



KIRKLEES CULTURAL HEART

RIBA STAGE 2 EXECUTIVE SUMMARIES REPORT

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0 | EXECUTIVE SUMMARIES

0.0 | INTRODUCTION

EXECUTIVE SUMMARY

This RIBA Stage 2 Summary Report for Kirklees Cultural Heart has been compiled by FCBStudios for the conclusion of RIBA Stage 2, with Design Team contributions from their relevant discipline.

From February 2022 to May 2022 the process has been concentrated and driven by the enthusiasm and passion of all involved. Frequent DTMs, workshops and service provider engagement meetings have informed the design and identified a number of key topics for development in the stage. The key activities undertaken in this period include:

- Developing the concept scheme design with the library, museum and gallery service teams at fortnightly engagement workshops, and visiting relevant precedent buildings
- Refining the proposal for a separate gallery along Queen Street
- Establishing an agreed concept to provide the combined car parking and venue buildings on the southern plot
- Developing landscape proposals for the cultural heart along the principle of four 'outdoor rooms'
- Producing outline engineering designs for all aspects of the scheme, coordinated with the architectural and landscape proposals
- Developing Sustainability targets and KPIs for all aspects of the project
- Engaging with, presenting to, and receiving feedback from Historic England, 20thC. Society and Huddersfield Civic Society on the emerging concept designs
- Developing strategies for fabric improvements to both Listed Buildings to meet sustainability targets
- Meeting with Inclusion and Diversity teams within Kirklees
- Engaging with Yorkshire Water, Kirklees District Heating Team and Northern Power Grid
- Presenting at Kirklees' Scrutiny Panel

The Stage 2 Concept Design provides the following accommodation across the site in response to the current Brief.

- **Library** - 4,680sqm GIA
- **Museum** - 5,800 sqm GIA
- **Gallery** - 2,930 sqm GIA
- **Venue** - 9,100 sqm GIA
- **Food Hall** - 2,100 sqm GIA
- **MSCP** - ~350 spaces (20% EVCP, 80% future flex)
- **Public Realm** - Flexible, family friendly, inclusive, safe, green character, ability to host up to 3,000 person event

The next 20 pages of this report are a presentation of the Stage 2 Scheme given to Kirklees Council's Programme Board at the end of RIBA Stage 2.

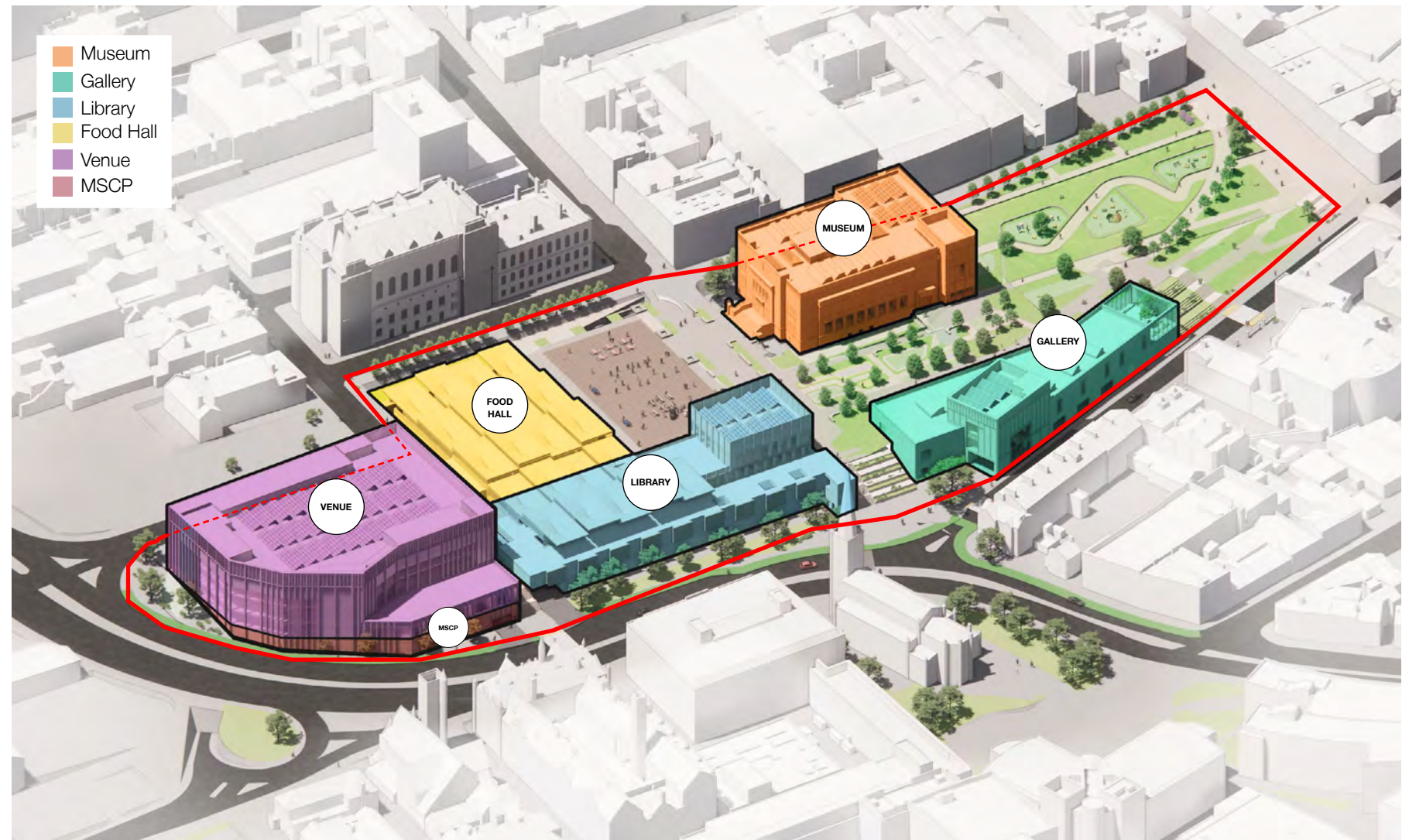


Fig. 0.0.1 Stage 2 Masterplan Diagram

0 | EXECUTIVE SUMMARIES

0.1 | STAGE 2 SUMMARY PRESENTATION

BRIEF/ AREA DEVELOPMENT

FIGURES AT THE END OF RIBA STAGE 2

LIBRARY 4,680 sqm GIA (300m2 event space added and plant coordinated)

MUSEUM 5,800 sqm GIA

GALLERY 2,930 sqm GIA (115m2 office accom, 50m2 shop and 80m2 education facilities added)

VENUE 9,100 sqm GIA (425m2 additional plant and 325m2 additional core area)

FOOD HALL 2,100 sqm GIA

MSCP 350 spaces (20% EVCP, 80% future flex)

PUBLIC REALM Flexible, inclusive, safe, green character, family-friendly, and with ability to host up to 3,000 person event

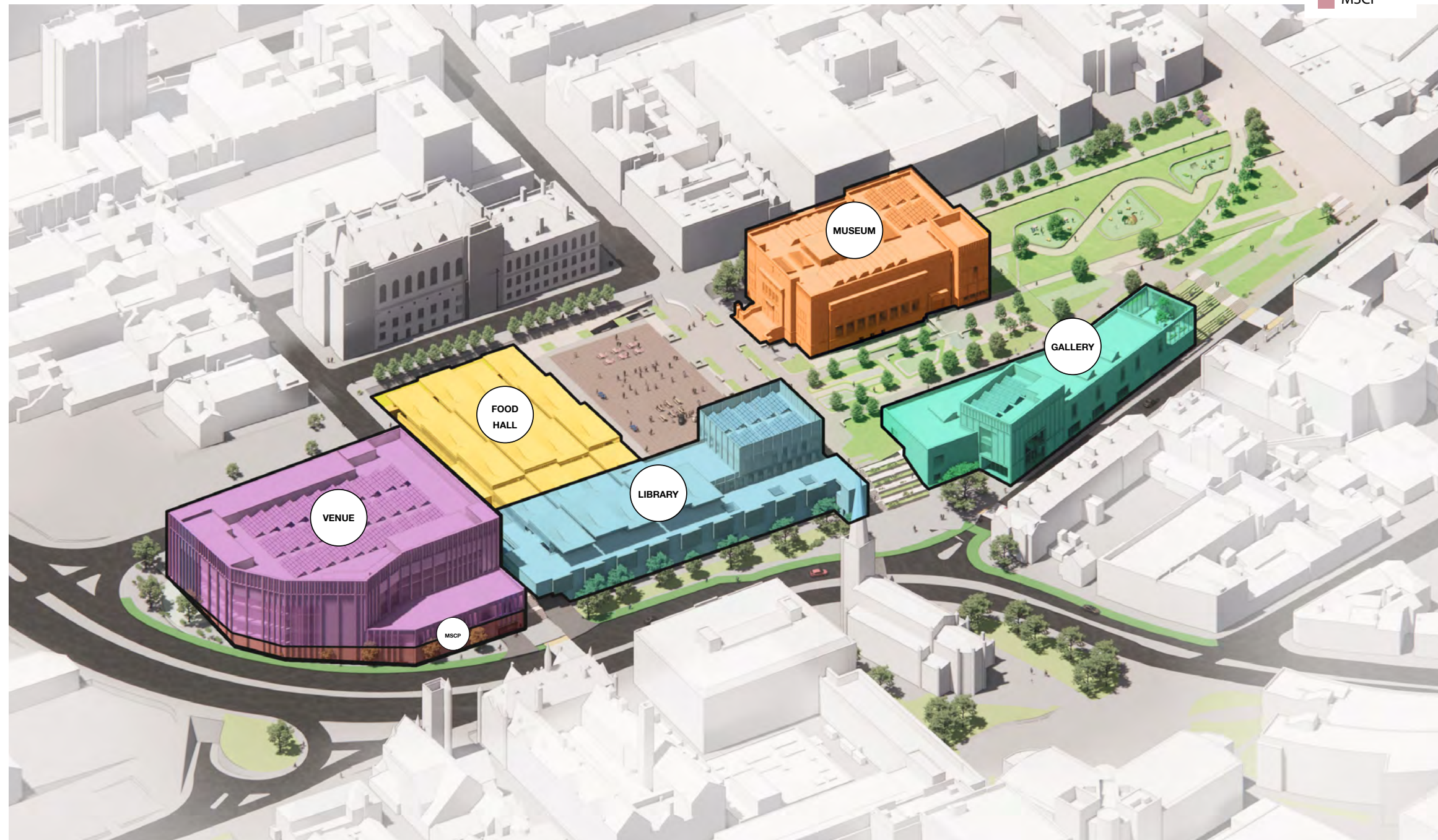
0 | EXECUTIVE SUMMARIES

0.1 | STAGE 2 SUMMARY PRESENTATION

DEVELOPMENT OF MASTERPLAN

OVERALL MASTERPLAN

- Museum
- Gallery
- Library
- Food Hall
- Venue
- MSCP



Kirkles Cultural Heart | Programme Board End of Stage 2

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0.1 | STAGE 2 SUMMARY PRESENTATION

DEVELOPMENT OF MASTERPLAN

UPPER GROUND FLOOR PLAN

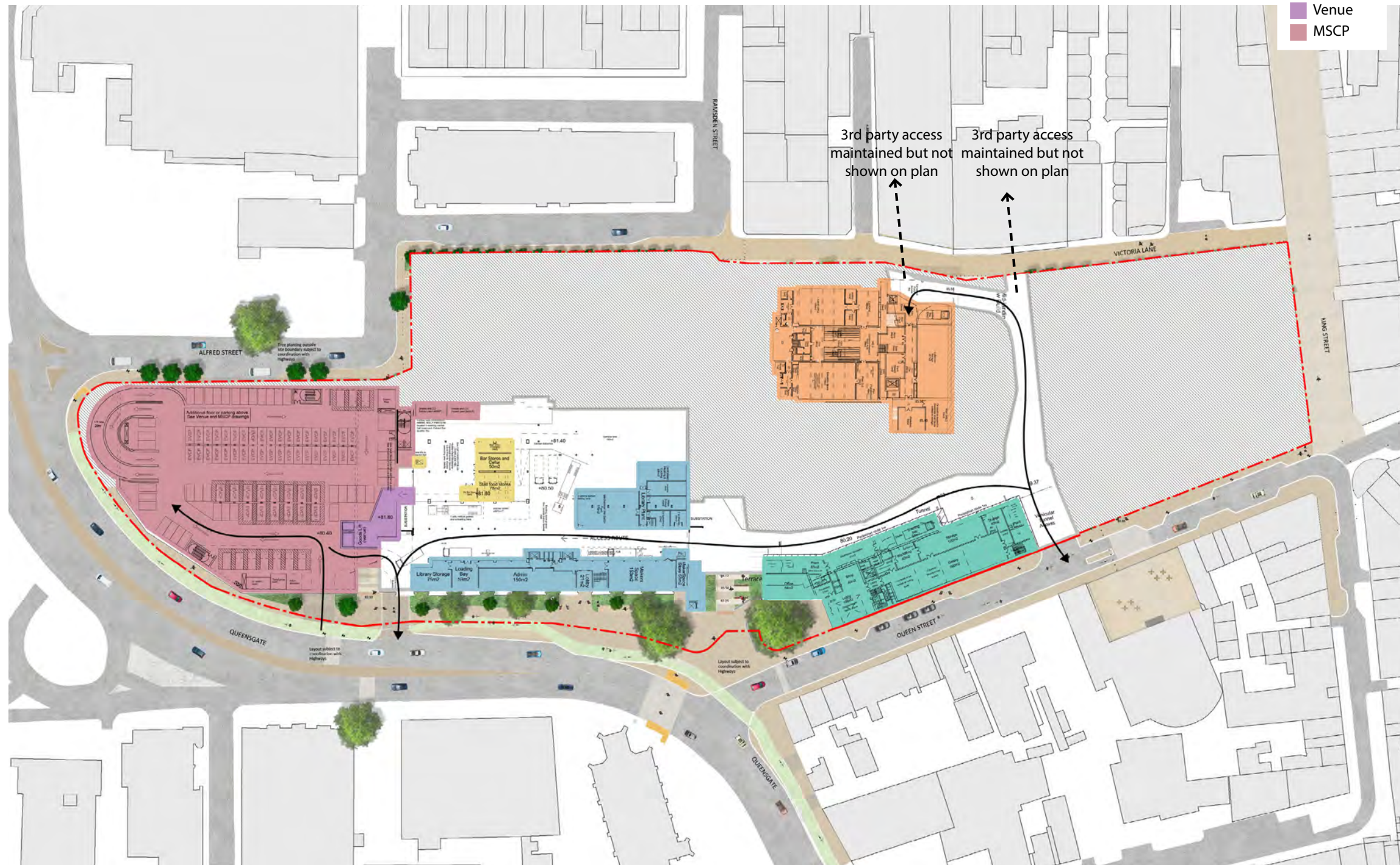


- Museum
- Gallery
- Library
- Food Hall
- Venue
- MSCP

0 | EXECUTIVE SUMMARIES

0.1 | STAGE 2 SUMMARY PRESENTATION

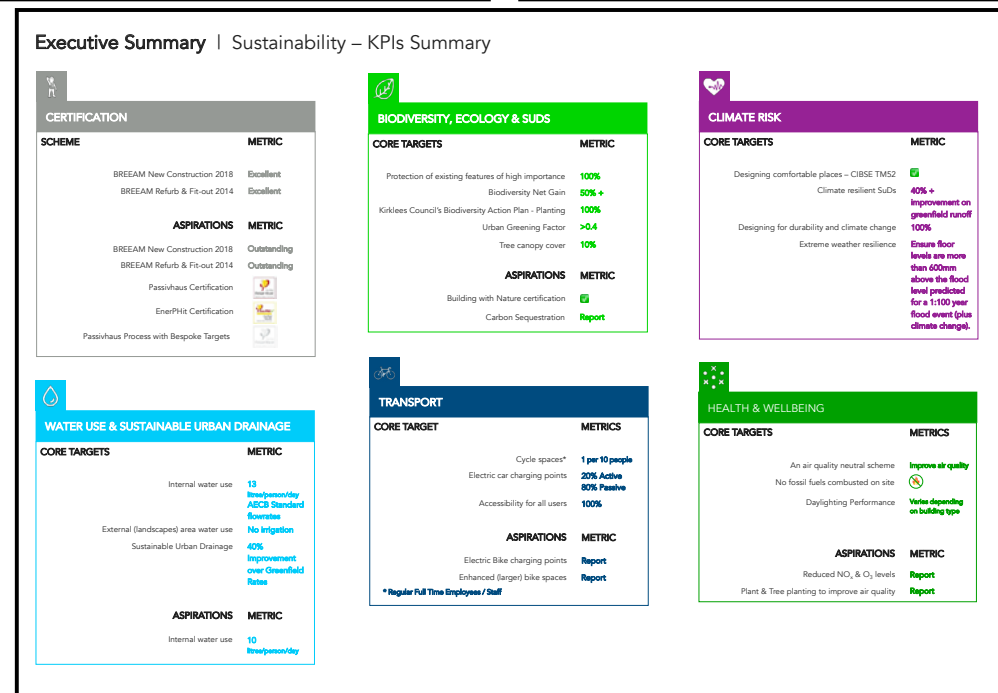
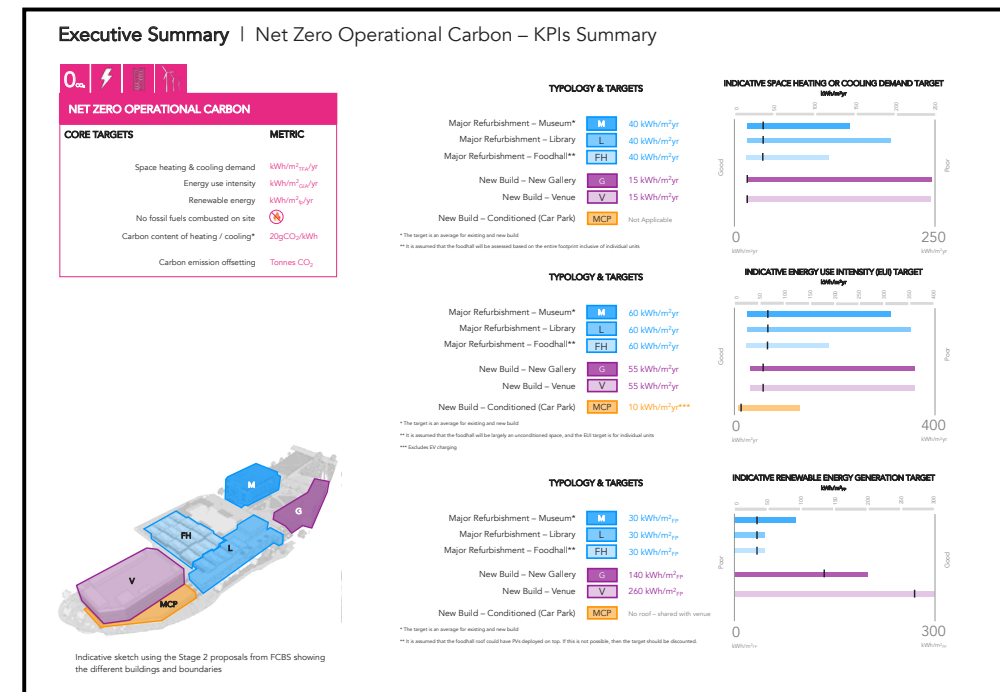
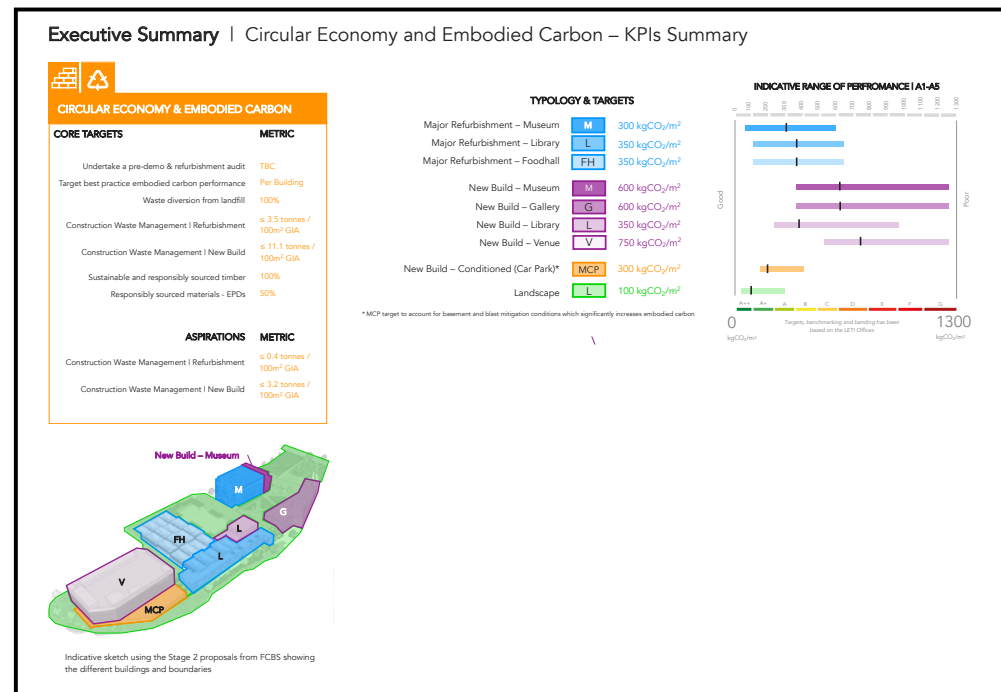
DEVELOPMENT OF MASTERPLAN LOWER GROUND FLOOR PLAN



0 | EXECUTIVE SUMMARIES

0.1 | STAGE 2 SUMMARY PRESENTATION

DEVELOPMENT OF MASTERPLAN SUSTAINABILITY



0 | EXECUTIVE SUMMARIES

0.1 | STAGE 2 SUMMARY PRESENTATION

PUBLIC REALM

VISION & BRIEF

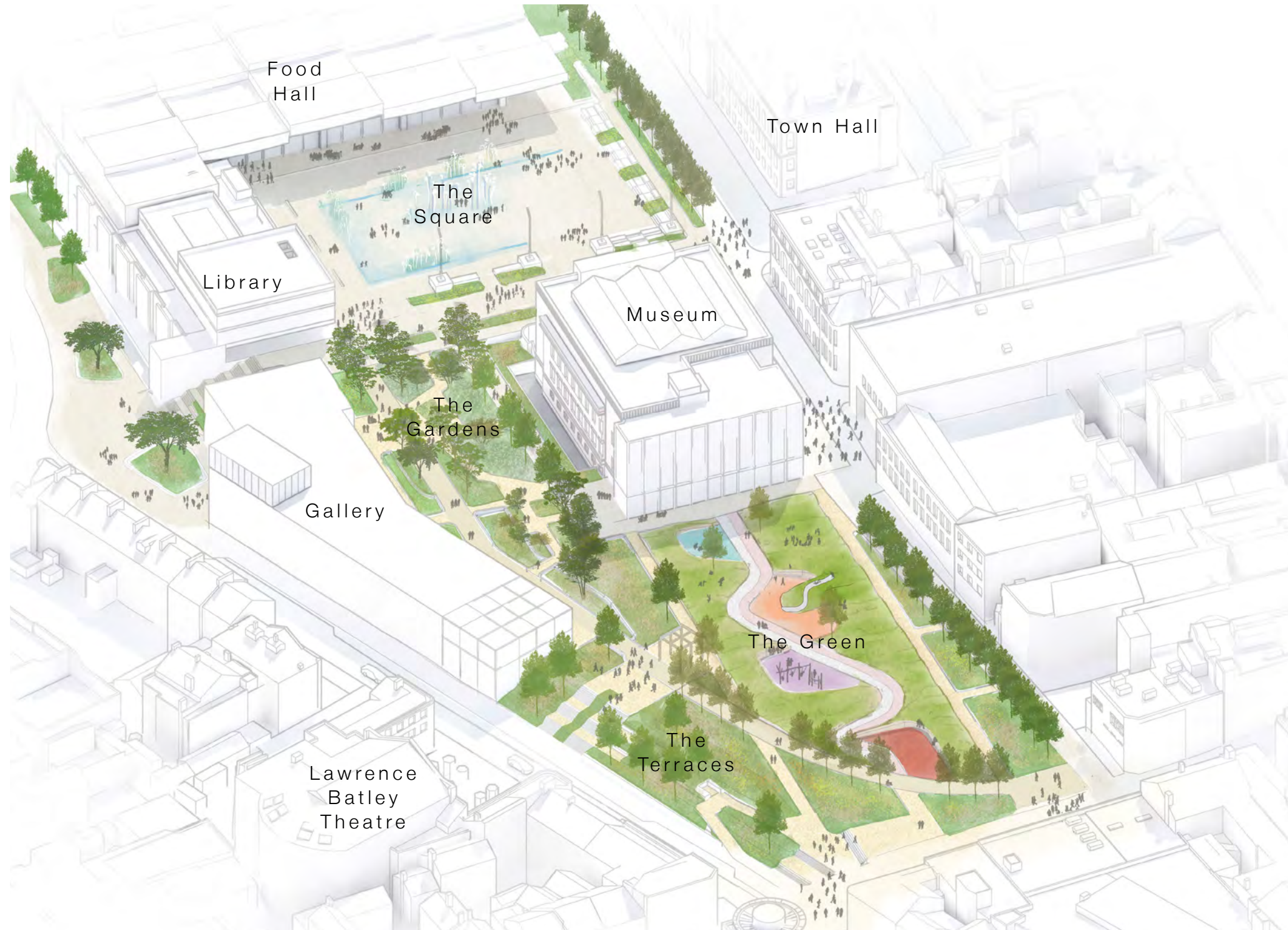
‘A major destination space which acts as the connector, the enabler, and the facilitator of a new vibrant outdoor cultural life for the town’.



0 | EXECUTIVE SUMMARIES

0.1 | STAGE 2 SUMMARY PRESENTATION

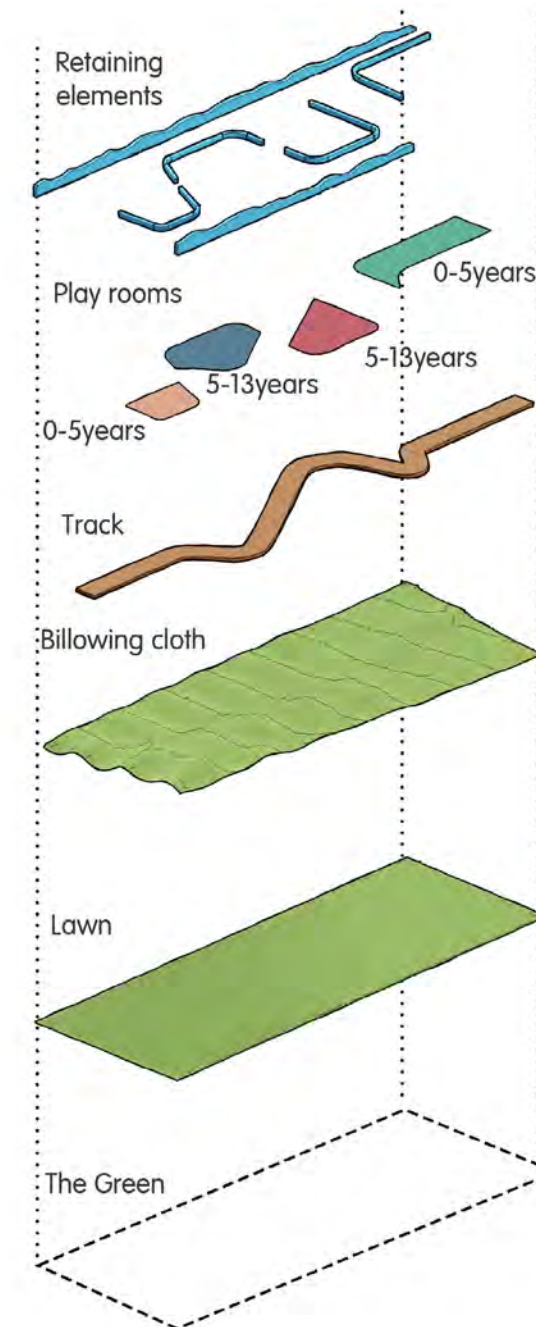
PUBLIC REALM DESIGN CONCEPT



0 | EXECUTIVE SUMMARIES

0.1 | STAGE 2 SUMMARY PRESENTATION

PUBLIC REALM THE GREEN



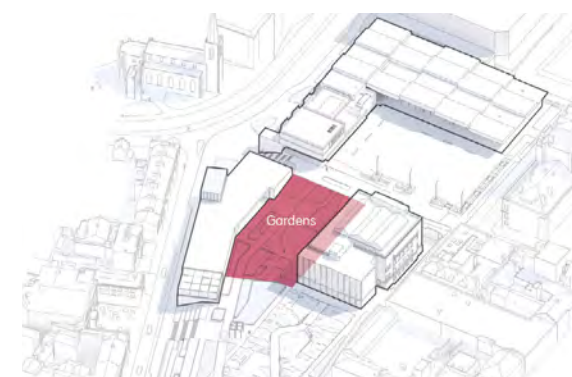
0 | EXECUTIVE SUMMARIES

0.1 | STAGE 2 SUMMARY PRESENTATION

PUBLIC REALM - THE GARDENS



VIEW SOUTH TOWARDS THE MUSEUM AND FOOD HALL



0 | EXECUTIVE SUMMARIES

0.1 | STAGE 2 SUMMARY PRESENTATION

PUBLIC REALM THE SQUARE



- 1 Proposed street tree planting
- 2 Existing trees to be removed
- 3 Rain gardens
- 4 Indicative Water feature
- 5 Steps and seating terraces
- 6 Lighting columns
- 7 Seating edges
- 8 Cycle parking
- 9 Food hall spill out
- 10 Seating
- 11 Bollards

Fig. 7.6.17 Plan: The square

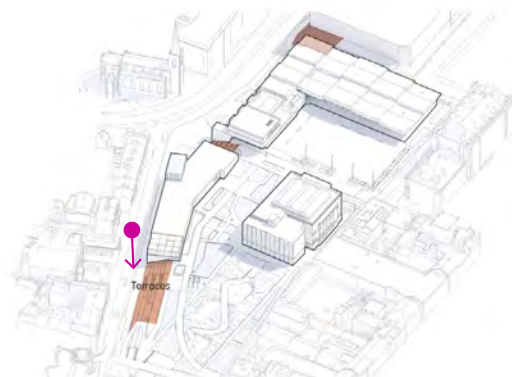
0 | EXECUTIVE SUMMARIES

0.1 | STAGE 2 SUMMARY PRESENTATION

PUBLIC REALM THE TERRACES



VIEW NORTH ALONG QUEEN STREET



Kirklees Cultural Heart | Programme Board End of Stage 2



0 | EXECUTIVE SUMMARIES

0.1 | STAGE 2 SUMMARY PRESENTATION

LIBRARY & FOOD HALL ARCHITECTURE SUMMARY



Lower Ground Floor

(Queensgate Level)

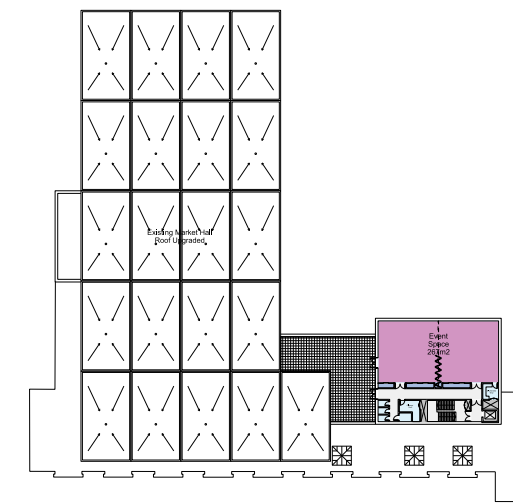


Upper Ground Floor

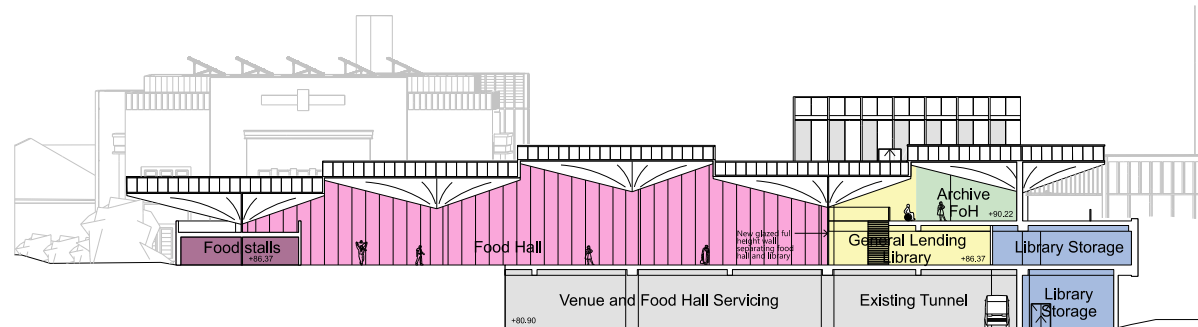
(Main entrance level and new public square)



First Floor



Second Floor



Section - LA-LA



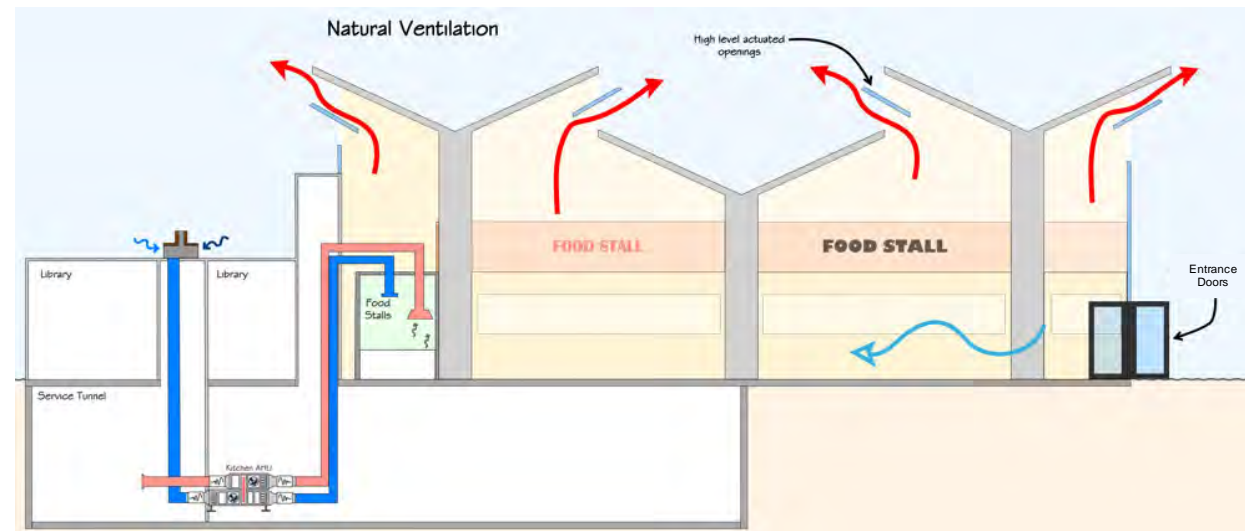
Internal view of General Lending Library looking North on Upper Ground Floor

LIBRARY & FOOD HALL

FOOD HALL VENTILATION, LIBRARY ARCHIVE STORAGE

Food Hall

- The Food Hall will be mainly naturally ventilated.
- Initial analysis – high-level openings performed well. Detailed analysis to occur at the next design stage to derive opening sizes / type.



Library

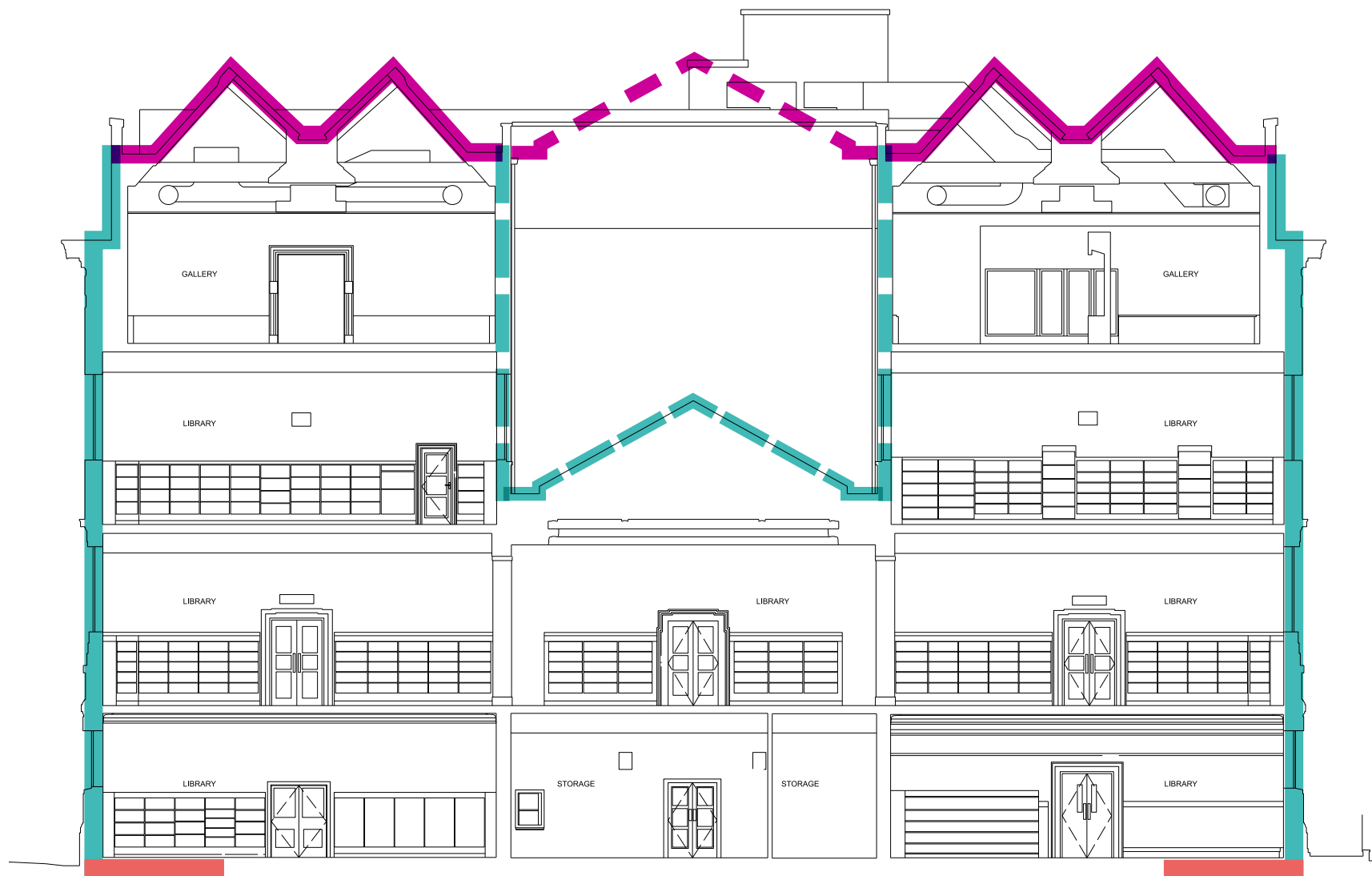
- Close control will be provided to the WYAS zones via an air handling unit featuring strict temperature and humidity control.

Room Type	Winter Room Design temp (min) (°C)	Summer Room Design temp (max) (°C)	Air Flow Rate l/s/person or ACH	Humidity RH%
WYAS Onsite	18 (+/- 0.5°C)	21 (+/- 0.5°C)	12 l/s/p (5% positively pressurised)	30 - 65

0 | EXECUTIVE SUMMARIES

0.1 | STAGE 2 SUMMARY PRESENTATION

MUSEUM FABRIC IMPROVEMENTS



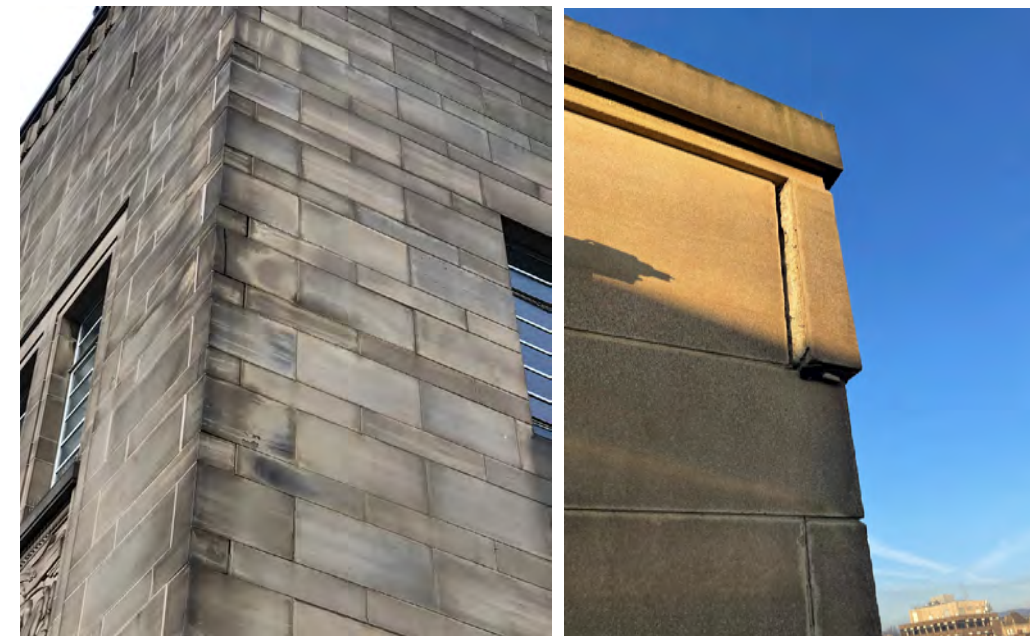
- Opportunities for thermal enhancement through **refurbishment** (e.g. fabric upgrade, IWI, overhaul windows and secondary glazing)
- Opportunities for thermal enhancement through **refurbishment** (e.g. fabric upgrade, IWI) - subject to design proposals
- Opportunities for thermal enhancement through **replacement**
- Opportunities for thermal enhancement through **replacement** - subject to design proposals
- Location of ventilation plenum

MUSEUM

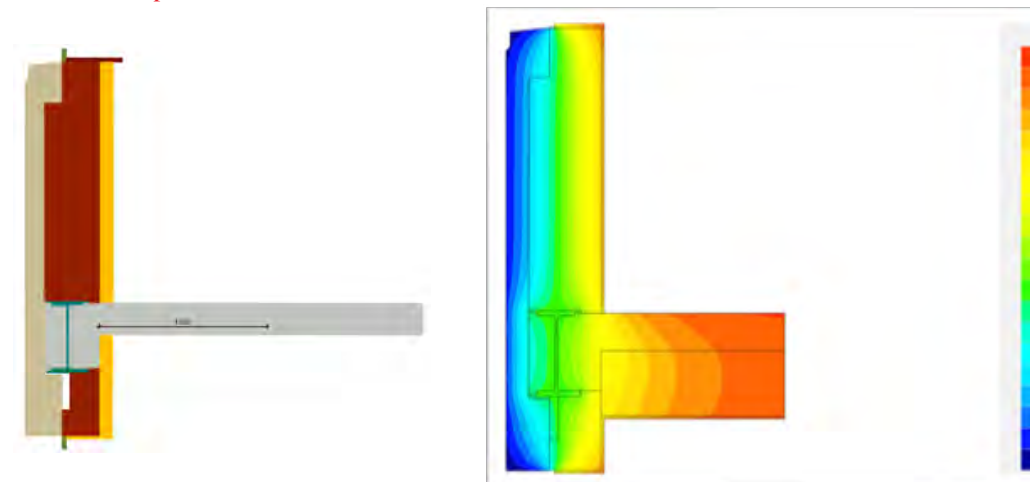
FACADE ENGINEERING

Summary

- Several stones of the existing cladding appear to be displaced, this may indicate signs of possible corrosion on the supporting steel structure. The extension and best strategy for remediations will be investigated following intrusive inspections.
- Preliminary thermal studies have been provided on typical wall sections of the wall to identify the current performance and evaluate possible retrofitting options. Detailed hygro-thermal assessment of the walls will be provided during Stage 3 to evaluate their response to the introduction of internal insulation (e.g. freezing risk of stones and bricks; potential for moisture accumulation and mould growth) and to assess optimum strategy for retrofitting.
- Secondary glazing are recommended to be installed to enhance thermal and weathertightness performance of the existing windows, which will need repairing (cleaning and re-painting).
- Penetrations between different floors (e.g. existing ventilation channels) are recommended to be sealed or completely removed to achieve good airtightness.



Pictures of displaced stones around different elevations/locations

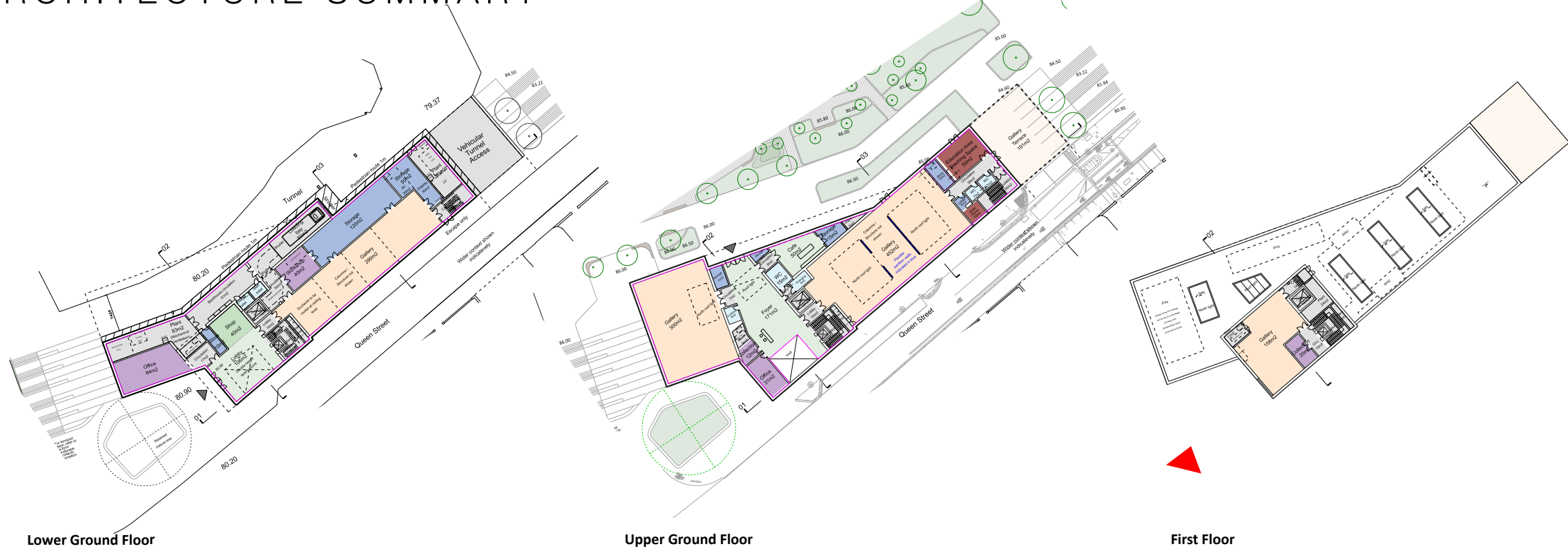


Extract from the preliminary thermal assessment provided on the existing walls with retrofit insulation

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0.1 | STAGE 2 SUMMARY PRESENTATION

GALLERY ARCHITECTURE SUMMARY



0 | EXECUTIVE SUMMARIES

0.1 | STAGE 2 SUMMARY PRESENTATION

GALLERY MEP STRATEGY

- Close control will be provided to GIS Areas via dedicated air handling units featuring strict temperature and humidity control. This entails all gallery space.

Room Type	Winter Room Design temp (min) (°C)	Summer Room Design temp (max) (°C)	Supply Air Rate l/s/person or ACH	Humidity RH%
Galleries	16-24°C Close Control – (max 4°C fluctuation within 24-hour period)		Mechanical ventilation to achieve design temperatures.	40-65% (max 10% fluctuation within 24 hour period)

MECHANICAL SERVICES STRATEGY – LOWER & UPPER GROUND FLOOR

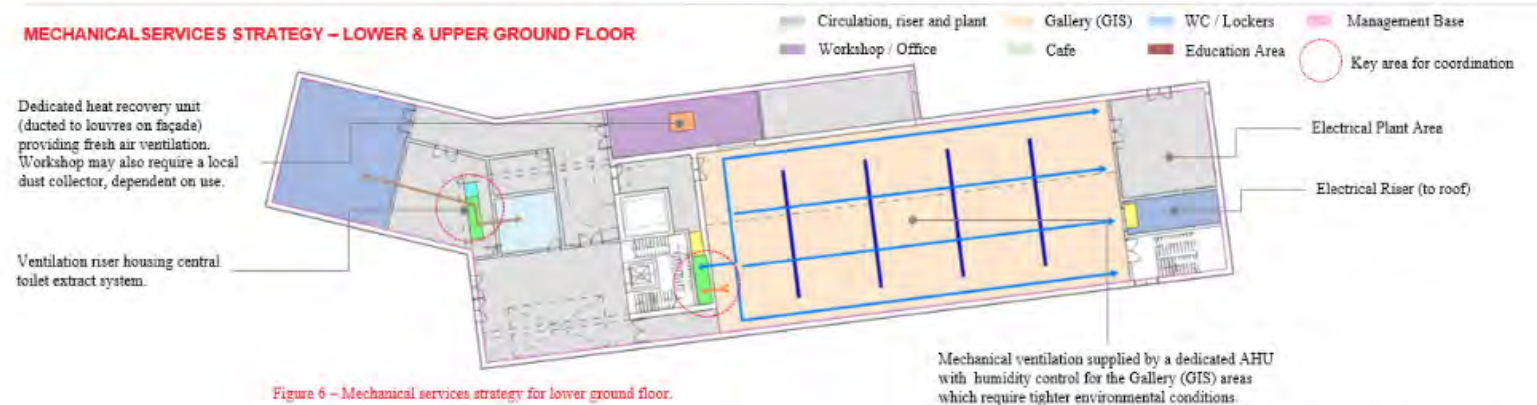


Figure 6 – Mechanical services strategy for lower ground floor.

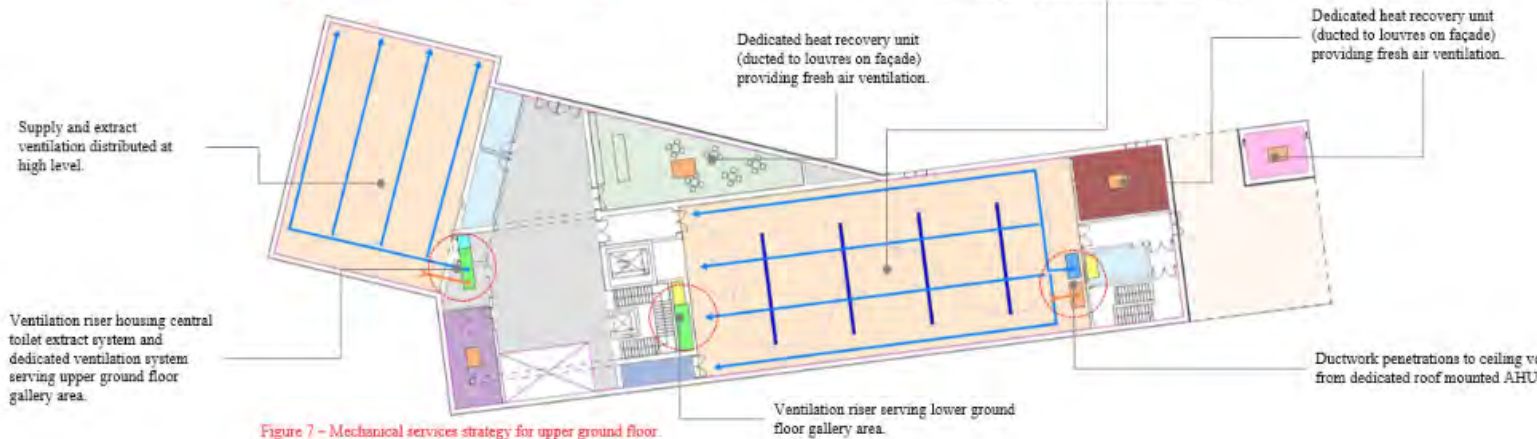
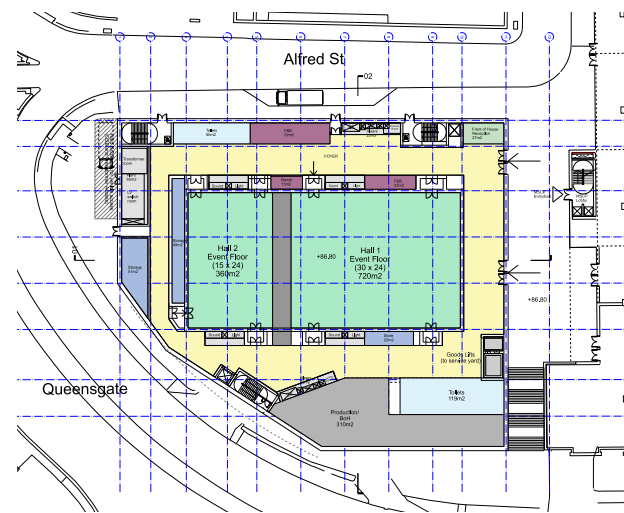


Figure 7 – Mechanical services strategy for upper ground floor.

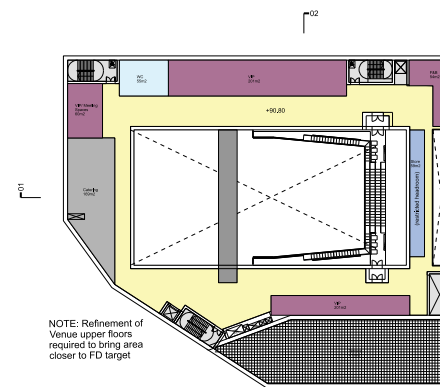
0 | EXECUTIVE SUMMARIES

0.1 | STAGE 2 SUMMARY PRESENTATION

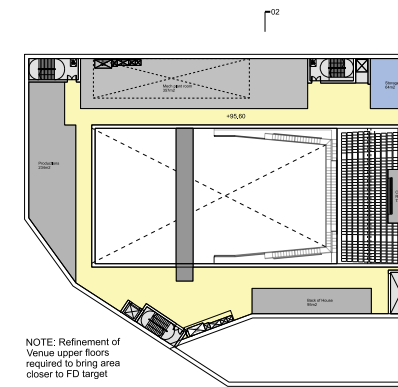
VENUE AND MSCP ARCHITECTURE SUMMARY



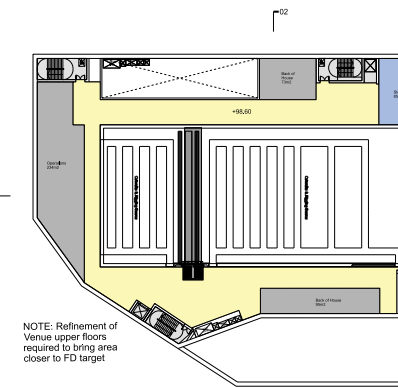
Upper Ground Floor



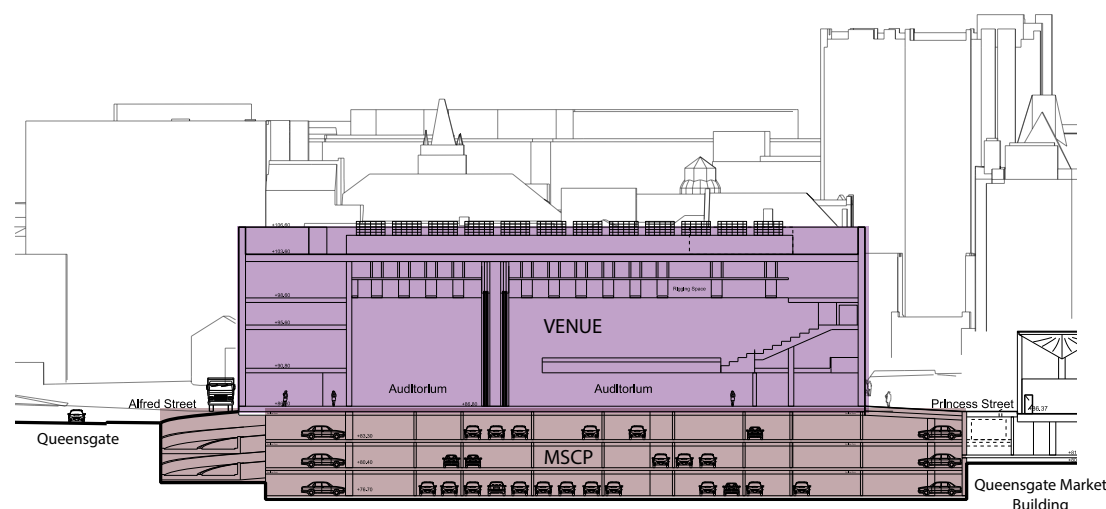
First Floor



Second Floor



Third Floor



Section cut - north south through the venue & MSCP



Venue visual of elevation along Queensgate

0 | EXECUTIVE SUMMARIES

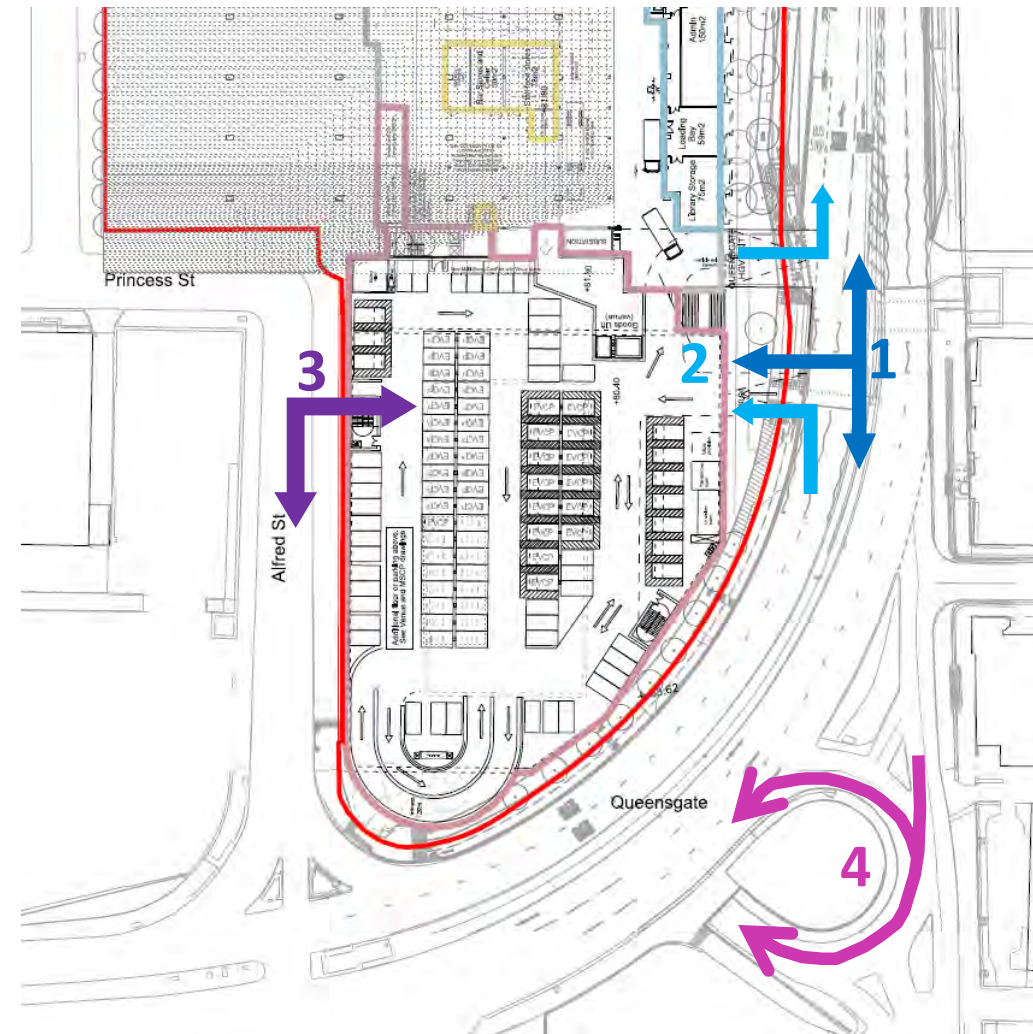
0.1 | STAGE 2 SUMMARY PRESENTATION

PUBLIC REALM

TRANSPORT, HIGHWAYS, ACCESS AND EGRESS

- Option 1 – Queensgate all movements
- Option 2 – Queensgate left-in left-out only
- Option 3 – Alfred Street
- Option 4 – Queen Street South and Subway

Design is based on Option 1 or 2 at the moment. Option 3 and 4 are also being assessed.



0 | EXECUTIVE SUMMARIES

0.2 | ARCHITECTURE AND HERITAGE NEXT STEPS

BRIEFING ASPECTS TO BE PURSUED IN RIBA

STAGE 3:

Discussions with various stakeholders during RIBA stage 2 have included brief items that were not covered in the individual building Facilities Descriptions at RIBA Stage 1, but which there is a commitment to provide in the cultural heart. The requirements for, and design investigations to include these items, will start early in stage 3.

The following have been included in the stage 2 costs, but are not shown on the plans:

- Management suite for the cultural heart and its park
- Publicly accessible WCs
- Changing places rooms in all buildings
- Site-wide/ estate staff welfare facilities or WCs
- Public realm/landscape maintenance storage within scheme
- Staff cycle parking, showers, lockers and changing, at 1:10 ratio
- Location of taxi drop-off, accessible parking and coach drop-off
- Full extent, location and amount of visitor cycle parking in landscape
- Full make-up of gendered and non-gendered WCs in each building
- Baby changing facilities, assuming one per building
- Breast-feeding spaces, assuming 1 or 2 in the scheme
- Multi-faith room and associated support spaces
- Sensory rooms and carer spaces across the scheme

NEXT STEPS AND LISTED BUILDING MATTERS

VENUE/MSCP

- Rationalisation of the design is required to bring the area closer to the Facilities Description: an agreed 500sqm reduction in area will be targeted
- Development of traffic junction design and modelling

LIBRARY AND FOOD HALL

- Careful consideration to be given to the heritage stakeholder feedback
- A second means of escape to be provided to the library top floor event space
- Direct engagement with West Yorkshire Archive to take place
- Technical performance of separating wall between the food hall and library to be confirmed

MUSEUM

- Careful consideration to be given to the heritage stakeholder feedback
- Rationalisation of the design is required to bring the area closer to the Facilities Description: an agreed 200sqm reduction in area will be targeted
- Rationalisation of the basement design is required, to accommodate vehicle movements at the turning head and economise on structure
- Further discussion/ liaison regarding the location of hire spaces
- Review of GIS requirements and detailed function of back-of-house spaces
- Additional ramped access to the existing southern entrance – design studies to be carried out early in stage 3 but assume a circa 10m ramped entrance ramp suspended over the sunken courtyard from Peel Street/Victoria Lane is required.
- Development of roof strategy to the existing building subject to condition of existing roof structure.

GALLERY

- Review of the location of the café and shop, and improvements to the vertical connectivity between the lower and upper ground floor foyers. This may include provision for a feature stair
- Review of GIS requirements and detailed function of back-of-house spaces
- Review of structural system, to investigate wider use of structural timber
- Investigation of rooflight design, number, size and locations generally

0 | EXECUTIVE SUMMARIES

0.2 | ARCHITECTURE AND HERITAGE NEXT STEPS

HERITAGE EXECUTIVE SUMMARY

Focus of concerns are the development of:
GII Listed – Library and Art Gallery (1939)
GII Listed – Market Hall (1969)
Huddersfield Town Centre Conservation Area (outside the Site boundary) including a number of listed buildings along its edge that address the Site.

SIGNIFICANCE AND CURTILAGE

A series of Assessments of Significance describe the buildings and setting. These have been shared with Historic England (HE), The Twentieth Century Society (C20), Kirklees Conservation Officer (CO) and Huddersfield Civic Society (HCS). These documents set out the basis of significance which is key when seeking to impose changes on listed buildings and the setting of heritage assets. Some questions remain over the curtilage of listing of the Market Hall.

CONSULTATION STRATEGY

There has been engagement on heritage matters with HE, C20, CO and HCS. The intention is for consultation to continue through RIBA Work Stage 3.

PROPOSALS / MANAGING CHANGE

The proposals should be rooted in a conservation philosophy that draws from planning policy and established conservation principles. The scale of the proposed changes to both listed buildings have been positively described by HE as “transformative”.

The proposals for the listed Library and Art Gallery are moving in the right direction. Care is needed to describe the repair, restoration and enhancement of the envelope, the restoration of key rooms and the retention of key features.

The Market Hall proposals are seeking fabric removal of a scale that is unlike many re-use projects to better reveal the most interesting and significant elements of the building. HE have noted that this is “interesting” and “striking” but “may have unintended consequences” and further studies are required to guide the development of proposals sensitive to the building’s special significance.

CONSULTATION FEEDBACK

Concept proposals and the strategies for managing change to the listed buildings have been shared with heritage stakeholders and formal comments invited. Initial consultations indicate that there is support in principle for the project’s direction, with invitations for further design development and dialogue on key areas of the proposals.

PRELIMINARY HERITAGE IMPACT ASSESSMENT

Our preliminary assessment recognises the scale of change proposed at Stage 2. Sensitive design development will minimise the potential for harm and as the designs develop, more key elements of historic fabric will be looked at to be retained and relied upon to inform the proposals. Should the design be shown to minimise the occurrence of harm, it is reasonable to anticipate that the substantial heritage gains and public / planning benefits that the scheme is seeking will offer sufficient balance and justify the granting of Listed Building Consent.

NEXT STEPS

Surveys and Investigations – The observations of the Heritage Stakeholders have informed the preparation of a list of surveys, areas requiring further research and design studies. These will need to be progressed during Stage 3 to inform the proposals for change to the listed buildings and justify the scheme for Listed Building Consent.

Consultation – Further consultation with the Heritage Stakeholders is proposed. The recommendation is to present the scheme as it develops to explain how the scheme is addressing the heritage needs of the buildings and set out the clear basis of justification where changes are proposed.

0 | EXECUTIVE SUMMARIES

0.3 | LANDSCAPE EXECUTIVE SUMMARY

THE BRIEF

The Cultural Heart masterplan presents the opportunity to deliver a family friendly distinct, contemporary, and inclusive urban park which will act as a new destination space for the town and region.

The vision for the park is to create:

A major destination space which acts as the connector, the enabler, and the facilitator of a new vibrant outdoor cultural life for the town.

The park will be a high quality, exemplar space. It will function as a green lung for the town, be welcoming and inclusive and have the capability of hosting a range of events.

Imaginative, innovative, and deliverable solutions are proposed which address a number of challenging constraints - both above and below ground.

The overall brief for the park and public realm can be distilled into five key themes:

1. 24/365 - An inviting, welcoming place, all day, all year round
2. Culture - where Art, Heritage, Performance and Literature can all be experienced
3. Nature - increasing biodiversity, built in climate resilience, and benefits to health and wellbeing
4. A destination in itself - A reason to visit and a reason to stay
5. A Place for all - Everyone welcome

DESIGN PRINCIPLES:

At Stage 1 of the process, we identified a number of opportunities that the site presented, and which addressed the brief and which responded positively to the emerging architectural masterplan. At Stage two we have developed these opportunities into a series of clear design principles which are used to inform and underpin the proposals for a new town centre park and public realm, namely:

- Principle 1. Four Rooms
- Principle 2. Connected & accessible
- Principle 3. The park as a cultural destination
- Principle 4. A place for all
- Principle 5. Green & biodiverse
- Principle 6. A sense of belonging

Four rooms

Under the first principle the park is organised into four distinct character areas or outdoor 'rooms': These are:

The Green- a predominately green space located to the northern part of the site. Facilitating connecting routes as well as activities that draw people in and animate the space. The Green is dominated by a dynamic undulating play space, the concept for which is based upon a billowing cloth. Designed for all ages the playscape offers spaces to play, explore & discover, to socially interact and to just watch the world go by.

The Gardens - occupying central space between the former library (proposed museum) and gallery

buildings, is a series of more intimate spaces - full of planting and complimentary to the surrounding building uses, facilitating spill out activity and access. These incidental spaces also provide opportunities to display items within the Kirklees Gallery & Museum collections, as well as playing host to travelling exhibitions.

The Square - a bespoke hard paved space capable of hosting events for up to 3000 people standing. Located between the former market hall and the former library (proposed museum) and symbiotic with the adjacent food hall and events space uses. During times when events are not being hosted the space will be animated through water and light, and trees will frame the space, helping to soften the otherwise hard expanse and provide places for shade and nature.

The Terraces - a landscape that addresses the level changes between the park plateaux and Queen Street & Queensgate to the east. Where elegant stepped and meandering routes allow good connectivity with destinations such as the University and the Lawrence Batley Theatre. Seating opportunities adjacent to steps and paths create a welcoming place for rest, as well as locations to sit and people watch or to watch the world go by.

Movement, connectivity and access

The park provides clear & legible network of connections across the site. Direct pedestrian links are provided between the town centre and the University, as well as to destinations within the cultural heart itself. These new connections will be open, inviting and accessible routes, with clear sight lines. The Cultural Heart will be entirely pedestrianised, with vehicles permitted for loading and emergency access during events only. It is envisaged that cyclists will be encouraged to use the existing street network around the site, and cycle parking for the Cultural Heart will be provided to the edges of the park.

Performance & culture

The park will be a cultural asset in itself, a place which changes in cultural offer seasonally, attracting visitors back again and again. It will provide a canvas for a variety of cultural activities, complimenting the building uses and creating vibrant, engaging outdoor spaces. The park will contain opportunities to display existing items and artefacts within Kirklees collections and the Square will cater for large scale outdoor events.

A place for all

The park is designed to cater for all age groups, fostering a multigenerational and widely inclusive approach. Consideration has been given to how different age groups behave and are likely to interact with the Cultural Heart and its surroundings.

Opportunities for play and recreation will permeate the park, creating activity and life throughout the site. It will take different forms, from more formal equipped play, to interactive, multi-functional and incidental opportunities such as that created by the water features within the square.

Green & biodiverse

The park will be a green and verdant place, containing a variety of trees, shrubs, perennials, and grasses. A significant quantity of new trees will be planted, contributing to the sustainability performance of the site as well as visual amenity. There will be a significant net gain in the site's biodiversity due to the quantum of planting and the range of different habitat types proposed

0 | EXECUTIVE SUMMARIES

0.3 | LANDSCAPE EXECUTIVE SUMMARY

A biological solution to sustainable drainage is also incorporated proposed in the form of rain gardens. These are planted areas consisting of a free draining substrate above a gravel soak away which will take run off from surrounding areas of hard landscape. The textile heritage of Huddersfield will also be referenced through the incorporation of plants traditionally used in the natural dyeing process.

A sense of belonging

Both the setting and the rich social, industrial & cultural heritage of Huddersfield permeate the look, feel and function of the park. The layout, fabric and planting has been carefully considered in order to take advantage of townscape and views, and which makes subtle reference to the local vernacular architecture and industry upon which the town was founded, whilst at the same time providing a new, forward-looking sense of place, which is both contemporary and timeless in character.

Engineering constraints

Engineering constraints, which include the retention of the tunnels has been integrated into the design – with structural strengthening, alteration and re-construction coordinated with the project engineers. Likewise, close collaboration on other civil engineering aspects of the scheme, such as site demolitions and filing, existing services and strategic surface water drainage has also been closely coordinated.

Sustainability

Likewise, close collaboration has taken place on the sustainability aspects of the landscape design, and key performance indicators covering ecology and biodiversity, urban greening, the potential re-use of materials and the specification of new hard landscape materials and products. These are all to be developed in further detail during Stage 3 of the project.

Existing trees

An arboricultural survey has been carried out in order to assess the health, condition and quality of the existing trees. The guiding principle is to retain all trees where desirable and possible. However, a number of existing trees need to be removed in order to facilitate the re-modelling of the Cultural Heart and in particular to enable new site levels and accessible environments to be formed. It also proposed to remove some of the trees that have become over mature, are in a poor condition, such as those along Queensgate to obscure views to the artwork along Queensgate Market. To compensate, a comprehensive tree planting strategy is proposed right across the site. This will comprise sizeable new trees planted in more appropriate and favourable ground conditions ensuring a longer-term legacy of tree planting within the town centre. It is proposed that 4 trees are planted for every 1 removed.

Safety & security

The approach to public safety will be multi-faceted, comprising of a number of elements which combined create a safe yet welcoming place. The safety & security strategy includes CCTV coverage, good quality lighting, good sight lines & inter visibility, designing out areas that might attract anti-social behaviour, and designed in features that prevent access by hostile vehicles. The park and public realm are designed to be active and vibrant thus attracting users throughout the day and during the evening. Evidence indicates that a high level of use and activity over these periods, generates footfall, which in turn assists with the self-policing of these environments – pushing antisocial and criminal activity elsewhere.

NEXT STEPS

Client approval to the Landscape & public realm stage 2 brief and design concepts
Further development and understanding of site and masterplan technical constraints, in particular:

- the structural properties of the subterranean tunnels and basements, both existing & proposed
- Site demolitions, filling and profiling including requirements for soils
- Surface water drainage system and incorporation of suds features
- Strategy for biodiversity net gain
- Building interfaces – connection, movement and spill out uses
- Services & utilities

Production of an arboricultural impact assessment

Further consultation with the public/end users, key service providers within Kirklees Council, and other relevant external third parties & interest groups.

Client site visits to relevant contemporary urban parks & spaces.

Design development and coordination of all external spaces in collaboration with the design team.

Procurement and involvement of specialist design & technical services (which may include services already included under the engineer's cope):

- Water feature design
- Play area/equipment specialist
- Soils scientists
- Lighting design
- Security engineering (Hostile vehicle mitigation etc.)
- Signage & way finding

Further consultation, including (but not limited to) the following:

- Consultation with key Kirklees Council Services
- West Yorkshire Police & Counter Terrorism Unit
- Huddersfield Civic Trust
- Access groups
- Inclusivity organisations
- Local schools, colleges & Huddersfield University
- Community organisations & outreach works (particularly in respect of hard-to-reach groups)

It is understood that a general strategy for consultation has been put in place by Counter Context, however, we advocate specific, targeted, and participatory (co-design) workshops – aimed at specific user groups - particularly for elements such as play, access, and inclusivity.



Kirklees Council

Kirklees Cultural Heart Project

Engineering Work Stage 2 Executive Summary Report

Reference: CDT430201-ARP-XX-XX-RP-Z-0002
P01 | 19 May 2022



Introduction

Ove Arup and Partners Ltd (Arup) have been commissioned by Kirklees Council to develop the RIBA Stage 2 (Concept design) for the Kirklees Cultural Heart (KCH) project, a major new mixed use development at the heart of Huddersfield Town Centre.

The project consists of the redevelopment of two existing listed buildings, and the construction of further new build to create a cultural centre for the town. The development will provide a new museum, art gallery, food hall, multi use performance venue and multi storey car park, as well as facilitating the relocation of the central library. The development will also create a new urban park to tie these buildings together.

Project Team

The design of the scheme has been developed in conjunction with the following team:

Client: Kirklees County Council

Development Manager: Queensberry Real Estate

PM and Cost Consultant: Turner & Townsend

Architect: Feilden Clegg Bradley Studios

Planning Consultant: Pegasus Planning

Landscape Architect: re-form

Sustainability Consultant: Etude

Engineering (including specialists): Arup



Existing site massing view showing redline boundary. Site buildings shown in blue.

Purpose of the Report

This Stage 2 report executive summary report has been issued to present the concept engineering design options and solutions together with the engineering constraints to the development.

The design team has developed the overall masterplan together with the design of the individual buildings, as summarised in this report.

The separate, full Stage 2 report includes outline options and proposals for structural and civil design, together with a discussion around suitable utilities infrastructure strategies across the masterplan and proposals for MEP and structural systems. Where it is not possible to recommend a particular system at this stage the report identifies further work and outstanding information required from the design team.

This report mainly focusses on the engineering aspects to support the planning design of the buildings as well as providing input into the Stage 2 cost plan, which in turn will feed into the Outline Business Case (OBC.)



Proposed masterplan massing view

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The Site

The KCH scheme site is located to the southeast of the town centre core within the Ring Road (A62 Castlegate / Queensgate / Southgate). The site is bounded by the vehicular routes of A62 Queensgate to the south east, Queen Street to the east and Peel Street and Alfred Street to the west, and the pedestrianised routes of King Street to the north and Victoria Lane to the west.

The existing site is currently occupied by the Piazza Shopping Centre, Market Hall, Huddersfield Library and Art Gallery. There are a few small shops and an area of open space public realm fronting the entrance to the library and art gallery. The recently demolished Market Hall multi-story car park is also located within the footprint of the scheme.

The site measures approximately 350m x 120m, with an approximate area of 3.25 hectares.

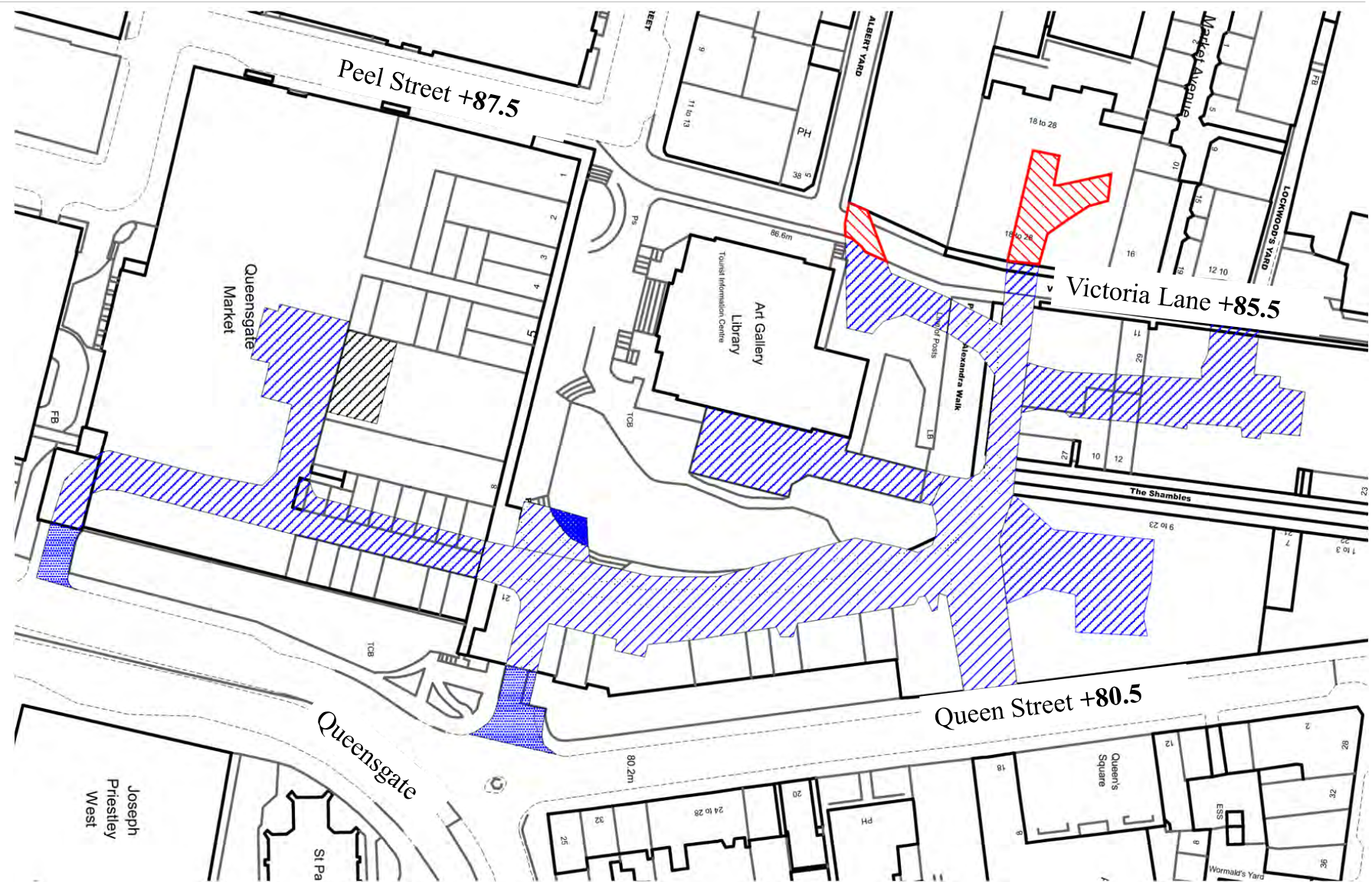


The Site

The site originally sloped steeply between Peel Street at +87.5m AOD and Queen Street at +80.5m AOD, but as part of the development of the site during the 1970s the site was levelled with the introduction of service tunnels, accessed off Queensgate and Queen Street.

These service tunnels are of reinforced concrete construction and provide service vehicle access to the site and to retail units to the west, beyond the site boundary.

The diagram to the right indicates the extend of existing service tunnels across the site. The areas in red denote sections of the tunnels that extend beyond the site boundary.



Plan showing service tunnels across the site

ARUP

Geotechnical Engineering

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Kirklees Cultural Heart Arup Stage 2 Executive Summary Report
 Kirklees Metropolitan Council



Geotechnical Engineering
 Executive summary

Site History

The site has a long history of development. Mostly small scale building units were present from the 1850s. By the late 1800s several larger buildings were built including a market hall, chapel, fire station and theatre.

The site layout remained largely unchanged until the mid twentieth century when the art gallery/library was built and Queensgate encroached onto the site, followed by the new market hall and MSCP in the late 1960s and the piazza shopping centre.

No previous industrial uses that may be sources of significant contamination have been identified, however small scale sources may have been present such as fuel storage tanks.

Residual foundations, a former burial ground and backfilled basements may remain from previous phases of development.

Ground Conditions

There is limited ground investigation data in the vicinity of the site and no data within the site.

Superficial: Thin made ground is likely to be present across the site associated with previous development, typically less than 3m thick. Made ground is likely to be underlain by up to 2m of mixed soil (Head deposits).

Bedrock: Bedrock beneath the site is the Middle Band Rock, a sandstone unit 5m thick, overlying mudstone of the Lower Coal Measures. The Soft Bed Coal, underlies the site at around 15 to 25m and may have been worked beneath the site.

Groundwater may be present within the Middle Band Rock however it is unlikely groundwater will be encountered within 5m below ground.

The site is underlain by the Millstone Grit at greater than 60m depth, an aquifer with potential for utilisation for ground energy.

Ground Related Constraints

The key ground-related constraints for the scheme are:

- Coal mining risk: Soft Bed seam expected beneath the site at around 15 to 25m depth that may have been worked.
- Service tunnels: Accurate location plans/depths required.
- Other obstructions: Previous development will have resulted in remnant foundations and associated obstructions across the site.
- Ground conditions are uncertain: Limited ground investigation data is available.
- Contamination: There are no potentially significant sources that are likely to require remediation. However, clean cover in soft landscaping is likely to be required.
- Ground gas risk (associated with mine workings) must be assessed by ground investigation and possibly also monitoring of existing basement/tunnels.

Ground Investigation

Ground investigation is required:

- To determine ground conditions for foundations and earthworks
- To identify potential ground and groundwater contamination, plus potential hazardous ground gases
- To confirm the depth and thickness of the underlying coal seam and potential presence of mine workings.

The scope of investigation comprises:

- 10 no. boreholes
- 11 no. machine-excavated trial pits
- 17no. Hand dug observation pits
- Installation and monitoring of gas and groundwater standpipes
- Geotechnical and chemical laboratory testing.

No exploratory holes are currently proposed in the northern part of the site. This area should be investigated post-demolition. Supplementary investigation may also be required post- demolition in other parts of the site.

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ARUP

Civil & Transport Engineering

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Civil Engineering Executive Summary

Existing Drainage

Currently three main combined Yorkshire Water sewers cross the site, draining west to east. One of these sewers runs between the existing Queensgate Market and former MSCP site. Masterplan proposals to connect the service tunnels and proposed Venue would cross over this existing sewer and require a diversion or build over agreement with Yorkshire Water. During WS2, it was agreed in principle that the sewer would be diverted. This will be confirmed following further development of costs and risks of each option during WS3. It is proposed that a further meeting with Yorkshire Water is undertaken with the developed WS2 plans, to discuss the potential implications on the masterplan of a build over agreement. This will then inform the client decision to either pursue a diversion or build over agreement in WS3.

The masterplan has been developed to avoid diversion/clashes with other YW sewers crossing the site. During WS3 the development of the landscaping proposals will be coordinated with any applicable easements/offsets of YW sewers that are to remain in-situ.

Survey Review

Arup have undertaken a detailed review of the 5no. historical surveys available for the site to maximise the use of this information and to minimise costs of additional drainage survey. The findings of this review are summarised in a separate report (CDT430201-ARUP-XX-XX-RP-C-000002). This review highlighted there is insufficient information available to confirm location, connectivity and condition of the sewer network in some critical areas. Therefore it is recommended a partial re-survey of the site

Proposed Drainage

An outline drainage strategy has been developed for the site and shown on sketch CDT430201-ARUP-XX-XX-SK-C-000001. Based on the current masterplan, indicative drainage catchments have been identified, with

proposals to discharge the surface water drainage to public sewers crossing the site as per the existing. The proposed surface water discharge rate has been reduced to include a 30% reduction, in accordance with YW's requirements and WYCA Guidance for Brownfield sites. Surface water attenuation is to be provided in each catchment to maintain the proposed flow restrictions and ensure no flooding up to the 1 in 100 year storm.

For the former MSCP site (Catchment 4), there is a risk the Local Lead Flood Authority (LLFA), will treat this catchment as a Greenfield Site. This is on the basis the MSCP and associated infrastructure has been removed and therefore the site is not currently actively draining and contributing runoff to the local sewer networks. If this stance is taken, the site will be subject to a greater flow restriction (5l/s/ha). Therefore greenfield calculations for the attenuation requirements at Catchment 4 have been undertaken to inform discussions with the LLFA at the next stage.

The proposed drainage strategy for each catchment is summarised below-

- Catchment 1 (Park north) – the park will drain north-east to YW sewer network on King St, adjacent to the site. 100-165m³ of surface water attenuation will be provided through bioretention systems and other Sustainable Drainage Systems (SuDS) integrated with the landscaping.
- Catchment 2 (Gallery & Park South) – the area will drain south to the YW combined sewer crossing the site. Underground geocellular tanks in the landscaping and a blue roof on the Gallery will provide the required 170-270m³ surface water attenuation.
- Catchment 3 (Former Queensgate Market) – the area will drain north to the Yorkshire Water combined sewer. Underground attenuation tanks will provide the required 145-235m³ surface water storage.
- Catchment 4 (Venue & Car Park) - The roof drainage

will drain north and connect into the eastern stub of the diverted Yorkshire Water combined sewer which currently crosses the site. The 100-380m² required flood storage is to be provided within the building footprint (blue roof). There is insufficient space externally to accommodate the required attenuation for the this catchment outside the building footprint

Following determination of the WS2 site layout and drainage strategy, Arup are progressing with liaison with the LLFA (Kirklees Council) to discuss the initial drainage strategy proposals.

Foul Drainage Strategy Overview

Proposals are to drain foul water to the combined sewers crossing and adjacent to the site. The foul drainage will be separated from the surface water drainage prior to connection to the public sewers, in accordance with Building Regulations Part H. Where appropriate existing drainage will be reused, subject to suitability and condition.

Existing utilities

Arup obtained Statutory Utility plans for the site. Cross-referencing the available utility survey data (SEP 2020 Utility Survey, S20124-U), these plans were used to map out the buried services at the site.

A review of the potential utility diversions and disconnections for the site has been undertaken. Refer to the above drawings and schedule CDT430201-ARUP-XX-XX-SH-C-000001. It should be noted that other buried services may exist which were not indicated on the Statutory Records nor identified in the utility survey. The following is a summary of the existing utilities crossing the site:

- **Potable water** - At this stage it is assumed that existing potable water connections to buildings will not be suitable for the supply of the proposed development and will be replaced. On this basis,

proposals are to abandon this existing infrastructure. A potential through route water supply crosses the site between the existing Library and Queensgate Market. This route will be retained. Coordination of the landscaping design will be developed at the next stage to minimise any potential diversions.

- **Gas and Telecommunications Infrastructure** - At this stage it is assumed that existing gas and telecoms connections to buildings will not be suitable for the supply of the proposed development and will be replaced. On this basis, proposals are to abandon this existing infrastructure. Gas and Telecoms apparatus in the area appears to be local connections with no clear through route crossing the site. Therefore no diversions have been identified at this stage.
- **Electrical Infrastructure** - At this stage it is assumed that existing gas connections to buildings will not be suitable for the supply of the proposed development and will be replaced. On this basis, proposals are to abandon this existing infrastructure. There are several sub-stations within the site boundary. Arup are currently have ongoing discussions with Northern Powergrid to determine if these assets currently supply other 3rd parties outside the site boundary. Subject to these discussions, these sub-stations may be decommissioned and replaced as part of the scheme proposals.

At WS3 it is recommended to obtain C3 budget estimates for the proposed diversions and disconnections identified for the site. Additionally it is recommend to obtain confirmation existing substation assets and determination of proposed strategy for these.

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Pedestrian Flow Assessment

Kirklees Cultural Heart Arup Stage 2 Executive Summary Report
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Pedestrian Flow Assessment Executive Summary

Introduction and Objectives

A high-level pedestrian flow assessment for 'RIBA Work Stage 2' (WS2) for the Kirklees Cultural Heart (KCH) has been summarised below. The purpose of this summary and accompanying documents is to provide a high-level review of the design. This executive summary specifically focuses on the capacity of the Venue. It is supported by two other reports covering the venues and landscaping elements of the design. Please refer to these for further information.

The key objectives of the study were to determine the capacity of the Venue during the phases of ingress, egress and circulation for different modes of operation (e.g. conference, music); provide a qualitative review of the potential crowd flow considerations (e.g. concessions, concourses and vertical circulation routes), and provide any recommendations for potential design alterations or operational strategies to mitigate issues in Work Stage 3.

Scope and Approach

A spreadsheet-based analysis and qualitative review process has been used to provide a high-level assessment of the proposed Venue designs from the perspective of pedestrian movement. The study is based on indicative population assumptions that have been provided in the facilities description to represent specific scenarios for the venue and the outdoor stage in terms of the quantum of visitors and operational challenges.

The study analysis considers events operating in Hall 3 only (i.e. Hall 1 and 2 combined) as this mode of operation enables greater attendance and therefore reflects a potentially worst case scenario from a capacity perspective.

Two scenarios have been selected to form the basis of assessment and to reflect our initial understanding of the challenges associated with the different modes of operation from a pedestrian movement perspective.

- Scenario 1: Exhibition Mode with 1,250ppl between Hall 1 and Hall 2
- Scenario 2: Concert Mode with 2,200ppl between Hall 1, Hall 2, VIP and Level 1-3 Seating

The impact of circulation and access route closures to/from the venue (i.e. external environment) is also considered in each scenario.

The assessment criteria used to determine the capacity of the venue used in this study is based on the Fruin 'Level of Service' pedestrian planning concept for flow rates (people per metre per minute) and densities (people per square metre). A range of service levels have been applied to reflect Arup's experience of conditions associated with event operations (ingress, circulation and egress).

Exhibition Mode Venue Capacity

Scenario 1 considers the impact of Exhibition shows to test the performance of the Venue during a non-concert event with a high anticipated attendance (1,250people) which expects circulation throughout the day as spectators arrive, depart and travel between stands.

It is assumed to be the aspirational density for exhibition should enable very comfortable conditions for circulation. Planning for these conditions assumes that the vast majority of visitors will be circulating freely with some isolated areas of dwelling and few conflicts between opposing flows. The target planning conditions enable a good level of comfort to be maintained if movement conflicts occur.

A total of 464 spectators can be accommodated within the venue at the target density. This equates to approximately 37% of the aspirational target attendance of Exhibition events. The capacity of the Venue during Exhibition mode is likely to incorporate event specific behaviours within other spaces of the building and therefore this capacity is likely to be sufficient for the transient

behaviours that may occur. These include:

- Networking within the circulation spaces
- Break out spaces and seating
- Meeting spaces on Level 1
- Coffee breaks and concessions usage
- Single speaker events where higher crowd densities are acceptable within the viewing accommodation

In light of this, event planning should consider the information provided to visitors to encourage the desired use of space.

Ingress, Egress & Circulation Capacity

A key feature of an Exhibition event will be circulation through the Venue. The capacities of the narrowest points enables comfortable circulation and cross flows with minimal conflicts.

The analysis suggests that the combined capacity of the external and internal doors would be sufficient to accommodate the planned attendance at the target flow rates. The capacity is sufficient to support typical movements (e.g. Hall to concession) and provide contingency in the event of route closures (e.g. closures to enable BoH movements). Although, further analysis using refined assumptions for circulation patterns is recommended.

The capacity of the circulation routes is also sufficient to accommodate the entire Exhibition attendance during the peak 15 minutes, which suggests that the peaks of ingress and egress would also be supported without significant congestion. Consideration of dwelling and queuing movements should also be considered in later assessments.

Concert Mode Venue Capacity

Scenario 2 considers the impact of operating the Venue

during concert mode when standing capacity is maximised.

This is considered to be a worst case scenario due to the maximum planned capacity being achieved (2,200people). This type of event will also require mass circulation between the Venues facilities during the event intervals.

The capacity of the Venue has been identified as 2,200 people with visitors positioned between the upper seating areas on Level 1-3 (626ppl) and standing on the floor of Hall 1 (1,574ppl). Hall 2 is assumed to be reserved for stages and event overlay.

The level of density required accommodate 1,574 people within the 720m² that Hall 1 is typical of standing events and would be comfortable for sustained periods of dwelling during a concert event.

The actual behaviours and conditions within a standing crowd are likely to vary locally within the standing area and with the type of concert event that is being hosted. The standing capacity should be reviewed against the KCH venue operational aspirations.

Concert Mode Ingress Capacity

The arrival of visitors to the Venue is a key consideration in assessing the capacity of the design.

Based on events of a similar nature, it could be expected that c. 40% of visitors could arrive during the peak 15 minutes of ingress. It should be noted that different event types and information sent to visitors prior to the event may result in variability on this demand but the assumption is assumed to be appropriate to use as a threshold for the high-level analysis.

(Continued overleaf...)

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Pedestrian Flow Assessment Executive Summary

Concert Mode Ingress Capacity

If 40% of visitors arrive during the peak 15 minutes, the Venues entry processes would be required to accommodate 880 people at the target flow rate of 49ppl/m/minute.

The combined ingress capacity of the external doors is sufficient to accommodate c. 2,800ppl during a peak 15 minutes. However the actual ingress capacity is likely to be determined by the throughput of entrance processes rather than geometric constraints. Further analysis is recommended to assess these activities (e.g. ticket scanning, security screening).

Egress Capacity

The departure of visitors to the Venue is also a key determinant in determining capacity. Based on events of a similar nature, it could be expected that c. 80% of visitors may be expected to exit the venue during the peak 15 minutes of egress. This assumption should also be verified with the Venue's operational team.

Based on this assumption, the Venues exit routes would be required to accommodate 1,760 people (80% of venue attendance) during the peak 15 minutes at the target flow rate of 66ppl/m/minute.

Each of the external doors provide capacity for 1,881ppl/15 minutes at the target flow rate for concert egress, which exceeds the target capacity. Further analysis is recommended to consider the aspirational behaviours (e.g. egress profiles, dwelling behaviours) and onward routing plans (i.e. interaction with other venues, transport nodes) as these may impact the notional capacity.

A review of the Venues emergency egress capacity is also recommended in line with the fire evacuation strategy and should consider:

- Refined Venue layout and populations.
- Vertical circulation.
- Individual building and sitewide evacuation plans considering simultaneous evacuation.
- Means of escape for non-ambulant visitors.

Circulation Capacity

Circulation between facilities within the Venue will be required once visitors enter the venue, during the event (e.g. intervals) and during the egress period before leaving the event.

The capacity at the narrowest points of the design have been assessed using the effective width and assuming Level of Service C (49ppl/m/minute). This reflects the busier conditions that are typically experienced at concerts (vs. Exhibition mode) while still providing a good level of comfort and circulation for visitors.

The 15 minute capacity of a single internal door provides sufficient capacity for 60% of the total exhibition attendance (2,200ppl) within the peak 15 minutes. Thus, in line with the Exhibition mode capacities, a minimum of two doors would sufficient to accommodate the entire event attendance. This suggests a good level of resilience for contingency planning (i.e. route closures).

Concessions

The design provides concessions stands with a total of 18 Points of Sale (POS) located in four locations within the venue. The capacity of the concessions provision is highly dependent on the propensity to visit concessions, service rates and operational efficiency (staff training, till systems, pouring technology). It should be noted that different event types may result in variability in actual demand and performance but the assumptions are deemed to be appropriate to use as a threshold for this indicative analysis.

It could be expected that c. 50% of visitors looks to access concessions during the peak 5 minutes at the start of an event interval (1,100ppl). A high-level assessment of the concessions suggests that the 16 POS for general admission attendance provide capacity for 80 transactions in 15 minutes.

Sanitary Facilities

The facility description indicates the minimum area provisions for sanitary facilities within the Venue. A total area of 229m² is reserved for sanitary facilities in the existing facilities description. This sizing is based on an attendance of 1,250 people and should be reviewed in line with BS6465:2 as the design evolves.

The minimum provision and associated capacities for the Venue during concert mode (2,200ppl) have been calculated using the Technical standards for places of entertainment. The facilities provide a notional capacity for 668 males and 362 females during the 15 minute interval. This equates to approximately 47% of the planned concert attendance during a 15 minute period.

Further analysis is also recommended to consider the impact of disabled and unisex facilities on spatial design and capacity.

Conclusions and Recommendations

The high-level quantification of capacities suggests that the sizing of the Venue infrastructure is appropriately sized to accommodate the anticipated levels of demand for the two different event types tested to date at the nominal target flow rates.

In all scenarios the performance of the Venue is highly dependent on the operational strategies and event management, information received and assumptions made and the aspirational behaviours of visitors being achieved. Consequently, a review of the existing assumptions in line

with the KCH performance aspirations and further iterations of the analysis are recommended to consider:

- The sensitivity of input assumptions to the outputs should be further reviewed (e.g. to understand the impact of infrastructure usage, Levels of Service etc.)
- A review of the KCH desired experience and performance criteria (e.g. max delay/queue footprint/queuing time at facilities) to support the development plans of individual infrastructure elements and the overall spacing configuration and sizing with the Venue.
- The interaction between floors, halls, facilities and other venues during multi-event modes.
- Inclusive design to reflect the requirements of the different user groups who will experience the space.
- Operational mitigation measures should be developed with the event management team to minimise the impacts of queuing and congestion at critical locations, particularly circulation and vertical circulation spaces.
- Dynamic modelling of the whole or localised areas (e.g. the ingress process, concessions) of the Venue during key periods of demand (ingress, circulation and egress) could provide more detailed assessment of both space provision and operations for different event types.

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Structural Engineering

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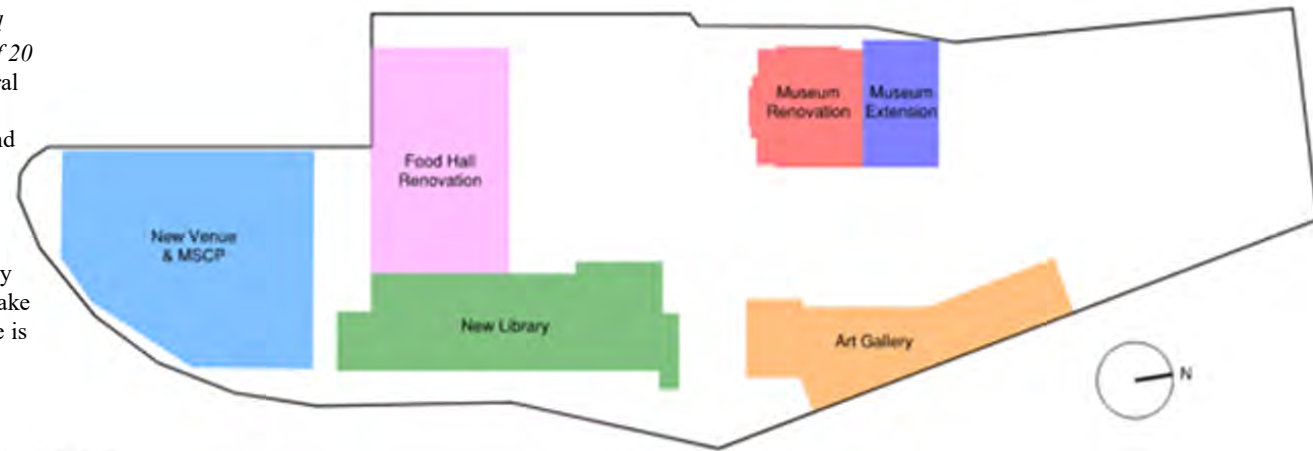
Structural Engineering Executive Summary

Design Stage

The Structural Engineering design has currently progressed to Stage 2 *Concept Design* As defined in the IStructE Structural Plan of Work 2020, which has been developed to coordinate and integrate with the RIBA Plan of Work 2020. It is intended that the Structural Plan of Work provides a complementary framework for organising the structural engineering requirements for building projects to provide clients and other design disciplines with a more collaborative and unified approach to the process planning of projects.

Stage 2: *Concept Design* is intended to; 'prepare the structural concept design defining the scope, scale and form of the structure and integrated with the other design disciplines appropriate to a design contingency of 20 – 25%'. The contingency assessment provides an indication of the level of contingency within the structural design, which is likely at each of the design stages. It is provided to both highlight the increasing level of definition that will be provided as the design develops (see below) and to indicate the level of uncertainty and risk which should be allowed for within the Cost Plan.

At this stage of the design, not all the structure has been optimised and so there will be some contingency inherent in the current design. However, there will also be a number of items that inevitably are not explicitly described within the design at Stage 2 and the cost management consultant should use their experience to make allowances appropriate to the stage of work such that a sensible level of design contingency described above is allowed for within the Cost Plan.



The Institution of
Structural Engineers

The Structural Plan of Work 2020

v1.0 (26/04/20)

NOTES:
The IStructE Structural Plan of Work 2020 has been developed to coordinate and integrate with the RIBA Plan of Work 2020. It is intended that the Structural Plan of Work provides a complementary framework for organising the structural engineering requirements for building projects to provide structural engineers, clients and other design disciplines with a more collaborative and unified approach to the process planning of projects.
Reference: RIBA Plan of Work 2020
Stages 0 and 1 comprise the Briefing portion where the initial brief and project requirements are determined.

	0 Strategic Definition ¹	1 Preparation and Brief ¹	2 Concept Design ¹	3 Spatial Coordination ¹	4 Technical Design ¹	4.5 Production Information	5 Manufacturing and Construction ¹	6 Handover ¹	7 Use ¹
	Briefing		Design			Delivery			Evaluation
Overview¹	Client's key requirements defined	Project feasibility confirmed and initial Project Brief defined. Revised information collated and prepared to enable the project to progress	Architectural and engineering concept information prepared and developed to meet the Project Brief	Architectural and engineering information Spatially Coordinated between disciplines into a single solution aligned to the Project Brief, Cost Plan and Project Strategies	Architectural and engineering technical design finally coordinated and completed to assemble and construct the project	Engineering information, including specialist sub-contractors' technical information, prepared to enable the manufacturing, assembly and construction to proceed	Manufacturing, assembly and construction completed	Project handed over, defects rectified and initial Aftercare completed	Facilities and asset management. First Occupancy Evaluation of building performance in use as retained
Contingency Assessment			Appropriate to a design contingency of 20 - 25%	Appropriate to a design contingency of 10 - 15%	Appropriate to a design contingency of 5 - 10%	Appropriate to a design contingency of 2 - 5%			
	Contribute to preparation of Client Requirements	Contribute to preparation of Project Brief Contributes to the Site Information Identify survey information required and provide survey scopes Identify structural constraints Identify information required for structural design	Prepare the structural concept design, defining the scope, scale and form of the structure, and integrated with the other design disciplines Review survey information and identify any additional surveys required and provide survey scopes Develop, review and assess structural options	Develop the structural design for defining the detailed form and function of all components (in terms of overall size, typical detail, performance and outline specification) Spatially coordinate the structural design and integrate with the architectural and other design disciplines Prepare calculations in sufficient detail to facilitate and verify design solutions	Prepare Structural Technical Design Details and designs of specialist structural contractors coordinated and integrated into the structural design Prepare full setting out information for all structural items, fully coordinated and integrated with other design items Review Contractor Designed Items	Development and review of temporary works design	Review temporary works design		

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Museum Structural Overview

Overview

The existing grade II library/art gallery building is to be converted into a new town museum. The building, originally built in 1939 will be refurbished and retro-fitted. A new extension will be built to the North in place of a small portion of the existing building which will be demolished.

Current & Proposed Structure

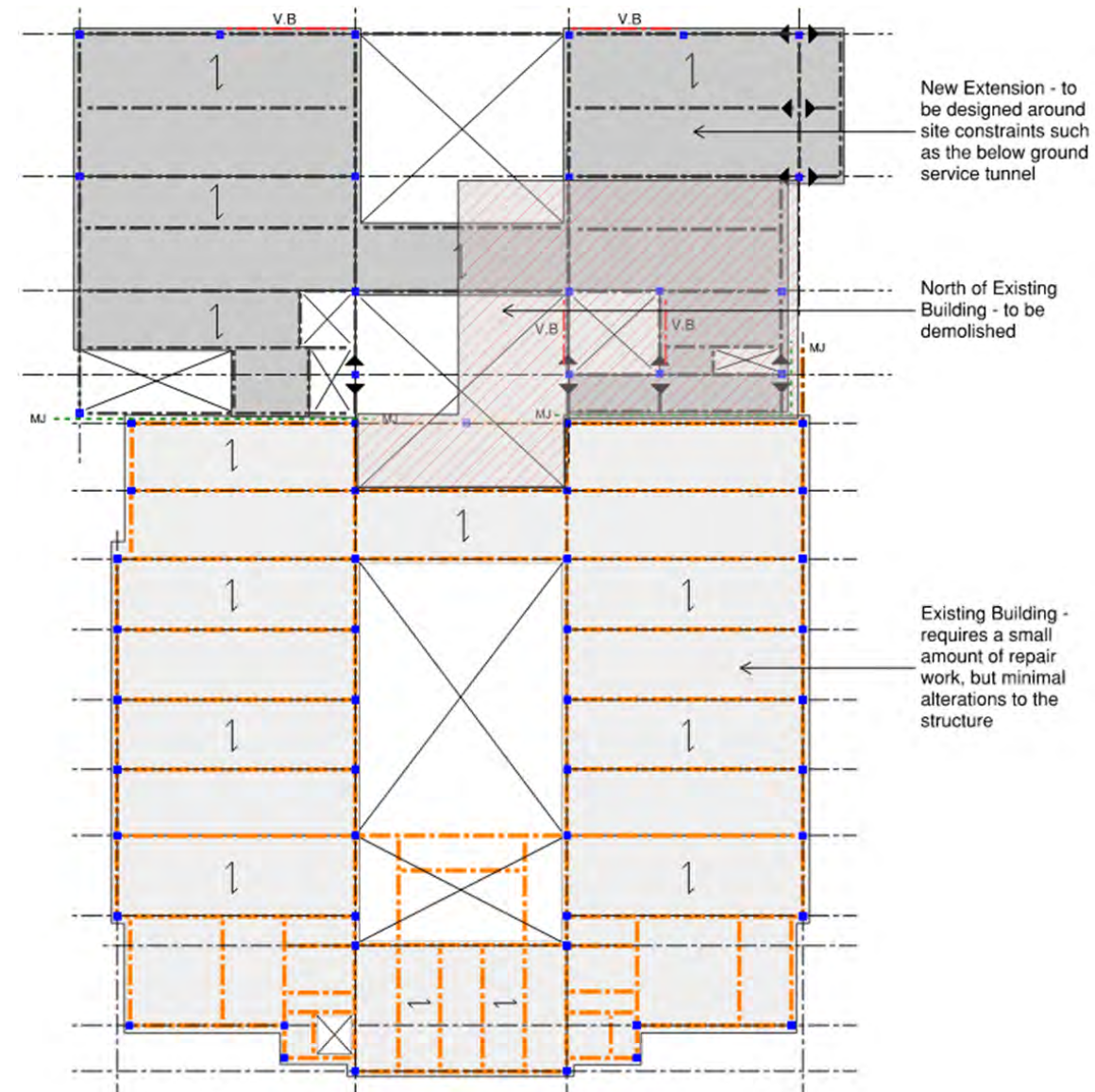
The existing 4-storey building consists of a steel frame with concrete floor slabs on an approximate 11.0 x 3.5m structural grid. Minimal modifications are proposed for this area with the exception of the demolition of the small rear portion of the building, which has been deemed to be inappropriate for re-use.

It is currently proposed the extension will also be steel frame with concrete slabs with columns located to align with the spatial requirements. An alternative timber superstructure option will also be explored in Work Stage 3.

Constraints

Several constraints exist on the site. The existing building is grade II listed, which could limit the allowable alterations to the structure. Where possible a 'light-touch' and load balancing approach have been used to minimise the required structural modifications to the refurbished portion of the building.

The proposed footprint of the new extension to the rear of the building extends over the top of an existing service tunnel which is to be retained. The new extension must therefore be designed to not hinder access within the tunnel beneath. The proposed extension is to also be built up against the listed building, and over an existing basement which is to be demolished. In both cases foundation and formation levels need careful consideration to ensure the structural integrity of both the new and existing structures.



Structural general arrangement for a typical floor showing the existing structure at the bottom, the portion to be demolished, and the extent of the new extensions

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Gallery Structural Overview

Overview

In the location of the existing piazza shopping area to the East of the site a new art gallery is to be constructed. The current concrete framed building was built in the 1970's as a series of separate retail units built on a staggered upper ground floor level to accommodate the slope of the site. The lower ground floor level has been used as a series of small store rooms with direct access off the tunnel network beneath the site.

The limitations of the existing structure including column locations, floor levels, loading allowances etc. have led the design team to look at demolishing the existing structure and building new rather than retrofitting the existing.

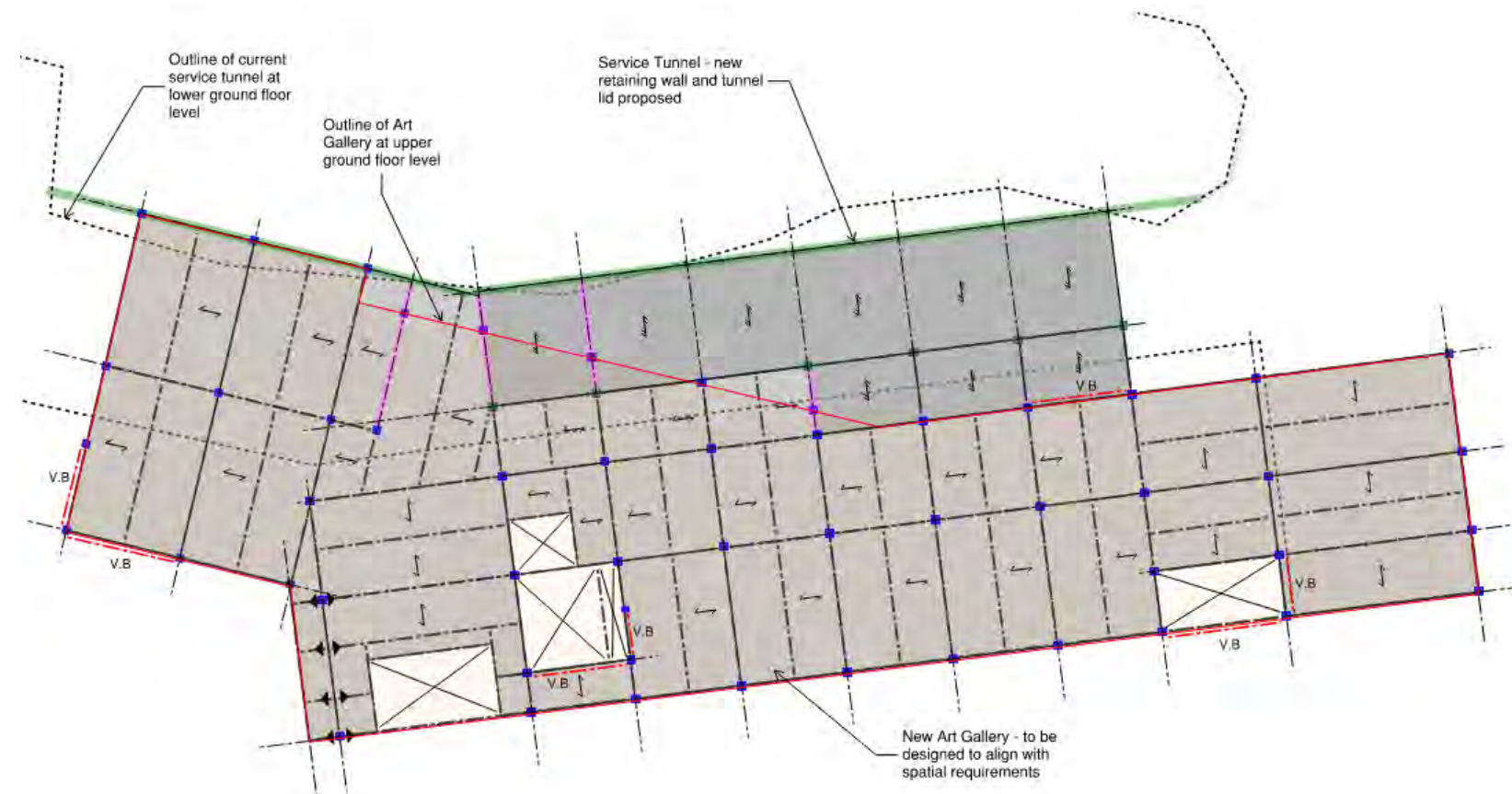
Current & Proposed Structure

The existing 2-storey building is formed of a reinforced concrete frame with concrete floor slabs on an approximate 4.5 x 4.0m structural grid. The tunnel lid structure is understood to consist of precast concrete planks spanning between the piazza frame and a retaining wall. Following a review of the feasibility of re-using the existing building, and the impacts it would have on the gallery space, it is proposed all structure in this area is to be demolished.

The new gallery will be a steel frame with concrete slabs on the lower levels, and timber slab at roof level. An alternative timber superstructure option will also be explored in Work Stage 3 in order to deliver a lower carbon solution.

Constraints

Several constraints exist on the site. The tunnel which runs adjacent to the gallery location is to be retained, and the proposed upper ground floor footprint of the new gallery is to partially bridge over this. The new gallery must therefore be designed to not hinder access within the tunnel beneath. The building will also be constructed on the site of the existing shopping piazza, which is to be demolished. The foundation and formation levels therefore need careful consideration to ensure the structural integrity of both the new and existing tunnel structures.



Structural general arrangement for the upper ground floor showing the service tunnel location and area the new gallery is built over this

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Library & Foodhall Structural Overview

Overview

The existing Queensgate market hall in the centre of the Cultural Heart development is to be refurbished to house a new Library and Food Hall.

The Grade II Listed building with an exposed concrete shell roof over the Market Hall is to be stripped back to the structure and refurbished. The library will be housed in the existing market offices and to provide the required space a small extension will be added.

Prior to extending the building, partial demolition will be undertaken to remove an existing basement that cannot accommodate the proposed external event space, and some existing roof structure.

To support the increased load a few existing columns in the lower ground floor are to be strengthened.

Constraints

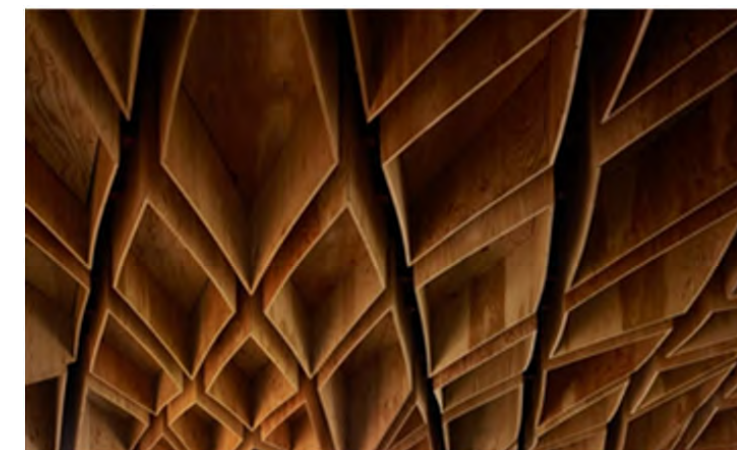
The development is constrained by:

- The listing of the structure as Grade II.
- Adjacent development areas for the Venue, MSCP, Gallery and external event space.
- The ring road and public footway to the east of the development.
- Two existing substations that are to be retained.

Proposed Structure

The new library structure will be a concrete and timber hybrid. This matches the depth of the existing structure and minimises embodied carbon.

The event space at second floor is envisaged to be a complete timber structure designed to express the special nature of this space.



Precedent Images for the Event Space: Clockwise from top right: Bunraku Puppet Theatre, Serpentine Pavilion 2005, Peter Hall Performing Arts Centre, Soma City - Home for All and Hoshakuji Station

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Venue & MSCP Structural Overview

Overview

On the site of the now-demolished car park at the southern end of the site between Alfred Street and Queensgate, the development of a new purpose-built 2200 capacity flexible venue is proposed that will provide facilities for music, entertainment, hospitality, conference and exhibition events and acts as a key part of the Cultural Heart, filling a gap in the market in the town and region, providing a valuable facility and attraction for both residents and visitors. It will provide a strong local and regional option for conference organisers, further enhancing the economic impact of the venue by increasing business tourism.

There are several configurations of the halls possible using operable walls between the two main halls.

Three approaches for how the MSCP and venue relate to each other have been considered during Stage 2. Architecturally, the preference was to progress with Approach 3, which sited the venue directly above the MSCP meaning the two facilities share the same structure. At this stage it is not known how the construction contracts are to be let. This requires careful consideration since the structural frame for the two facilities is shared; the MSCP at lower ground level and below and the venue at ground level and above.

It is proposed that the venue is a composite steel structure approximately 80m x 60m in plan. The proposed venue steps in at level 2, but below this, it is supported directly above the MSCP. The column grid around the perimeter of the MSCP is therefore dictated by the venue grid above.

The component parts are:

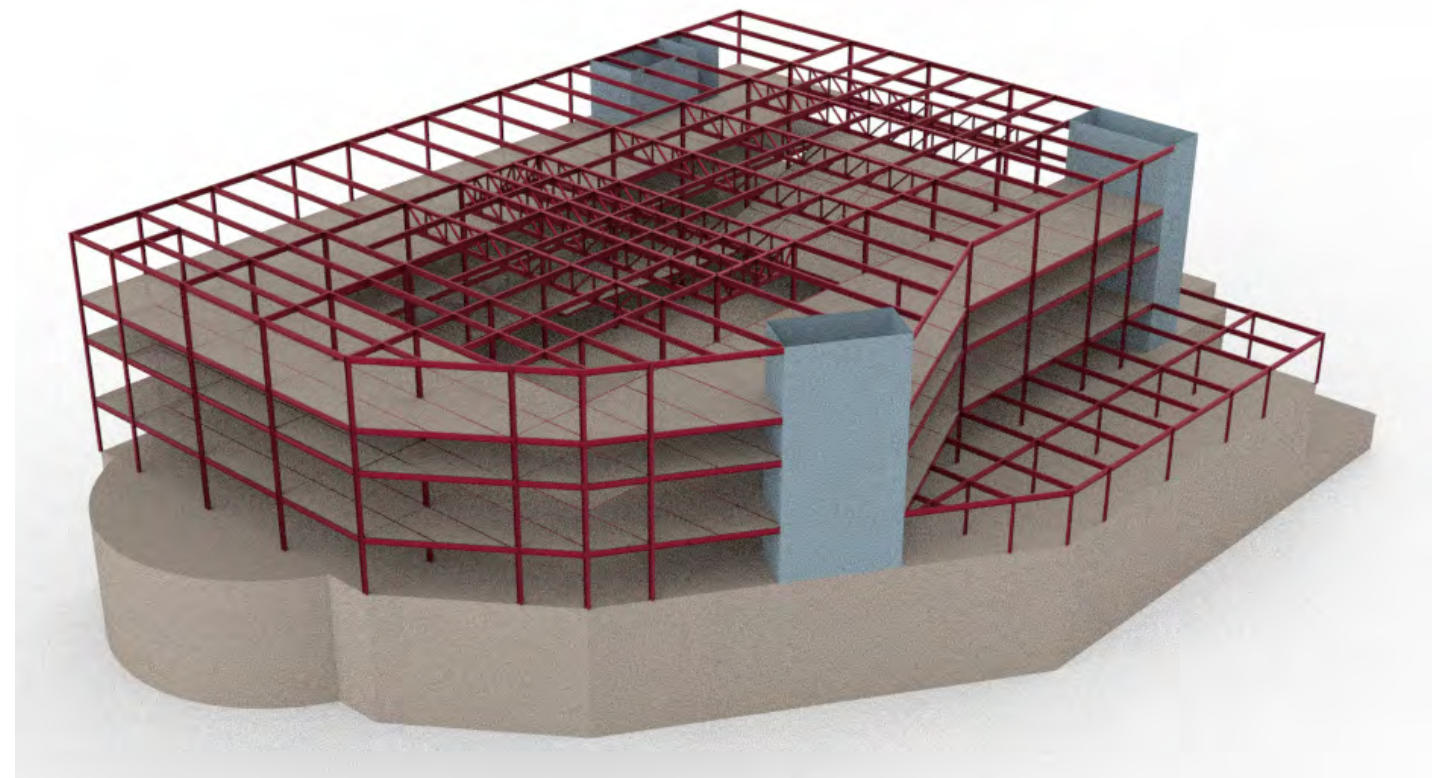
- Reinforced concrete raft foundation
- Reinforced concrete columns (MSCP)
- Steel columns (Venue)
- Reinforced concrete flat slab (MSCP)
- Composite steel and concrete floor plates (Venue)
- Steel trussed roof structure

Structural Design Aims

The primary aims of the structural design are to:

- Produce an economic design to suit the operator and architectural requirements.
- Facilitate fast construction methods through prefabrication.
- Integrate simply with the building services.
- Provide future flexibility layout for the operator's needs via careful consideration of the structural layout.
- Minimise the use of resources and the MSCP and venue's environmental impacts.

A number of alternatives have been explored to meet these aims and have resulted in the selection of a steel frame for the venue that can be largely prefabricated and quickly assembled. In the MSCP, the reinforced concrete flat slab structure utilises a square grid to maximise future flexibility in spatial planning and provides minimal structural depth to maximise clear floor-to-floor heights and provide free distribution of services along the flat soffit. The exposed concrete surface reduces the extent of follow-on trades, adding efficiency and sustainability benefits and providing inherent fire resistance.



3D View of MSCP with Venue above

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Tunnels & Site-wide Structural Overview

Overview

The existing basement and below ground service tunnel network across the site have been divided into five zones to record the Work Stage 2 proposals. These zones can be seen on the adjacent image.

Zone 1 – Existing Basement below the Queensgate Market

- Basement to be retained with alteration as required architecturally and for servicing.

Zone 2 – Existing internal slab to the proposed External Event Space

- Basement lid to be demolished and rebuilt for a higher load capacity

Zone 3 - Existing Piazza and site of New Gallery

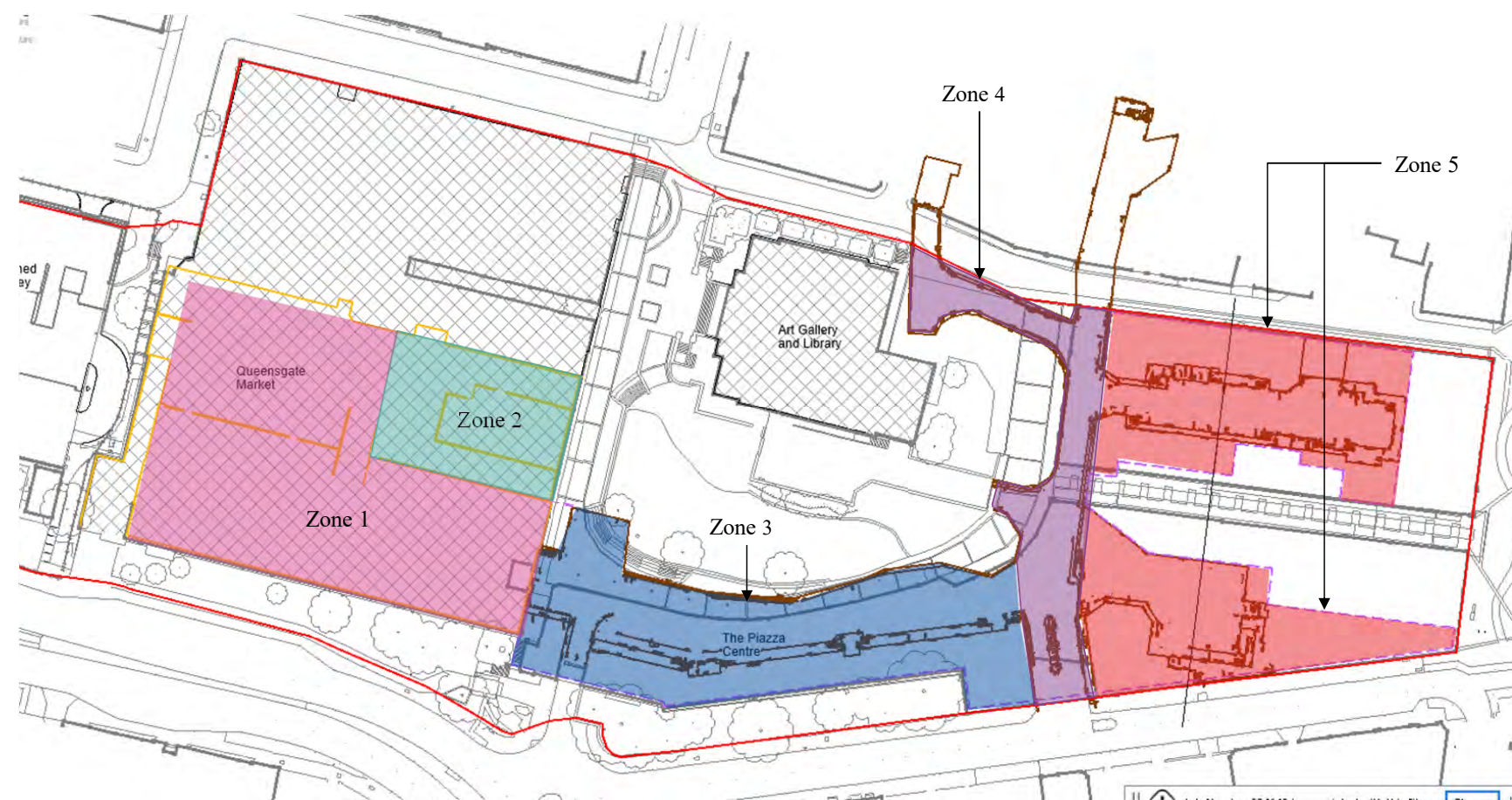
- Roof and supporting columns to be demolished
- Retaining wall and slab currently proposed to be demolished and rebuilt, however could be retained subject to results of intrusive investigation

Zone 4 – East West Service Tunnel

- Service tunnel to be retained, but the lid to be rebuilt for a higher load capacity

Zone 5 – New Park

- Existing basement to be demolished and infilled



Existing Basement – Division into zones

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Structural Sustainability

Structural Overview

Overview

Structural sustainability is primarily focussed on limiting embodied carbon - greenhouse gas emissions associated with the production and installation of construction materials and components. Our design philosophy therefore centres around minimising structural embodied carbon whilst still achieving the project brief and functional aims.

Pathway to Net Zero

The following list outlines the possible methods (from greatest to smallest impact) that structural embodied carbon can be limited. These are therefore the design principles which have been considered on the Cultural Heart in order to limit carbon emissions.

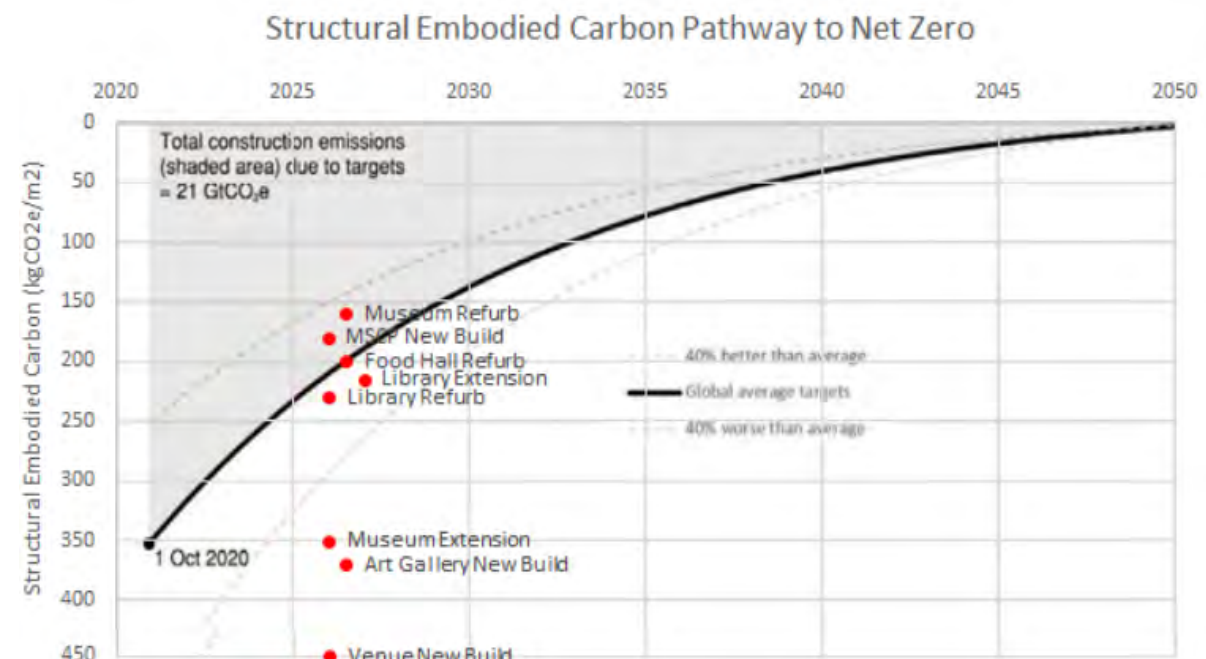
1. Re-use as much existing structure as possible.
2. Avoid building basements or retaining structure.
3. Keep design simple, avoid using transfer structures.
4. Use low carbon structural materials such as timber, and incorporate recycled materials into the design.
5. Avoid overdesigning. Do not design for higher loads than required and maximise element utilization.
6. Avoid long span structures. Aim for a 9x6m structural grid, or smaller.
7. Do not squash the structural zone, deeper beams are more efficient.
8. Use lightweight construction materials.
9. Use prefabrication where possible to minimize waste.
10. Design connections to be reversible to allow easy disassembly and re-use at the end of a building's life.

Carbon Targets

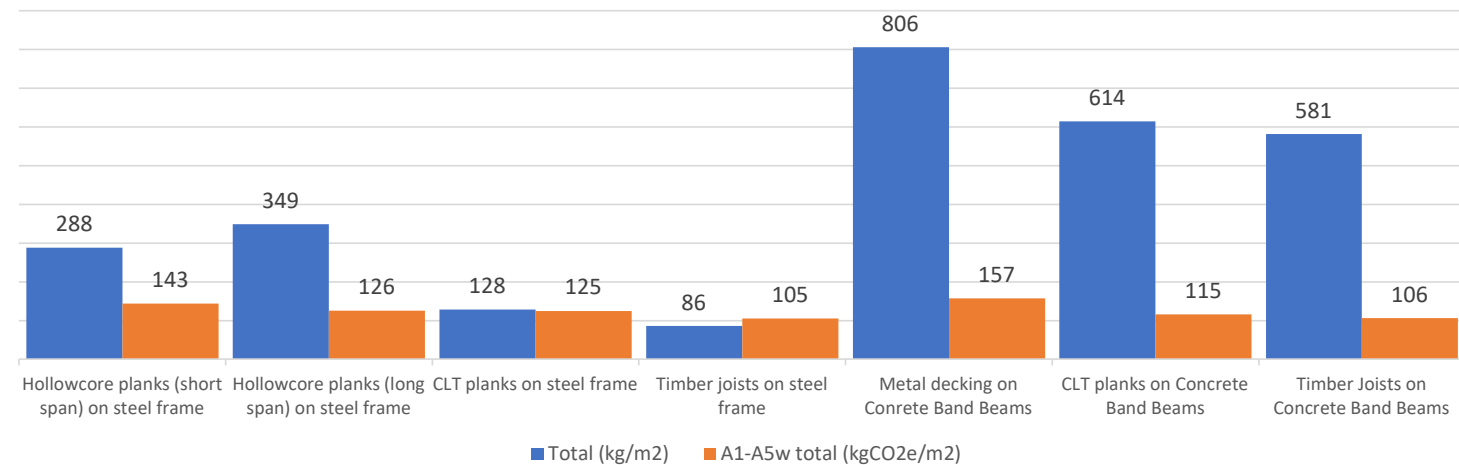
As well as providing design advice and recommendations for how carbon can be limited on the scheme, we have carried out carbon assessments of different structural options to help guide design decisions. The adjacent chart shows the embodied carbon for a series of structural solutions within the new library building. We are also actively investigating the incorporation of low carbon structural timber into the design, which is lightweight, and from a renewable source amongst other benefits.

Carbon targets have been set by the sustainability consultant and client. The structural component of these targets have been plotted against the estimated year of completion for each building in the adjacent graph. It can be seen that for the majority, these targets roughly align with the Institute of Structural Engineers Pathway to Net Zero which is based on a 50% probability of reaching net zero by 2050. For the other buildings, we will be actively aiming to deliver results with much lower carbon than the targets.

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Embodied carbon targets for the structure for each of the buildings plotted against the IStructE's suggested pathway to net zero



Comparison of embodied carbon of different structural options with the Library

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Key Design Criteria

Structural Overview

Design Standards

The design codes and standards that have been used are in accordance with current Building Regulations, Approved Documents and general best practice.

The following guides and Eurocodes have been used for the Work Stage 2 design. UK National Annexes and material and execution codes referenced in the Eurocodes will also be used for the structural design, as required.

- BS EN 1990 Basis of structural design
- BS EN 1991 Actions on structures
- BS EN 1992 Design of concrete structures
- BS EN 1993 Design of steel structures
- BS EN 1994 Design of composite steel & concrete structures
- BS EN 1995 Design of timber structures
- BS EN 1997 Geotechnical Design

Other Design References

- British Cement Association: Economic concrete frame elements
- SCI P354, 2009: Design of floors for vibration
- Concrete Centre: A Design Guide on Footfall Induced Vibration of Structures
- Department of Culture, Media and Sport's 'Guide to safety at sports grounds 6th edition', 2018.
- The NSCS for Building Construction, 4th edition
- The NSSS for Building Construction, 7th edition
- SCI Publication 076: Design Guide on the Vibration of Floors
- IStructE's Dynamic performance of permanent grandstands subject to crowd action
- C&CA TR 34 3rd Edition: Design of Concrete Slabs on Ground
- ICE Specification for Piling and Embedded Retaining Walls
- CIRIA Technical Note 107: Design for Movement in Buildings, Construction Industry Research and Information Association.

- CIRIA Technical Note 139: Water resisting basements, Construction Industry Research and Information Association
- CIRIA C580, 2003: Embedded Retaining Walls Guidance for Economic Design
- 'The Green Guide', Guide to Safety at Sports Grounds, 5th Edition, by Department for Culture Media and Sport

Robustness

Robustness refers to the ability of a building to sustain a limited amount of damage or failure without causing a collapse that is disproportionate to the causative event, i.e. damage to a small area of structure must not cause the collapse of a major area of the building. Buildings are categorised into risk classes depending on the size, number of storeys and type of occupancy. This risk classification determines the implications on the structural design.

The Building Regulations Approved Document A (2004 Edition) define the relevant building sensitivity risk groups as follows:

2A	• Public buildings less than 2 storeys and 2000m ² GIA /storey
2B	• Public buildings greater than 2 storeys but less than 5000m ² GIA /storey • Venues and Grandstands with less than 5000 capacity • Car parks less than 6 storeys

Design Life & Durability

The main structural elements of the building will be designed assuming a design life of 50 years.

Durability to concrete elements will be achieved by providing the minimum concrete grades and covers to reinforcement as recommended in BS EN 1992.

All structural steelwork will have a paint corrosion protection system to give a life to first major maintenance of 10-15 years compatible with sprayed intumescent fire protection to the required rating.

Any external timber exposed to rainfall will have a design life much less than 50 years, unless treated. All structural timber should have a regular inspection regime during its design life to ensure no damage has occurred.

Movements

Deflection of Floors

Floor beams generally	= span/360 under imposed load only
Floor beams generally	= span/200 under total SLS load
Transfer beams	= span/250 under total SLS load
Edge beams*	= span/500 under total SLS load

* No specific edge deflection criteria has been established. Some façade designs require a much stricter deflection limit of span/1000.

Horizontal Sway

The stability system will be designed to limit horizontal sway of the building to height/500.

Structural Vibration

Footfall induced vibration has been assessed using the guidance published in "A Design Guide for Footfall Induced Vibration of Structures (CCIP-016)"; Concrete Centre; Willford and Young 2006.

The targeted vibration performance of each of the structural systems in the different areas of the buildings varies depending on proposed use. In circulation areas and spaces of general use, the standard response factor R<8 is targeted. However, in some exhibition spaces a stricter response factor of R<4, has been targeted.

The auditorium bowl is to be designed to comply with 'Category 4: Extreme events excited crowd - includes jumping' in the 'Dynamic performance of permanent grandstands subject to crowd action', by the Institution of Structural Engineers.

Fire Resistance

The superstructure throughout the development is to be typically designed for 60 minutes fire resistance. Refer to the fire engineering drawings for drawings and further details.

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Outline Material Specifications

Structural Overview

Structural Steelwork Specification

To facilitate the easy reuse of the steelwork in the building the sections are to be hard stamped with their serial size and the mill certificates included in the health and safety file.

Site bolted connections will also be used, with welding avoided wherever possible.

The environmental impact of the steelwork could be reduced if water based corrosion protection is specified as this virtually eliminates the Volatile Organic Content (VOC) of the coating. Stipulation of these requirements may limit the choice of product and increase the overall cost of the steelwork.

Waterborne intumescent paint is more commonly supplied than waterborne corrosion protection systems. Specification of this is less likely to limit the suppliers or increase the cost of the protection system. Alternatively, it may be possible to adopt a fire-engineered approach to the steelwork and reduce or eliminate fire protection entirely.

All steelwork shall comply with “The National Structural Steelwork Specification for Building Construction” 7th edition, published by BCSA/SCI, as modified by the project steel specification.

UNO, steel grades shall be S355, designed to BS EN 1993 and delivered in accordance with BS EN 10025, 10210 or 10219 as applicable.

Steel of a density of 7,850kg/m³, and the following grade:

- Hot rolled sections (UKBs, UKCs) S355
- Hot rolled sections (PFCs, angles) S275
- Hollow sections (RHS, SHS, CHS) S355

All bolts to be Grade 8.8 in accordance with BS EN 1993.

Concrete Specification

All concrete shall comply with “The National Structural Concrete Specification for Building Construction” 4th edition, published by Concrete Centre/CONSTRUCT, complying with BS EN 13670:2009.

Unless noted otherwise, the concrete grades to BS EN 206-1 are:

- Blinding - Gen 1.
- Mass concrete fill - Gen 1.
- Normal weight concrete to substructure - C32/40
- Precast concrete elements – C50/60
- Columns and walls in MSCP / Venue – C40/50
- Normal weight concrete (density 2,500kg/m³), to typical upper floor - C32/40.

Note: Suffix ‘X’ denotes ASR resistant concrete.

For all concrete in contact with the ground, the mix shall comply with the requirements of BRE special digest 1 “Concrete in Aggressive Ground” for concrete grade DC-2. (sulphate Class DS-2, ACEC Class AC-2).

All concrete to use a minimum of 40% cement replacement, and use locally sourced aggregate

If the consistency in shade or finish of any exposed concrete is important, sample elements, or part-elements, could be cast in-situ for benchmarking.

All concrete is to be constructed to execution class 2.

Reinforcement in Concrete

All reinforcement to be high yield bar, typically grade 500B.

Timber Specification

All timber shall be obtained from well managed forests and should have PEFC or FSC chain of custody certification to demonstrate they have been sourced from sustainable sources.

All timber shall be graded to approval and marked accordingly.

The glulam members shall be manufactured to BS EN 14080, and adhesive to BS EN 301 capable of withstanding climatic conditions specified in BS EN 386 for Service Class 1. Tolerances shall be to BS EN 13474. At this stage, it should be assumed that the glulam wood species used is spruce, and all elements should be manufactured to ‘visible’ surface quality.

Unless noted otherwise, the glulam grade shall be GL32c.

Any cross-laminated timber (CLT) panels shall be manufactured using adhesive to BS EN 301 capable of withstanding climatic conditions specified in BS EN 386 for Service Class 1. They should also be manufactured to ‘visible’ surface quality. The panels are to be fabricated to the geometrical requirements of the space, with service penetrations formed, and edge joint profiles to suit the building services and architectural intent.

Unless noted otherwise, the CLT and any standard softwood timber shall be grade C24.

All timber elements are to be raised off the ground in the permanent case to minimise rot and insect attack.

All connections are to BS EN 14592, and bolt spacing, edge and end distances to BS EN 1995-1-1. Wane, splits, knots and other defects should be limited in the region of the connections.

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Reinforcement Rates for Reinforced Concrete Elements Structural Overview

Reinforcement Rates

Element	Rate kg/m ³
Beams	200
Flat Slabs	175
Ground Beams	175
Columns	400
Pad Foundations	100
Raft Foundation	200
Retaining Walls	225
Transfer Beams	250
Walls (Shear Walls and Cores)	125
Lift Pits and other pits	125
Ground Bearing Slabs	2 layers of A252 mesh

General Notes on Estimates

1. All reinforcement quantities are estimates and should, therefore be regarded as provisional.
2. All reinforcement estimates are indicative based on the design to date and an appropriate level of contingency should be allowed in the cost plan.
3. The reinforcement estimates provided are consistent with the level of design undertaken. Appropriate allowance should be made in the quantities for design development.
4. The extent of all concrete elements can be found on the structural drawings.
5. Estimates allow for main steel, laps and links only. Estimates do not allow for chairs, spacers and other such incidental bars.
6. All reinforcement is High Yield type 2 deformed bars.
7. All loose bar and mesh reinforcement to be grade B500 (min. ductility grade B).
8. All mesh reinforcement assumed to be provided with flying ends, min. 500mm both directions.
9. Folds, sumps, pits and troughs etc. to be allowed for separately.

Notes for Liner Wall and Capping Beam Estimates

1. The final design of the retaining walls (overall size and reinforcement quantity) dependent on the Contractor's proposed construction sequence. Changes may be required to suit the proposed method.
2. Reinforcement weights are based on the nominal thickness of the elements.

Notes on Measure

1. Columns and walls should be measured from SSL to SSL (reinforcement continues through slabs).
2. Slabs should be measured through walls and beams (reinforcement continues through walls and columns).
3. Downstand beams should be measured from top of slab level (SSL).
4. The reinforcement estimates assume reinforcement is lapped in accordance with EC2.

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Key Project Risks & Next Steps

Structural Overview

Project Risks

- Ground conditions. Mitigation – Ground Investigation.
- Existing structure durability. Mitigation – intrusive investigation.
- Asbestos. We understand further survey work is required and being procured by Kirklees Council. This will need to be competed and reported before other intrusive investigations are undertaken. Or targeted investigations undertaken, or advice provided on the areas proposed for intrusive investigation.
- Dimensional survey not complete. Mitigation – survey on going to programme.
- Primary structure in timber. Mitigation – consultation with the council’s insurers.
- Venue seating system dynamics – vibration analysis to be carried out.
- Existing basement walls along Alfred Street and Queensgate retains the highway above. To safely retain the highways and buried services within the footpaths, temporary support has been identified by Wilde Consulting Engineers - temporary support will need to be considered in the design and construction of the permanent structural elements.

Project Opportunities

- Enabling works contract to reduce project risk?
- Relatively well-developed concept and limited work to the existing building. Could the Library and Food Hall be brought forward?
- Using steel as the primary structure to reduce weight but noting the additional complexity of integrating the services.
- Foundation design optimisation based on outcomes of ground investigation.
- Optimisation of venue roof truss.
- Optimisation of element sizing.
- Review the opportunity for complete timber frames to the Library, Museum and Gallery to avoid wet trades, reduce interfaces and minimise embodied carbon.

CDM

- Ground conditions.
- Deleterious materials - Lead paint, anthrax spores, RAAC

Next Steps

Our immediate next steps are:

- Obtain copies of drawings held by WYAS.
- Tender intrusive investigations.
- Receive tenders for the Ground Investigation and appoint the Contractor.

Consultation

There are some areas that would benefit from further consultation, early in Work Stage 3. These items are:

- Kirklees Council Insurers regarding timber as part of the primary structure.
- Stakeholder groups on the required structural load capacities in each building.
- Main Contractor engagement on logistics and preferred methods of working.
- Trade Contractor consultation on specific methods and costs.

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ARUP

MEP Engineering

MEP Engineering Executive Summary

Mechanical, Electrical and Public (MEP) design for 'RIBA Work Stage 2 for the Kirklees Cultural Heart has been summarised below. It is supported by multiple reports and design notes. Please refer to these for further information.

The purpose of this summary and accompanying documents is to provide a high level summary for stakeholder approval. It should be used by Kirklees Council to ensure that the proposals detailed within meet their requirements.

Utilities

Five new substations are planned. We have been liaising with SSE as an Independent Distribution Network Operator (IDNO) for the scheme. Substations will range from 1 MVA to 2 MVA. The existing substations will either remain (due to them feeding supplies outside of the site boundary) or will be decommissioned. Consultation with Northern Power Grid (NPG) is ongoing. New mains cold water supplies will be provided for each building. A development enquiry has been lodged with Yorkshire Water. There will be no natural gas connections.

Energy Strategy

During Work Stage 2, we have explored both centralised and decentralised plant configurations for heating and cooling purposes. A centralised configuration was initially recommended namely due to the space constraints at roof level. Alongside this, we have appraised both heating and cooling sources. This included energy consumption, cost and associated carbon. The appraisal included the planned District Heat Network and numerous heat pump technologies. A decision was reached on 05/05/2022 by Kirklees Council for each building to connect to the planned district heat network. Plant configuration should be decentralised for heating/cooling purposes. The design should also progress with secondary heating options (i.e.

not solely reliant on the district heat network).

Part L

Initial Part L analysis has been undertaken based on conceptual details. All buildings achieved a pass. There is a new version of Part L that comes into effect on the 15th of June. Modelling software is currently in testing and therefore the scheme has been modelled based on the previous version. This remains an active project risk. Modelling against the new methodology will be prioritised as soon as software permits.

Site-Wide Integration

Aspects of the MEP services require a more sitewide approach.

In terms of fire suppression – all buildings will be fed via a centralised sprinkler tank and pump set. This will likely be positioned within the Service Tunnel.

CCTV will primarily be controlled via each building. However, through data loggers, the CCTV system(s) will have the ability to interface with the Huddersfield Town Centre CCTV Central Monitoring Station. Any public realm CCTV will be connected directly to town centre monitoring.

Each building will have its own standalone fire alarm system that can be independently maintained and tested. The fire alarm systems will require a considered approach in terms of interfacing. Interfaces will be necessary to provide notification of fire to adjacent or adjoining buildings. The specific requirements will be developed during the next stage of design in collaboration with the fire engineer.

Each building will include intelligent building management and metering systems. The ability to bill tenants or operators will be developed further during the next stage of design.

MEP Servicing Strategies

All buildings will incorporate photovoltaic panels. The exact arrays will vary per building and will be sized based on sustainability targets.

The **Library** will be mechanically ventilated. Noting, natural ventilation remains an open option to be explored further during the next stage of design. Air handling plant will deliver minimum fresh air (supply and extract) to terminal units that will ultimately condition each space. The terminal units will be coupled with the building low temperature hot and chilled water systems. Close control will be provided to the WYAS zones via an air handling unit featuring strict temperature and humidity control. Power will originate from a shared sub-station and the building will be supplied from local distribution boards fed from a central switchroom. LED lighting will be provided throughout with intelligent lighting control. The building will include an automatic fire detection system, CCTV and access control. Data and wi-fi will be distributed from a central comms room. Potable cold water will originate from a storage tank in the service tunnel. Hot water will be via electric point of use heaters. The roof will incorporate a 'blue roof' rainwater drainage system.

The **Venue** will be a fully sealed mechanically ventilated building. The main event hall(s) will be served by dedicated air handling units, with the ability to segregate each hall. Air will condition the space, entering at high level. All surrounding spaces (foyer, offices and VIP areas etc.) will be provided with minimum fresh air (supply and extract). Terminal units will ultimately condition each space, coupled with the building low temperature hot and chilled water systems. An air transfer arrangement will provide additional make-up to foyer and WCs from the event hall. Food and beverage areas will be provided with dedicated supply air and kitchen extract

systems. The Venue will have a dedicated sub-station. From the main switchboard at ground level, supplies will be taken to distribution boards at each floor level. LED lighting will be provided throughout with intelligent lighting control. The building will include an automatic fire detection system, CCTV and access control. Data and wi-fi will be distributed from a number of comms room. Potable cold water will originate from a storage tank in the service tunnel. Hot water will be via electric point of use heaters. The roof will incorporate a 'blue roof' rainwater drainage system.

The **Multi-Storey Car Park** (MSCP) will incorporate a hybrid ventilation system. Fresh air will be pulled in via the entrance and surrounding façade. Dedicated extract fans will extract fumes/smoke into the atmosphere. Impulse fans will be utilised to push air toward the extraction points. No heating and cooling will be provided. The building will include a dedicated sub-station. Electric Vehicle Charging Points will be provided to 20% of the spaces. The building will be 'cable enabled' (as defined by Part S) for 100% EV charging. LED lighting will be provided throughout with intelligent lighting control. The building will include an automatic fire detection system, CCTV and access control. Data and wi-fi will be distributed from a central comms room. Potable water is not proposed.

MEP Engineering
Executive Summary

MEP Servicing Strategies (Cont.)

The **Food Hall** will be mainly naturally ventilated. This includes the seating area. The stalls will be mechanically ventilated with conditioned supply air and kitchen extract ventilation. Heat will be provided through low-temperature hot water via underfloor heating and perimeter trench heaters/door air curtains. Local mechanical extract will be provided to all ancillary spaces such as WC, Pot Wash etc. The Food Hall will have a dedicated sub-station. Power will distribute from a switchroom within the Service Tunnel. Stalls will be fed via an overhead busbar system. LED lighting will be provided throughout with intelligent lighting control. Specialist lighting will highlight the historic roof structure (along with other key features). The building will include an automatic fire detection system, CCTV and access control. Data and wi-fi will be distributed from a central comms room. Potable cold water to each stall will be via a manifold arrangement. Each supply will incorporate a dedicated utility meter. Hot water will be via electric point of use heaters. Pot washing will likely entail a local hot cylinder with an immersion heater.

The **Museum** will be mechanically ventilated. Air handling plant will deliver minimum fresh air (supply and extract) to terminal units that will ultimately condition each space. The terminal units will be coupled with the building low temperature hot and chilled water systems. Close control will be provided to GIS Areas via dedicated air handling units featuring strict temperature and humidity control. Power will originate from a dedicated sub-station and the building will be supplied from local distribution boards fed from a central switchroom. LED lighting will be provided throughout with intelligent lighting control. The building will include an automatic fire detection system, CCTV and access control. Data and wi-fi will be distributed from a central comms room.

Potable cold water will originate from a storage tank at ground level. Hot water will be via electric point of use heaters.

The **Art Gallery** will be a fully sealed mechanically ventilated building. The galleries will be closely controlled via dedicated air handling units, to GIS Standards, featuring strict temperature and humidity control. The remaining areas will be ventilated via local ventilation units coupled to the building façade and treated by terminal units. The terminal units will be coupled with the building low temperature hot and chilled water systems. Power will originate from a shared sub-station and the building will be supplied from local distribution boards fed from a central switchroom. LED lighting will be provided throughout with intelligent lighting control. The building will include an automatic fire detection system, CCTV and access control. Data and wi-fi will be distributed from a central comms room. Potable cold water will originate from a storage tank on the lower ground floor. Hot water will be via electric point of use heaters. The roof will incorporate a 'blue roof' rainwater drainage system.

The **Service Tunnels** will incorporate a hybrid ventilation system. Fresh air will be pulled in via the entrances and surrounding façade. Dedicated extract fans will extract fumes/smoke into the atmosphere. Impulse fans will be utilised to push air toward the extraction points. Generally, no heating and cooling will be provided. With the exception of plant areas – where frost protection will be provided. Power will originate from a shared sub-station and the tunnels will be supplied from local distribution boards fed from a central switchroom. LED lighting will be provided throughout with intelligent lighting control. The tunnels will include an automatic fire detection system, CCTV and access control.

Public Realm Lighting Strategy Summary
 Executive Summary

SUMMARY

Public Realm Lighting

Introduction

The quality of experience in the public realm is as important after dark as it is during the daylight hours. The provision of an appropriate lighting scheme will be a key determinant of the success of the overall vision for the Kirklees Cultural Heart (KCH) Project.

This section outlines the proposed approach to the public realm lighting strategy for the KCH Project that will be considered during WS3 of the project. The KCH Project consists of a number of new and renovated existing structures connected via a new public realm landscape and even space.

Lighting philosophy

Without good quality lighting urban spaces often become confusing and disorientating; the texture and colour of materials is lost and the character becomes hostile and uninviting. A clear understanding of the shape and scale of spaces, their mood and atmosphere, textures and colours are therefore critical during the hours of darkness – not only so that people can ‘see’ but also so they can enjoy their environment.

The approach to the external lighting design will focus on the quality of the overall experience, not only for visitors to the venues, but also uses moving through the space. The design will be developed to consider careful integration of the light with the various streetscape, landscape and architectural features within.

The lighting design philosophy is captured by the following core objectives:

- Identity
- Placemaking
- Legibility
- Sustainability

- Safety
- Longevity

The sections below provide further information and illustrate how these core objectives are envisioned to be achieved in the context of the varying areas and opportunities that can be developed as part of KCH regeneration strategy.

Kirklees cultural heart lighting experience

The lighting masterplan will be developed to capture the unique qualities of the existing and proposed development:

- Compact urban form
- Friendly Environment
- Landmark structures
- Landscape setting
- External event space

It is the ambition of the lighting masterplan to help accentuate and elucidate these distinctive flavours for both residents and visitors to KCH.

The illuminated experience is crucial in delivering a positive experience lighting character embracing the lighting philosophies outlined above will help to reinforce the identity and functionality. In particular the following elements will inform the development:

- Highlighting of historical facades of the renovated Museum and unique form of the Foodhall and Library structure - reinforcing the identity of the town by drawing attention to the unique fabric and heritage of the city.
- Consider the visual presence of the venue from beyond the site
- Layering of lit facades - further reinforcing the compactness and urban form of the site, while

- providing a legibility to allow users to orientate themselves within their surroundings.
- The considered use of lighting equipment styles - complementing the variety of architectural aesthetics to support key placemaking strategies.

Design principles and approach

A layered approach will be utilised to inform a consistent overarching design of lighting within the development. The considered application of lighting layers in conjunction with a cohesive lighting strategy to individual character areas will reinforce their unique identities while creating legible and safe environments throughout the development.

The three key layers of light to be considered and developed at the next stage are are:

- Ambient horizontal illumination
- Ambient vertical illumination
- Accent illumination

Operating modes

We anticipate the Kirklees Cultural Heart public realm will have has three different operating modes:

- Event Mode - Venue - High pedestrian movement using the venue main entry points and dwelling/queuing in the public areas and increased foot fall around the food court and public realm.
- Event Mode - Event Space - High pedestrian usage within the external event space, high footfall in and around the public realm and the food court.
- Non-event Mode - Minimal pedestrian footfall related directly to the venue. The public realm becomes a more transient space.

The KCH lighting strategy will provide defined lit spaces

that respond to their use, encouraging the public to stop and relax. It will provide visual assistance to identify routes, allowing destinations to be reached in comfort.

Playful and event day lighting

An overlay layer of lighting will be considered during the next phase of design, to provide an element of play and interaction with the community, both during the daylight hours and after dark. This lighting over lay is intended to:

- Facilitate temporary event and seasonal usage, flexible lighting provision and control to curate the lit environment
- Creation of dynamic and interactive lit spaces at night.
- Adding playfulness to feature lighting elements e.g. tree lighting
- Linking the community together with communication via light
- Serendipitous play to give more character to transition spaces and engaging a broader range of demographics.
- Providing canvas for artistic interventions and festivals

To deliver these aspirations, different types of play interventions will be considered as part of the lighting strategy, these may include:

- Passive interactive projects on to the floor in targeted areas
- Dynamic face lighting/fountain lighting to support temporary and civic events and broader communication with visitors to KCH.
- Playful interactive street furniture - permanent playful artist developed digital interventions along key routes, to introduce colour at a pedestrian scale and encourage ‘play-on-the-way’ with young and old alike.

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ARUP

Facade Engineering

Kirklees Cultural Heart Arup Stage 2 Executive Summary Report
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Façade Engineering Executive Summary

General (all buildings)

Key inputs provided

- Embodied carbon assessment of different façade options for all the buildings, including whole life carbon (A1-A5, B4 and C) and A1-A5 stages only;
- Thermal performance considerations for different façade options;
- Airtightness considerations;
- Comments on energy performance requirements of the new and existing fabric;

Summary of findings

The following recommendations should be considered to minimise embodied carbon of the new facades:

- Timber framing for curtain walling and SFS or CLT backing walls for opaque walls are recommended;
- Curtain walling generally presents higher carbon content and U-values compared to opaque walls with punched openings;
- Addition of post fixed insulation to curtain walling has a lower embodied carbon impact than alternative/additional options (e.g. triple glazing), whilst considerably reducing the overall U-value;
- If aluminium framing is to be used, a high recycled content is recommended (up to 93%) to minimise embodied carbon.

Thermally performing curtain wall systems (U-value < 0.9 W/m2K) can be achieved only via extensive opaque spandrel areas (>50%) and with triple glass units and/or post-fixed insulations (300-400 mm deep);

We understand that the airtightness target of 1 m³/(h·m2) @ 50Pa is being considered for the project. This is a challenging requirement which will involve a continuous vapour control line, perfect sealing between façade junctions/penetrations and rigorous monitoring of workmanship on site;

We understand that the airtightness target of 3 m³/(h·m2) @ 50Pa is being considered for the Museum (former library). This is requirement may be met only by enhancing the existing windows (e.g. secondary glazing), retrofitting the existing walls and compartmenting the penetrations (e.g. existing ventilation channels etc.).

Museum (former Library)

Key inputs provided

- Desktop study of existing facades via historic drawings/details;
- Outline specification for intrusive inspection of the existing facades;
- Preliminary thermal performance assessments of the existing walls and of possible retrofit options;
- Options for enhancement of existing windows;
- Evaluated hygro-thermal risks associated with retrofit options;
- A&M considerations of the existing building.

Summary of findings

The hygro-thermal behaviour of walls with inner wall insulation may be critical and may lead to risks of frosting and interstitial water accumulation. Further bespoke detailed analysis have been proposed to Kirklees for evaluation. A step-by-step approach has been described, involving computer simulations, material sampling/testing and site measurements;

Secondary windows are recommended to enhance thermal and weathertightness performance of the existing glazing. The U-value of secondary windows may range between 0.85 W/m2K (triple glazed units) to 1.6 W/m2K (double glazed units) and it is influenced by the required level of ventilation in the cavity created by the existing windows and the new ones;

The thermal performance of the existing walls has been preliminary calculated to be U-value = 1.95 W/m2K; possible retrofit options have been considered and the U-value range achievable is between 0.6 and 0.75 W/m2K, depending on different levels of retrofitting and

extensions of the internal insulation;

The existing steel columns may present an ongoing corrosion process which is the cause of the displacements currently observed in some of the stone cladding units (regent street disease). Intrusive inspections are recommended to survey this condition, refer to Section 4 of the Façade Stage 2 report;

Façade Access: There are many non-compliant or dangerous access issues regarding the existing roof access, many of these will be resolved for the new development of the roof.

Food Hall and New Library (former Queensgate Market)

Key inputs provided

- Desktop study of existing facades via historic drawings/details;
- Draft outline specification for intrusive inspection of the existing facades (still under discussion);
- Preliminary sizing of the new glazed facades;
- Structural and movements considerations;
- Solar radiation analysis of the new and existing glazed facades;
- Options to enhance the existing glazed areas;
- A&M considerations of the existing building and outline strategy for A&M.

Summary of findings

The clerestory glazing contribute significantly to the overall solar gains of the spaces (>40% of the total solar gains). Optimum solar radiations in the Food Hall can be achieved by installing new glazed units and upgrading the existing glazing to meet a g-value of 0.4. Alternatively, solar shadings can be explored in the next stages. Optimum solar radiations in the New Library can be met by minimising glass/wall ratios to 40% for the second floor or 60% for the remaining parts of the building respectively. A minimum g-value of 0.4 should also be met;

The existing clerestory glazing and curtain walling can be improved to enhance their thermal, weathertightness and solar performances. To note that the current glazing system presents inherent flaws in the assembly detailing which have resulted in periods of water ingress. The resolution of these details is constrained by the original design but improvements are possible. Different options are evaluated within Section 7 of the Façade Stage 2 report. Full replacement guarantees better performance, but a higher carbon and heritage impact, while a refurbishment/enhancement of the existing framing would have a lower carbon impact. The selection of the optimum option is heavily affected by the critical target/s selected by the Client for this space (e.g. thermal comfort of building users, heritage, sustainability etc.);

The new curtain walling at the ground floor of the Food Hall is recommended to be stacking on the floor and laterally restrained to the existing roof shells at the top, to minimise sizes and carbon. The effects on the movements generated by the additional load on the shells will be analysed. The glass panels are recommended to be no taller than 2-3 m, to facilitate procurement and installation, and accommodate relative movements. Double mullions are recommended at the interfaces between roof shells, to allow for differential movements. A concertina gasket detail will be developed to accommodate the relative movements;

The support strategy and condition of different existing façade types is to be explored at the next stage (e.g. ceramic mosaics, curtain walls at East elevation, clerestory glazing etc.). Intrusive inspections are planned to survey these elements, refer to Section 3 of the Façade Stage 2 report for detailed mark-up of locations;

- Façade Access: The main roof appears to have an existing strategy for access. Investigation is needed to establish the suitability of this solution, the force that can be exerted and the current testing and compliance.

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Façade Engineering

Next steps, Key Assumptions & Information required

Next steps

General (all buildings)

- Refined embodied carbon assessment of different façade options for all the buildings, including both whole life carbon (A1-A5, B4 and C) and A1-A5 stages only;
- Matrix of the façade types;
- Outline Specifications;
- A&M strategy;
- Building Physics Analysis of key details/junctions;
- Assist the Design Team to define performance targets for the buildings' fabric;
- Additional Arup Solar analysis as required to define optimum glazing strategy;
- Preliminary structural sizing and movements considerations;
- Assist the Architect in developing the technical design of the facades;
- Review of Architect's drawings.

Museum (former Library)

- Detailed hygro-thermal analysis of the existing walls and evaluation of different retrofit options, once approved by Kirklees;
- Intrusive inspections of the existing walls and report of findings;
- Definition of enhancement strategy for the existing windows;
- Definition of new façade types (for the building extension).

Food Hall and New Library (former Queensgate Market)

- Intrusive inspections of the existing walls and report of

findings;

- Definition of enhancement strategy for the existing clerestory windows and curtain walling;
- Definition of new façade types (for the building extension and new parts of the buildings);
- Review existing documentation for the roof anchors or insurance inspections records. Carry out test of anchors to determine if they can be reused in a new strategy;

Venue & Gallery

- Definition of façade types;
- Review the performance requirements of the facades.

Key assumptions made during Stage 2

- Existing facades of Queensgate Market and Library as per indicated in historic drawings and Architectural documentation;
- Materials, finishes and dimensions of facades as per Architectural documentation;
- Except from locations where obvious signs of deterioration are visible, the general condition of the existing façade is assumed to be in good state (provided further intrusive inspections during next stage).

Information required

The following outlines the information and decisions required to progress the fire strategy at the next design stage:

- Coordination and input into Façade Specifications from different disciplines within Arup. In particular:
 - Structural Consultant;
 - MEP Consultant;
 - Acoustic Consultant;
 - Fire Consultant;
 - Sustainability Consultant;
 - Security Consultant.
- Architectural intent drawings and materials;
- Hygrothermal analysis scope extension approval from Kirklees for the Museum (former Library);
- Conservation approvals for key decisions (e.g. re-roofing of the former Library, extension of re-glazing of conservatory windows to the former Market Hall etc.);
- Access for inspections;
- Historic information from archives (i.e. WYAS);
- Instruction for eventual material tastings;
- Salvage for materials and reuse scope extension;
- Access to anchors at roof shell level of Queensgate Market and existing documentation for the roof anchors (if any available).

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ARUP

Fire Engineering

Kirklees Cultural Heart Arup Stage 2 Executive Summary Report
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Fire Engineering Strategy Executive Summary

Executive Summary

Arup has been appointed by Kirklees City Council to develop a fire strategy to support the design of the Kirklees Cultural Heart (KCH) scheme design located in Huddersfield Town Centre.

The fire strategy document along with the Fire Strategy mark-ups in the appendix outline the principles of the Stage 2 fire safety design for the scheme.

The KCH masterplan consists of a number of new and existing buildings, i.e. Foodhall, Library, Museum, Gallery, Venue and Multi Storey Car Park (MSCP). The site also has an underground service tunnel that is accessed by back of house staff and services the different areas of the development.

The fire strategy has been developed to satisfy the functional life safety objectives of Part B of the Building Regulations 2010. To achieve this, the buildings have been assessed in accordance with the recommendations of BS 9999:2017.

At this stage no additional property/business continuity and/or Insurer/Client requirements have been identified which may require fire safety provisions in excess of those needed to meet the minimum life safety requirements of the Building Regulations. These will need to be clarified with the Client at the start of next design stage.

The following points summarise the key fire safety design features of the development.

- Each building is expected to evacuate independently from one another. In the event of a fire in one building, a simultaneous evacuation of that building only will occur. For instance, for a fire in the Gallery, only the occupants within the Gallery will evacuate. All adjacent buildings and the tunnel will be provided with a notification on their respective fire alarm panels to inform the staff in those areas of a fire scenario in an adjacent building. This strategy is facilitated by the compartmentation (fire resisting construction) provided between the different buildings. This will reduce the disruption to business operations in the other buildings. The tunnel has been provided with fire compartmentation separating it from all buildings/accommodation. On this basis, in the event of a fire scenario in the tunnel, only the tunnel will evacuate;
- All buildings including the tunnel are to be served by an L1 category automatic fire detection and alarm system in line with BS 5839-1, equipped with voice alarm (PAVA in the Museum, Foodhall, Library and Venue, and voice chip sounders in the Gallery, MSCP and tunnel);
- The populations in each building (other than Venue) have been calculated using suitable floor space factors in line with BS 9999. These are to be further discussed and agreed with the Client and design team. The means of escape assessment that has been undertaken for each building provides the number of stairs/exits and their widths to accommodate the required populations. These are outlined in the respective Fire strategy mark-ups in the appendix;
- Disabled refuges and Emergency Voice Communication facilities are to be provided within each staircore and where exits are stepped to assist with the evacuation of mobility impaired occupants. In addition to the above minimum provision, it is recommended that evacuation lifts be provided in each building to assist the management with the evacuation of mobility impaired occupants;
- Where there are voids/openings present in buildings, all fire escapes and storey exits should either be away from openings/voids or the occupants escaping should not have to pass within 4.5m of the opening/void if that is their

only escape route. Where this can't be achieved, additional measures such as separating the void from accommodation by a physical barrier (fire-resisting and/or smoke-retarding construction), introduction of a smoke control system or introduction of smoke down stands will need to be explored at the next design stage;

- Sprinklers (designed in line with BS EN 12845 and any other Client Insurer requirements) are recommended throughout each building as this provides several benefits to the fire strategy of each building. Sprinklers would reduce the risk profile of each building, thereby benefiting the design of the fire strategy and making the fire safety provisions become less onerous. A few examples of these are increased travel distances, reduction in the number of exits, and the required door/exit widths, reduction in the fire resistance of elements of structure and compartmentation, reduction in the amount of fire rated façade required and design flexibility with the use timber structures in the Museum, Gallery and Venue buildings etc. A sprinkler tank could be provided per building, or as a centralised tank that can serve all the buildings on site. The preferred method is to be agreed with the Client.
- Where there are kitchens with open/naked flames and catering facilities, they need to be either enclosed in fire resisting construction or be provided with local suppression for each kitchen canopy;
- Compartmentation has been provided between interconnected buildings currently (e.g., Foodhall and Library, Venue and MSCP etc.) on the basis that the different buildings are treated as separate evacuation zones. This is to be agreed with the Client (see Item 1 above);
- A 60-minute period of structural fire resistance is required for all buildings except for the Library building which requires a 90-minute period of structural fire resistance. This could be reduced to 60-minute period with the provision of sprinklers in the Library;
- Compartment floors are not required to separate the individual floors within the building as all buildings are below 30m in height, however compartment floors are required to be provided where basements are to be separated from above ground floors. They may also be required to reduce the extent of fire resisting façade required in buildings. This will be reviewed further at the next design stage;
- An initial external fire spread assessment has been undertaken to determine the extent of fire rated façade needed in each building. For all buildings, the assessment has been undertaken without the provision of compartment floors. For the Venue, this has also been undertaken with compartment floors. The results of the external fire spread assessment are identified in the external fire spread section of the *Fire strategy mark-ups* in the appendix;
- The provision of firefighting shafts and other fire service facilities required for each individual building are detailed on the respective Fire strategy mark-ups in the appendix;
- Smoke ventilation will be required in firefighting stairs and firefighting lobbies (where ventilation cannot be provided via natural means, mechanical smoke shafts will be required), buildings with voids/atria, service tunnel, loading bays, MSCP and in basements storey that have a floor area more than 200m², or a floor more than 3m below the adjacent ground level.
- Fire hydrants should be provided within 90m of dry fire main inlets on a route suitable for laying a hose. Where existing hydrants are not available, an arrangement for new hydrants will need to be discussed and agreed with Yorkshire Water.

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ARUP

Venue Consultancy

Venue Design Executive Summary

Summary

This section summarises the proposed concepts for specialist performance technical systems for the venue, consisting of Production (Event) Lighting (PL) and Production (Event) Sound, Video and Communications (PS).

Scope

The scope covers design of installed and loose specialist performance technical equipment systems (Production (Event) Lighting (PL) and Production (Event) Sound, Video and Communications (PS)) for event-related spaces in the Venue. There are some scope gaps identified in the Stage 2 report, which will be reviewed with the rest of the project team prior to commencement of Stage 3.

Assumptions on uses

We have based our design on the stated Purpose of the Facilities in Kirklees Cultural Heart Venue Facilities Document.

- (2.3) "... flexible to accommodate a wide variety of events and respond to future trends and requirements locally, nationally and internationally ..."
- (2.4) "... flexible venue with capacities ranging from 600 to 2,200 people ..."
- (2.5) "... provide facilities for music, entertainment, hospitality, conference and exhibition events ..."

We have made the following additional assumptions that:

- Music events will be amplified. The venue will not host professional orchestras or other acoustic music events
- Touring entertainment will not require complex flow scenery or staging
- The Operator will maintain a small permanent

technical crew capable of both supporting small scale events and supporting incoming rental event teams

- The Operator will hold a permanent stock of in-house lighting, sound, video and communications equipment sufficient to support mid-scale events without the need for significant equipment rental.

Production Lighting

The venues will require a number of separate but coordinated lighting systems for setup, during and after events:

- **Production (event) lighting**, to light the stage for events.
- **Architectural lighting**, including dimmable houselights to illuminate the space as audience enter.
- **Emergency lighting** to meet code requirements, but designed to provide minimum distraction to the audience and performers.
- **White worklight** used for maintenance, set up and cleaning.
- **Low level ("blue") performance worklight** used to illuminate backstage tasks and for way-finding during performance.

Production Sound, Video and Communications

Specialised audio systems are required to support performances, and include facilities for:

- Performer sound reinforcement
- Music and soundtrack replay
- Audience announcements

- Recording

Supported by an extensive infrastructure, installed and demountable loudspeakers will be located throughout the performance spaces.

Video displays will be used to support performances and events. These include emissive (LED) displays and projection screens.

Centrally located video servers and central equipment are used to manage distribute video content, with associated control and missing consoles located in control rooms.

The recording, streaming and broadcast systems outlined above will include installed and relocatable cameras which will be used in conjunction with the video systems infrastructure. These will link with production systems for integration of live video with performance.

Video projectors, projection screens and displays

Good quality, high output video capability is required in the Halls and VIP rooms for lectures, production, commercial events, talks, presentations and film screenings.

Video projectors will be capable of screening films, but will not meet full cinema standards. Infrastructure will be provided to support rented video / LED walls.

Technical Intercom

A multi-channel intercom system (number of channels to be confirmed) will allow technical staff to communicate between performance spaces, control rooms and other back-of-house spaces.

Outside Broadcast

Level flat locations sized for full length double width

articulated vehicles will be provided at stage and basement levels for outside broadcast vehicle park up. Temporary power, temporary cable routes and facility panels to production sound, video and communication feeds will be provided locally.

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ARUP

Venue Consultancy – Acoustics

Venue - Acoustics
Executive Summary

Summary

Scope

The acoustic scope for the project covers the venue acoustics as well as acoustic engineering to support the planning application for the scheme.

Current progress

A noise survey commenced week commencing 2nd May 2022, to establish ambient and background noise levels around the proposed location of the indoor and outdoor venues and at the nearest noise sensitive receivers. The results from the survey will be used to set noise limits for plant noise and to assist in calculating the sound insulation performance requirements for the building envelope to control noise ingress and egress.

Venue

The following criteria have been used for the development of the Stage 2 work:

Internal sound Levels

Typical internal sound levels during a music performance have been assumed, based on previous projects / measurements within a range of similar venues (106dB_{L_{Aeq}}).

The internal sound levels on which the detailed design is to be based need to be agreed as soon as possible with the Operator.

Operating hours

Based on experience of similar venues it is assumed that major noise producing events such as music concerts, would end before 23:00.

If events are to take place after 23:00, the internal sound levels would need to be lower than the assumed sound level, and/or the roof and façade would need to have an

increased sound insulation performance.

Noise Emission Limits

External plant noise will be limited to 5dB below the typically lowest background noise level at the nearest noise sensitive receivers.

Noise limits for the outdoor venue will be agreed once more is known about the frequency and type of use. However, if the usage is infrequent (less than 30 events per year), then the noise limits will be in line with the CIEH's Code of Practice on Environmental Noise Control at Concerts.

Noise due to the indoor venue (entertainment sound) will be limited to the noise limits given in BS8233 for hotels and residential buildings, given that the Stay Hotel is the closest noise sensitive receiver and Buxton Tower is likely to be the closest residential building.

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