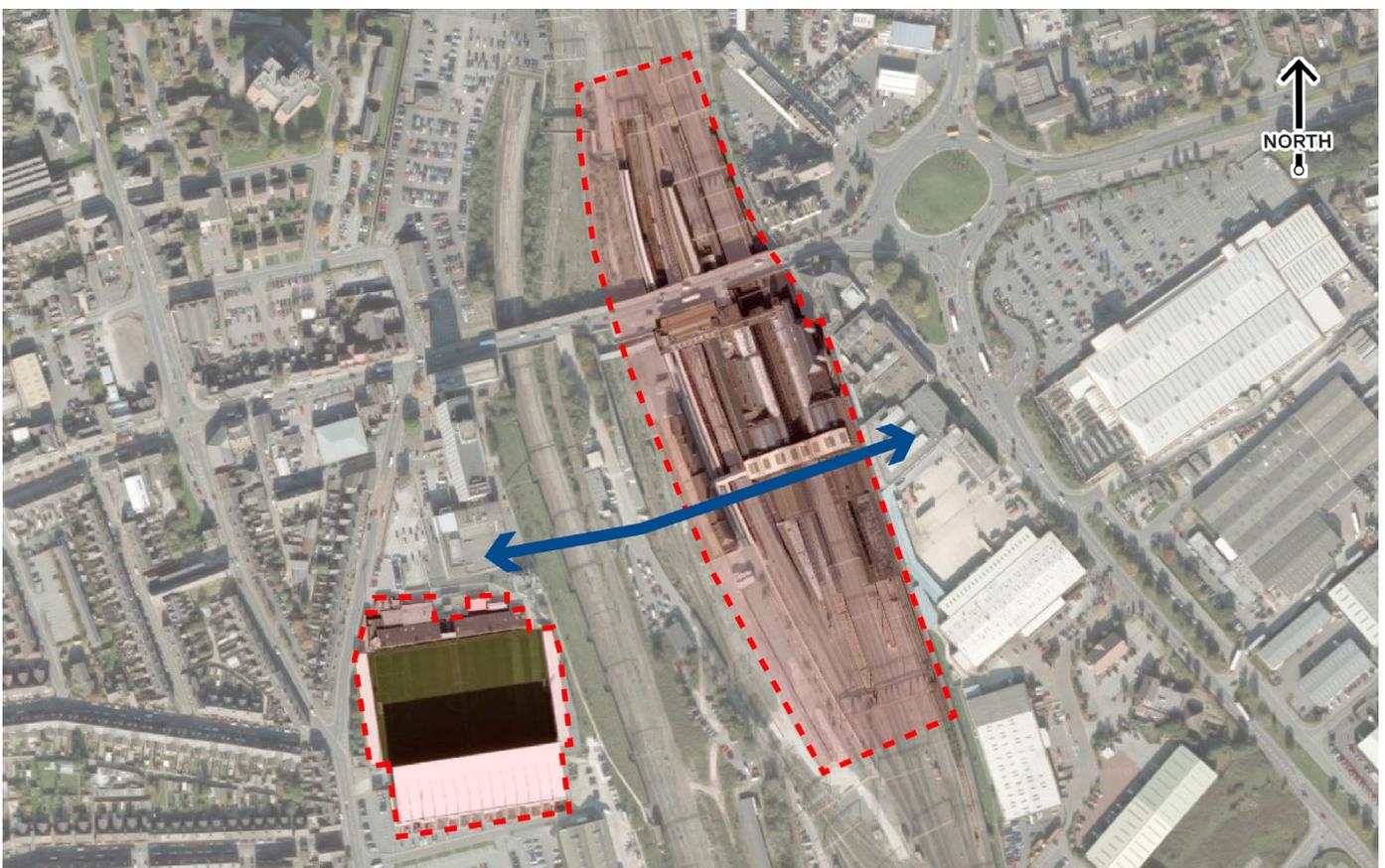
1. The current location creates a physical barrier to the south side of Gresty Road (fig.4.21). A 'pinch point' is created along Gresty Road when walking south as the stadium stand extends close to the current road edge (fig 4.20). The pavement is approximately 1.5m wide which prevents the proposed wide pedestrian greenlink from linking into the southern masterplan area.
2. The football stadium is located on potentially high value land, which could be released for commercial land use to unlock additional capital to fund the masterplan and station design.
3. Should the existing location remain, the Gresty Road entrance would be located to the back of the northern stand. This could challenge a sense of formal arrival experience when entering from the western side.

Potential stadium relocation or refurbishment will be addressed in more detail as part of a separate study.

Image 4.20 - Road width alongside western football stand ⁸

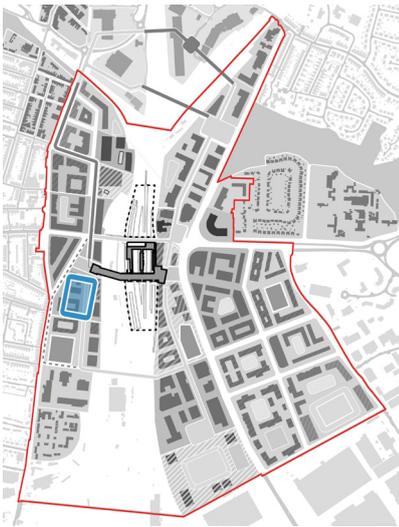


Image 4.21 - Existing stadium creates a barrier southward of the proposed western entrance



⁸ - Source: Google Maps. Street view.

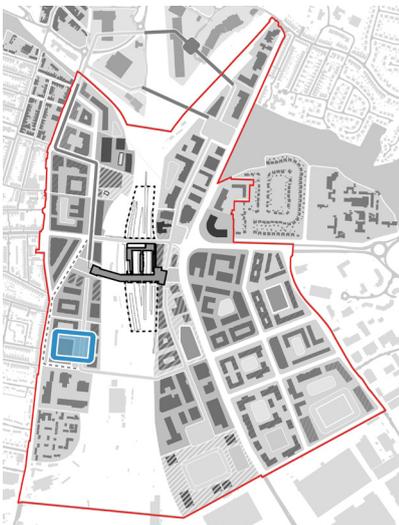
Image 4.22 - Option 1: existing location reconfigured (Land use area 2)



- 1. Location creates a less inviting arrival experience into forecourt / station due to imposing stadium.
- 2. Location next to new station entrance could provide an attractive redevelopment opportunity, subject to satisfying need for a suitable relocation.
- 3. Demolition of the existing stadium is required. CAFC are required to move grounds to facilitate deconstruction and reconstruction of stadium.
- 4. Car parking location increases journey time.

- 1. Gresty Road can be widened to reduce potential traffic congestion, and provide intermodal facilities by reorientating and rotating the stadium 90 degrees.
- 2. Corner junction constriction is removed and the width is increased to enable a green route.
- 3. Stadium is located on existing land, reducing the complication of involving complex land discussions.

Image 4.23 - Option 2: located south of existing location (Land use area 2)



- 1. Questionable why stadium would be relocated further south given complexity of phasing with relative closeness to existing stadium.
- 2. Potentially complicates phasing for car parking in intermediate construction phases.

- 1. Stadium located on lower value land parcel with potential for alternative land on higher value sites.
- 2. Stadium relocation enables configuration of the Gresty Road street corner conflict.
- 3. Car parking can be located between station and stadium enabling it to support both.
- 4. Further way from existing residential properties.

Image 4.24 - Option 3: southeast of red-line masterplan (land use area 7) - Preferred Option Selection



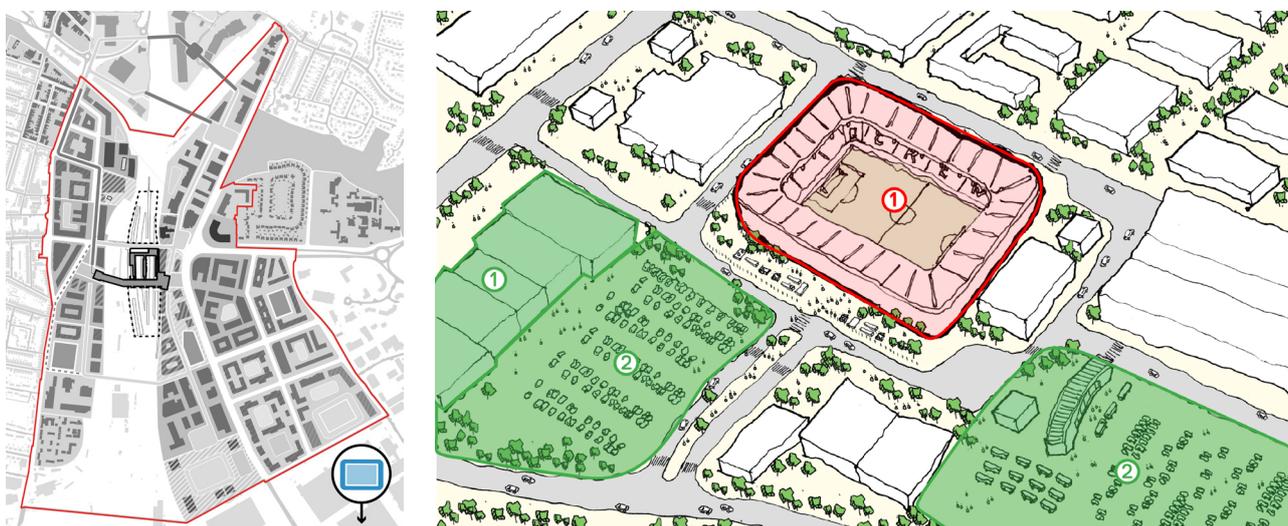
1. Potentially complex land ownership parcels in the southeast area of masterplan.

1. Location to the south-east provides an attractor to the land use, driving footfall to support local businesses.

2. Stadium can be linked to station through a new pedestrian link.

3. Stadium location is more easily integrated with local industrial context.

Image 4.25 - Option 4: outside of the red-line



1. Removal of the 'Railway Men' out of Crewe is contentious and may not be well received by local fans or businesses.

2. External location doesn't provide any additional footfall to local businesses within the Crewe red-line masterplan.

1. Location outside of Crewe provides opportunity to relocate the existing Grand Junction Retail Park to free development space within central Crewe.

2. Unconstrained location provides better opportunity for car parking, and can be linked to the town using a rapid transit bus link.

5

5.0 - STATION DESIGN DEVELOPMENT

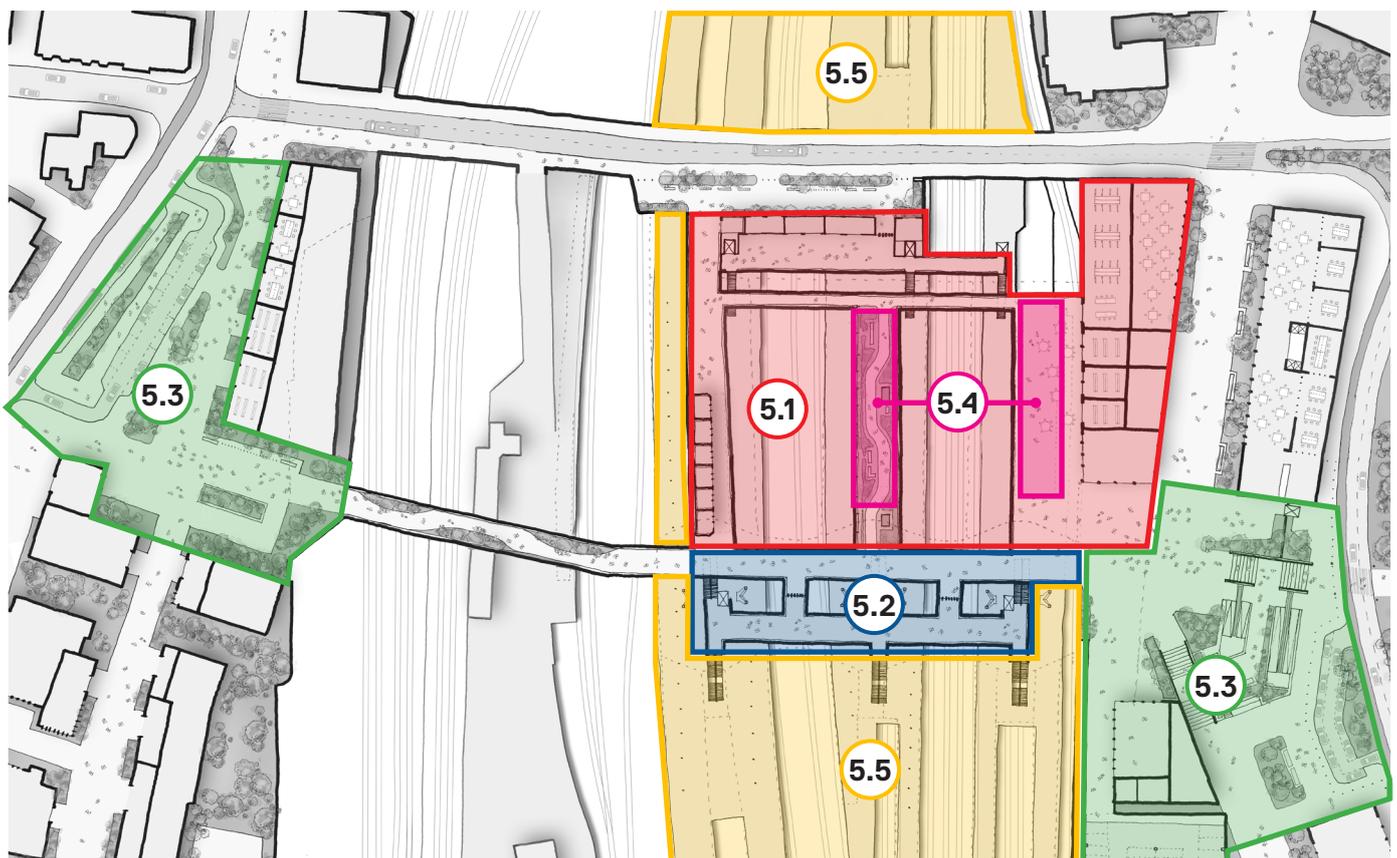
The previous Feasibility stage report set out the core concepts and ambitions for the station design. This Options study report develops on the less progressed areas of the design from the previous stage.

One key difference between the Feasibility and Option stage design is the instruction to include a paid gateline, which was instructed after Workshop 5 (change request CR88 - Design of Ticket Gatelines). This new requirement challenges some of the original concepts of the previous stage. Whilst concepts have largely remained in the Options stage design development, further work is required within the next stage to develop the design further and reintegrate the previous aims with the new requirements. This chapter will focus on the following station design elements:

- 5.1 - Mezzanine extensions
- 5.2 - Transfer deck: Incorporation of a ticket gateline
- 5.3 - Forecourt and high level intermodal strategy
- 5.4 - Heritage development
- 5.5 - North and south canopy development

This report will also present an approach to architectural phasing, which will outline the grouping of elements that are required to deliver parts of the design, and construction phasing which presents the method of constructing the station.

Image 5.1 - Station development key



5.1 - MEZZANINE EXTENSIONS

The Feasibility design proposes mezzanine extensions that link the northern Nantwich Road transfer structure and the southern transfer structure. These extensions not only provide an improved permeability within the station, but also provide additional station facilities, commercial, and community space. The strategy for implementing the mezzanine links was explored in the previous stage report (section 6.2). This study attempts to highlight their value within the station design.

To understand their benefit to the station vision two options were presented:

- **Option 1: No mezzanine extensions:** a new passenger transfer deck is located to the south which enables unpaid pedestrian access from east to west. In the north the existing Nantwich Road enables station interchange along the existing transfer structure.
- **Option 2: With mezzanine extensions:** along with the new transfer deck, new mezzanine 'finger' extensions create links between the existing Nantwich Road transfer structure and the proposed southern transfer bridge. This option better meets the ambition of NR's 'Station Design Principles' (SDP) section 6.11.2 which notes that as long as retail, or commercial activities do not hinder the safe and operational aspects of the station, that they will have a positive effect on the economic viability of the station.

The following study presents a non-exhaustive list of benefits and constraints associated with each option, and concludes with a recommended option.

Image 5.2 - Illustrative mezzanine concepts

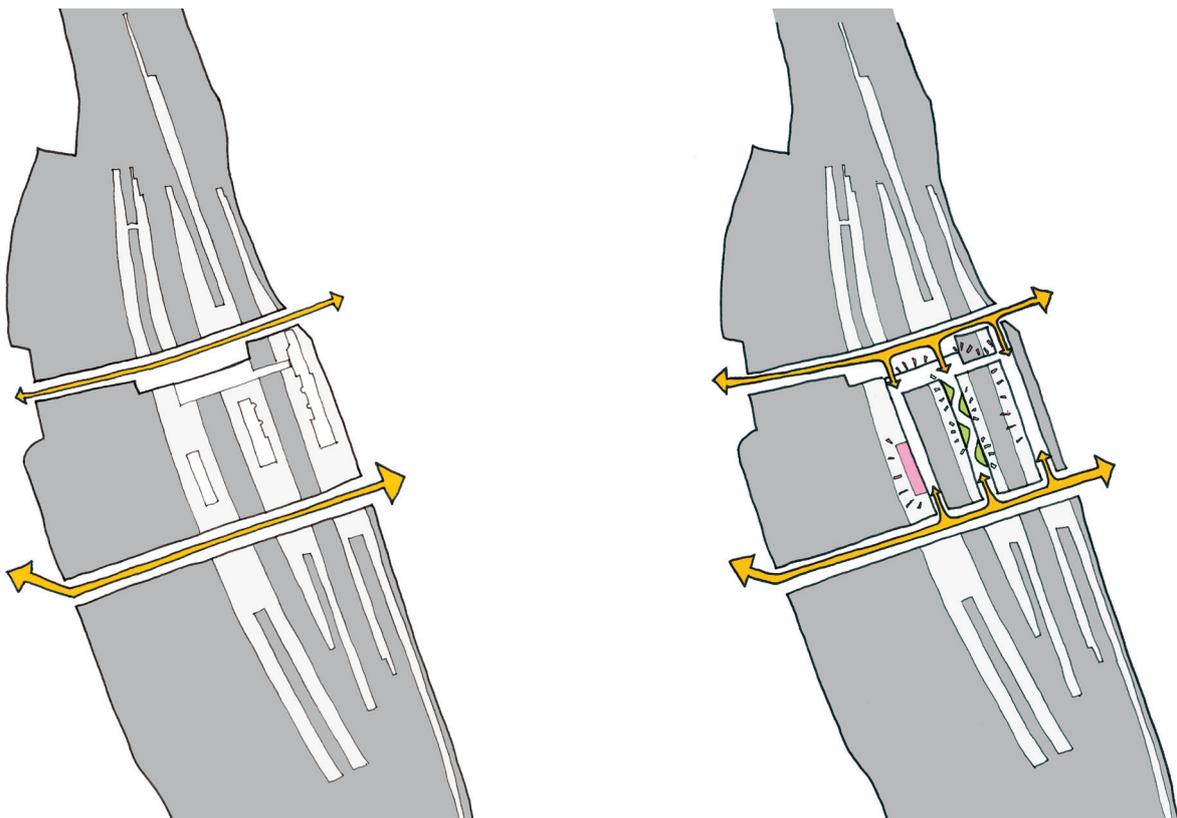


Image 5.3 - Option 1: no mezzanine extensions

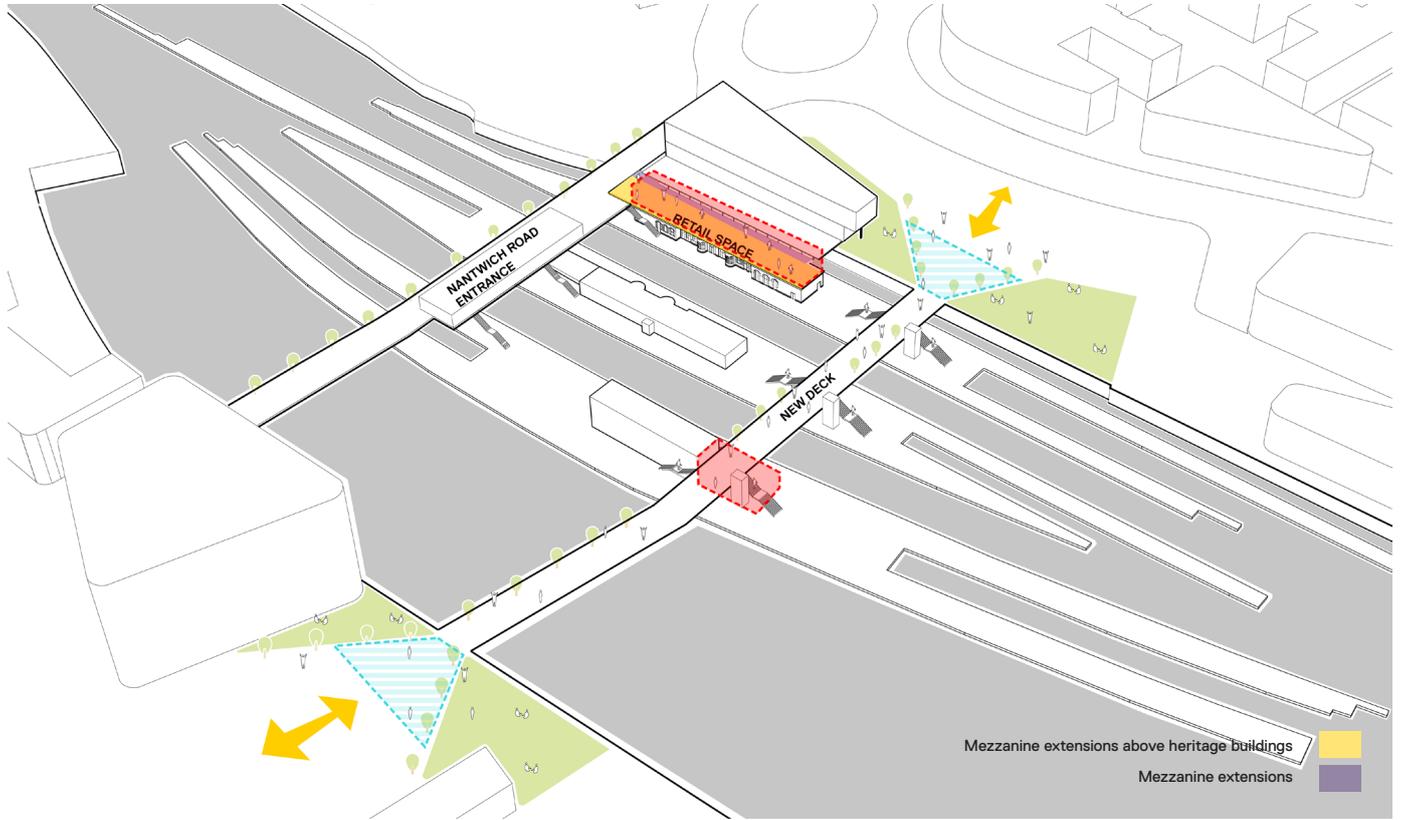
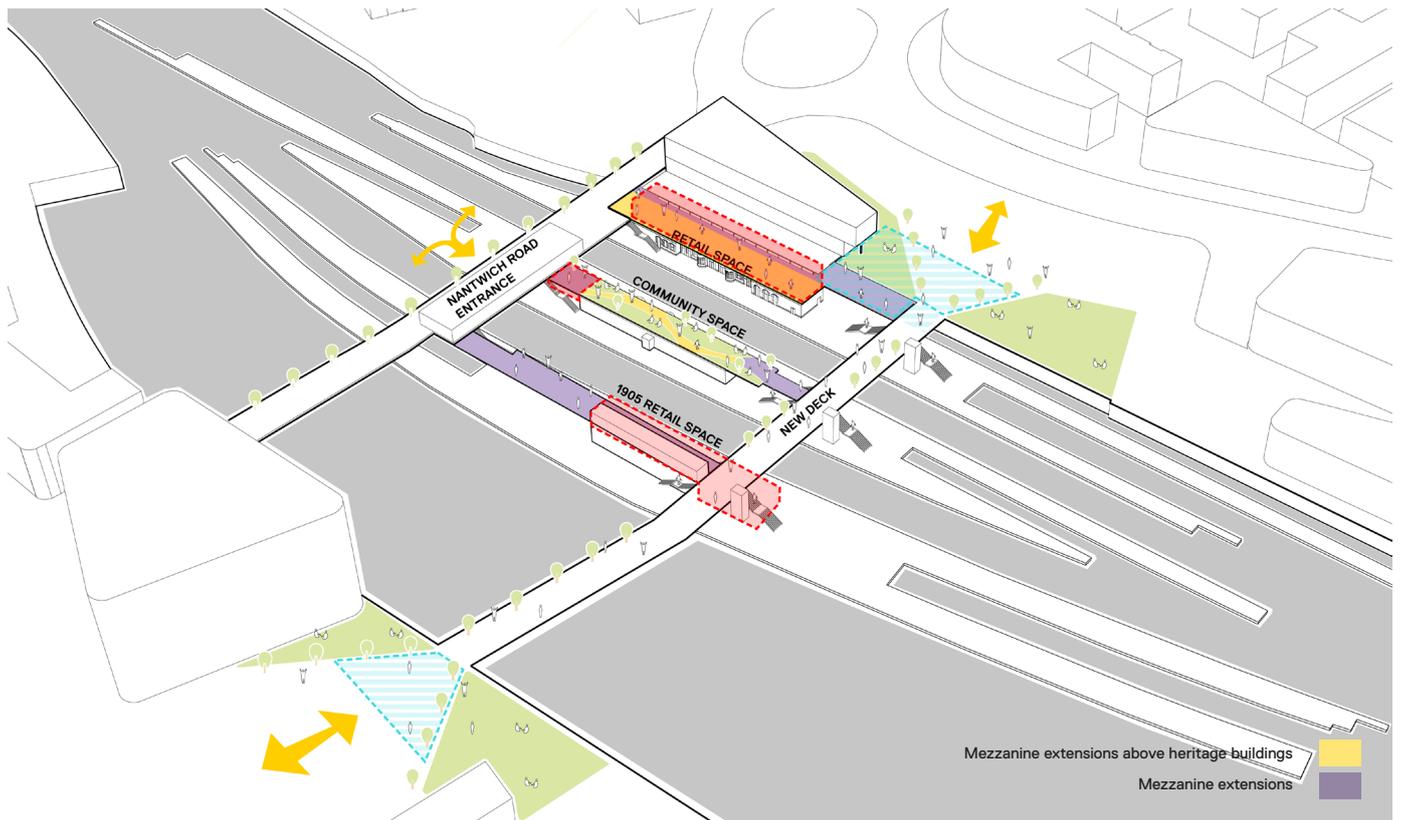


Image 5.4 - Option 2: full mezzanine extensions



5.1 - MEZZANINE EXTENSIONS

Cross Movements

No Extensions:

- Station and retail functions will be located at platform level.
- Non rail passengers using retail provision will be required to access platform level, which may cause potential cross movements and clashes at platform level.
- Ability to target specific users is reduced as retail will be mixed with station facilities which reduces the amount of station centric functions at platform level.

With Extensions:

- Cross movements are reduced through separation of facilities.
- Station facilities such as waiting rooms, station directed retail, toilets, and first class lounges can be located at platform level.
- At mezzanine level, retail and services can be located to target non-station users reducing the chances of cross flows by separating users through the different station levels.
- Mezzanine extensions provide better functionality, more commercial space, and therefore better value.

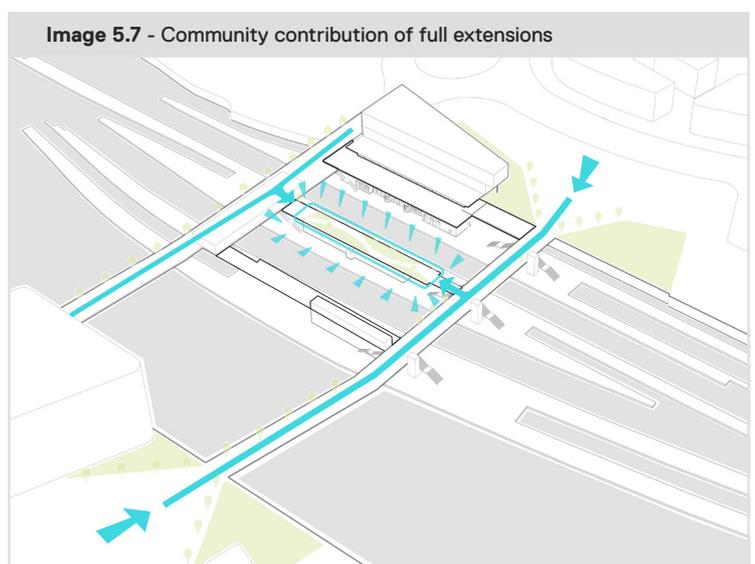
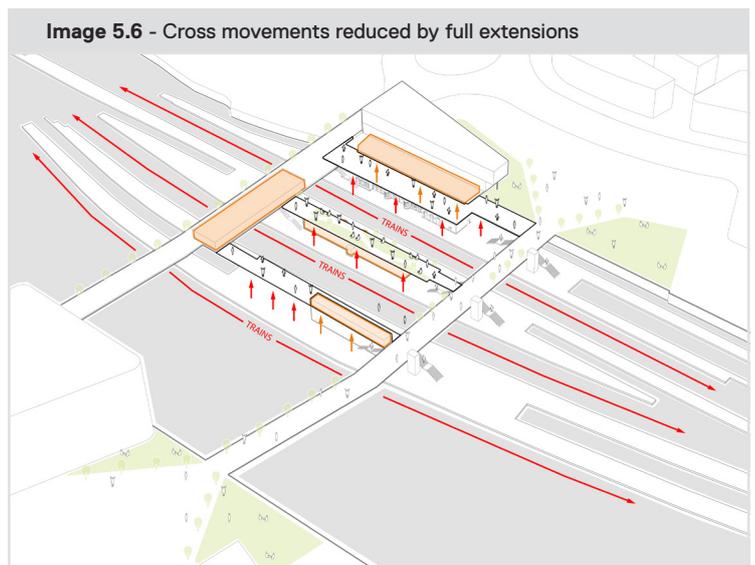
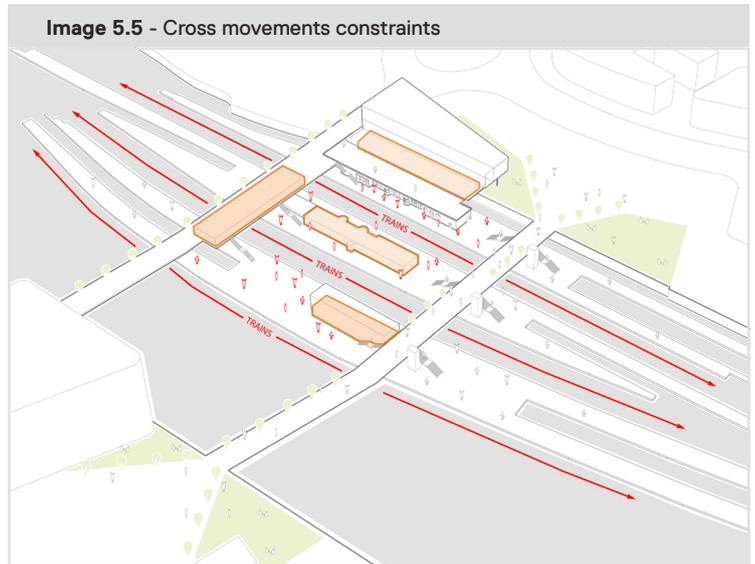
Community Contribution

No Extensions:

- No available space to provide a community contribution.

With Extensions:

- Central deck provides a community station garden.
- This space provides a waiting space for station users, or a new piece of local amenity to Crewe.
- Opportunity to provide a space for small retail kiosks.



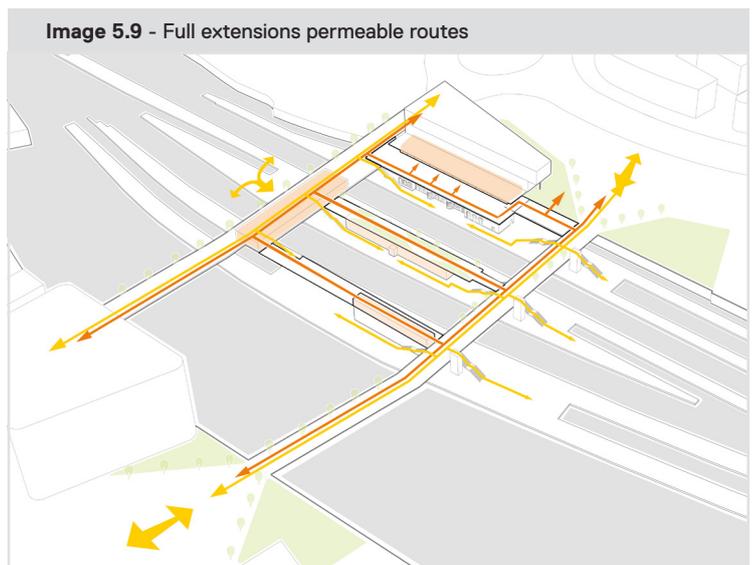
Permeability

No Extensions:

- Unpaid east to west link is still possible without mezzanine extensions, however no northern access is possible.
- Any mezzanine level above platform 1-5 would be only accessible from Nantwich Road, reducing its potential value to commercial landowners.
- Footfall past any retail units would be reduced, further questioning the benefit of retail provision.

With Extensions:

- Most permeable station option. Users are free to move from east to west, but also north to south.
- This permeable connection not only improves intuitive wayfinding, but also provides an enhanced station atmosphere.
- The mezzanine extensions create public squares that can be experienced from street level.
- Better business case for commercial spaces not only as more space is created, but also because the permeable connections generate more footfall.



Mezzanine Extensions Recommendation

Aside from the cost, there were minimal downsides with constructing the mezzanine extensions. However the benefits that they offered were superior to providing no links at all:

- **Better separation of paid & unpaid services.**
- **Valuable community contribution is provided.**
- **Greater flexibility in the design for future provision.**
- **Better functionality, permeability and wayfinding.**
- **Offers a greater amount of commercial space which may lead to increase returns, ultimately offering better value than the no extension option.**

With that in mind, the preferred option was the full mezzanine extensions. However, for full optioneering analysis the design team were asked to investigate an option whereby the eastern extension is removed leaving only the western and central mezzanine extension. The hotel building is moved eastward allowing the eastern bank to be utilised as an extension, ultimately reducing the station cost.

5.1 - MEZZANINE EXTENSIONS

Removing the Eastern Mezzanine Extension:

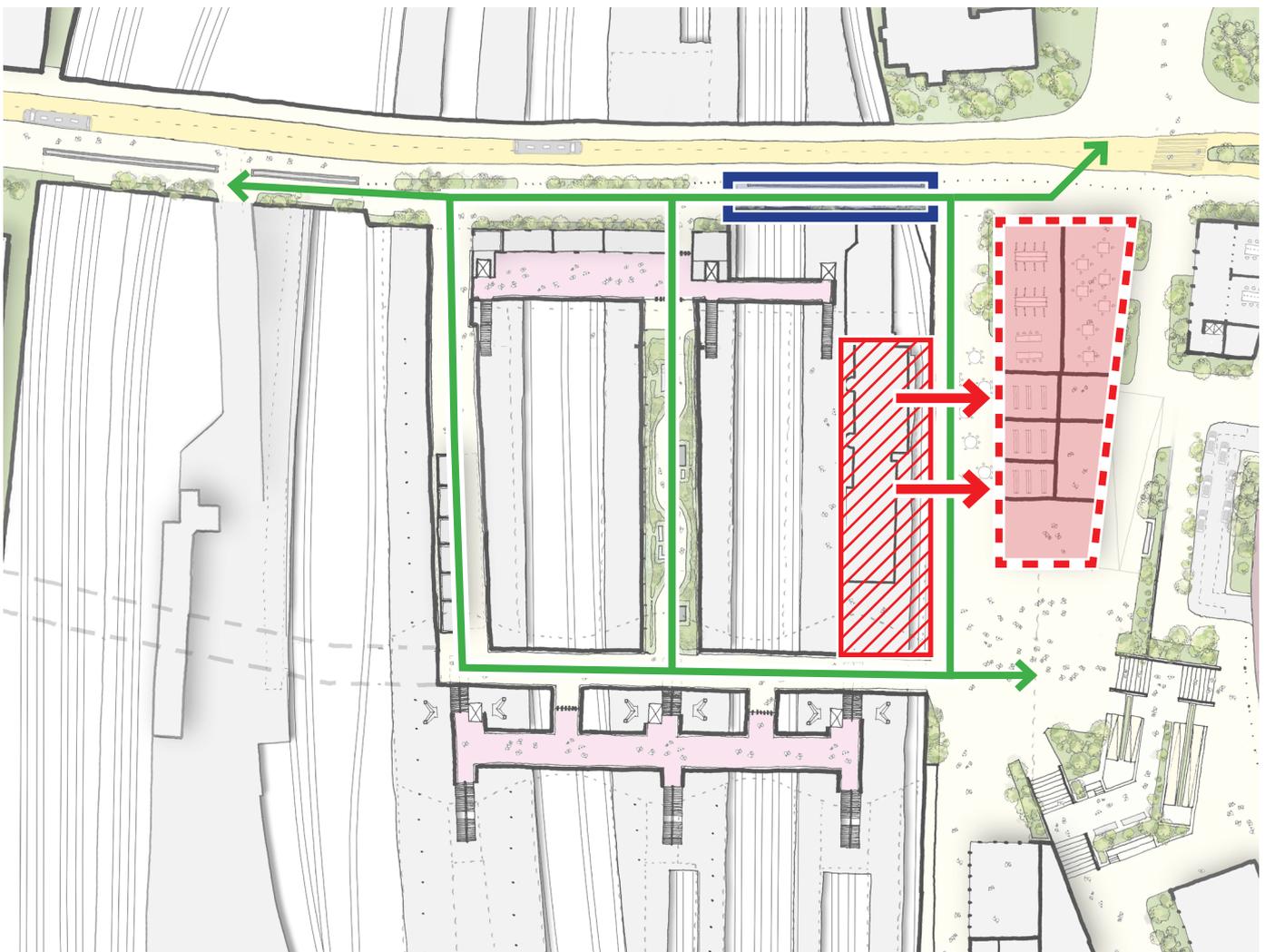
Following Workshop 6, a further study was undertaken to investigate whether the eastern mezzanine extension could be removed and the station building moved further east to provide an extension on the existing land bank, in an attempt to reduce station cost. The study highlighted multiple constraints if the mezzanine is removed, which from a design perspective would not be advisable for the following reasons:

Constraint 1: Heritage consideration:

One of the most important factors that the removal of this mezzanine creates is in relationship to the heritage buildings. Whilst the removal of this mezzanine is possible it will still require the upper building levels of the platform 1-5 heritage building to be removed and a possibly replaced with a pitched style heritage roof to match the similar heritage style, which may not offset the cost benefit of providing the extension.

Another key heritage aim is to maintain a consistent relationship between all three mezzanine extensions and the heritage buildings below. By removing the link above one but retaining the link above the other two, a contrasting relationship is created that may affect the approval of a listed consent. It is advisable that consultation with relevant statutory authorities occurs as soon as possible to minimise risk of rejection.

Image 5.10 - Removing the eastern mezzanine extension key plan



Constraint 2: Challenging the 'Peak' concept:

- Original 'Peak' concept reflected the original design concept by denoting a decision point to move from deck to platform. This concept is being challenged by the changes, which in this scenario loses its relationship to the platform.
- The eastern peak would be relocated to reflect the movement of the eastern mezzanine.
- This would create a disparity between the remaining two peaks as the distance would be increased.
- Peak would lose its relationship to platform 1-5 as it would no longer be located over it.

Constraint 3: Questionable cost benefit / heritage relationship:

- Even if the mezzanine extension moves east, the existing station building upper levels need to be removed. This means a new covering is required. The cost saved moving the extension may therefore not be as beneficial as it may seem.
- The heritage building top therefore becomes a challenge for maintenance and cleaning within a live station environment, as well as being visible from the surrounding mezzanine extensions creating a potentially less desirable station environment.

Constraint 4: Structural complexities:

- Relocating the mezzanine further eastward increases the canopy structural span from 35m to almost 50m.
- This additional 15m may complicate the structural approach and is likely to require thicker structural members, challenging the light and airy platform environment.
- An intermediate column may be required on platform 5, which is not in keeping with the original concept of light and airy canopies promoting an enhanced station environment.
- There may also not be adequate width on the platform to locate these columns.

Image 5.11 - Peak concept challenges

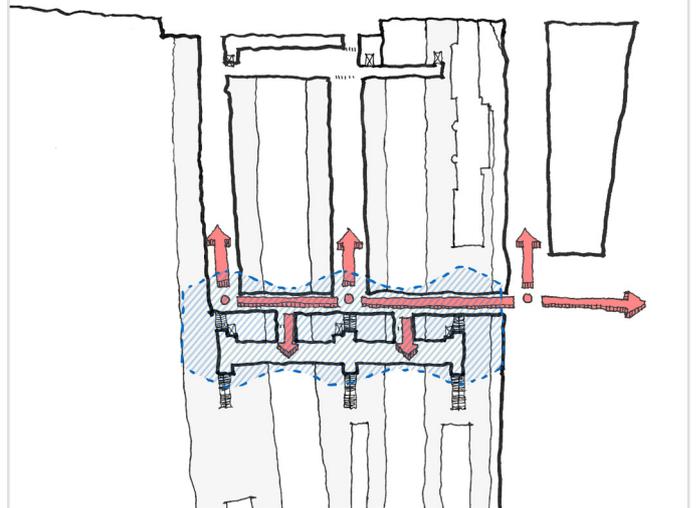


Image 5.12 - Questionable cost benefit

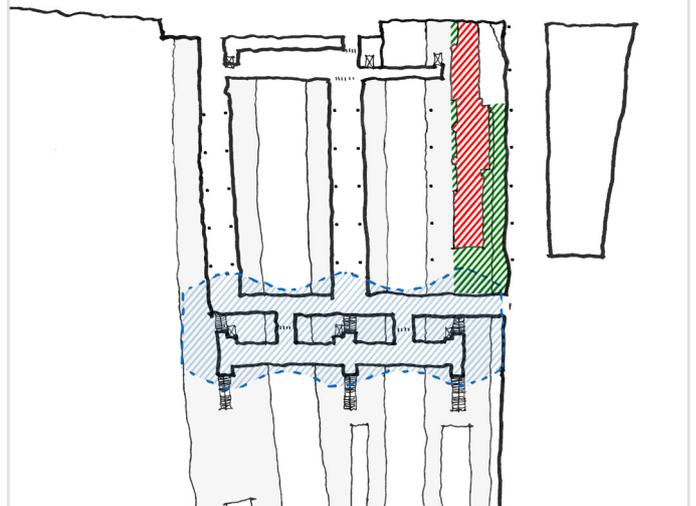
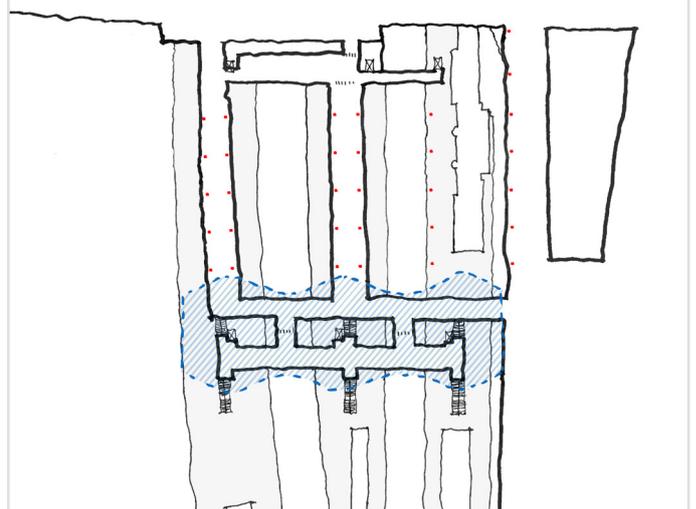


Image 5.13 - Structural complexities



5.2 - TRANSFER DECK: GATELINE

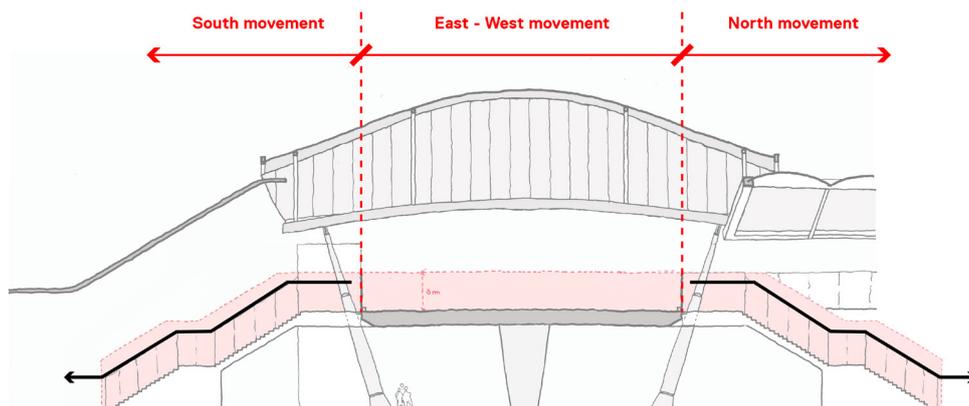
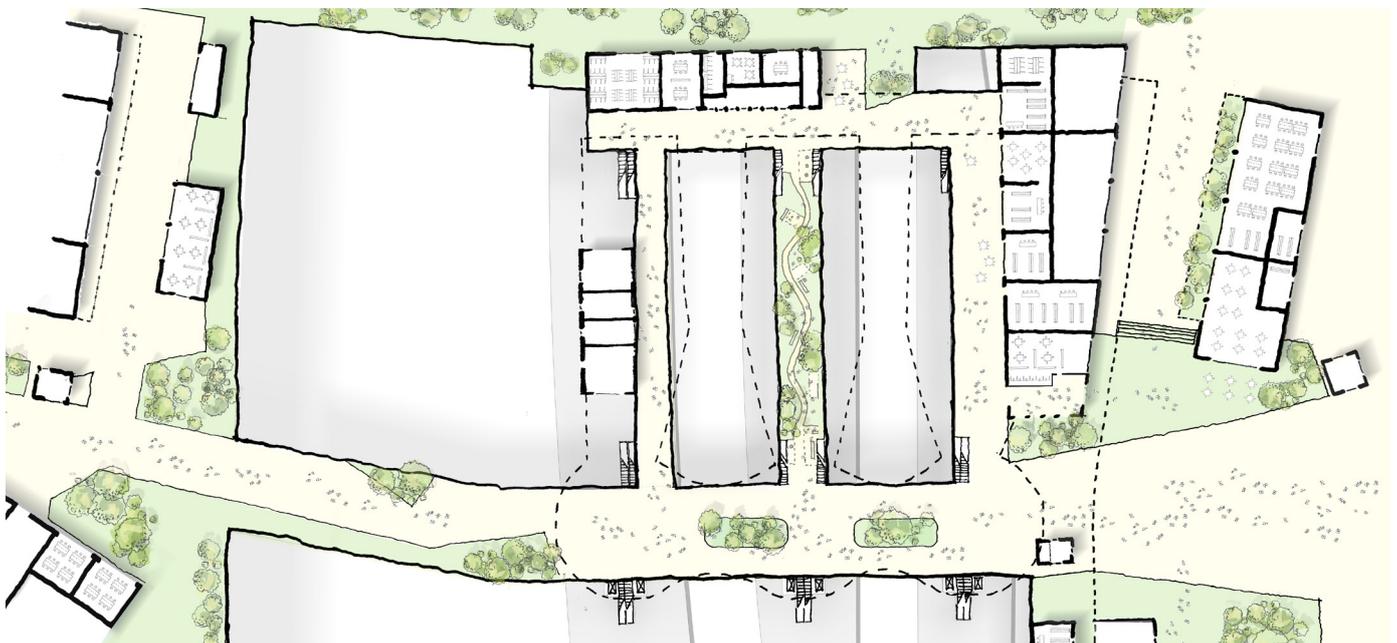
As previously noted, the biggest difference between the previous station design and this current study, is the inclusion of a ticket gateline. The previous transfer deck concept (fig 5.11) provided an unpaid east to west route along a 20m wide deck structure. Vertical circulation was attached to the north and south to provide access to platform level, with mezzanine links connecting the northern Nantwich Road deck to the southern unpaid transfer structure.

The NR change request 'CR88' alters this approach to include a paid gateline. The remit of the change was to include as few gatelines as possible - ideally a maximum of two gatelines. However, it must create separation between paid and unpaid station environments. To progress the design assumptions were made which can be found in section 1.4 of this report.

The design was developed through a series of options with the aim of including gatelines with the least impact on the original design concept. The opposite page presents the first series of high-level gateline options.

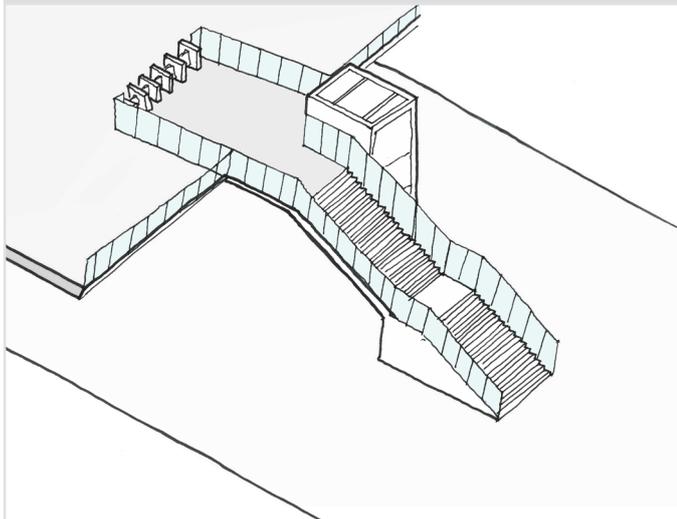
The study will then present different configurations of gateline arrangements, and finally develop a single preferred option. It is worth noting that further development is required in the coming Solutions stage, especially in relation to the canopy and entrance design.

Image 5.14 - Feasibility transfer deck concept



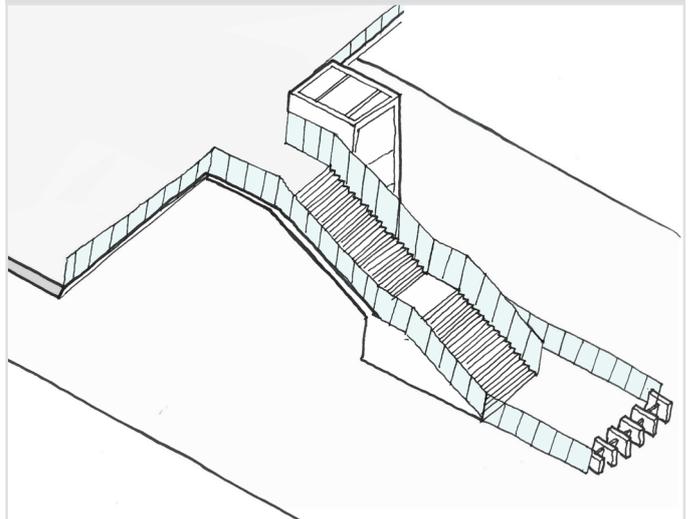
5.2 - GATELINE CONCEPTS

Image 5.15 - Gateline at top of stair access



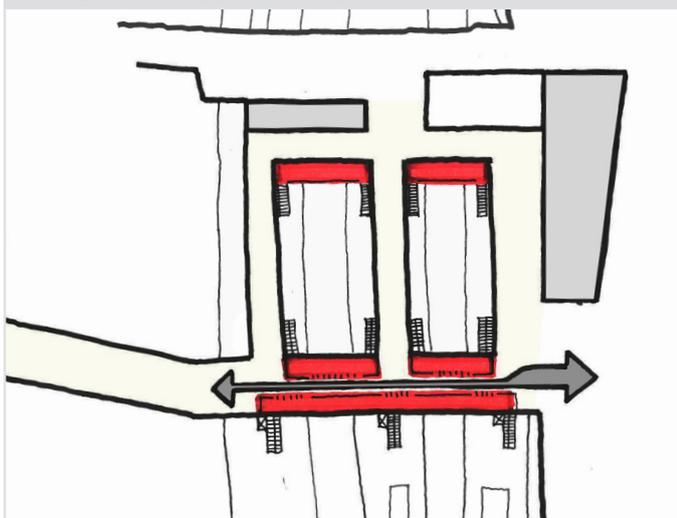
- Gatedines along top of platforms require approximately nine individual ticket gatedines.
- No ability to interchange without exiting and re-entering via ticket gatable.
- Wayfinding is compromised by complexity of gatedines

Image 5.16 - Gateline at bottom of stair access



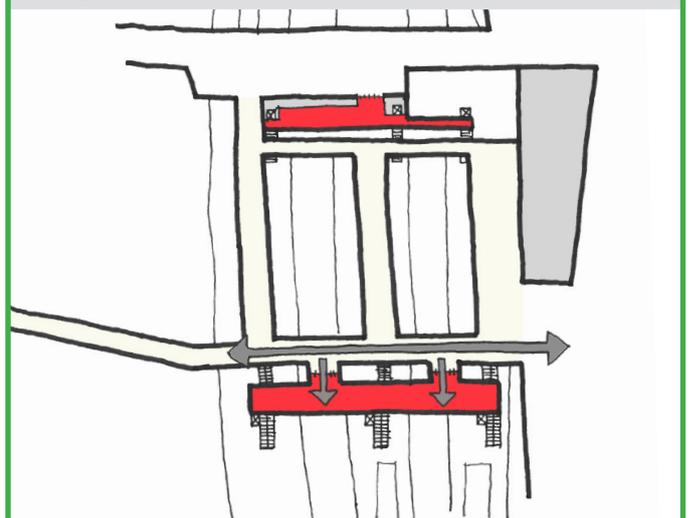
- Same issues as with gatable at the top of the stairs option, with additional complexities:
- Functional impact in passengers going down to platform and having to go back up if they don't have a ticket.
- Reduced useable platform width created by unpaid zone.

Image 5.17 - Long gatable along transfer deck



- Little ability to interchange across all platforms without exiting and re-entering of gatable.
- Wayfinding is compromised by complexity of gatedines.
- Main unpaid east to west route overlaps into ticket barrier run-off zone creating possible conflicts.

Image 5.18 - Parallel deck



- Clear hierarchy of movement along an unpaid route, crossing into paid route.
- Parallel paid decks enable interchange to both north and south without exit and re-entry of gatedines.
- Unpaid route from east to west, and north to south is retained.

5.2 - GATELINE ARRANGEMENTS

The previous gateline concepts study presented four methods of implementing ticket gates into the design: at the top of a stair access, at the bottom of a stair access, a long gateline along the feasibility deck design, and as a parallel deck scheme. The parallel deck scheme was preferred because of its ability to provide interchange on both the north and south deck, a clear hierarchy, whilst maintaining the original Feasibility concepts and CEC's unpaid east to west access requirements.

With this in mind, there are various ways of configuring this gateline concept into different arrangements. For example, the location of the links and the number of gatelines create a different station design with differing benefits and constraints. The following 5 options were presented, and critically evaluated to present a single preferred option.

'Option C' was the preferred option due to its ability to distribute exiting passengers equally along the unpaid transfer bridge, giving the best possible future provision to add additional gates, minimising the potential impact of run-off clashes by creating distance between gates and vertical circulation, and providing an enhanced platform environment as extensions are located above tracks. The even distribution provides better ability for emergency evacuation, which is noted in section 6.1 of NR's SDP.

Image 5.19 - Option A: Single eastern gateline on eastern bank

Benefits:

1. Smallest cost.
2. Only a single gateline fits sponsorboard aims of a maximum of two gatelines per option.

Constraints:

1. Rail users from the west have an extended distance to travel to enter on the eastern side.
2. Single eastern entrance challenges the hierarchy of the station entrance. The decision point is located on the eastern urban realm.
3. Gateline is not future proof as the number of possible gates is limited by the deck width.

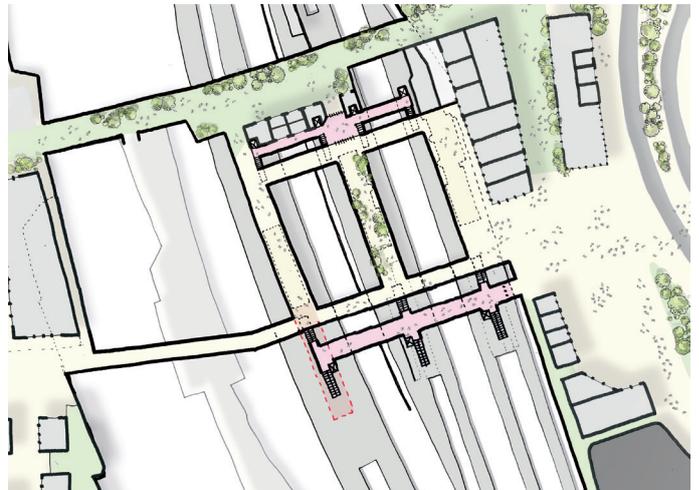


Image 5.20 - Option B: Single central gateline on centre of paid transfer bridge

Benefits:

1. Resolves issue of hierarchy - it encourages entrance to main station before decision making.

Constraints:

1. Gateline forces northern vertical circulation onto the south face of deck requiring passengers north to double back onto stairs to exit.
2. Potential run-off issues with gateline opposite vertical circulation.
3. Should stairs be located on north face, it may suffer from run-off issues, and a lack of adequate width to structurally support canopy.



Image 5.21 - Option C: Split central gatelines

Benefits:

1. Better distribution of exiting passengers along unpaid transfer bridge.
2. Better future provision for additional gates
3. Offers least conflict with run-offs around vertical circulation being separated furthest.
4. Enhanced platform environment by utilising void spaces as light voids.
5. Maintains clear hierarchy of access along an unpaid route.
6. Multiple, evenly distributed gatelines improves emergency evacuation (SDP - 6.1)



Image 5.22 - Option D: Split end gatelines

Benefits:

1. Good distribution of exiting & entering passengers.
2. Maintains clear hierarchy of access along an unpaid route.
3. Clear relationship between gateline bridges and mezzanine extensions.

Constraints:

1. Potential run-off issues with gateline close to transfer deck corridor.
2. Reduced structural zone on platforms 11, & 1-5.

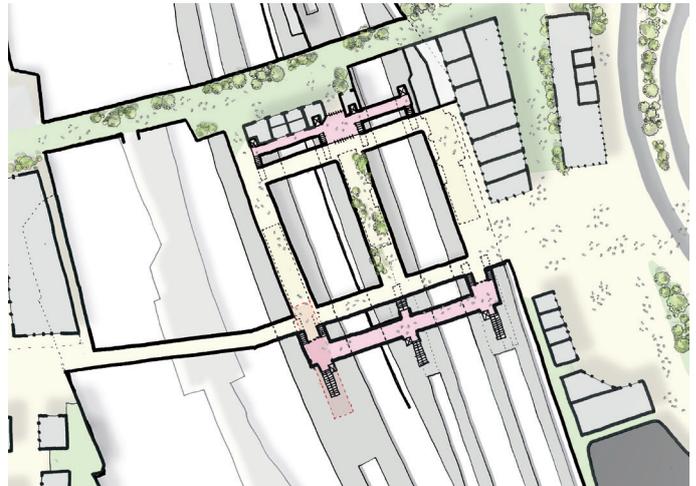


Image 5.23 - Option E: 'Tuning fork'

Benefits:

1. Offers least conflict with run-offs around vertical circulation being separated furthest.

Constraints:

1. Entrance locations challenge the hierarchy of the station entrance. The decision point is located on the ends of the deck rather than in the station environment.
2. Gatelines are not future proof as the number of possible gates is limited by the deck width.
3. No central access requires passengers exit outside the station environment.



5.2 - TRANSFER DECK DESIGN DEVELOPMENT

Image 5.24 - Option stage gateline transfer deck concept

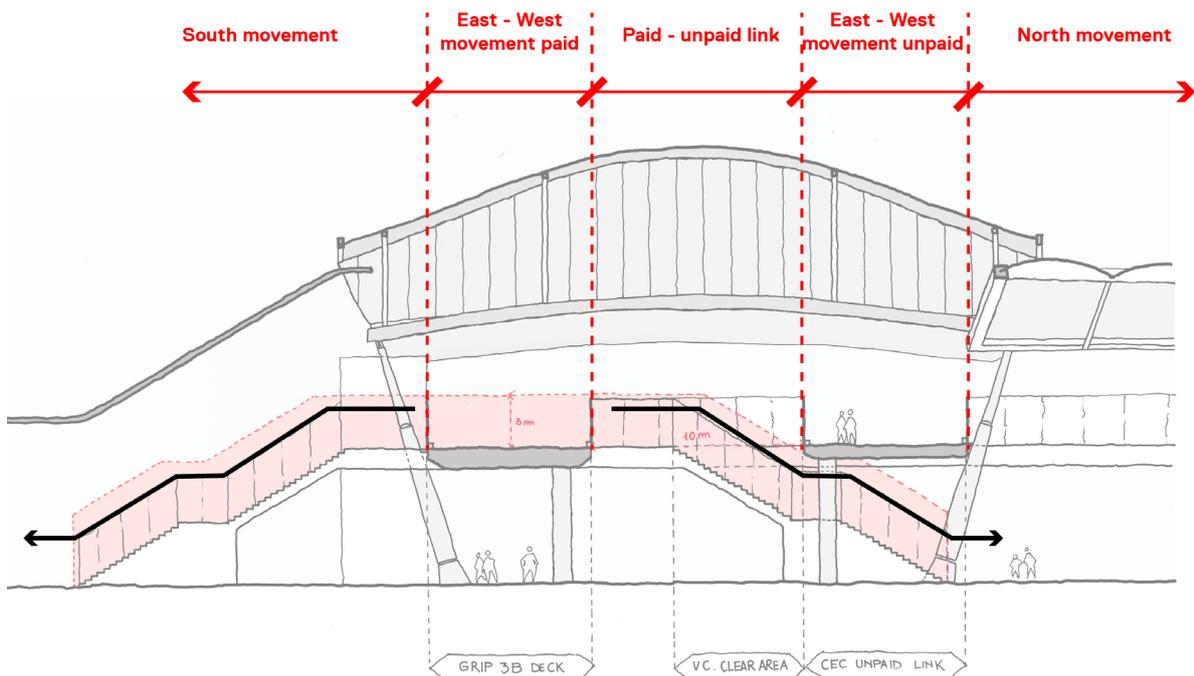
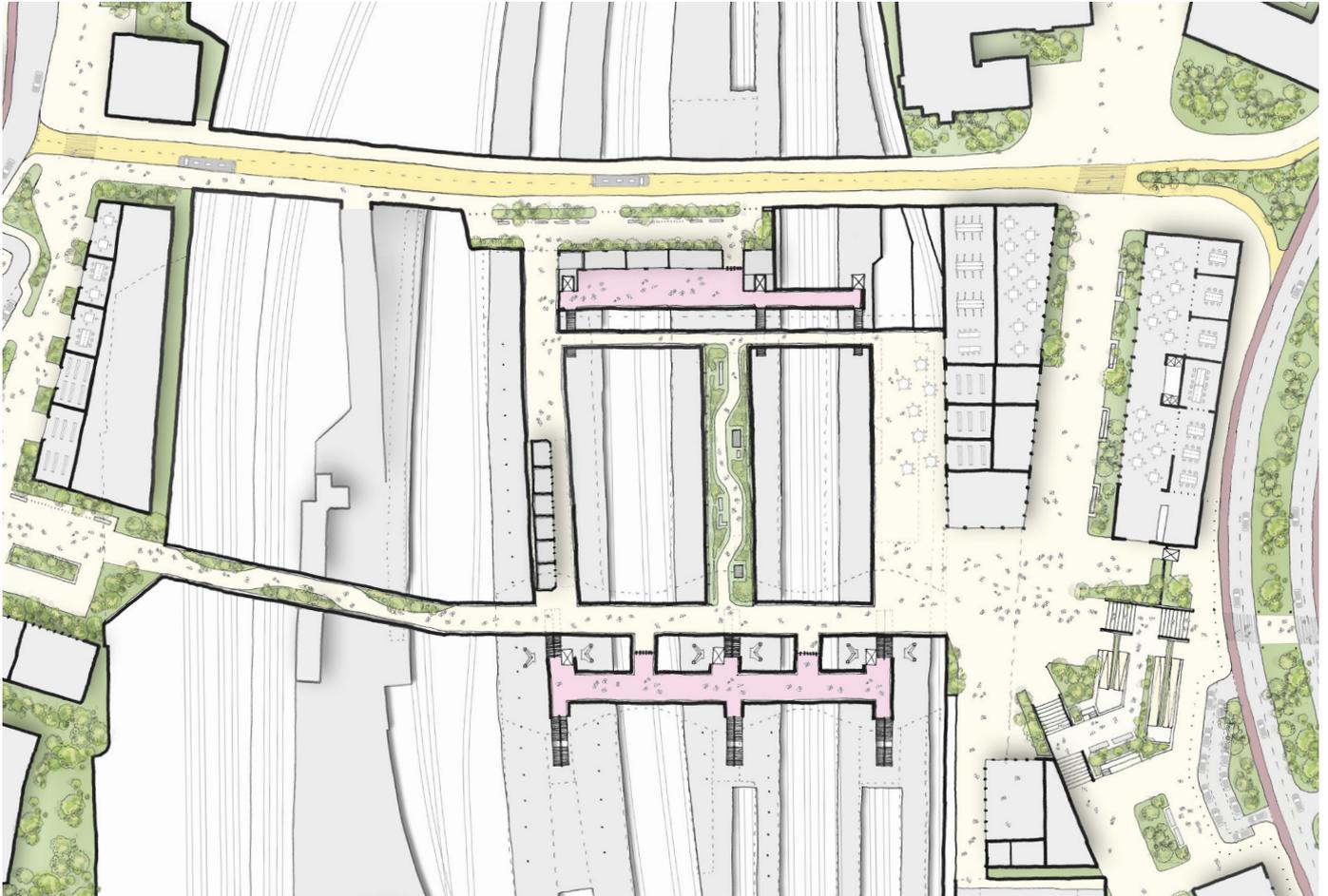
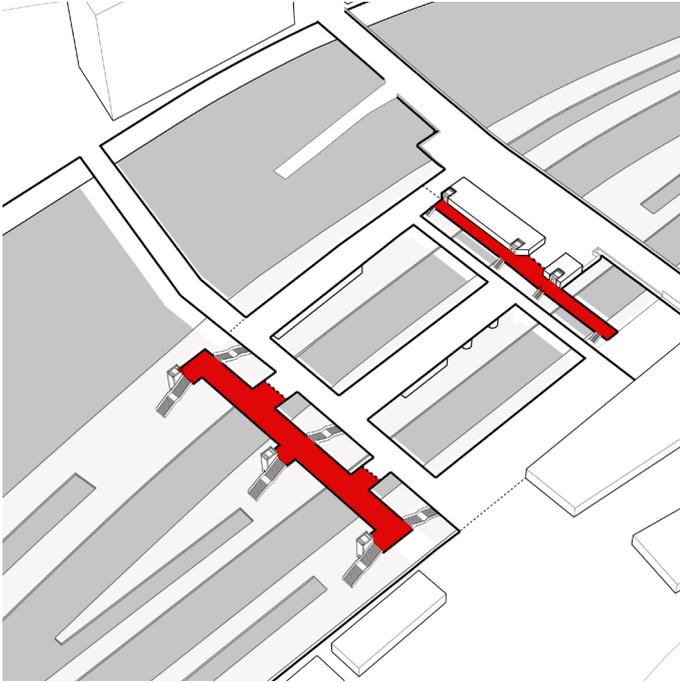
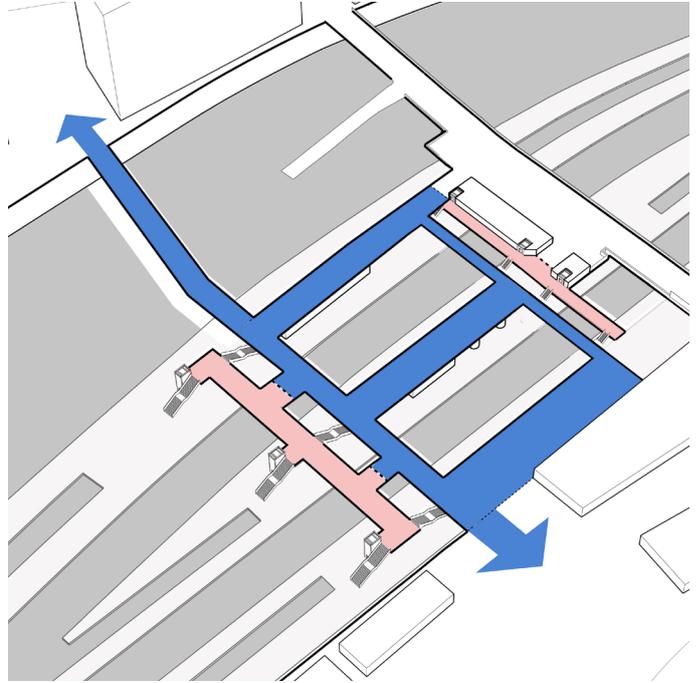


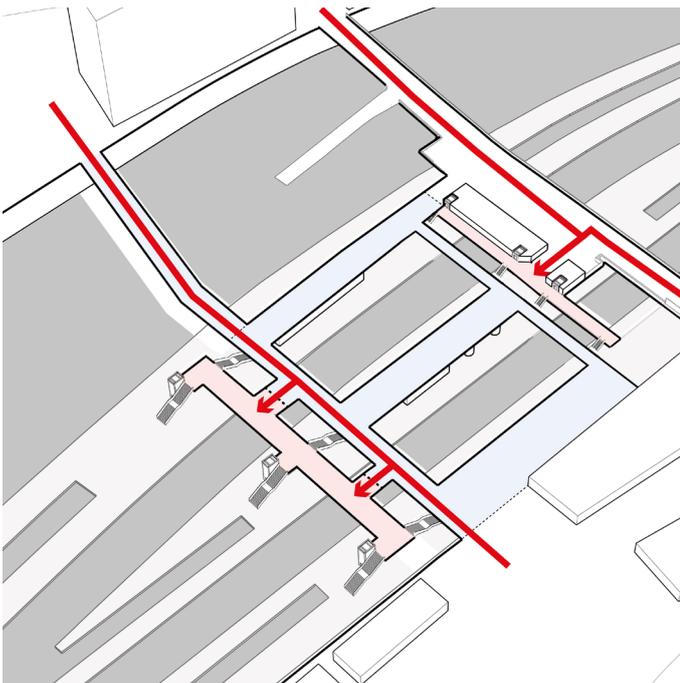
Image 5.25 - Gateline transfer deck operation



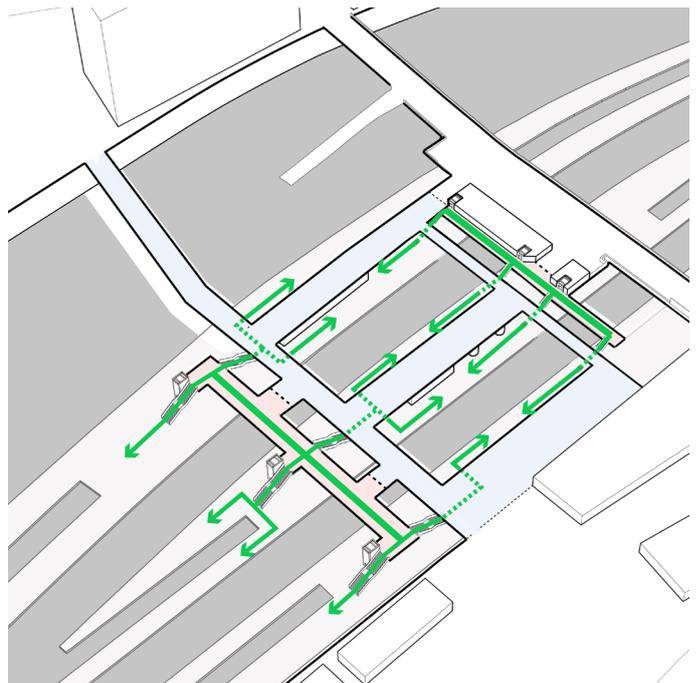
Paid transfer bridge: the parallel deck option provides two paid bridges: one to the north, and another to the south.



Unpaid transfer bridge: by splitting the paid and unpaid bridges with extensions between, an unpaid east to west route is maintained.



Paid entrances: three ticket gatelines are located for entry on both paid decks: one to the north, and two to the south. This split highlights the southern deck as the primary point of entry for most station users.



Interchange: exit free interchange is maintained in both the north and southern paid decks. This gives passengers the ability to interchange across all platforms.

5.3 - FORECOURT DESIGN: WESTON ROAD

The eastern entrance is considered the larger 'regional' entrance of the station and is approximately 3500m². It gives direct access to the Commercial Hub and is therefore likely to be experienced by a visitor to Crewe.

Under the SDP section 6.9.1, level access should be sought to integrate seamlessly with the surrounding context. Not only does this maximise station inclusivity, but also offers an enhanced station experience. **All information presented has been developed using OS map and LEC4 data, and is still awaiting up to date survey information.**

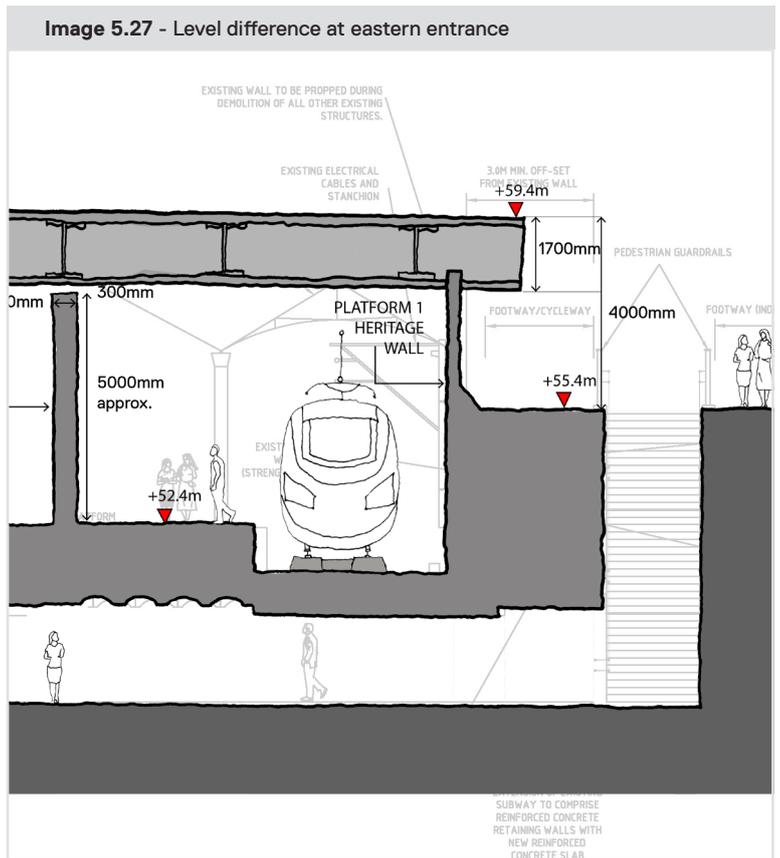
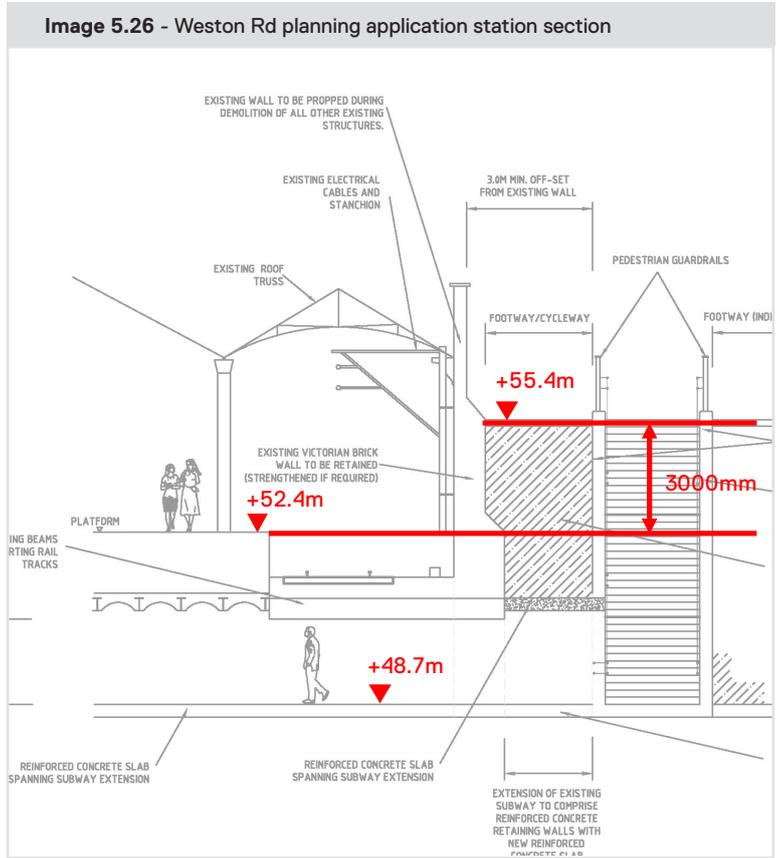
Introducing data from existing planning application drawings from the Weston Road entrance submission we can assume that the level difference between road level and Platform 1 is approximately 3m.

The current concept attempts to avoid existing building structures, and Listed screen walls wherever possible by positioning new structures above any listed elements. This strategy also provides adequate clearance from overhead line equipment (OLE). The underside of a transfer structure is therefore approximately 5.3m above platform surface.

The current structural design assumes a deck thickness of 1.7m to finished floor surface, which when combined with the previous planning application gives a level difference of 4m between the top of deck and Weston Road floor surface.

There are various methods of dealing with this level difference, but it is considered that the most suitable solution is by using a gently sloped surface to a landscape staircase. This urban realm stair will rise approximately 2.5m.

Further work is required in the next stage to considered a full suite of design options against a measured topographic survey.



5.3 - FORECOURT DESIGN: WESTON ROAD

Whilst the level difference may be seen as a constraint, it can be used as a benefit within the intermodal strategy as short stay parking can be located at ground level, directly attached to the green pedestrian route (fig 5.28). Whereas long stay and blue badge parking (SDP - 6.5.5) is located at first floor (station mezzanine level). This provides a direct, obstacle free route behind new station facilities building, and direct level access to the station (fig 5.29).

Taxi facilities are proposed as an independent location to reduce traffic congestion and improve wayfinding. The separation of modal points reduces chances of interaction between pedestrians and vehicular movements (SDP - 6.5.1).

The provision of a station building on the corner of the urban realm reduces ownership issues within the hotel building and is better suited to construction phasing. The positioning of the ticket office also reduces internal congestion within the station transfer deck (SDP - 6.1)

The forecourt landscape contains a series of steps, compliant with the Department for Transport's (DfT's) 'Design Standards for Accessible Railway Stations'. It also provides a ramp embedded within the hard landscaping for 'Person with Reduced Mobility' (PRM) access.

Lift access could also be provided to aid PRM visitors.

The pedestrian routes are orientated to promote onward movement into the surrounding context, particularly the Commercial Hub (SDP - 6.5.8 / 6.9.3).

Image 5.28 - Eastern forecourt ground floor

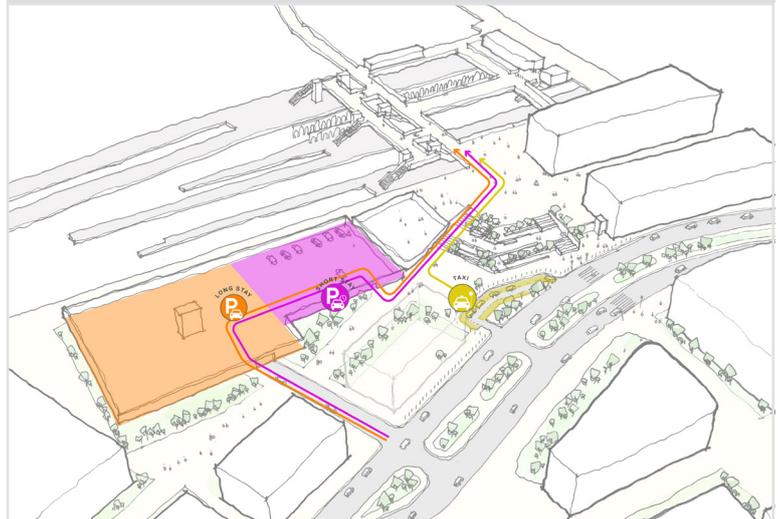
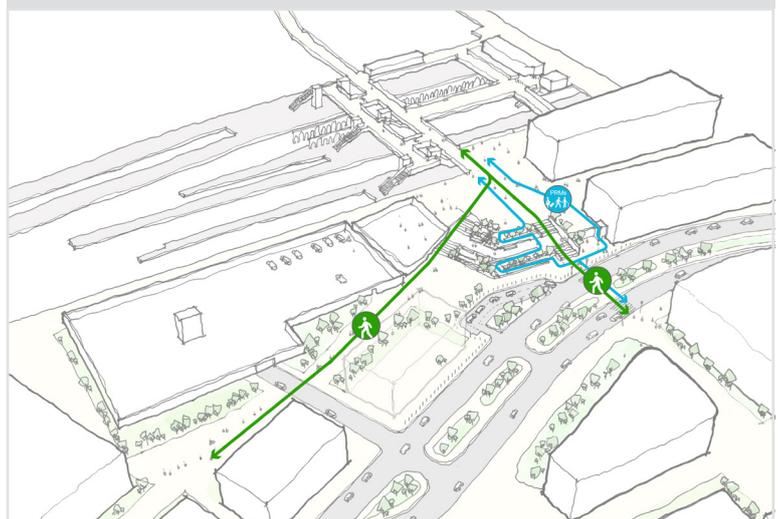


Image 5.29 - Eastern forecourt first floor (station mezzanine level)



Image 5.30 - Pedestrian and PRM access



5.3 - FORECOURT DESIGN: GRETTY ROAD

The western entrance is assumed as being the 'local' entrance, and therefore the smaller of the two entrances being approximately 1700m². The forecourt is linked to the east to west transfer bridge, and provides a clear pedestrianised route towards the existing town centre and towards the intermodal facilities.

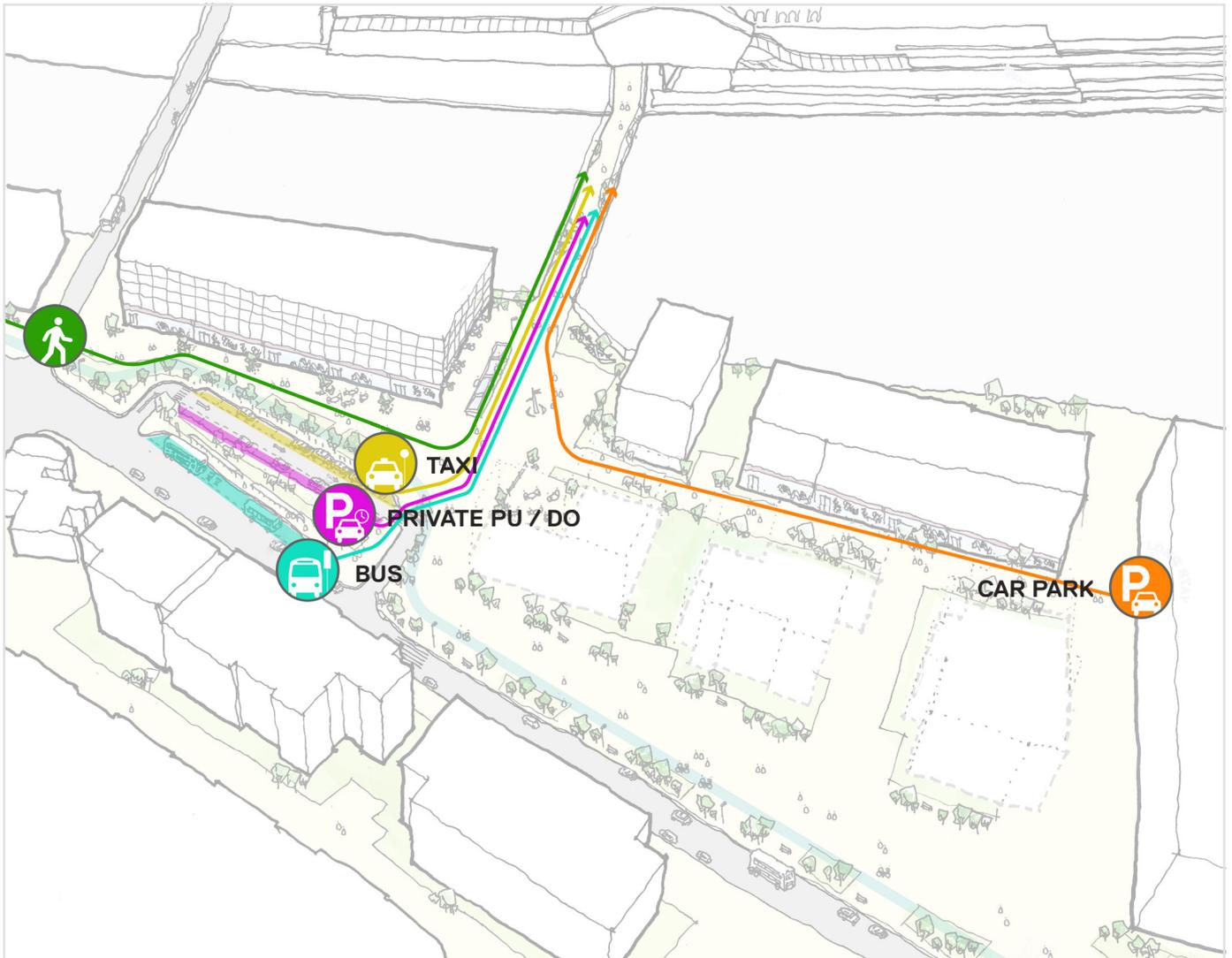
The western forecourt (fig 5.31) design is founded on the original concept of locating public squares along a pedestrian route. This forecourt is the most westerly square and provides wide activated avenues into and out of the square. Building footprints frame the square with an integrated green route highlighting key routes to the town centre. Local functions are located around the forecourt providing an activated space by using local cafés, bars, and restaurants, which promote visitors to linger and enjoy the space (SDP - 6.9.2). Being the 'local' face of the station, it may be advisable to locate cycle parking within the station square (SDP - 6.5.4).

Intermodal functions are located north of the forecourt, opposite a landmark commercial development (fig 5.32). The intermodal hub provides bus, taxi and local pick up and drop of functions with direct access to the station entrance via the pedestrianised greenlink that links station to the town centre (SDP - 6.5.2). A multi-storey car park is located south of the entrance along a wide activated frontage of commercial and retail buildings (SDP - 6.5.5).

Image 5.31 - Western forecourt design



Image 5.32 - Western forecourt intermodal strategy - to be further developed



5.4 - HERITAGE: KEY PRINCIPLES

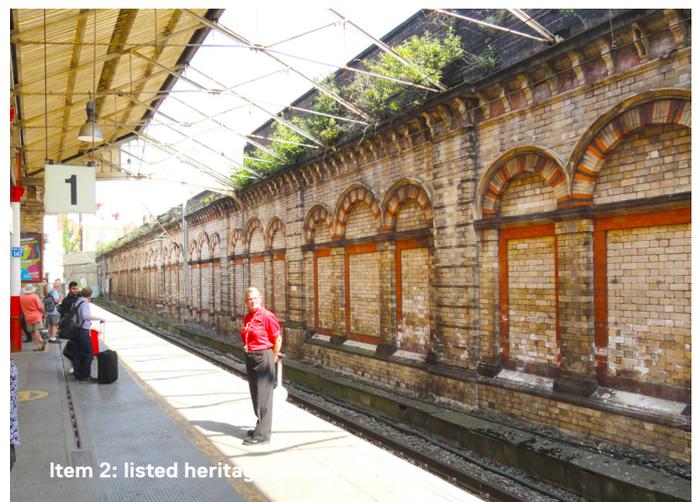
The Option stage heritage design progresses core themes founded in the previous Feasibility stage. The previous design proposed a series of mezzanine extensions, as seen in section 5.1 of this report. These extensions have a direct relationship with the station buildings (element 1 on figure 5.33), and the heritage screen walls (element 2). It is important to note that no consultation process has yet commenced with the local council, Railway Heritage Trust, or Historic England (SDP - 6.9.6). The listing notice is complex and has a series of exclusions, including the canopies. Consultation with key heritage bodies on the impact of the proposed areas of demolition is critical to inform the design development.

The design also considers the relationship between the newly proposed courtyard canopy and existing 1867 canopy. A key characteristics of the existing 1867 canopy is the rhythm of the structure and its interface with the listed platform buildings and listed screen walls (fig 5.34), which may inform a future canopy design. Pending further CAD survey information, the proposed design may echo the rhythm of the existing canopy bays and assist in mitigating the impact of removing the 1867 canopies and enable the new structure to respond to the heritage context. Current survey information does not reflect the existing canopy modules, and thus the design does not currently reflect this concept.

Image 5.33 - Station heritage assets as per GRIP 3 information



Item 1: listed station building



Item 2: listed heritage

Image 5.34 - Existing canopy roof grid



5.4 - HERITAGE: STRUCTURAL STRATEGY

As presented in section 6.2 of the Feasibility stage report, the concept design proposes a series of mezzanine extensions that link the southern transfer bridge and the northern Nantwich Road transfer structure. To construct these links, the following actions are required:

- Removal of existing canopy surrounding station buildings.
- Removal of the redbrick upper floors above the listed yellow brick station buildings and 1905 building.
- Structural columns are constructed into the heritage buildings to support the mezzanine extensions and proposed canopy above (fig. 5.35), as seen in section 5.5 of this report.

Three structural approaches were explored in coordination with heritage experts to consider the most suitable approach (more detailed structural analysis will follow in section 5.5 of this report):

- **Option 1:** Columns are located in their original positions (according to recovered heritage documents).
- **Option 2:** Columns are located along original wall lines, set against building edges to aid structural spans.
- **Option 3:** Columns are located at the most structurally suitable locations that enable a more efficient use of internal space. Columns must not obstruct heritage features such as doorways and window openings to maintain the character of the original structure.

'Option 3' was selected as the preferred structural approach, however it is also important to consider the visual impact of the columns that will support the 'courtyard' canopies. Further development in the coming stage is required to understand how these structural supports will appear adjacent / over the listed buildings.

Image 5.35 - Mezzanine extension station building impact

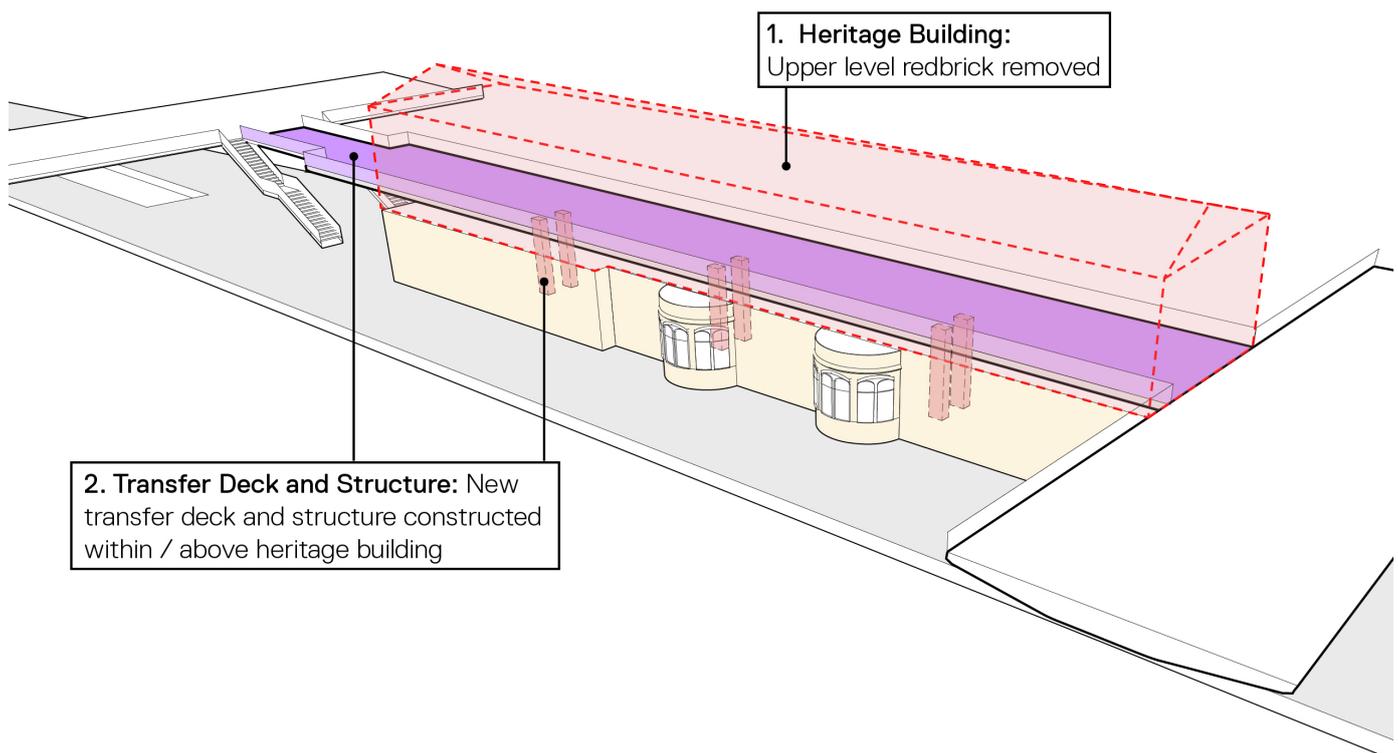
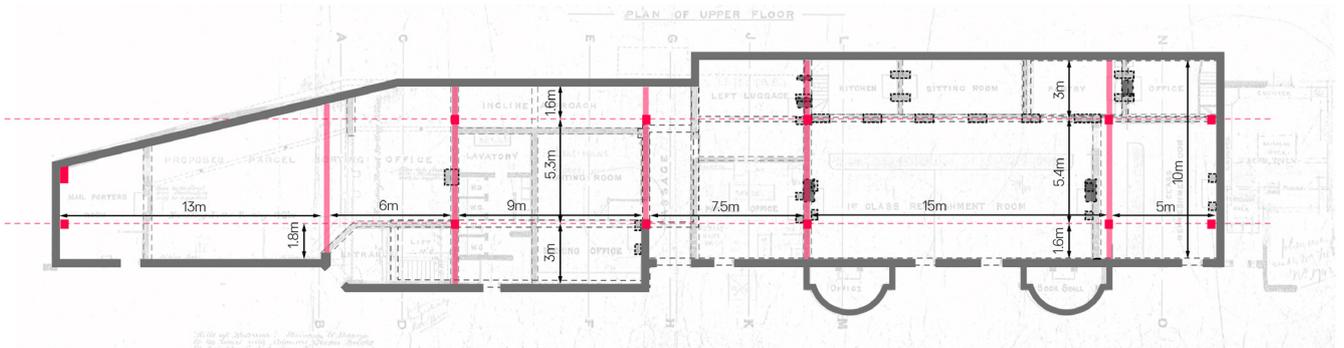
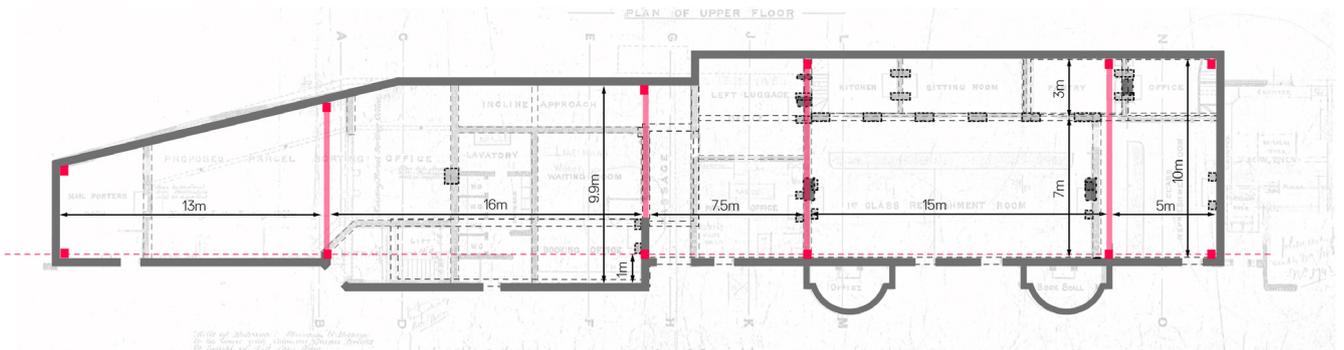


Image 5.36 - Option 1: columns reinstated in original heritage location



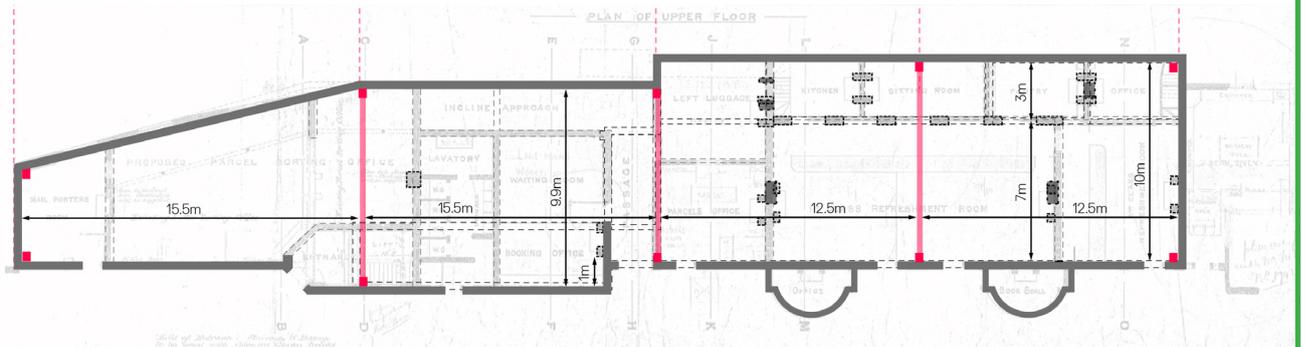
Option 1 is the least preferred structural solution. Column locations create a complex structural solution, and may not provide internal space planning that is suitable to current requirements.

Image 5.37 - Option 2: columns located along original wall locations towards edge of building



Option 2 provides a better structural arrangement as it requires a smaller cantilever on the edge of the mezzanine slab, although it suffers the same internal room planning constraints that may not fit today's requirements.

Image 5.38 - Option 3: columns are located to aid structural and room planning strategy without obstructing heritage features



Option 3 is the preferred option providing the best structural solution as columns are located towards the edge of the building at regular spans, and also offer the best flexibility for internal space planning. It is vital that structural locations do not impact the heritage features, and should be developed further with coordination from heritage consultants to develop the structural strategy and locations.

5.5 - STRUCTURAL DESIGN: PRINCIPLES

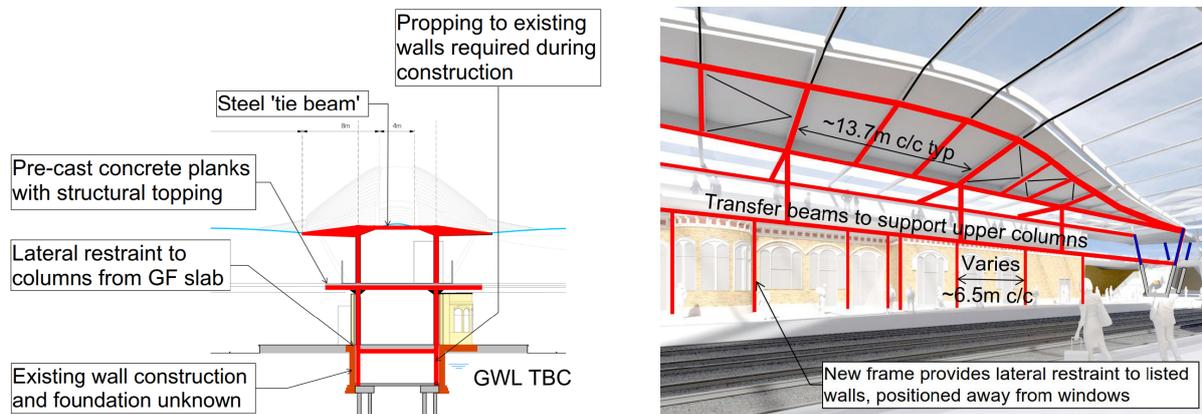
Introduction

The structural proposals presented in this report involve significant structural modifications to the existing station buildings as well as the introduction of new structure to form the new transfer deck, pedestrian walkways and canopy roof. The structural team worked in close collaboration with the architecture team to develop the design that was in keeping with the original station vision presented at the Feasibility stage. Where changes to the 'station buildings' are referred to, it is anticipated that the following work will be required:

- A. Removal of some existing canopies
- B. Removal of 1st floor and roof of Heritage Building 1
- C. Removal of roof of Heritage Building 2
- D. Removal/rationalisation of existing internal walls within Heritage Buildings
- E. Part demolition of 1905 building
- F. Construction of new pedestrian walkways to link new transfer deck with Nantwich Road
- G. Construction of new Kalzip / ETFE roof over tracks

The structural solutions for the station buildings and new transfer deck are:

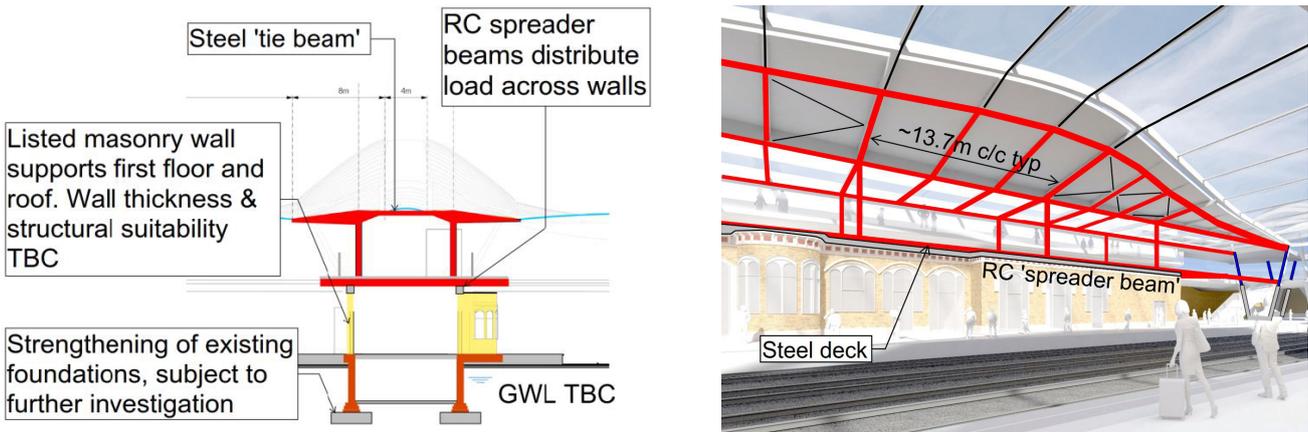
Image 5.39 - Option 1: 'New Steel Frame'



A new steel frame provides lateral restraint to the listed masonry façade, supports pedestrian walkways & the roof structure above. Steel transfer elements at 1st floor level allow for an offset column grid with stability provided by portal frame action. Roof bracing and a rigid floor diaphragm at 1st floor transmit lateral loads to the stability system.

Benefits	Constraints
Quick construction	Complex interfacing between retained façade and new frame
Future flexibility to accommodate structural modifications	Moment connections required for portal frames, adding to cost
Aesthetics of steel hollow sections	New piled foundations & proximity to basement and existing wall foundations (waterproofing etc)
Most in-keeping with original concept design	

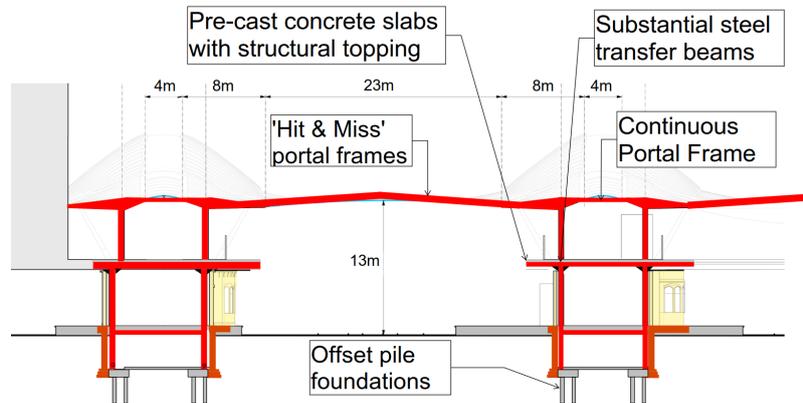
Image 5.40 - Option 2: 'Reuse existing masonry with new portal frames above 1st floor'



A Reinforced Concrete (RC) 'spreader beam' is cast over the listed external walls to provide support to a new steel deck - forming the pedestrian links at 1st floor. The roof is supported off a series of 'upper portal frames' and stability provided by a combination of masonry walls & portal frame action.

Benefits	Constraints
Less columns at ground floor	High level of building monitoring required during construction
Reduction of steelwork tonnage / carbon expenditure	Further structural investigation required to confirm scheme option appropriateness.
	Complex interfacing between listed masonry walls, RC spreader beam & steel deck at 1st floor level

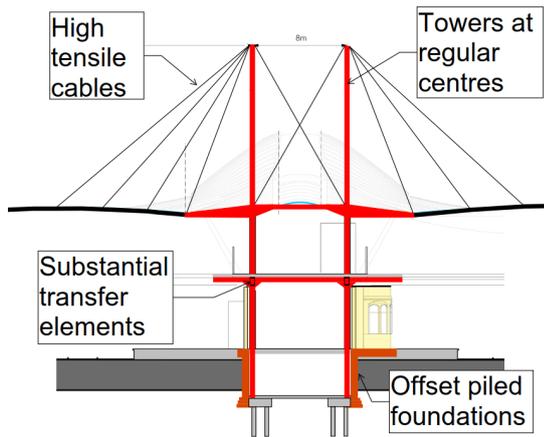
Image 5.41 - Option 3: 'Large portal frame'



A new steel frame at basement/ground floor level gives lateral restraint to external masonry walls & support to a series of large portal frames. Significant transfer beams at 1st floor level allow for a offset column grid, with all columns founded on bored piles. Lateral stability provided from moment connections.

Benefits	Constraints
Common form of construction (portal frame)	Large section sizes required for long span portal frame
Relatively simple design solution	High thrust reactions at base of columns / increased level of detail required at existing basement/foundation interface
Quick construction	Substantial transfer elements at 1st floor level and substantial foundations required to support large portal frame structure

Image 5.42 - Option 4 - 'Cable stay roof'



New steel frame at basement/ground floor with substantial transfer elements at 1st floor level. Transfer beams support portalised tower structures that extend above roof level with suspension cables providing support to the new ETFE/Kalzip roof structure. Lateral stability provided by a combination of portal frame action and from tension only cables.

Benefits	Constraints
Minimises structural steel requirements	Maintenance of cables
Lightweight construction	Blast load considerations for cables, critical connections & structural redundancy
	Aesthetics of structure above roof level not in keeping with original station vision

Outcome of Option Appraisal

'Option 1' was selected as the preferred structural solution for Building Structures aspects on the basis that the new independent steel frames reduce the risks associated to overloading the existing listed masonry, whilst achieving the desired architectural concept. Further coordination is required with heritage consultants in coming stage to develop design interface with listed structures.

Structural Aspect Commentary on recommended solution (Option 1)

It is recommended that the existing canopies adjacent to the platform buildings are removed prior to the commencement of any building modifications/new construction. Further structural investigation should be undertaken to confirm all dependencies between the existing canopies and adjacent structure(s).

Although removing components of the existing Heritage Buildings relieves the existing foundations of load, it is considered prudent to install a series of new steel frames to accommodate the CEC scheme (fig. 5.39). Based on current understanding of the ground conditions and the proposed loading, it is likely that these new steel frames would be supported on new bored piles.

The new frames would provide lateral restraint to the listed building façades and allow for the internal walls to be rationalised. New steel columns at ground floor level would be positioned away from windows for aesthetics and where columns do not coincide with the roof grid layout - steel transfer elements are provided.

In addition, the new steel frames provide support the new pedestrian walkways at first floor level and the large kalzip/ETFE roof. Using moment connections, the new frames can accommodate cantilevers at 1st floor level and support the new roof above the tracks. The 1905 Building is to be curtailed at a suitable structural position to minimise strengthening works, this would require further investigation at the next stage. The ETFE roof system (including frame surround) would be subject to specialist design and could arrive pre-assembled to site. This would prevent excessive out-of-plane forces acting on the roof steelwork and accelerate the construction programme.

5.5 - STRUCTURAL DESIGN: TRANSFER DECK

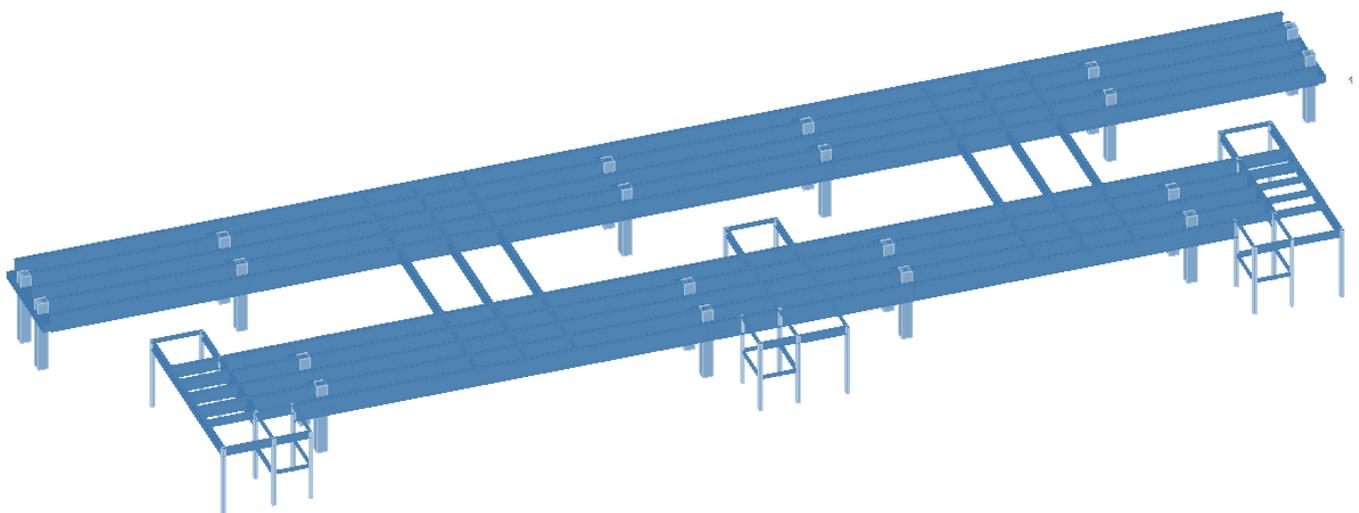
The new transfer deck consists of two 8m wide platforms formed using fabricated steel plate girders which support an insitu concrete slab on permanent formwork. Architectural finishes will be applied to the surfaces of the structural design to clad the top, sides and underside of the deck structure.

The structural depth of the deck is critical given the constraints imposed by existing structures, overhead line equipment (OLE) clearances and tie in levels. Composite action between the transfer deck slab and structural steel beams result in an approximate overall depth of 1.7m for spans of up to 31m in length. At this length of span dynamic performance of the deck becomes critical and is the dictating factor in determining the overall structural depth. Further detailed dynamic response analysis will be required at the next design stage to fully determine performance characteristics and final depths.

The deck is supported vertically by monolithic concrete supports located at an offset from the edge of the platform in order to keep out of the impact zone. The concrete supports require further design collaboration with the design team to determine a suitable form. The plate girders will span between concrete supports over the tracks and will incorporate horizontal movement joints to accommodate expansion and contraction of the deck at one end. Further design development and collaboration will be required during the next design stage to coordinate these aspects further.

The bridges between north and south decks will be formed using simply supported universal beams with movement joints to allow for independent movement of each of the decks. Lateral stability of the structure is achieved via diaphragm action of the insitu slab and steel beams which transfer lateral loads to the concrete supports. The concrete supports will transfer moments to the piled foundations.

Image 5.43 - Transfer Deck level steelwork



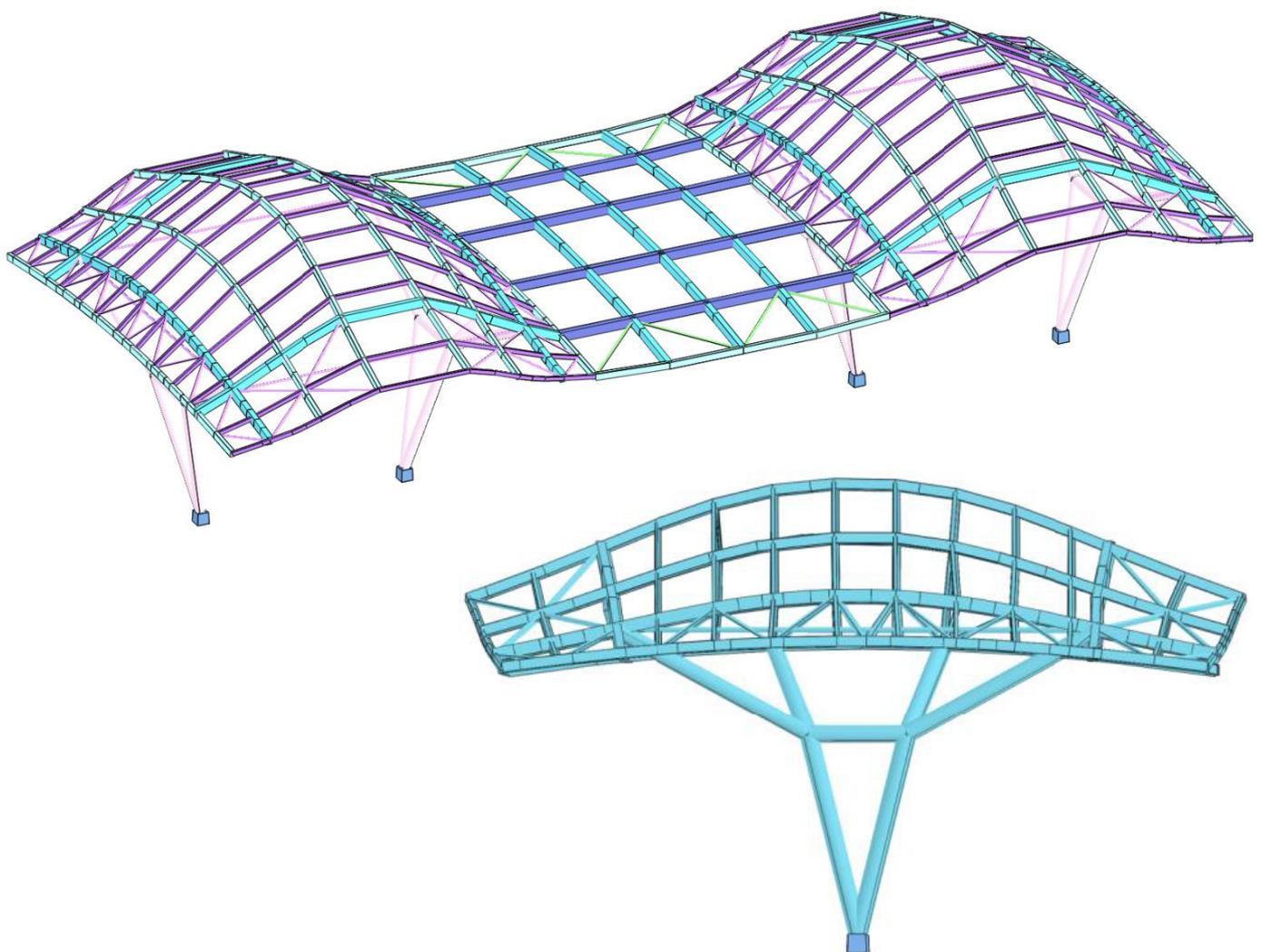
5.5 - STRUCTURAL DESIGN: CANOPY

The canopy roof is proposed as an independent structure which will support the roof consisting of kalzip cladding / cassettes and ETFE rooflight areas. The canopy features a series 'peak' structures over each of the primary landing areas of the transfer deck. These are supported upon V-shaped columns over which a series of primary and secondary arched beams span. The primary arched beams span between the V-columns and are tied horizontally to minimise lateral spread at the head of the columns. In addition, ties are also provided running across the canopy to minimise spread of the arched beam in line with the column head. Further development and collaboration with the architecture is required at the next stage to minimise tie requirements.

The structures are stabilised by using plan bracing around the perimeter of the 'peaks' which span horizontally between the V-columns. The V-columns will transfer moments through their bases to piled foundations. Each of these arched structures are independent to allow for phasing, to simplify construction and end-of-life demolition as well as to allow for flexibility in the design for the infill canopy roof over the tracks.

The infill canopy frame over the tracks, between the 'peaks' is a simply supported frame spanning between the arched frames. Longitudinal expansion and contraction of the frames are allowed at the interface at one end of the infill. 3D structural design and analysis software was used to develop the design of the roof canopy over the new transfer deck, an extract of which is provided in figure 5.44.

Image 5.44 - Output from structural analysis and design model



5.6 - SOUTHERN CANOPY DEVELOPMENT

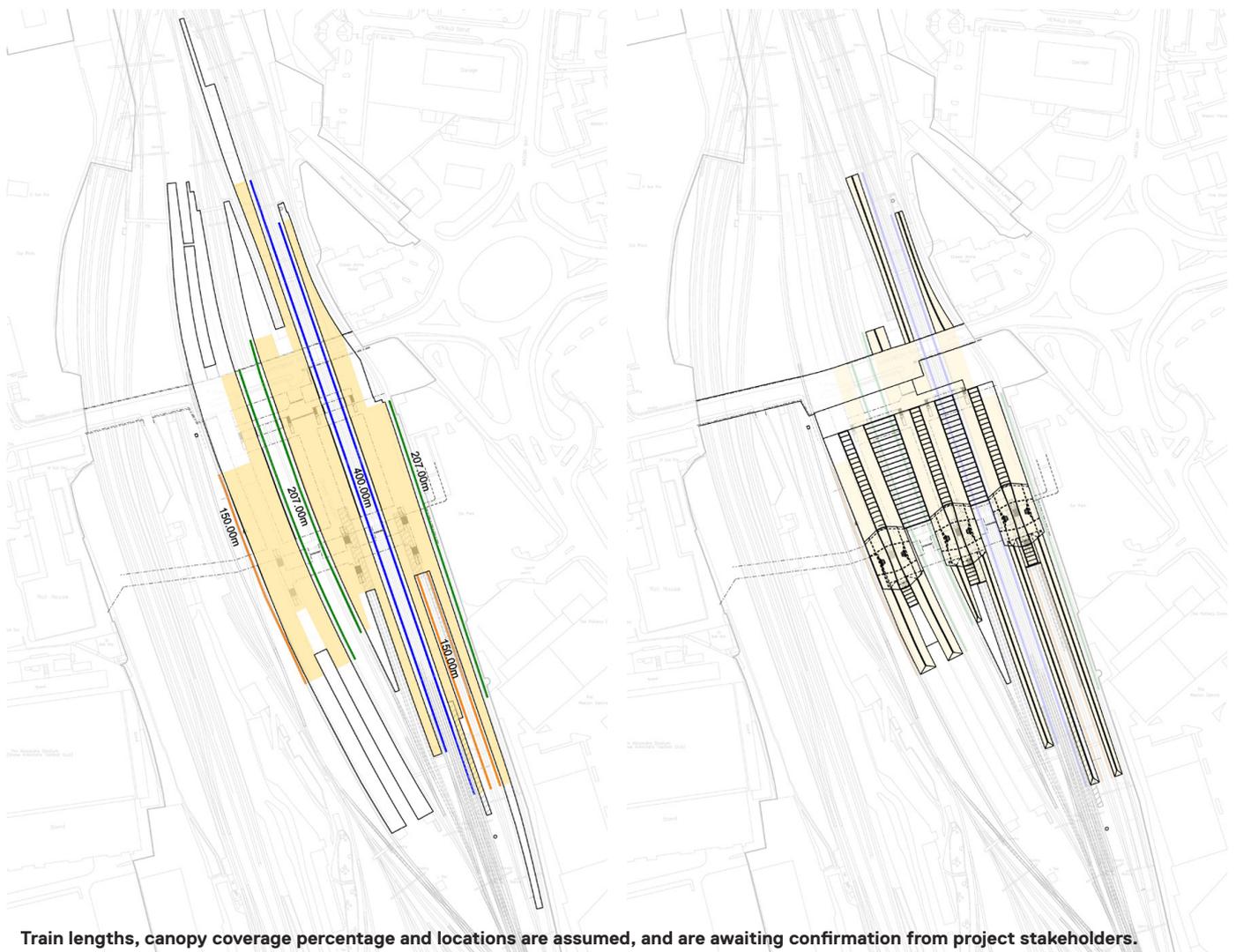
In an enhanced station design, it is envisaged that the existing station canopy will be removed and replaced with a new canopy. Previous Feasibility design has addressed the central courtyard, and transfer deck design which is considered apart of the construction of the new mezzanine extensions and station transfer deck. It is also presumed that as per GRIP 3, the southern most canopies are in a poor state of condition and may require full removal pending further structural assessments. As a minimum it is considered that a new southern canopy will be required to cover the vertical circulation stairs with tie-in between the proposed 'peaks' and the existing canopy. Where the existing canopy cannot be retained a total replacement may be required. For the basis of this study the worst case full replacement has been considered:

Canopy Coverage - Length

Canopy coverage was defined by the future anticipated platform requirement. Train lengths were plotted per platform (fig 5.45), and a specific level of protection was assigned as seen below. The coloured lines depict the train length, with the yellow hatching representing the area of canopy coverage. The lengths were created by:

400m trains - 100% coverage. **275m trains** - 75% coverage. **200m trains** - 75% coverage

Image 5.45 - Canopy coverage requirement set out by train length per platform



Train lengths, canopy coverage percentage and locations are assumed, and are awaiting confirmation from project stakeholders.

5.6 - SOUTHERN CANOPY DEVELOPMENT

Canopy Coverage - Width

The width of the canopy was defined by its relationship to the overhead electrical catenary wire. To prevent clashes with the electrical equipment the platform canopy finishes at the platform edge.

An exclusion zone of 5.6m above rail top has been avoided, however further coordination with OLE teams is required to continue the development of southern canopy design.

Canopy Coverage - Height

The typical height of the canopy was defined by precedent examples, such as London Bridge station.

London Bridge uses a similar platform construction of kalzip cassettes. It maintains a 2.5m clear headroom between structural beam and top of platform with a tapered surface to allow rainfall drainage. This combines to give a canopy height of approximately 4.6m at platform edge (fig 5.47).

Canopy Coverage Proposed

With the height, width and plan length defined the formal gesture was developed to match the existing Feasibility canopy design, using ETFE and kalzip. Similar to the transfer deck design, the southern canopy is designed using modular elements (SDP - 6.10.1-2).

The canopy rises above the vertical circulation to highlight the movement routes at platform level (SDP - 6.12.1-5). The canopy provides a cost effective and minimal solution by covering only the required length of platform.

Image 5.46 - Width by OLE requirement

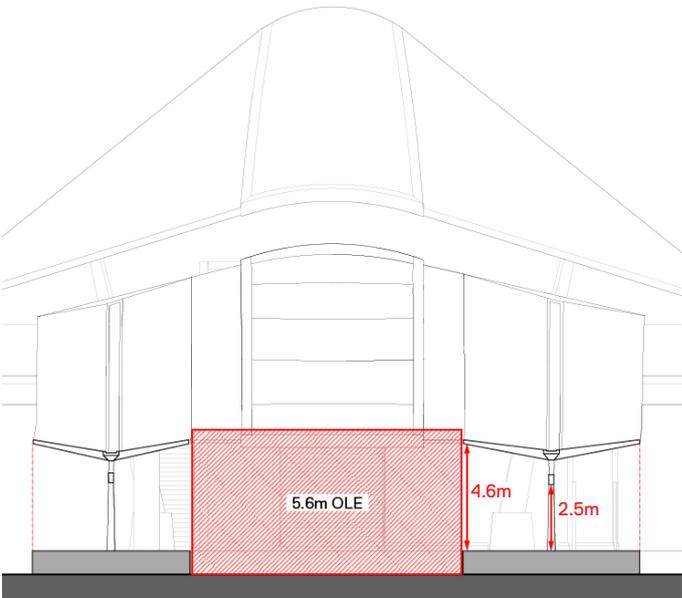


Image 5.47 - Height by precedent example

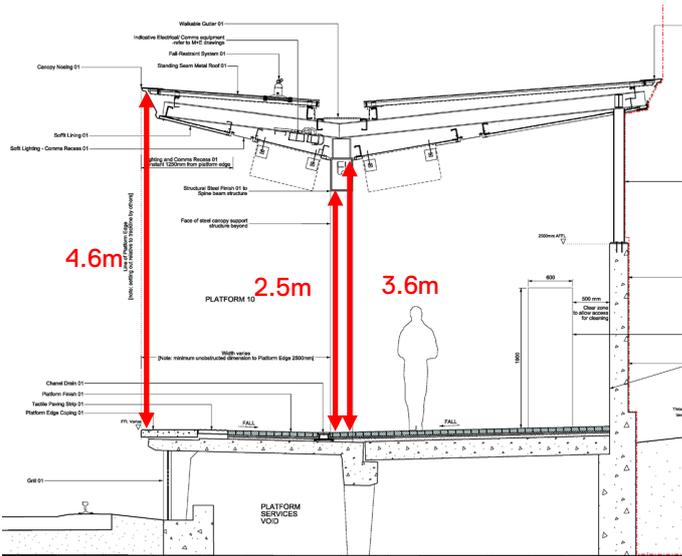
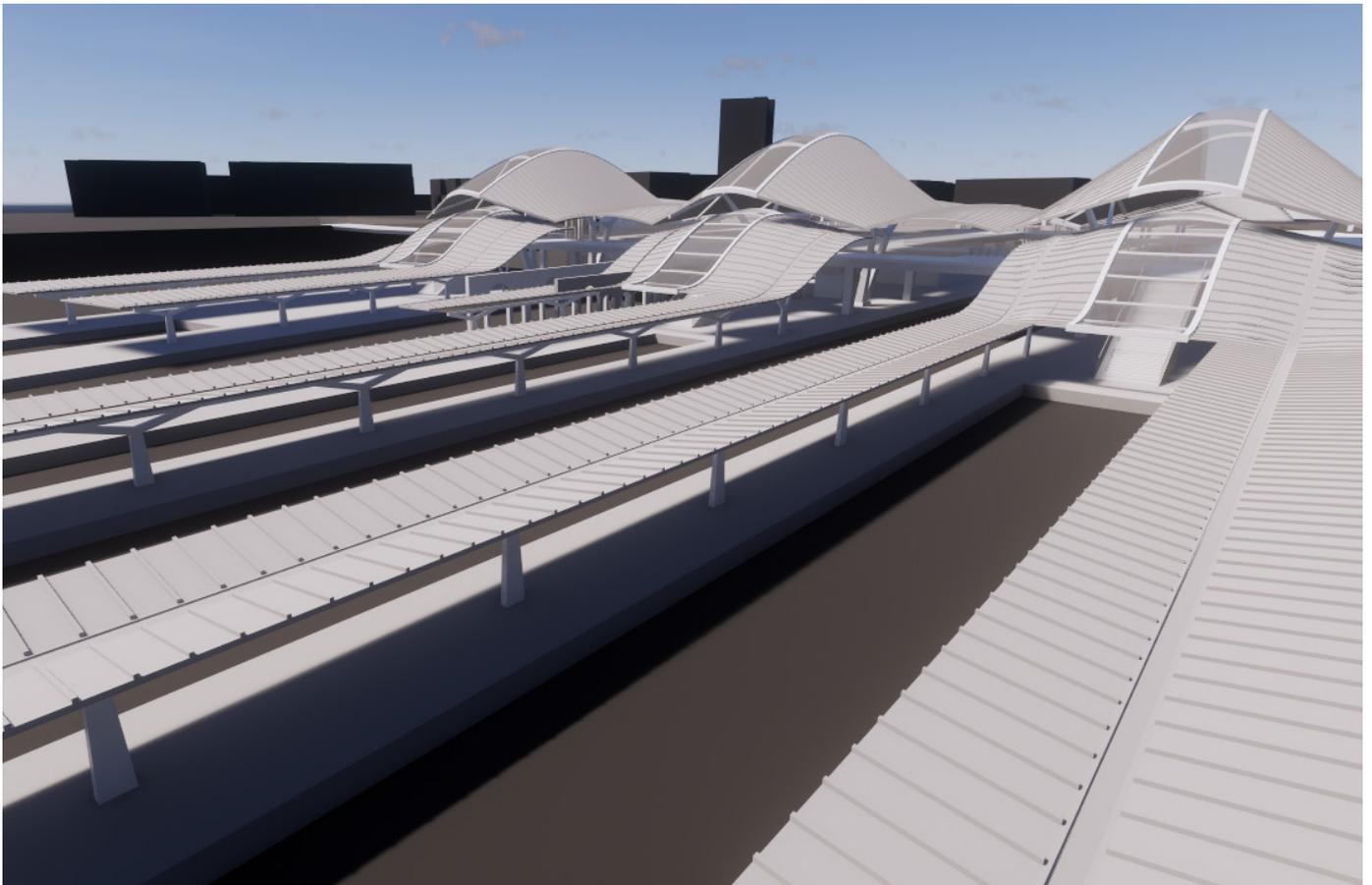


Image 5.48 - Artistic illustration of southern canopy





6.1 - ARCHITECTURAL PHASING

The station could be delivered as a series of 'elements' that can be constructed together, or over a longer phased period. The architectural phasing does not suggest a specific order, or method of constructing the station but only attempts to outline the components that need to be constructed together, hence the terminology of 'Elements' and not 'Phases' in this section:

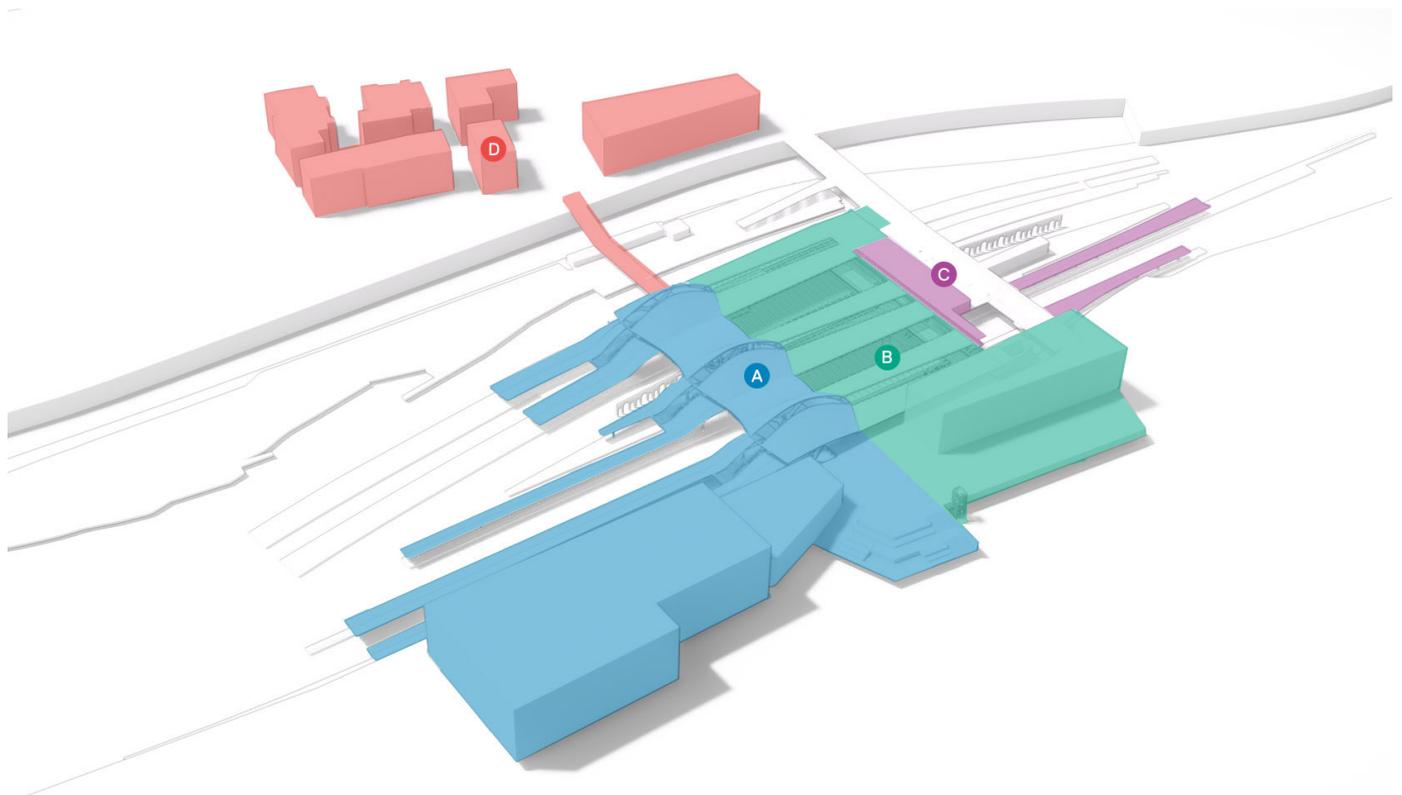
Element A: construction of southern transfer deck (paid and unpaid), southern canopy, transfer deck canopy, eastern entrance, urban realm, multi-storey car park, and associated station building.

Element B: construction of central mezzanine extensions, courtyard canopies, eastern hotel building, and urban realm.

Element C: reconfiguration of Nantwich Road, and northern platform canopies.

Element D: relocation of existing Crewe Alexandra football stadium to provide space for construction of east to west transfer deck link, western multi-storey car park, urban realm, intermodal facilities, and associated development.

Image 6.1 - Architectural phasing elements



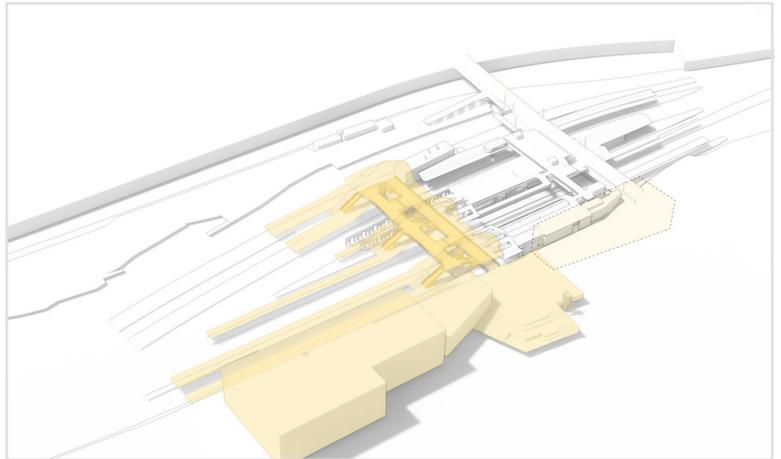
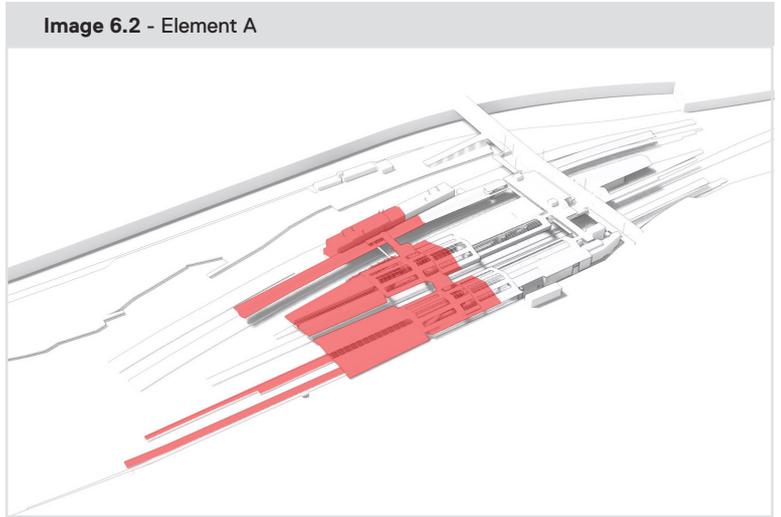
'Element A' must be delivered before any of the other elements to release the existing Nantwich Road entrance, and provide obstruction free interchange in the south of the station.

The existing canopy, partial 1905 building, and lattice bridge must be removed, along with infilling the platform ramps.

The removal of these components allows the construction of the new southern transfer bridge, associated canopy, a new entrance on Weston Road, an associated car park, urban realm, intermodal facilities and station building.

Once 'Element A' has been constructed the existing Nantwich Road entrance can be decommissioned as the primary entrance, and the new eastern entrance will become the primary entrance.

Image 6.2 - Element A



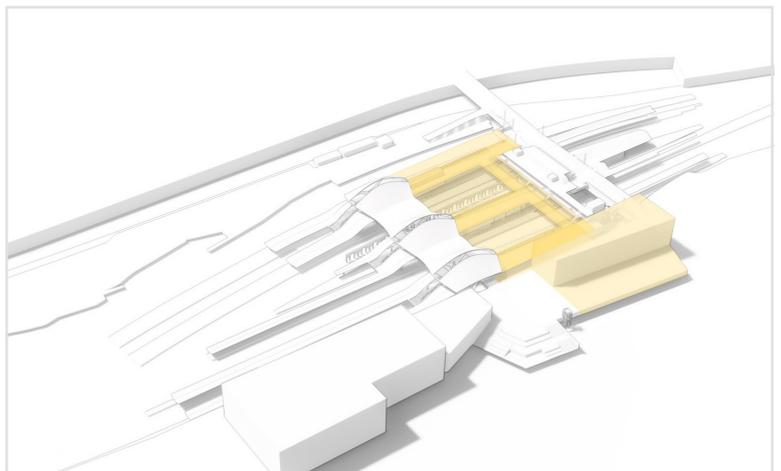
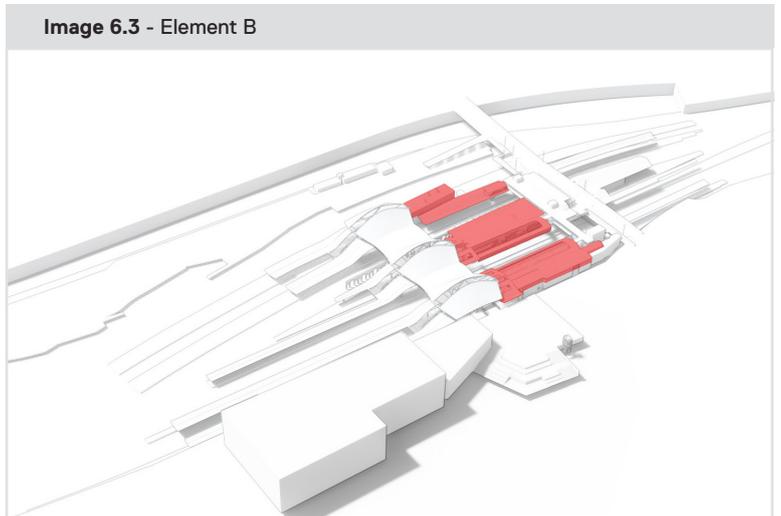
'Element B' consists of the removal of the existing station building's upper levels (above listed heritage), and removal of the existing central canopy.

Following this, the mezzanine extensions between the southern transfer deck and Nantwich Road can be constructed above the heritage building, as well as the canopy that protects them.

The hotel and commercial building on the eastern bank may also be constructed in this phase.

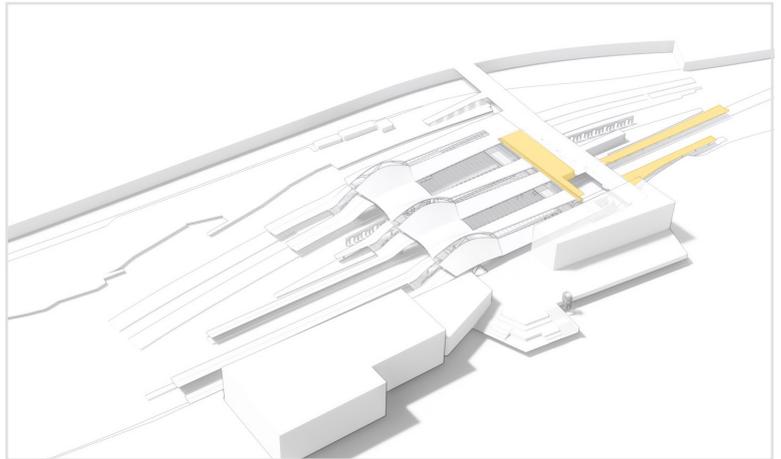
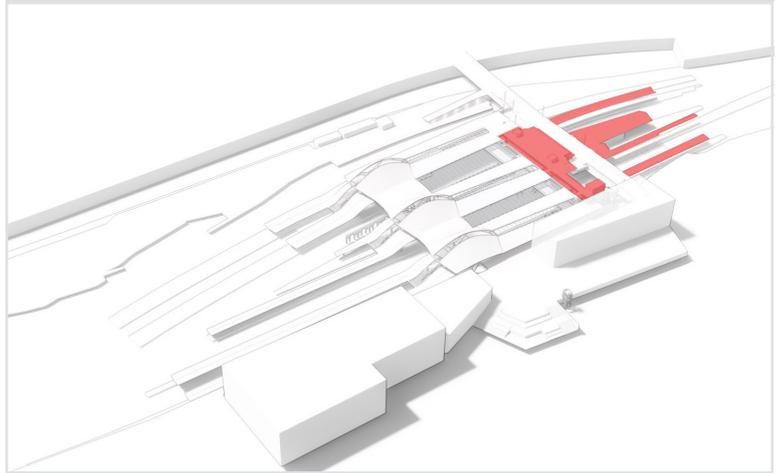
It requires the construction of 'Element A' as this element provides the mezzanine level connection between the newly constructed southern transfer bridge and the northern Nantwich Road transfer bridge.

Image 6.3 - Element B



'Element C' requires the reconfiguration of Nantwich Road, and the removal of the existing northern canopies in order to deliver an enhanced Nantwich Road entrance and new northern canopies.

Image 6.4 - Element C



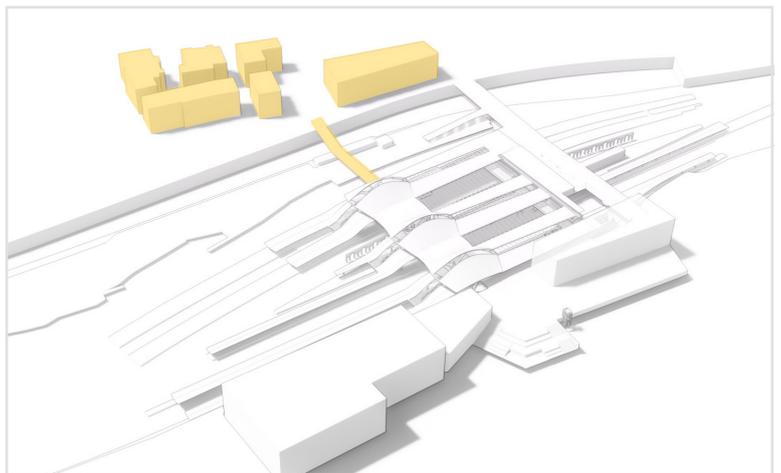
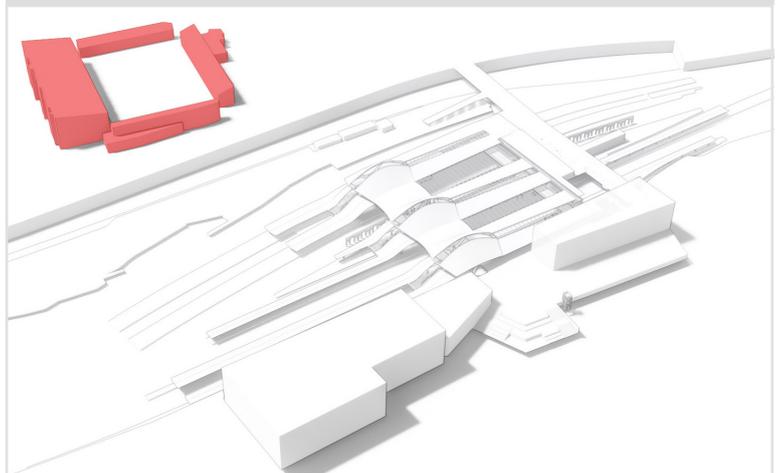
'Element D' requires the removal of the existing football stadium to release land capacity on the western bank.

Following the relocation of the football stadium the east to west link, urban realm, western entrance, multi-storey car park, intermodal facilities and associated western development can be constructed.

As per 'Section 4.4' of this study, the football stadium may be relocated to the southeast of the red-line masterplan, and should this occur 'Element D' can be constructed.

It requires the construction of 'Element A' as it provides an extension to the southern transfer deck, but may be delivered at the same time.

Image 6.5 - Element D



6.2 - CONSTRUCTION PHASING

The previous architectural phasing sets out the 'elements' that must be delivered together which in turn aids the development of phased construction sequence. As defined by the architectural phasing, there are four set elements, which each have their own construction 'phasing' approach:

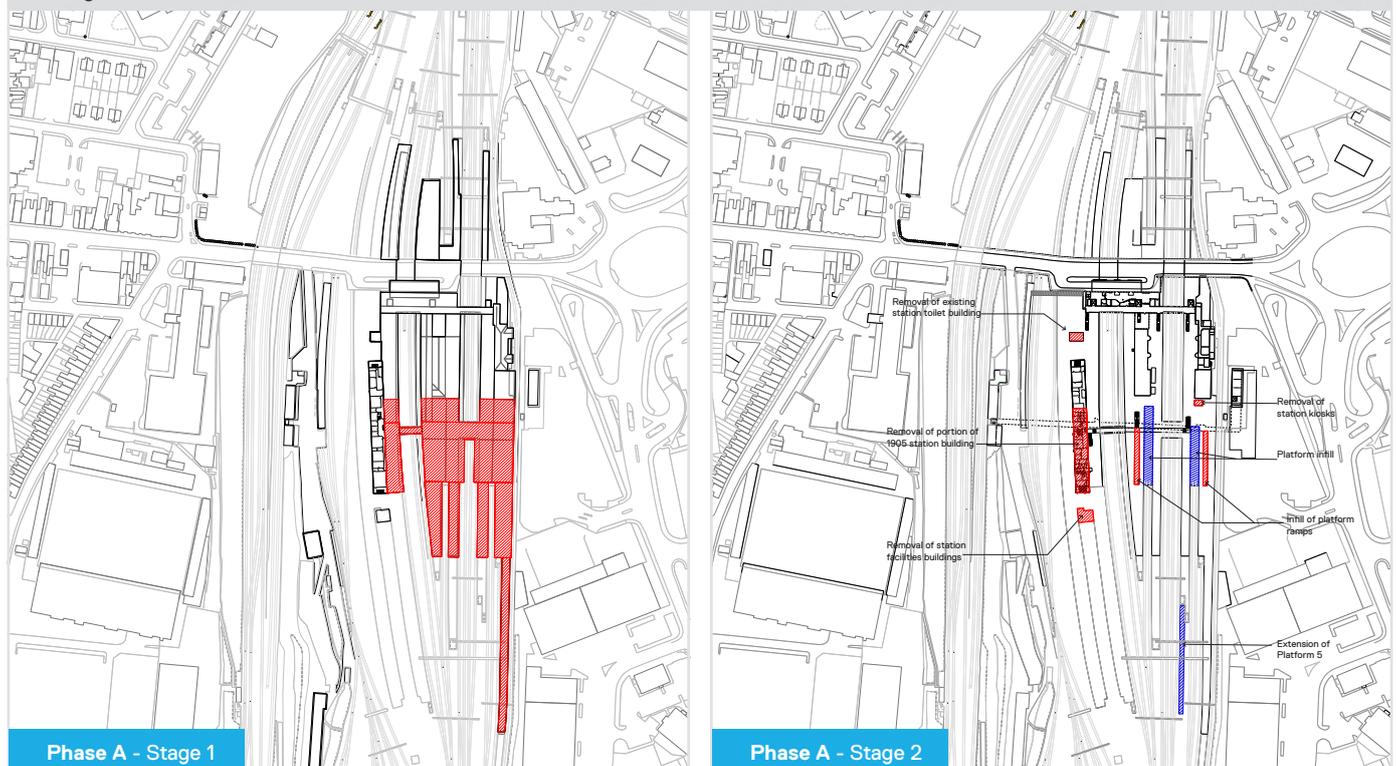
Phase A is constructed first, delivering the main southern transfer link along with the associated eastern entrance, public realm, and car parking facilities. This phase is required before any other phase to maintain interchange in the south and facilitate the movement of the main entrance from Nantwich Rd to Weston Rd. Prior to construction work on advanced telecoms, M&E, OLE, and consents, must be in place.

Phase B must be delivered after Phase A as the mezzanine extensions connect the two decks. It delivers the central section of the station: mezzanine extensions, central canopy, new Nantwich Rd entrance, hotel development on the east, and associated commercial building with urban realm.

Phase C can be delivered at any stage of the project after Phase A has been delivered, delivering: northern canopy removal and replacement, and the reconfiguration of Nantwich Rd entrance.

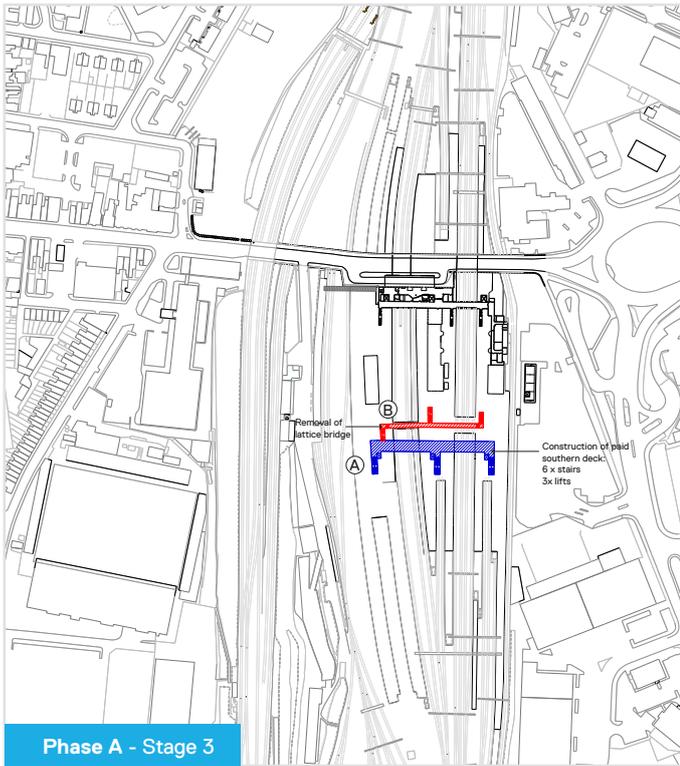
Phase D can also be delivered at any stage of the project after Phase A, but is generally considered in tandem with the relocation of the existing football stadium. This phase delivers: the new western multi-storey carpark, urban realm with western entrance, East to West link, intermodal facilities and associated development.

Image 6.6 - Construction Phase A

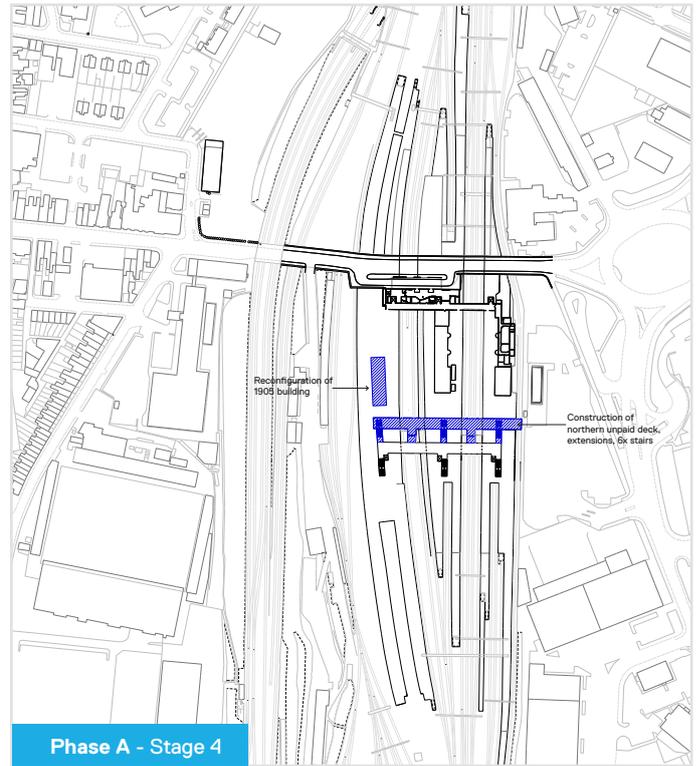


Removal of existing station canopy: 1. Temporary propping of canopy north of removal. 2. Cut out and removal of highlighted canopy. 3. OLE temporary support with temporary rain shelter.

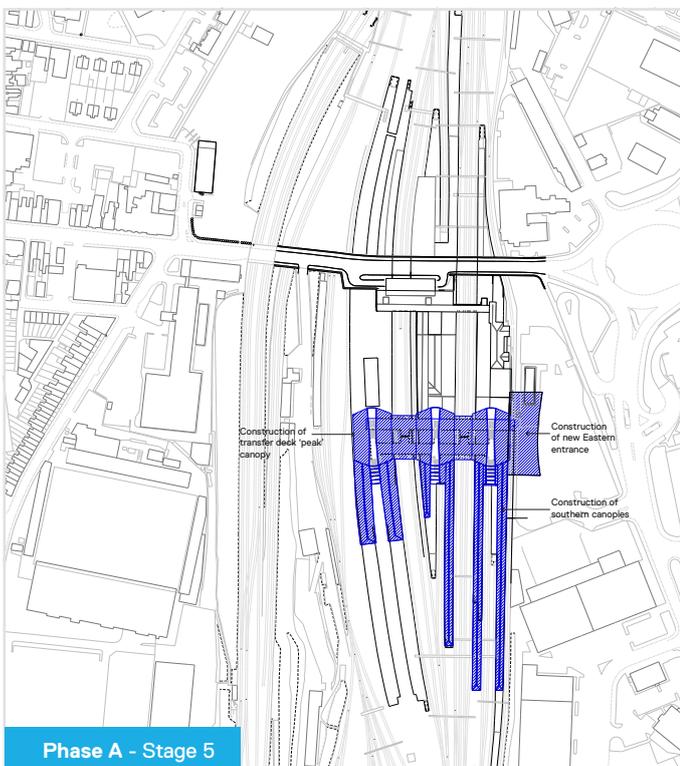
Removal of portion of 1905 and other station buildings, infill of platform ramps, construction of new platform infill: 1. Infill of ramps / demolition of structures. 2. Piers for new deck constructed.



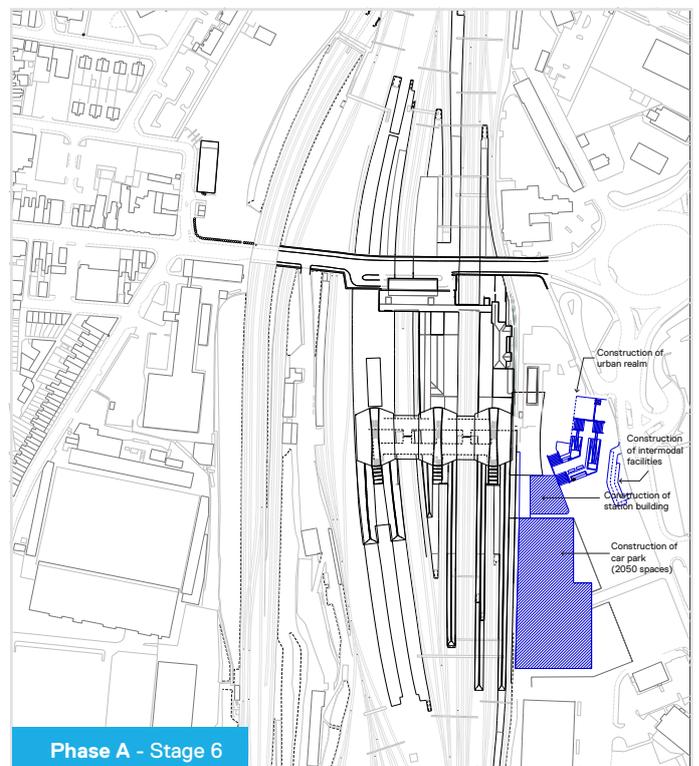
Construction of southern paid bridge, and removal of existing lattice structure: 1. New transfer bridge constructed to the south with new stair and lift access. 2. Once new transfer bridge is in operation existing lattice bridge is decommissioned and demolished.



Construction of new unpaid link north of previously constructed paid link, and reconfiguration of 1905 building.

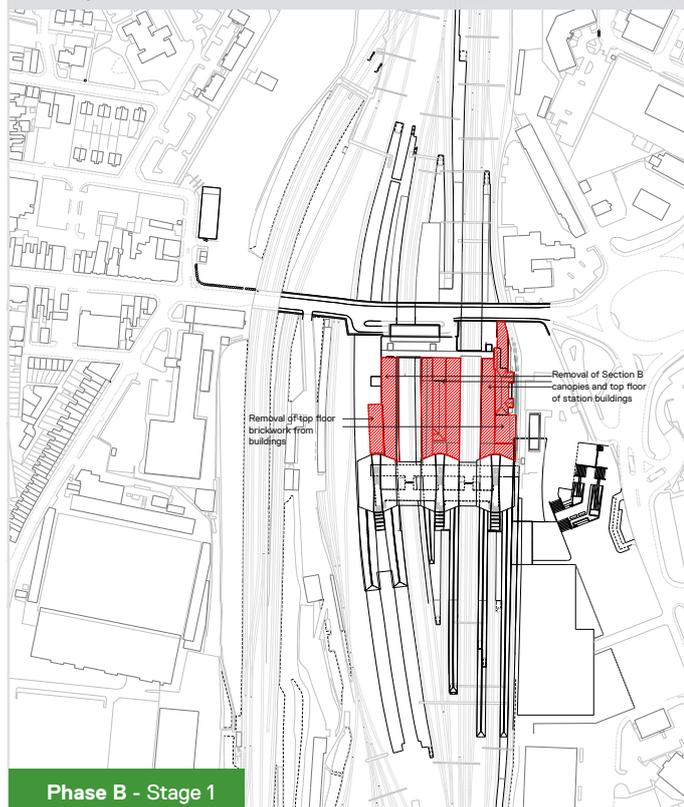


Construction of transfer deck canopy, southern platform canopies and eastern entrance: 1. New canopies are constructed. 2. Advanced temporary works conducted with new OLE structures installed.

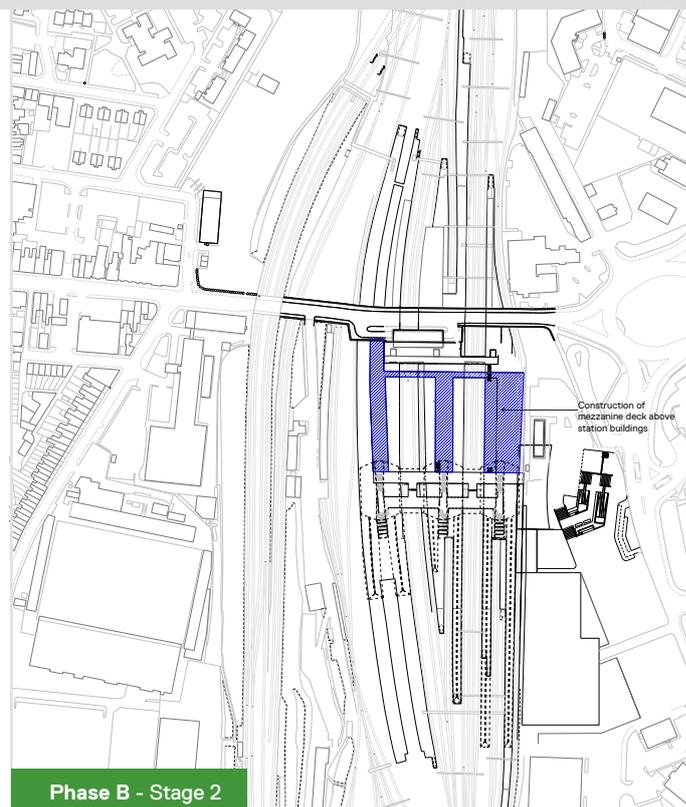


Construction of eastern urban realm, intermodal facilities, station building, and 2050 space multi-storey car park.

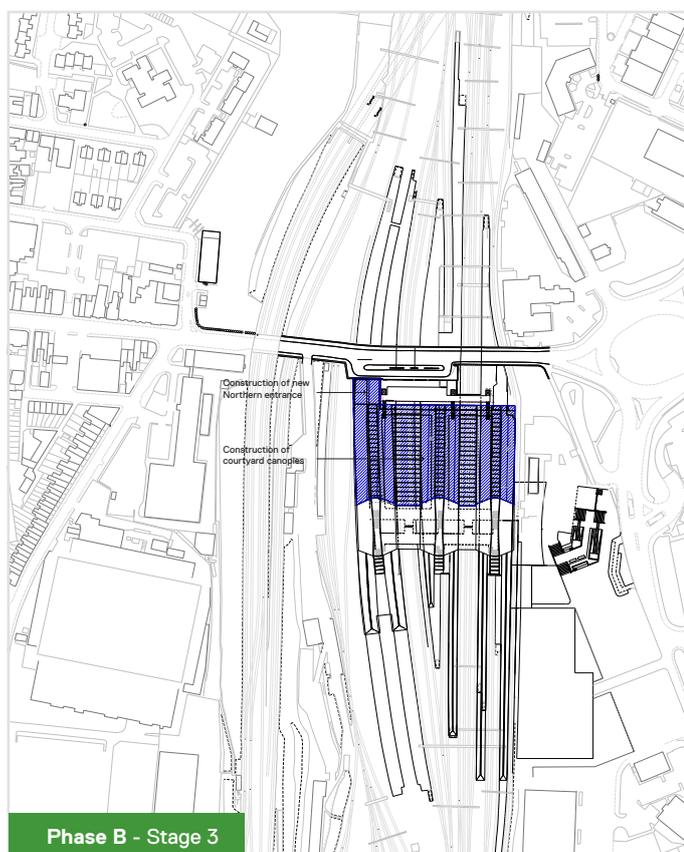
Image 6.7 - Construction Phase B



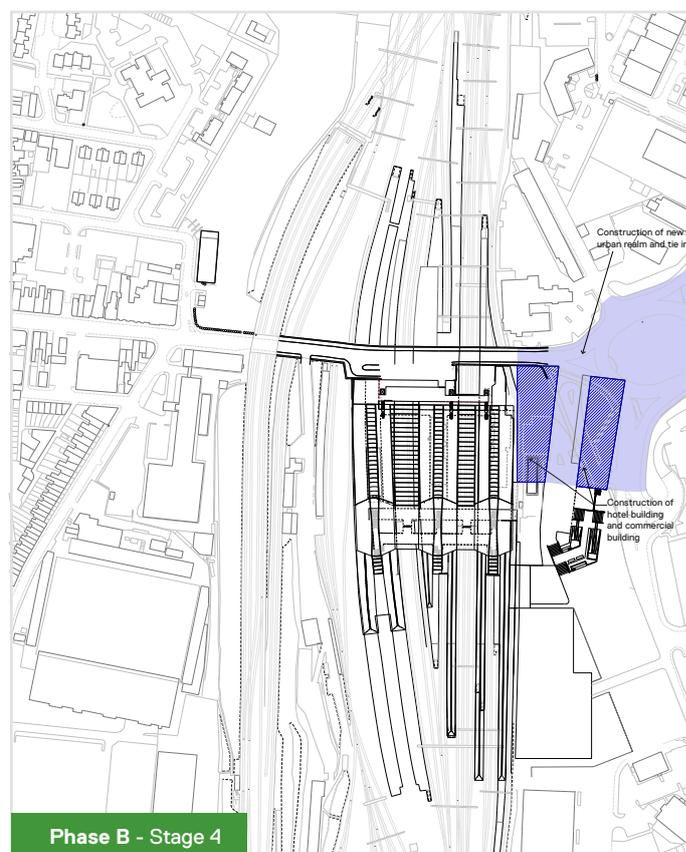
Removal of existing central canopy, and upper levels of station buildings: 1. Existing station canopy removed. 2. Upper levels of platform 1-5, platform 6-11, & 1905 removed.



Construction of new mezzanine extensions, and new Nantwich Rd entrance.

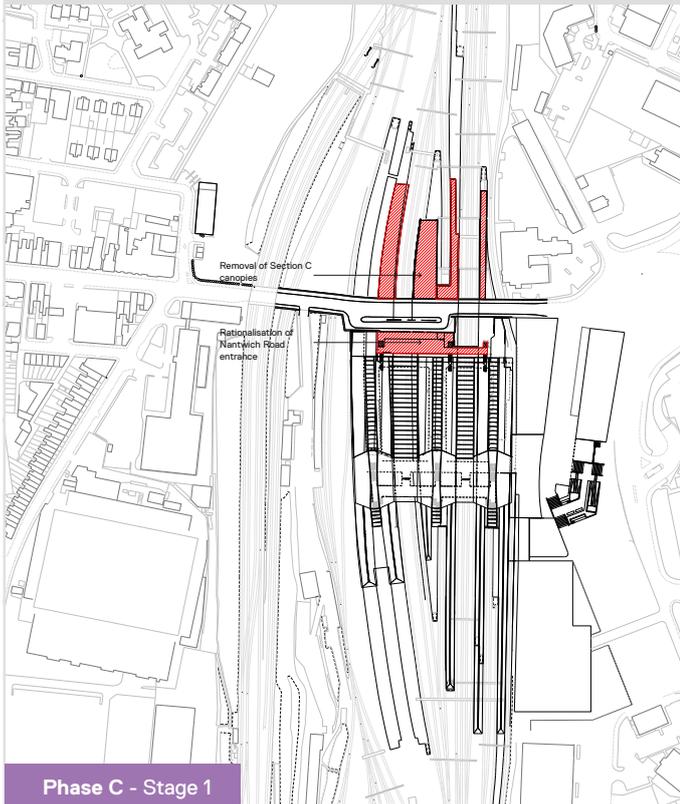


Construction of central 'courtyard' canopies.

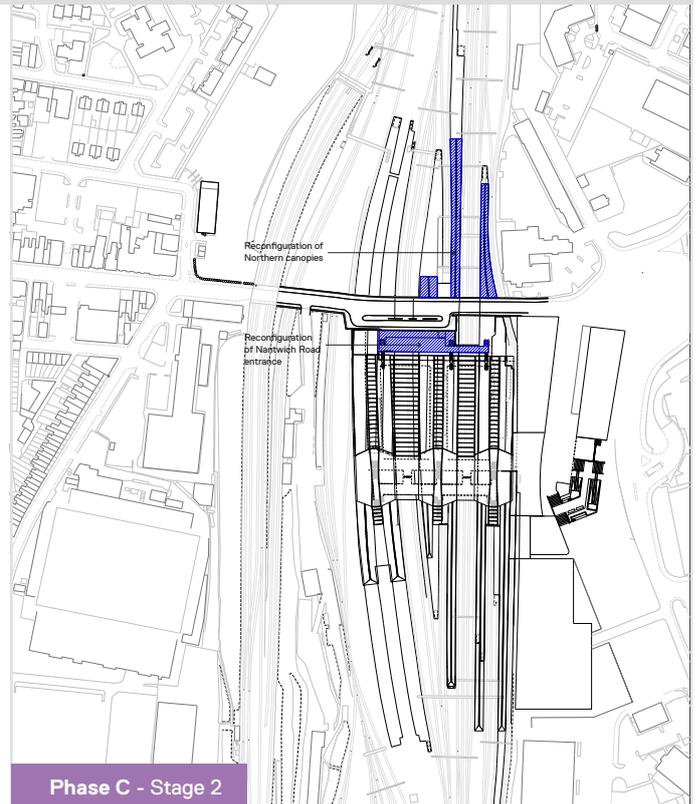


Construction of new Hotel building, commercial building and urban realm: Urban realm tie-in to existing context is required (road rationalisation, junction works, crossing points, landscaping, etc).

Image 6.8 - Construction Phase C

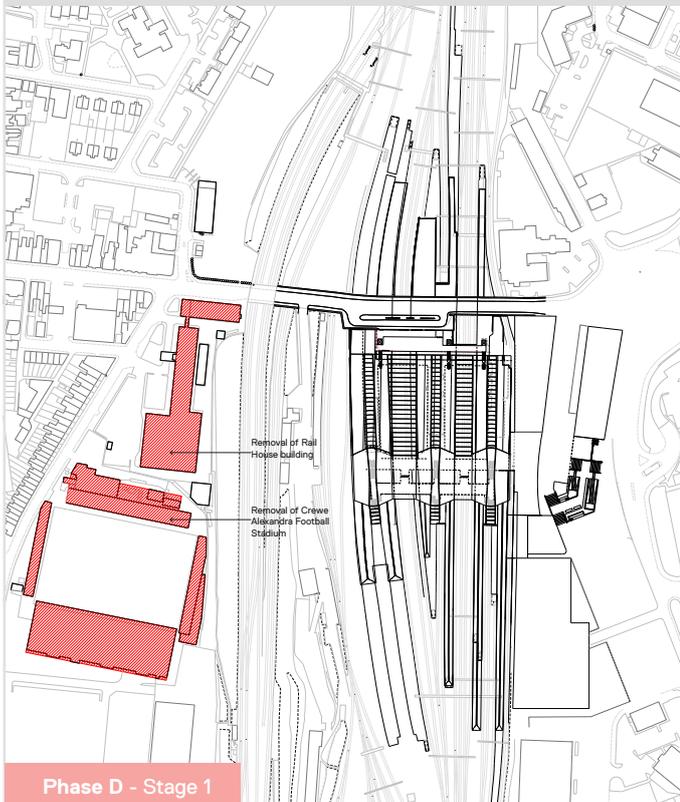


Demolition of existing northern canopies, and rationalisation to Nantwich Rd entrance.

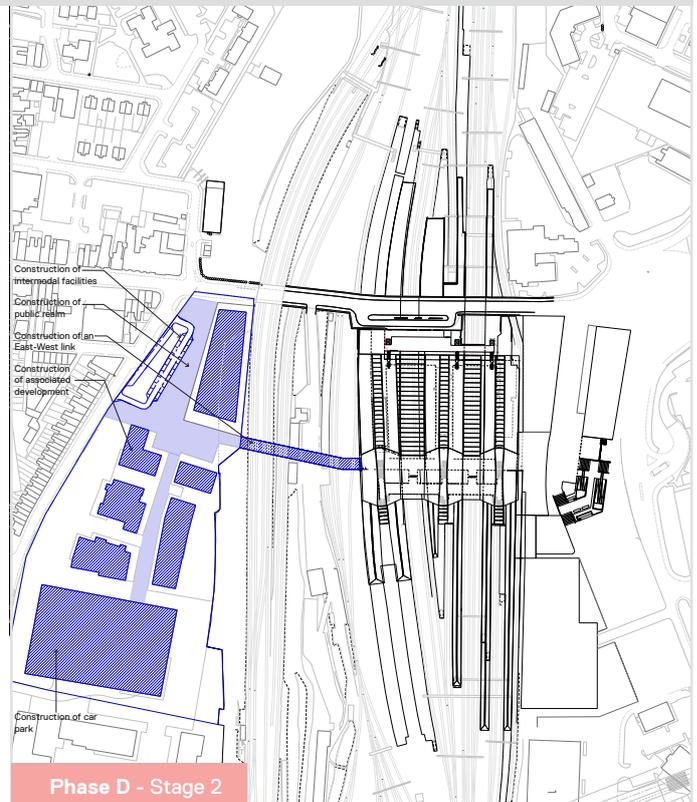


Construction of new northern canopies, and internal / external reconditioning to existing Nantwich Rd entrance building.

Image 6.9 - Construction Phase D



Demolition of stadium, rail house building, and associated ancillary buildings.



Construction of new east to west link, 2900 space multi-storey carpark, urban realm, intermodal facilities and associated development.



7.1 - STATION VISION

This report has presented the work conducted during the Options study, and has documented the decisions made. The station vision has been largely retained from the previous Feasibility stage, albeit with advancements and alterations from requested gateline changes.

Image 7.1 - Mezzanine level plan - not to scale

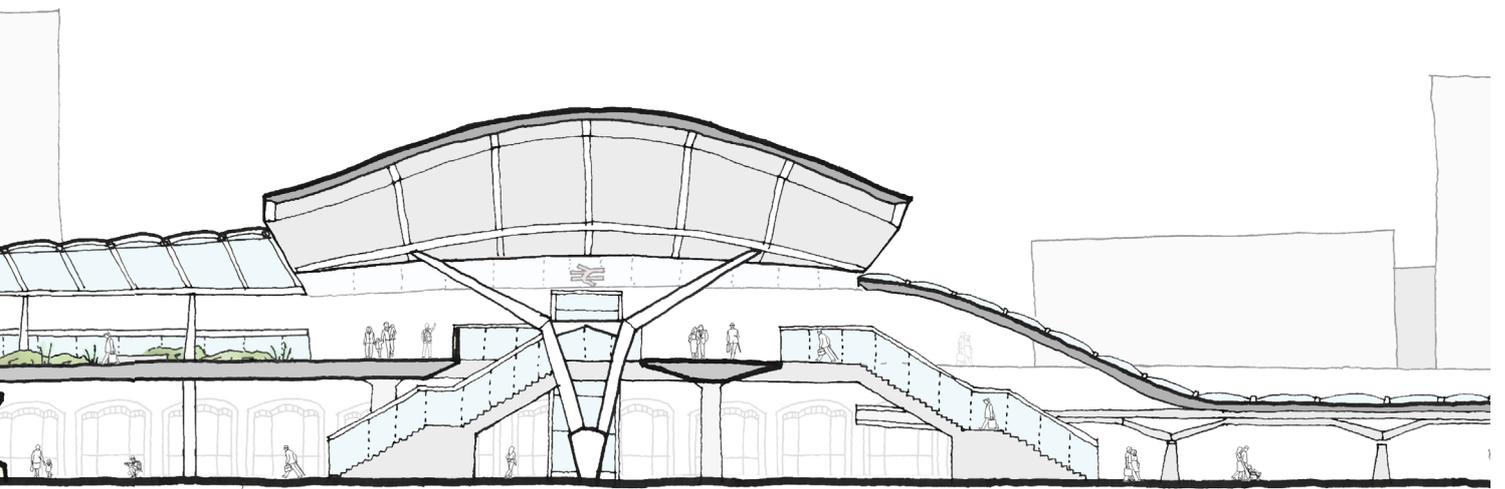


7.1- STATION VISION

The long section presents the station developments made to the 'parallel' southern deck, splitting the paid and unpaid transfer bridges. It demonstrates the relationship between southern canopy and transfer deck peak, although acknowledges that due to the change request incorporation of gatelines that additional work is required in the next Solutions stage to further integrate the canopy design.

Image 7.2 - Long section - not to scale



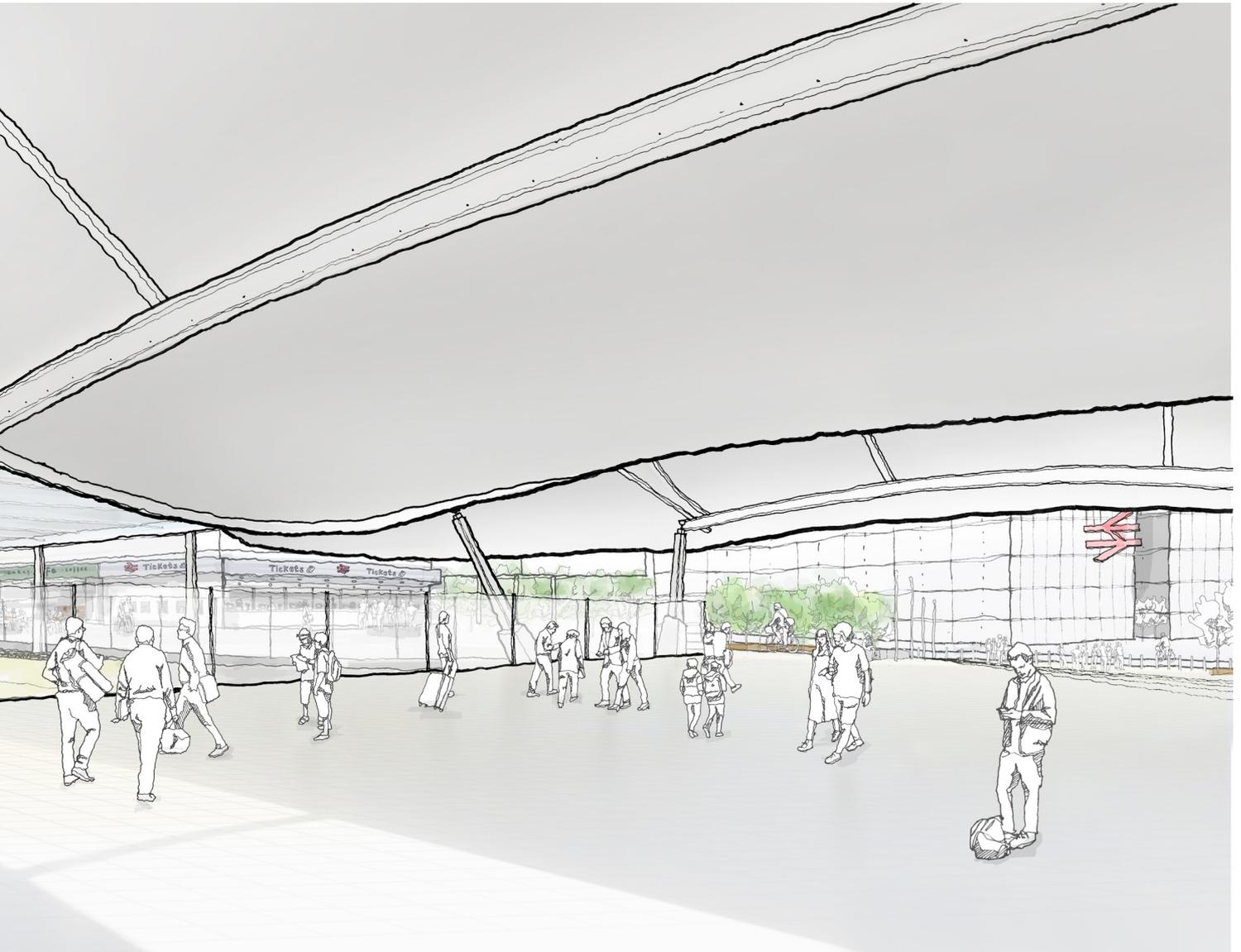


7.1 - STATION VISION

Within a ticketed gateline station the central mezzanine extensions still maintain the original 'courtyard' concept. The central garden bridge provides a community space where small kiosks could be positioned. The eastern extension sits above the platform 1-5 heritage building maintaining a consistent language to the other extensions, and the main eastern entrance is linked to the unpaid east to west route.

Image 7.3 - Artistic impression of internal mezzanine courtyards along unpaid transfer bridge





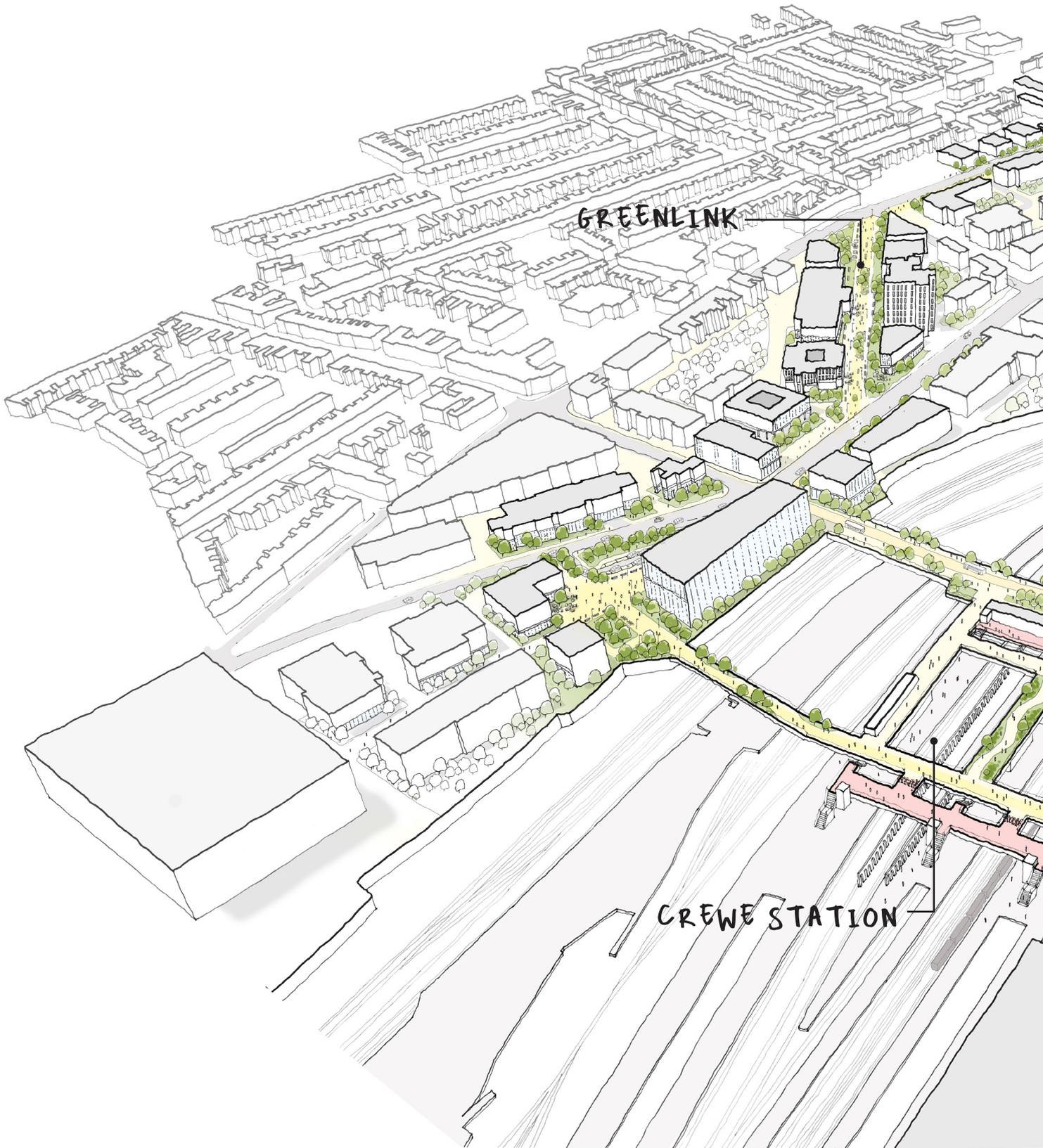


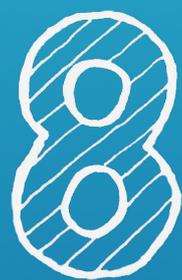
Image 7.4 - Station and Masterplan concept artist impression - Linking the station to the existing town

TOWN CENTRE



COMMERCIAL HUB





WHATS NEXT?

The developed masterplan shown within this study, along with the station design is to be taken into the next stage of concept design (Solutions Stage). During this stage of work, greater refinement of the station design, incorporation and development of the transport strategy and input from the Finance and Funding Strategy and the Business Case and Revenues workstreams will occur. Specifically greater attention needs to be given to further adjusting the station canopy to respond to the new gateline change, and investigating the station entrances to retain a sense of clear hierarchy at the station edges.

Future masterplan work is expected to focus on a reduced red-line area to allow a greater focus on the station and its immediate surrounding context.

