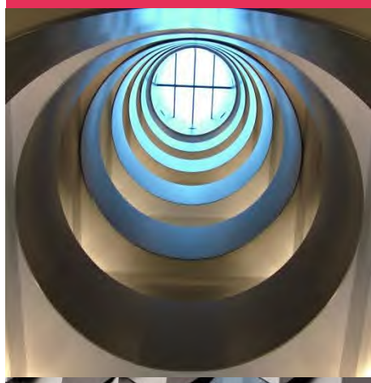
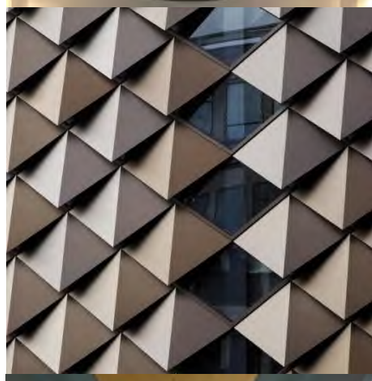
Great Northern Warehouse
Manchester

Stage 2 Civil and Structural Report

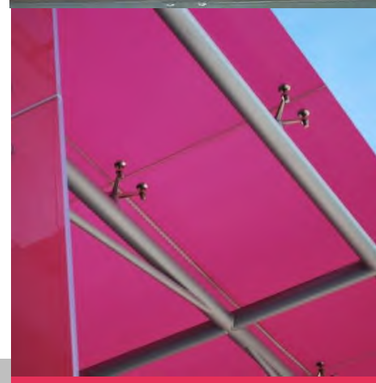
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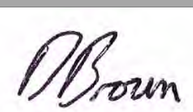
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Reviewed	Signature	Date

1.0 Contents

1.0 Executive Summary 4
Great Northern Square 4
Great Northern Warehouse 4
Deansgate Terraces 4
2.0 Introduction 4
3.0 The Site 6
3.1 Site Location 6
3.2 Existing Utilities, Services and Drainage 6
3.4 Existing Structures 6
3.3.1 Great Northern Warehouse 7
3.3.2 Highline (Historical High Level Yard) 7
3.3.3 Deansgate Terraces 8
3.3.4 Pavilion 8
3.3.5 Great Northern Square 9
3.4 Demolition 9
3.3 Responsibility Plan 10
4.0 Constraints 11
4.1 Listed Structures 11
4.2 Great Northern Warehouse 11
5.0 The Project 12
5.1 Great Northern Square 12
5.2 Great Northern Warehouse 12
5.3 Deansgate Terraces 12
5.3 The Highline 12
6.0 Substructure Proposals 13
6.1 Deansgate Terraces 13
6.2 Basement Plant Room 13
6.3 Viaduct Proposals 14
6.4 Warehouse 14
7.0 Superstructure Proposals 15
7.1 Great Northern Warehouse 15
7.2 Deansgate Terraces 15
7.3 Viaduct Proposals 16
8.0 Design Criteria 17
8.1 Design Life 17
8.2 Design Loads 17
8.2.1 Permanent Loads 17
8.2.2 Variable Loads 17
8.2.3 Wind Loads 17
8.2.4 Effective Horizontal Forces 17
8.2.5 Vehicle Surcharge / Lateral Earth Pressures 18
8.2.6 Accidental Loads 18
8.2.7 Snow Loads 18
8.3 Serviceability 18
8.3.1 Gravity Load Deflections 18
8.3.2 Horizontal Movements 18
8.4 Fire Protection 18
8.4.1 Great Northern Warehouse 18
8.4.2 Deansgate Terraces 18
8.5 Natural Frequency and Dynamic Response 18
8.6 Disproportionate Collapse 18
8.6.1 Great Northern Warehouse 18
8.6.3 Deansgate Terraces 18
8.6.4 Waterproofing 18
9.0 Design Standards 19
10.0 Geotechnical 20
10.1 Phase 2 Site Investigation 20
10.2 UXO Report 21
11.0 Civils 22
12.0 Opportunities and Risks 24
12.2 Key Project Opportunities 24
12.3 Key Project Risks 24
Appendices 25

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1.0 Executive Summary

This report outlines the structural options for the proposed development in conjunction with the site constraints.

The scheme information contained within this report has been developed to provide cost advice at planning stage but development of the design in conjunction with the design team is required through the next stages.

The potential structural forms have been developed to provide a basis for integrating the proposed structure with the existing structures on site and other constraints in conjunction with the project team discussions with the Statutory Consultees and construction supply chain market forces.

Site Location

The site comprises the former Great Northern Railway Goods Warehouse, Deansgate Terrace which were the former railway yard shops and offices and the public realm to the North of the Warehouses.

The site is bound by Peter Street to the north, Watson Street to the east, a leisure complex and Great Bridgewater Street to the south and Deansgate to the west.

Development Proposals

Great Northern Square

The sunken amphitheatre is to be demolished and a single storey basement constructed in it place. Within the basement there is to be a plant room containing water storage and sprinkler tanks. The basement also has space available for community use or storage. Escape from the Pavilion basement is also to be incorporated into the proposals.

The roof of the structure is to support an intensive green roof.

Great Northern Warehouse

The ground and first floors are to be retained as commercial uses with a change of use for levels 02 to 04 to be made from car park to office use.

Part of Level 01 is to be re-configured to create a Co-working / events space within the Warehouse which requires the incorporation of a new mezzanine floor.

A central section of Levels 03 & 04 is to be ‘opened-up’ and the roof covering replaced with glazing to create a three storey high central atrium.

New plant terraces are introduced at roof level, requiring the local removal of existing roof trusses and new structure to provide the required support.

The existing glazed ‘high line’ structure linking to the leisure box is to be demolished and level 01 is to be converted into a terrace. Elements of the existing floor structure are to be removed to provide a visual link to the lower level. The existing primary structural beams and columns are to be retained to celebrate the structure.

A new mezzanine floor is to be constructed between ground and level 01 to provide bicycle store for the office units, via access provided via an external ramp.

At ground level plant rooms and commercial units are to be provided.

A external new lift structure is required to service the warehouse floors from a new ground floor reception area.. A new link bridge provides access between the Warehouse and Terrace office units at level 01.

Deansgate Terraces

The proposals are to create a new north-south pedestrianised street to the rear of Deangate Terraces.

A new two / three storey extension is proposed to the rear of the northern extent of the Deansgate Terraces with retail units at ground floor and office units over.

Listed Buildings

There are listed structures within the development site boundary:

- The Warehouse is a Grade II* listed building
- Deansgate Terraces are Grade II listed
- The remains of the Salford & Manchester Junction Canal, benath the Site and running west Deansgate is separately listed as Grade II.

Our philosophy been to minimise the structural intervention works to all of the listed structures but still achieve the benefit of the re-development and re-use of the site to secure the long-term future of the listed structure.
In order to achieve this we have looked at various options as to how the development can integrate with the existing, this is covered in Section 4.0

2.0 Introduction

Curtins consulting have been commissioned by GNW Developments Limited to provide civil and structural engineering services in connection with the Great Northern Warehouse development.

This document provides a Concept Design study that includes outline proposals for the structural design.

These structural solutions have been generated to aid the assimilation of the impact on the adjacent structures provide a basis for discussion around:

- Managing the impact on the existing structures from a historical perspective
- Understanding the risks associated with building adjacent to existing structures
- Site construction logistics
- Inform cost plan prior to Planning Submission

The architectural scheme proposals are presented elsewhere and they have not been included here to avoid confusion.

Factual information, including, where stated, a visual inspection of the site, has been obtained from a variety of sources. Curtins presume the third party data to be reliable, but have not independently confirmed this; therefore, Curtins cannot and does not guarantee the authenticity or reliability of third party information it has relied upon.

The findings and opinions provided in this document are given in good faith and are subject to the limitations and constraints imposed by the methods and information sources described in this report. Further information, ground investigation, construction activities, change of site use, or the passage of time may reveal conditions that were not indicated in the data presented and therefore could not have been considered in the preparation of the report.

Where such information might impact upon stated opinions, Curtins reserves the right to modify the opinions expressed in this report.

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Figure 2.0:
3D Historical View of Development Site

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3.0 The Site

3.1 Site Location

The site is bound by Peter Street to the north, Watson Street to the east, a leisure complex and Great Bridgewater Street to the south and Deansgate to the west. Site grid reference SJ835978



Figure 3.0: Aerial Photograph (© Google)

3.2 Existing Utilities, Services and Drainage

WSP have produced a combined services layout. The majority of the utility services are shown to be located within Watson, Peters Street and Deansgate.

There are gas and electricity cables running within the site. These run from Watson Street which enter the Warehouse centrally along the southern elevation.

The sewer records indicate a 500mm diameter combined sewer running under Great Northern Square. The 500mm diameter sewer was proved to be redundant and formally abandoned in 2018, however it has not been removed from United Utilities records. ,therefore clarification by United Utilities will be required.

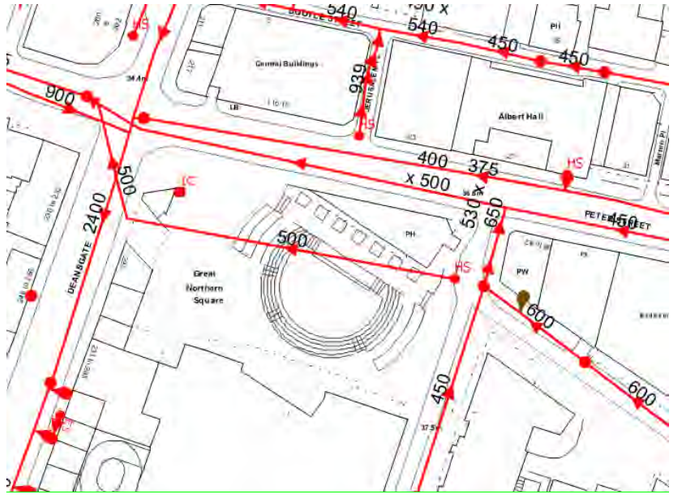


Figure 3.1: Extract from UU Sewer Records

The existing drainage is discussed in further detail in section 11 of this report.

A below ground drainage survey of the site drainage was undertaken in June 2017. The private site drainage was proved to discharge in to the 2400mm diameter combined sewer in Deansgate. An additional CCTV survey will be required for internal building drainage.
It is also recommended to resurvey the existing retained private external drain to confirm the condition of retained pipes.

3.4 Existing Structures

The development site comprises five distinct Buildings/Zones:

- Great Northern Warehouse
- Highline Link Structure over the viaduct
- Deansgate Terraces
- Pavilion
- Great Northern Square

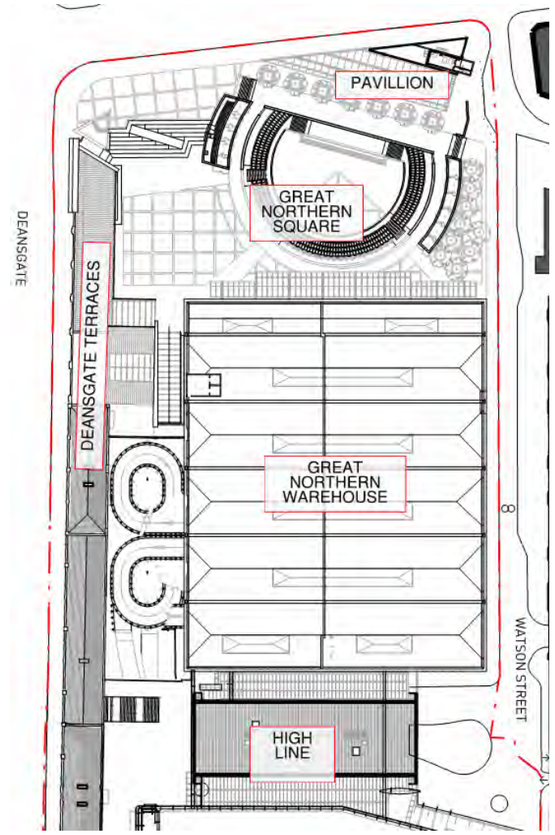


Figure 3.2: Existing Site Buildings

3.3.1 Great Northern Warehouse

The Warehouse is a Grade II* listed building.

The construction of the Warehouse began in 1897 and was completed circa 1900.

The main warehouse comprises a five-storey building approximately 81.4m (267ft) long and 66.1m (217ft) wide. The two lower levels of the building were previously used as rail and road depots. The upper three levels were used to store goods such as malt, grain, paper, cloth, rags, cotton and case goods.

The high-level depot linked directly with the Great Northern rail line with the low-level depot being linked to the high-level rail line via two number inclines to the east and west of the viaduct.

Both levels were also linked to the road network, with an approach ramp constructed to the north and west of the warehouse to provide road access to the high-level depot.

Refer to Appendix A for historical plans of the Goods Station.

The following is the description of the building structural form from 'The Engineer' dated September 1898.

'It is entirely of fireproof construction, practically a series of storeys built of mild steel stanchions with connecting girders, cast iron junction boxes being employed to join them, and cross girders, with jack arches turned between them, forming the floors. The walls are constructed in a most substantial manner, the lower portion consisting of blue brickwork in cement and the upper portion of hard local red bricks relieved by blue band bricks. The brickwork of the station is wholey in cement.

The steel stanchions rest on large granite bases, which are bedded upon blue-brick and concrete foundations going down to solid rock, as is also the case with the walls.

Each Stanchion is calculated to sustain a weight of 650 tons, when the warehouse and the stations are fully loaded.'

The upper floors comprise of 9" inch brick jack arches spanning between mild steel riveted plated girders and mild steel stanchions. The brick arches are believed to be capped with concrete.

The roof structure comprises a series of traditional Queen post timber trusses supported by the external masonry piers and internal columns which historically were located at the end of each truss. The trusses support timber purlins, supporting timber rafters, supporting timber battens, supporting tiles.

The building was refurbished in 1999 as part of the Morrison Merlin works. The building currently houses leisure units including a casino, restaurant and a bowling alley at ground and first floor with the top three storeys utilised as a car park.

To provide access into the upper car parking levels two one-way ramps (entry and exit) were constructed to the west of the warehouse. These required a series of new openings to be formed between the existing piers.

To allow for vehicular movements at third floor level a significant number of the stanchions supporting the timber trusses needed to be removed within the proposed car parking aisles. Steel beams were installed to transfer the roof loads to the adjacent columns.

The columns above third floor are significantly smaller that the columns on the lower levels, we believe that concrete surrounds were added to the columns above third floor to provide protection against vehicular collision, but also to provide support to the new transfer beams.

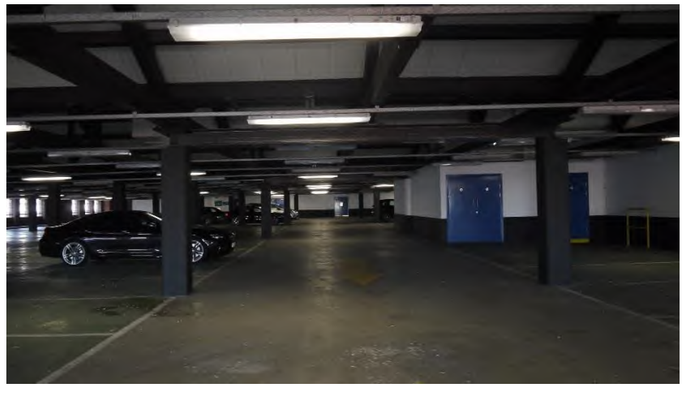


Figure 3.3: Column removal installation of transfer beams



Figure 3.4: Concrete surround supporting transfer beams?

3.3.2 Viaduct (Historical High Level Yard)

A significant length of the historic yard has been demolished. There is now only approximately 28m length structure remaining to the south of the Great Northern Warehouse.

The following is the description of the building structural form from 'The Engineer' dated September 1898.

'The high-level yard, which is outside the station, is built upon a series of steel stanchions supporting steel girders, between which 9" brick jack arches are turned.

The stanchions are practically H steel girders set on end, and at their bases are cast iron guards to protect them from injury.

The stanchions rest upon granite blocks which are laid upon concrete foundations going down to sandstone rock.

The jack arches are covered in concrete, and asphalted to prevent their leaking.

The girders on the outside of the high-level yard have a thick band of Derbyshire Grit resting upon the top, and on this a brick parapet wall is built.'

Approximately 10m below ground under the Highline runs the Bridgewater canal. The canal was cut through the sandstone.

The Engineer noted that ' *Mr Foxlee has provided against any possible subsidence of the low-level yard lying over the site of the canal by laying a large quantity of cast iron girders, bedded in concrete, right*

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across the line at great depth beneath. These will effectually protect the crown of the arch of the canal.'

The canal is now drained and was used as an air-raid shelter during the wars. Access is currently provided by a stair access from within the warehouse building.

A modern single storey glazed steel frame sits on top of the historic structure. It is believed to of been constructed in 2002 as part of the Morrison Merlin works. This provides a covered link between the warehouse and the cinema to the south.

This structure is approximately 6m high. The structure is a steel frame comprising large circular hollow sections which are located onto the original columns below. The columns appear to cantilever from the deck with the roof glazing supported on trusses supported off branches from head of the column.



Figure 3.5: Glazed Atrium

3.3.3 Deansgate Terraces

The historical structure was constructed as part of the original depot circa 1900 and is Grade II listed.

The northern section of the terraces comprise the old single storey road approach ramp, which is a series of brick arches that provided vehicular access into the level 01 depot.

A modern steel framed extension was constructed in 1999 to the rear of the units, this extended the structure towards the warehouse by approximately 1.5m and provide a single storey over the arches.

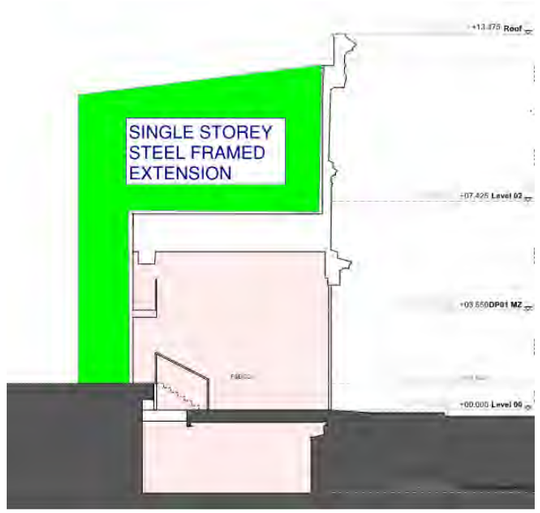


Figure 3.6: Deansgate Terrace Section – Old Approach

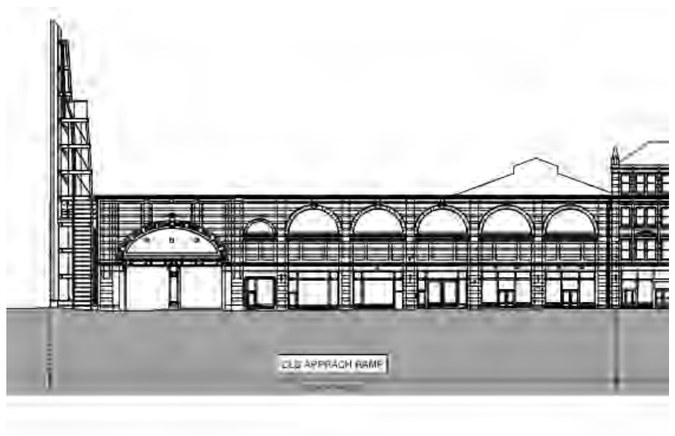


Figure 3.7: Deansgate Terrace Elevation – Old Approach

The southern section of the terrace comprise a three/four storey load bearing masonry structure with concrete floors. At ground floor there are retail units, historically the upper floors were used as a part of the warehouse facilities.



Figure 3.8: Deansgate Terrace Elevation – Old Approach

A basement runs under the full length of the terraces. It is assumed that the load bearing walls are bearing onto the underlying sandstone strata.

3.3.4 Pavilion

The following information is taken from the Site Constraints report undertaken by Arup, dated February 2014 and our own visual inspections.

The building was constructed in 1999. The building comprises a two-storey structure over a single storey basement.

The superstructure comprises a steel framed building with supporting in-situ concrete slabs on a composite metal deck. Stability is provided by a combination of frame action and a reinforced concrete stair and lift core.

The internal steel columns extend to basement level and are supported by pad footings which are founded onto the underlying sandstone strata.

The basement is formed using reinforced concrete walls which are supported by strip footings and propped at the head by the ground floor slab. Where the basement links with the low-level portion of the amphitheatre the external steel frame continues to the basement level. Refer to Figure 3.9.

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3.3.5 Great Northern Square

The Great Northern Square comprises a public realm. The central area comprises a sunken amphitheatre. It is assumed that the existing steps are bedded onto a sloping concrete slab with a down-stand toe at the base of the steps.

This assumption would need to be tested during the next stage of works.

The remaining area comprises a number of steps, ramps and retaining walls to manage the fall across the site from Watson Street to Deansgate.



Figure 3.9: Great Northern Square

3.4 Demolition

There are a number of existing structures which are to be demolished to make way for the proposed development these are:

- Glazed atrium structure over Highline and modern extension at level 01.
- Concrete steps and deck to end of Deansgate Terraces
- Car park entry and egress ramps
- Link block between Deansgate Terraces and Warehouse
- Steel framed extension to northern section of the terraces
- Sunken amphitheatre

The existing buildings, and their foundations and any buried obstructions are to be cleared to make way for the new development.

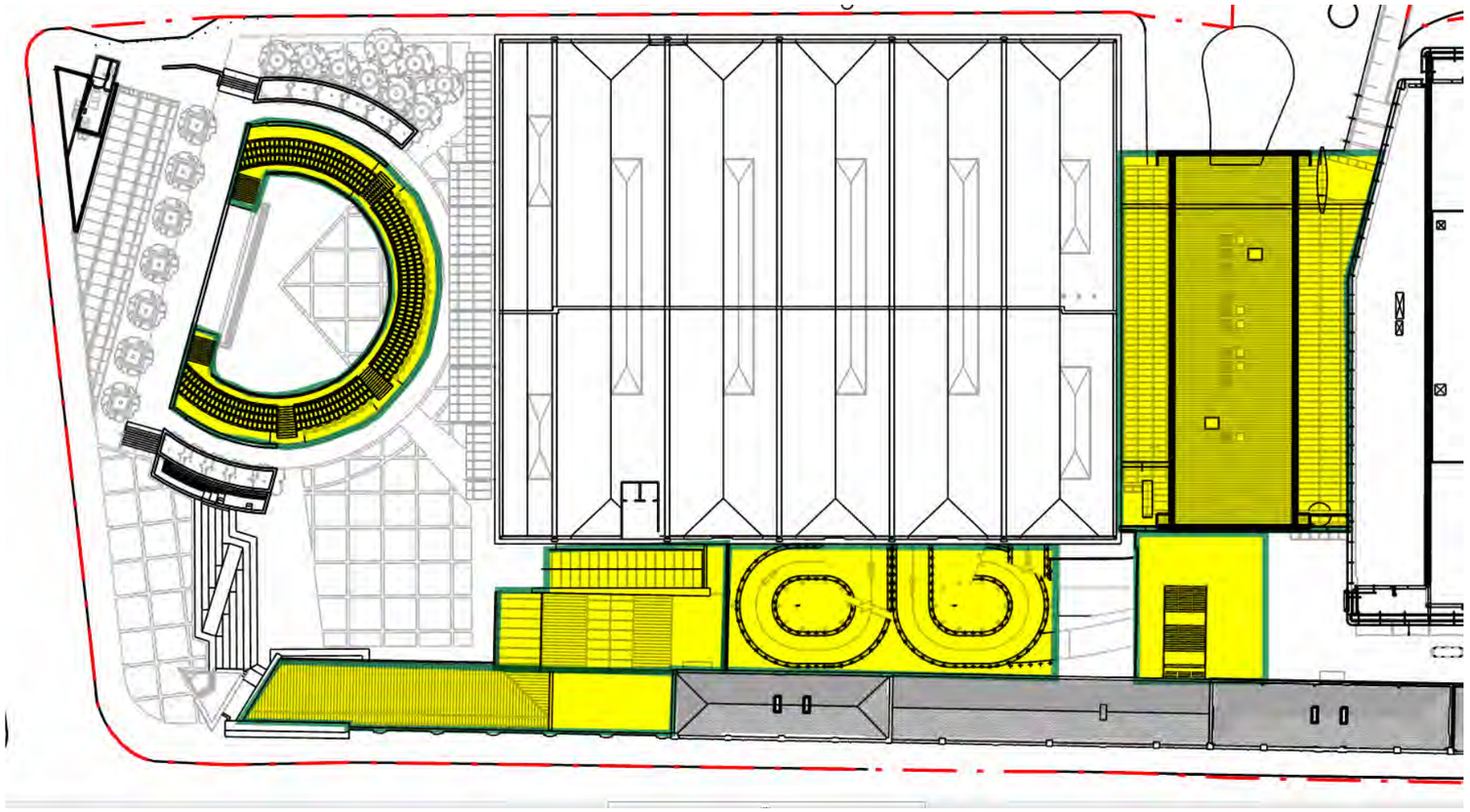


Figure 3.10: Structures to be demolished

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3.3 Responsibility Plan

Curtins are responsible for the Civil and Structural design of the structure contained within the area highlighted orange on the plan below.

Civic Engineers are responsible for the Leisure Box structure and ancillary areas which are highlighted green below.

Within the hatched area Civic engineers are responsible for structure relating to the leisure box. Curtins are responsible for structure supporting the atrium deck at first floor.

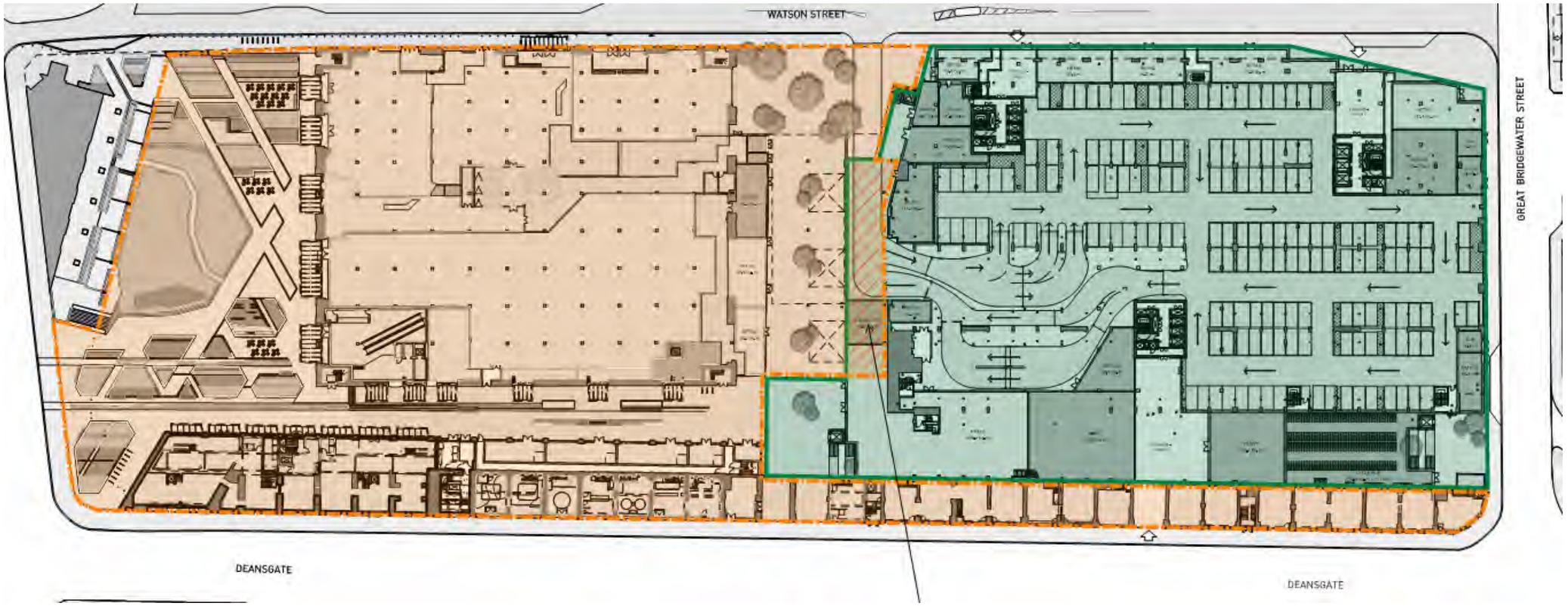


Figure 3.11: Extract from Civic drawing 772-02-CIV-XX-00-SK-X-9001 showing C&S responsibility plan

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4.0 Constraints

4.1 Listed Structures

The Stephen Levrant Heritage Architecture Report 'Great Northern Warehouse, Manchester: Opportunities and Constraints' dated December 2014 highlights the following aspects of the listed buildings have been noted to be of high significance

Grade II Warehouse:*

- External elevations
- Roof structure
- Surviving stone staircases
- Windows
- Fenestration pattern and former carriage ramp and track openings.
- Structural elements including brick jack-arches and columns (not including modern casings)

Grade II Deansgate mews buildings

- Uniformed west elevation including roof scape
- Group value
- Fenestration pattern including shop front openings
- Blind arcading detailing denoting the former screen wall to the former vehicular ramp

4.2 Great Northern Warehouse

Curtins have worked with the team to try and minimise the structural intervention works required to the existing Grade II* listed building.

A set of structural principles were established with the team at an early stage to ensure that the fabric, load bearing capacity and the stability of the remaining structure is maintained both permanently and during the construction of the works.

The main principles were:

1. Due to the sectional nature of the internal steel frame (storey height columns which are connected to each other and the primary floor beams by a cast iron junction) it was advised that the primary beams which brace the columns should be maintained if at all possible. This ensures the column restraint at each floor is unaffected and therefore the load bearing capacity is not compromised.



Figure 4.0: Connection junction at floor

2. Where possible the openings should run parallel with the secondary beams to avoid the removal of the secondary beams with the associated additional temporary works and trimming steel.

3. Horizontal holes through webs can be provided but would be ideally limited to a diameter of 200mm, larger opening could be formed but stiffeners would be required.

4. In all cases the edge of the opening must be at least 175mm above the underside / below the top of the beam to avoid the riveted angle sections connecting the web / flange plate. The horizontal location would need to be co-ordinated also to avoid the vertical web stiffeners.



Figure 4.1: Web stiffeners / angle connection

5. Openings should not be formed within 1200mm of the end of the beams.

6. Individual vertical holes up to 300 diameter are acceptable within the jack arches. Although openings greater that 200mm may require a steel sleeve.

7. Service risers would ideally run perpendicular to the secondary beams.

8. Where large openings are required, due to the nature of jack arches generating a lateral thrust at springing level, tie rods would be required were long openings are created in the floor plate.

Refer to drawings in Appendix B for further information.

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5.0 The Project

5.1 Great Northern Square

The sunken amphitheatre is to be demolished and a single storey basement constructed in its place. Within the basement there is to be a plant room containing water storage and sprinkler tanks. The basement also has space available for community use or storage. Escape from the Pavilion basement is also to be incorporated into the proposals.

The roof of the structure is to support an intensive green roof and associated external landscaping.

5.2 Great Northern Warehouse

The ground and first floors are to be retained as commercial with the change of use for levels 02 to 04 to be made from car park to office use.

Level 01 is to be re-configured to create a Co-working / events space within the Warehouse which requires the incorporation of a new mezzanine floor.

A central section of Levels 03 & 04 is to be 'opened-up' and the roof covering replaced with glazing to create a three storey high central atrium.

New plant terraces are introduced at roof level, requiring the local removal of existing roof trusses and new structure to provide the required support.

An external new lift structure is required to service the warehouse floors. A new link bridge provides access between the Warehouse and Terrace office units at level 01.

5.3 Deansgate Terraces

The proposals are to create a new north-south pedestrianised street to the rear of Deangate Terraces.

A new two / three storey extension is proposed to the rear of Deansgate Terraces with retail units at ground floor and office units over.

5.3 The Viaduct

The existing glazed structure link to the leisure box is to be demolished and level 01 is to be converted into a roof garden / public terrace.

Elements of the existing floor structure are to be removed to provide a visual link to the lower level. The existing primary structural beams and columns are to be retained.

A new mezzanine floor is to be constructed between ground and level 01 to provide bicycle storage facilities for the office units.

At ground level plant rooms and commercial units are to be provided.



Figure 5.2: Proposed Roof Terrace

6.0 Substructure Proposals

6.1 Deansgate Terraces

The Phase 2 site investigation undertaken by Curtins in October 2018 determined that the ground conditions consist of *Made Ground overlaying Manchester Marls Formation (sandstone*).

The sandstone was encountered at depths between 6.10m – 8.75m bgl (26.18m – 29.55m AOD).

Due to significant thickness of made ground across the site and relative shallow depth to the sandstone bedrock we are recommending that proposed columns are supported on a piled foundation with the piles socketed into the underlying sandstone. As the terraces have a basement, the piles adjacent to the basement will need to be sleeved or set back to avoid surcharging the existing basement. Due to the presence of made ground a

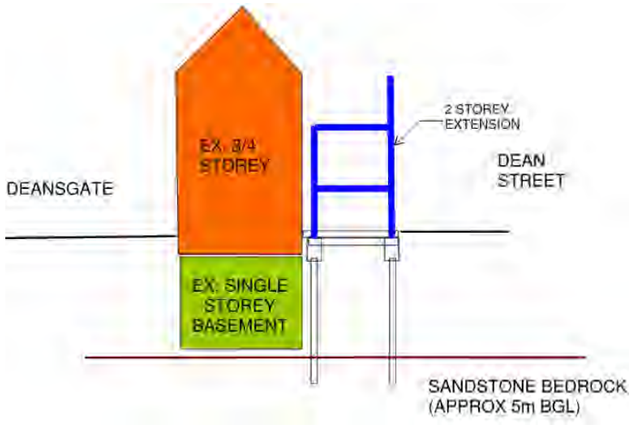


Figure 6.0: Foundation Solution

Alternative Foundation Solution

6.2 Basement Plant Room

The whole structure will be described in this section. The structure is to comprise a reinforced concrete frame. The current layout is in abeyance pending confirmation of M&E spatial requirements. Nevertheless the structural intent outlined in this section is expected to still be applicable if the plan extent of the basement is changed. Any changes to the overall depth of construction would need to be reassessed.

Retaining Wall

In relation to the construction sequence for the hub, we are recommending that a retaining wall is installed to the rear of the existing steps, the existing steps are then demolished and the basement excavated.

To avoid temporary propping we would also recommend that the wall is designed as a cantilever.

A cantilevered sheet piled wall would not be able to driven into the sandstone, therefore we are recommending a contiguous piled wall using a CFA pile. For the retained height of 3m a 450mm diameter pile would be required.

All ground obstructions would need to be removed within the line of the piles.

A liner wall is suggested to the face of the contiguous piled wall. This could also provide the required tanking with the addition of a waterproofing additive in the concrete mix subject to confirmation of the required environment grade to BS8102.

Foundations

The current available information indicates that the existing pavilion building is founded on pad foundations bearing onto the sandstone strata.

We are therefore proposing that the proposed columns are supported by traditional pad foundations bearing onto the underlying bearing strata which we are estimating is 2.0m below the proposed basement level.

An allowable bearing of 500kN/m2 has been allowed in the design.

From available information we have co-ordinated the location of the proposed columns with the foundation information we have for the pavilion foundations. Balance beams have been provided to enable off set foundations adjacent to the pavilion.

Ground Floor Slab

Due to the fact the site was excavated to form the sunken amphitheatre which means the made ground at basement level has previously been significantly surcharged, we would suggest that a ground floor slab is suitable.

We are suggesting a 200thk reinforced concrete slab with no joints. An additive could be included in the concrete mix to provide waterproofing requirements if required.

Changes in levels with the basement floor can be dealt with by creating folds in the ground floor slab.

Roof Structure

To minimise the construction depths the proposed construction is a traditionally reinforced concrete flat slab supported by reinforced concrete columns.

The slab is supported 300mm square columns at approximately 6m x 6m centres. The thickness of the roof slab is 300mm

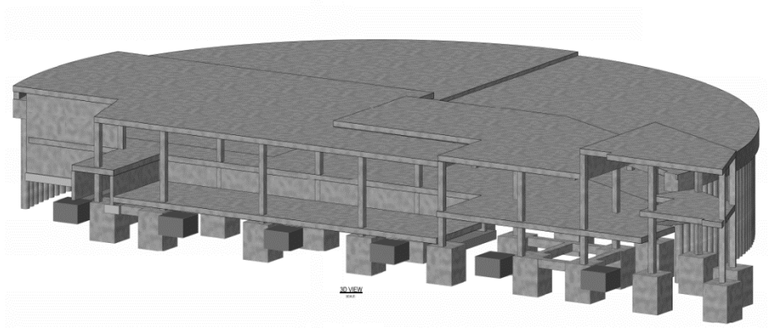


Figure 6.1: 3D View of Basement Plant

Alternative Solutions

A steel frame solution was developed but was discounted due to the depth of the structural zone required for the roof and the resulting additional excavation required.

A traditional reinforced concrete retaining wall could be considered.

The issue relates to the working space and the local drainage which would need to be protected.

6.3 Viaduct Proposals

It is expected that the ground conditions comprise the following:

Made Ground overlaying Chester Pebble Bed Formation (sandstone)

The sandstone is believed to be approximately at 30mAOD, which is circa 6.0m below proposed ground levels.

We are therefore recommending that proposed columns are supported on a piled foundation with the piles socketed into the underlying sandstone.

Piles up to 275mm diameter require a 3.5m clearance, the actual clearance is approximately 5m. This pile size is expected to be large enough for the required loads, but this is subject to detailed SI and sub-contractor input.

The drained Bridge-water canal runs under the Highline, the proposed columns have been co-ordinated to avoid surcharging the canal but also to try and avoid the beams cast in concrete which are described in the historical information. Intrusive works are required to determine locations.

As this area was previously a rail depot we are suggesting that a ground bearing floor slab would be suitable. This is needs to be validated by the Phase 2 Geo-Environmental report.

6.4 Warehouse

Foundations will be required for the proposed external lift core and new single storey retail units.

Due to the expected depth of the sandstone we are recommending piled foundations are provided.

The existing foundations have been determined to be suitable to support the change of use proposed with the building and the load from the proposed mezzanine floors.

Refer to Appendix B for Structural drawings

7.0 Superstructure Proposals

7.1 Great Northern Warehouse

The works have been co-ordinated with the general structural principles noted in Section 5.0.

The main requirement to maintain the primary beams has been achieved by the team.

The change of use from a warehouse to office does not have any structural implications as the proposed imposed loads and the additional superimposed dead loads are less.

Where there are large bays of existing floor plates are to be infilled, we understand the intent is to adopt a precast coffered – vaulted slab to replicate the structural form of the jack arches. These precast slabs would be supported on the bottom flange of a new steel beam, set out to match adjacent bays. The practicalities of the appropriate size of the units for installation would need to be addressed at the next stage, the other option would be to cast in-situ.

For the smaller openings we would recommend an in-situ reinforced concrete slab on a composite metal deck, depending on whether this would be aesthetically acceptable.

Where the large openings are required perpendicular to the secondary beam new trimming beams will need to be installed. Once the beams have been surveyed and flange thickness and material grade confirmed we will undertake a detailed design to determine the required strengthening works to the existing beams at the edge of the openings.

The proposal to opening up the third and fourth floors has been assessed. The preliminary design suggests that remaining floor plate will still provide the required diaphragm action. Further detailed design will be required to confirm.

The proposals to provide a vent at the atrium roof has also been considered. The suggested structural proposal is to provide a frame supported off the existing trusses. The replacement of the slate roof with lightweight materials will provide a similar loading and therefore loads and the existing load paths are unaltered.

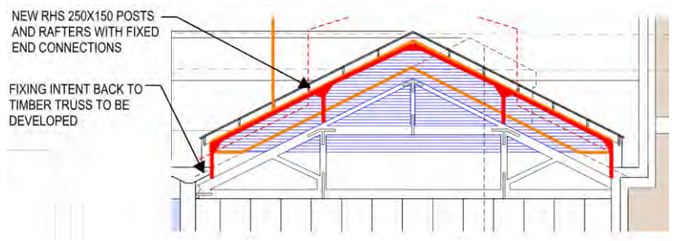


Figure 7.1: Framing over existing truss to atrium area

This frame will need to be braced and further works are required to understand the height of the raised section of roof and to develop the details to provide an aesthetically acceptable solution.

The addition of the terraces at roof level requires additional structure. The recommended structural proposal is to provide additional columns from level 04 (supported on existing columns which terminate at the underside of this level) and reinstate the column locations which have been removed for car park aisle access.

The introduction of additional columns reduces the required spans for the terrace structure which in turn reduces the required beam depth. The columns supporting additional load due to the introduction of the terraces will need to be assessed to determine if strengthening works are required. This assessment will be undertaken at the next stage once surveys are undertaken to confirm existing member sizes and material properties.

The steel columns above level 04 currently have concrete surrounds assumed for the protection from the collision of cars. The intent is to remove the concrete surround to all the columns. For the majority of the columns this is considered acceptable without any structural further works.



Figure 7.2: Transfer Beams supporting roof trusses

7.2 Deansgate Terraces

There are two distinctive zones for the Terraces.

Northern Terrace (old approach ramp)

The structural philosophy is to maintain as much of the existing structure which works with the Architectural space planning requirements. To minimise the overall works and temporary propping requirements to the northern parapet, we are proposing that the existing concrete slab over the arches and the majority of the concrete frame to the northern section are maintained.

The steel frame installed in the 1990's is to be demolished to allow the new extension to be constructed.

The structural challenges relate to the available structural zones. The structural zone at level 02 is limited to 450mm and the mezzanine is limited to 375mm.

To achieve these zones and provide the required open plan areas through the retail space the structural options are either a concrete or steel frame.

A concrete frame was discounted due to the inefficiencies relating to a structure being a single span and the large openings required at mezzanine floor.

The recommended construction comprises a steel frame to form the new levels adjacent to and over the existing arches.

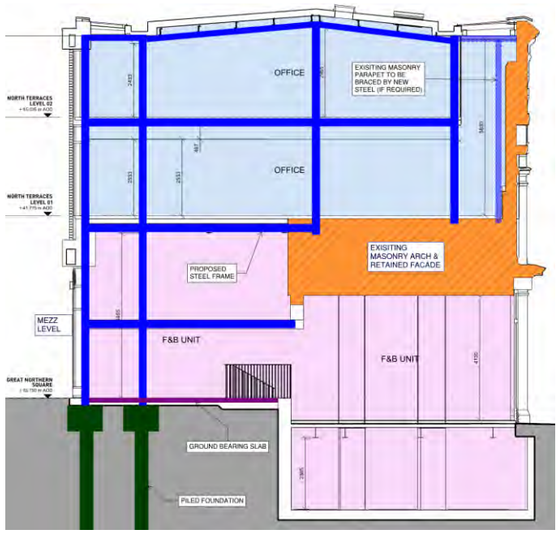


Figure 7.3: General Structural Proposals

Stability is provided by the floor plates acting as horizontal diaphragms to distribute the laterally applied loads back to the vertical bracing, the moment frames, and the existing structure. Steel bracing is provided within the roof plate to act as a wind girder.

To minimise the weight and to allow for future flexibility in relation to new openings within the mezzanine floor a lightweight solution comprising of cold rolled joist spanning into the side of a steel beam is recommended.



Figure 7.4: Lightweight floor support on hot rolled steel

The structure at Level 01 and 02 comprises a 160thk reinforced concrete slab on a re-entrant composite metal deck.

The slab will provide an intrinsic fire rating of 60 mins, but the steel frame will require fire protection.

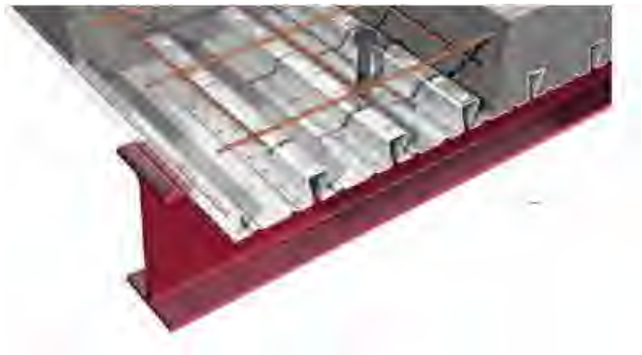


Figure 7.5: Re-entrant composite metal deck on hot rolled steel

The proposed external cladding comprises a combination of traditional brickwork restrained by a SFS spanning vertically between the floors and a curtain walling system. Where required masonry support angles are to be provided to support the external leaf of masonry.

Where the new frame bears onto the existing structure, we have assessed the historical loads, compared these to the new loads to ensure the existing structure is not subject to any additional loads.

Southern Terrace

The proposals are for a two-storey extension to the rear of the terraces.

To provide the required open plan areas through the retail space the structural options are either a concrete or steel frame.

The most practical solution is a steel frame. The current proposals are an independent steel frame which supports a reinforced concrete in-situ slab on a composite metal deck at level 01, 02 and 03 and roof terrace at Level 04.

Stability is provided by bracing and tying back to the existing structure.

It may be possible to span the new floors onto the existing structure and this will be assessed in the next stage of works.

7.3 Viaduct Proposals

The project proposals require the existing glazed ‘high line’ structure link to the leisure box is to be demolished and level 01 is to be converted into a roof garden / public terrace.

Elements of the existing floor structure are to be removed to provide a visual link to the lower level. The existing primary structural beams and columns are to be retained.

A new mezzanine floor is to be constructed between ground and level 01 to provide bicycle storage facilities for the office units.

At ground level plant rooms and commercial units are to be provided.

The proposals are to provide a steel frame, connected to the existing columns under the existing deck, with an in-situ concrete floor on a composite metal deck. Stability is provided by bracing from the existing deck.

Due to the fact the deck sits under the existing structure, lifting and placing precast planks is not practical solution, therefore an in-situ slab on a composite metal deck has been proposed.

A new access ramp is required for bicycle access to the dedicated store at mezzanine level. The ramp will be formed by new structural steel framing supported on the existing stanchions and new columns. The new columns will require foundations. Mini pile foundations are deemed appropriate due the relatively small loads and the limitations on access under the Level 1 viaduct structure.

The underside of the decking should be given additional protection in the form of a pre-applied coating or epoxy paint applied in-situ. Such an additional layer of protection has the advantage that it can be regularly inspected and remedial work undertaken if required.

Refer to Appendix B for Structural drawings

8.0 Design Criteria

8.1 Design Life

The building structure is to have a design life of 50 years in accordance with Category 4 to BS EN 1990.

Some structural elements, such as those with concrete wearing surfaces and corrosion protection will require periodic inspection and maintenance.

8.2 Design Loads

8.2.1 Permanent Loads

Dead loads (DL) take into consideration the basic self-weight of floor slabs, structural walls and columns; in effect the self-weight of the building shell before finishes are applied.

Superimposed dead loads (SDL) refer to the finishes that are applied to the building shell, usually as part of the fit-out. Dead and superimposed dead (uniformly distributed) plan loads assumptions in the permanent case are summarised in the table below:

Warehouse

Location	Super Imposed Dead	
Ground Floor Retail Units	Finishes (75 thk screed) Service & Ceiling	= 1.50 kN/m^2 = 0.50 kN/m^2
Bike Store Mezzanine	Finishes (25mm zone) Service & Ceiling	= 0.65 kN/m^2 = 0.50 kN/m^2
Office Mezzanine	Finishes Raised Access Floor Service & Ceiling	= 0.22kN/m2 = 0.35 kN/m2 = 0.50 kN/m2
Typical Office Levels	Ceiling and Services Raised Access Floor Finishes	= 0.50 kN/m2 = 0.35 kN/m2 = 0.22 kN/m2
Plant Roof Terrace	Waterproofing Insulation Service	= 0.1 kN/m2 = 0.3 kN/m2 = 0.10 kN/m2
Plant Communal Terrace	Finishes (Tiles) 18mm Plywood Waterproofing Insulation Service	= 0.4 kN/m2 = 0.12 kN/m2 = 0.1 kN/m2 = 0.3 kN/m2 = 0.10 kN/m2
Pitched Roof	Finishes (slate) Battens & felt Insulation Purlins Roof deck Services PV (Locally)	= 0.30 kN/m2 = 0.10 kN/m2 = 0.30 kN/m2 = 0.10 kN/m2 = 0.20 kN/m2 = 0.15 kN/m2 = 0.50 kN/m2

Terraces

Location	Super Imposed Dead	
Ground Floor Retail Units	Finishes (75 thk screed) Service & Ceiling	= 1.50 kN/m^2 = 0.50 kN/m^2
Mezzanine	Finishes Plywood Service & Ceiling	= 0.50 kN/m2 = 0.285 kN/m2 = 0.50 kN/m2
Typical Office Levels	Ceiling and Services Raised Access Floor Finishes	= 0.50 kN/m2 = 0.35 kN/m2 = 0.22 kN/m2
Terrace Roof	75thk Paving Slabs Waterproofing Insulation Ceiling and Services	= 1.80 kN/m2 = 0.40 kN/m2 = 0.10 kN/m2 = 0.50 kN/m2
Main Roof	Standing seam roof Purlins Ceiling & Services Roof Glazing (locally)	= 0.40kN/m2 = 0.15kN/m2 = 0.50 kN/m2 = 1.00 kN/m2

Misc

Basement Plant Roof	300 thk Planting material Waterproofing Insulation Services	= 6.00kN/m^2 = 0.60kN/m^2 = 0.10kN/m^2 = 0.25 kN/m^2

Note: The loads are subject to confirmation/development with the design team.

8.2.2 Variable Loads

Location	Imposed
Ground Floor Retail Units Category D1	4.00 kN/m^2
Bike Store Mezzanine	5.00 kN/m^2
Typical Office Levels	Offices (B1) Imposed = 2.50 kN/m^2 Lightweight Partitions = 1.00 kN/m^2 Corridors and Lift Lobbies (C31) Imposed = 3.00 kN/m^2 Staircases (C35) Imposed = 4.00 kN/m^2
Basement Plant Roof	5.00 kN/m^2 (Barriers are to be provided to ensure Vehicles heavier than 5t cannot access the roof)
Roof Terraces	5.00 kN/m^2
Viaduct / Amenities	5.00 kN/m^2
Plant Areas	7.50 kN/m^2
Roof Plant	5.00 kN/m^2
Water Tanks	10.0 kN/m^2 / m height
Roof (inaccessible unless for maintenance and repair) Category H	0.6 kN/m^2

8.2.3 Wind Loads

Wind loads have been determined in accordance with BS EN 1991-1-4.

8.2.4 Effective Horizontal Forces

The new structure will be designed to resist Effective Horizontal forces in accordance with the following:

BS EN 1993-1-1:2005 - Structural Use of Steelwork in Buildings;
BS EN 1992-1-1:2004 - Structural Use of Concrete.

8.2.5 Vehicle Surcharge / Lateral Earth Pressures

An imposed surcharge of 10kN/m² will be applied to the rear of all retaining walls to allow for construction vehicles during the construction works.

The lateral earth pressures will be based on the parameters defined by the Phase II Geo-Environmental Report.

8.2.6 Accidental Loads

Vehicular impact loads will be considered for the columns within the car park in accordance with BS EN 1991-1- 7 and the NA

8.2.7 Snow Loads

The general area design snow loads at roof level have been calculated in accordance with BS EN 1991-1-3.

8.3 Serviceability

8.3.1 Gravity Load Deflections

Deflection of the superstructure floor slabs and beams is considered in four stages:

Dead load deflection due to self-weight of the structure, this load will increase during construction and should not increase significantly any further once construction is complete.

Cladding Load installation of the cladding is usually undertaken once the supporting structure is complete. This provides a watertight envelope in which the internal fit out can be undertaken. During installation the cladding will be lined and levelled therefore the cladding will need to be designed to allow any further movement of the structure.

Superimposed permanent load due to permanent dead loads such as ceiling, raised access floor, and services where the loading will gradually increase as the fit out occurs. Once installed the load is not expected to vary greatly across the structure over a long period of time.

Variable load deflections which are likely to vary not just over the floor area but also between floors. These are loads associated with the imposed loading for the category of building use and include internal partitions and furniture. When considering deflections and creep the imposed loading is proportioned into long term loading, Quasi Permanent and the short term loading, Frequent. It is assumed that 30% of the imposed loading is quasi-permanent and 70% of the load is frequent.

The structure is designed for the flowing deflections:

Deflection Load Case	Internal Slab	Slab Edge
Short Term deflection due to slab self-weight (δ_{ST})	Span/1000	Span/1000
Incremental Deflection (δ_{INC}) Long Term deflection of dead and superimposed dead and cladding + Quasi Permanent imposed (δ_{IMPLT}) + Frequent Imposed (δ_{IMPF})	Span/360	Span/500
Total long term deflection post construction $\delta_{TOT} = (\delta_{INC} + \delta_{ST})$	Span/250	Span/250

8.3.2 Horizontal Movements

Vertical elements providing overall stability to the buildings are designed to limit horizontal deflections under wind loading. The stability system for each building has been developed to limit horizontal displacements resulting from lateral and longitudinal wind forces to attain the following movement criteria. :

Overall sway deflection of the building due to design wind load <H/300, where H = height of the building

These deflection design criteria will need to be considered in the development of the façade and cladding system in addition to normal construction tolerances.

8.4 Fire Protection

The requirements for the fire rating of the structure will be taken from the Fire Engineers Reports. Reference should be made to OFR Consultants information.

8.4.1 Great Northern Warehouse

90 mins protection to new office lift structure and existing units

90 mins protection to floors and supporting columns

8.4.2 Deansgate Terraces

Structural elements are to achieve 90 mins protection.

8.5 Natural Frequency and Dynamic Response

In accordance with BS6472 the following response factor performance criteria is to be achieved for a 'low probability of adverse comment':-

- Commercial / Retail R < 8

8.6 Disproportionate Collapse

8.6.1 Great Northern Warehouse

The building is considered to have a Consequence Class of 2b in accordance with building regulations.

The addition of the accessible terraces at roof level does not increase the existing consequence class of the building.

Discussions with Approved Inspectors are required to agree the approach, but during the next stage we are planning to investigate the connection details of the columns at the floors to demonstrate that there is a positive fixing at the columns (to provide a vertical tie) and investigate the secondary beam connections to review the horizontal tying capability.

8.6.3 Deansgate Terraces

The building is considered to have a Consequence Class of 2a in accordance with Approved Document A of the building regulations.

This will be addressed by providing effective horizontal ties.

8.6.4 Waterproofing

The only area of proposed basement construction is the Basement Plant area. As the intended usage is for plant rooms and storage the basement is assumed to be classified as a Grade 2 environment.

The ground water level is expected to be significantly lower that the basement and therefore generally a single system of protection would be acceptable.

One point to highlight is if the client requires a Grade 3 environment and is looking to obtain NHBC or a Premier Guarantee warranty they will require that a Certified Surveyor in structural waterproofing undertakes the design and it comprises a dual system.

Grade	Example of use of structure[a)]	Performance level
1	Car parking; plant rooms (excluding electrical equipment); workshops	Some seepage and damp areas tolerable, dependent on the intended use[b)] Local drainage might be necessary to deal with seepage
2	Plant rooms and workshops requiring a dry environment (than Grade 1); storage areas	No water penetration acceptable Damp areas tolerable; ventilation might be required
3	Ventilated residential and commercial areas, including offices, restaurants etc., leisure centres	No water penetration acceptable Ventilation, dehumidification or air conditioning necessary, appropriate to the intended use

a) The previous edition of the standard referred to Grade 4 environments. However, this grade has not been retained as the only difference from Grade 3 is the performance level related to ventilation, dehumidification or air conditioning (see BS 5454 for recommendations for the storage and exhibition of archival documents). The structural form for Grade 4 could be the same or similar to Grade 3.

b) Seepage and damp areas for some forms of construction can be quantified by reference to industry standards, such as the ICE's *Specification for piling and embedded retaining walls* [1].

Figure 8.0: Basement Grade BS8102

9.0 Design Standards

The design of structural elements is to be carried out in accordance with the latest editions of the relevant Eurocodes (with accompanying UK national annexes) and Codes of Practice as listed and as appropriate to the form of construction used, but not limited to:

BS EN 1990	Eurocode 0: Basis of structural design
BS EN 1991	Eurocode 1: Actions on structures
BS EN 1992	Eurocode 2: Design of concrete structures
BS EN 1993	Eurocode 3: Design of steel structures
BS EN 1994	Eurocode 4: Design of composite steel and concrete structures
BS EN 1995	Eurocode 5: Design of timber structures
BS EN 1996	Eurocode 6: Design of masonry structures
BS EN 1997	Eurocode 7: Geotechnical design
BS EN 752 2008	Drainage and Sewer Systems Outside Buildings
Building Regulations	Approved Document A - Structure
Building Regulations	Approved Document H – Drainage and Waste Disposal

10.0 Geotechnical

10.1 Phase 2 Site Investigation

A Phase 2 Site Investigation of the site was undertaken by Curtins Consulting dated October 2018 referenced 068997-CUR-00-XX-RP-GE-001

The following summarises the key geotechnical and geo environmental records from the Phase 1 Desk Study.

Current Site Status

The site is bound by Peter Street to the north, Watson Street to the east, a leisure complex and Great Bridgewater Street to the south and Deansgate to the west.

Most of the site is occupied by a multi-storey car park known as the Great Northern Warehouse, accessed of Watson Street. To the north of the site is a wedge-shaped bar and open space, with a sunken amphitheatre and areas of soft landscaping. The remainder of the site is covered by hard standing.

There are several pedestrian accesses into the site off Great Bridgewater Street and off Deansgate, restricted by steps. The area behind the shops on Deansgate is split on levels with planters. The only access to the north of the site is through the Great Northern Warehouse and the multi storey car park.

Summary of Phase 1

The earliest available historical mapping (1850s) indicates the site is occupied by unspecified buildings, which are likely residential dwellings. Lad lane is orientated east-west through the centre of the site. The Great Northern Railway Goods Station was constructed directly south of the site in 1908, and a chimney is located directly southeast of the site, associated with the Great Northern Railway Goods Station. Several small, possibly residential dwellings are present at the north and west of the site. Small units are also present at the centre east.

The site remains in this layout until 1948 when several new units were constructed in the centre of the site, orientated east-west. In the 1980s, the west of the site was redeveloped into a row of small commercial units. By 2000, the units remain in place, however those at the north were demolished and replaced by hardstanding surfaces.
The site is underlain by Made Ground, of unknown composition, superficial deposits comprising glaciofluvial sheet deposits (Secondary A Aquifer) and bedrock comprising the Manchester Marls Formation (Secondary B Aquifer).

There are no groundwater abstractions for potable water supplies within 250m of the site. The nearest surface water feature is the Bridgewater Canal 350m to the south.

Primary potential risks to be investigated during the Phase 2, as well as establishing ground conditions for geotechnical design, included; potential for ground gas, and risks to human health and controlled waters.

Fieldworks undertaken
Fieldworks were carried out between 23rd – 27th July 2018 and comprised three cable percussive boreholes to maximum 8.91m bgl, three window samples to maximum 5.45m bgl, and two hand excavated foundation pits to maximum 2.00m bgl. Ground gas and groundwater monitoring standpipes were installed within BH01 and BH03.

Selected soil samples were scheduled for chemical and geotechnical analysis. Six return ground gas monitoring visits have been undertaken.

Encountered ground conditions
Made Ground was encountered in all exploratory holes with maximum confirmed thickness of between 3.30m – 4.00m. Deposits comprise a surface cover of granite slabs or paviours, underlain by a concrete sub-base. This overlies loose to dense brown, reddish brown, dark brown gravelly fine to coarse SAND. A layer of soft sandy slightly gravelly clay was identified in WS boreholes at the east of the site was encountered directly overlying superficial soils. Anthropogenic gravels are fine to coarse angular to sub angular fragments of brick, concrete, clinker, glass, plastic, rare nails, and rare ash.

Superficial soils range in thickness between 2.40m – 4.75m and comprise medium dense to dense brown and orangish brown slightly clayey slightly gravelly fine and medium sand underlain by stiff to very stiff reddish brown, with occasional grey mottling on fracture lines, slightly sandy slightly gravelly clay. Bedrock was encountered at depths of between 6.10m – 8.75m bgl (26.18m – 29.55m AOD).

Made Ground deposits were recorded as wet from 2.50m bgl in WS01, and superficial soils were recorded as damp in WS02 (5.10m bgl) and BH03 (6.40m bgl). Groundwater level monitoring recorded BH01A and BH03 as dry.

BH03 recorded black bituminous material with a hydrocarbon odour, and a tar odour at 1.00m and 3.00m bgl respectively. No further visual or olfactory evidence of contamination was identified during the investigation.

Environmental laboratory testing and ground gas monitoring results
Slightly elevated concentrations of dibenzo(ah)anthracene were identified in BH01 (0.70m bgl) when compared against Tier 1 thresholds for a Commercial end use. These concentrations may be associated with clinker identified within gravels, as recorded on the exploratory hole log. All other samples tested recorded concentrations of contaminants of concern below Commercial thresholds.

During ground gas monitoring, a maximum concentration of 0.5% v/v carbon dioxide was recorded in BH01A on the second visit. No positive flow was recorded during the monitoring period. Concentrations of methane were recorded at levels below the limit of detection of the monitoring equipment in both wells throughout the monitoring period. The maximum concentration of CO2 and the maximum flow rate result in a calculated GSV of 0.0005 l/hr. With reference to UKWIR Report No. 10/WM/03/21, PE pipes are unlikely to be suitable for the development owing to elevated concentrations of C11 – C20 Mineral oils. Chemical testing results indicate that PVC pipes may be suitable for use. The exact requirements are to be confirmed with the relevant utility supplier.

Ground contamination and Ground Gas Assessment

A **Moderate/Low** to **Low** risk is presented to commercial site end users, construction workers and site visitors from Made Ground soils. A single exceedance of dibenzo(ah)anthracene was recorded in BH01 at 0.70m bgl. This borehole is indicated on development plans to be located beneath hardstanding surfaces, breaking the source-pathway-receptor linkage. With respect to POS thresholds, slightly elevated concentrations of benzo(a)pyrene, benzo(b)fluoranthene and dibenzo(ah)anthracene were recorded in BH01 and WS02 (0.70m and 0.80m bgl respectively. WS02 is located where development plans indicate an area of soft landscaping is to be installed. A suitable thickness of clean and inert capping should be placed in all areas of soft landscaping, to mitigate the risk presented to maintenance workers and site visitors.

A **Very Low** to **Low** risk is presented to controlled waters (groundwater and surface water). Although deposits were recorded as damp in three exploratory holes, post investigation ground water level monitoring recorded both BH01A and BH03 as dry. Given the wider historic industrial land use of Manchester city centre, it is likely that some residual contamination of the underlying aquifer will have occurred. It is considered unlikely that leachable contamination sourced from Made Ground soils will increase the risk to the underlying aquifer.

A **Low** risk is presented to site end users and construction workers from ground gas migration from Made Ground and natural sources. In accordance with an assessment by CIRIA C665, the calculated gas

screening value (GSV) indicates a Characteristic Situation 1 (CS1) classification may be assigned to the site, indicating no gas protection measures are required for the proposed development.

UK Radon Mapping confirms the site is situated in an area where less than 1% of homes are above the radon action level. Where the new development incorporates a basement the advice of a specialist Radon assessor must be obtained.

Geotechnical Assessment

Due to the significant thickness of Made Ground and the relatively shallow depth to the underlying Sandstone bedrock at the site; it is recommended that a piled foundation solution be utilised, end bearing in the sandstone.

As piled foundations are anticipated, a suspended slab is recommended to bear on the pile caps by a network of beams which will minimise any differential settlement between the floor and the piled structure.

Based on laboratory test results, it is considered that a Design Sulphate Class may be taken as DS-2, and an ACEC Class of AC-2 would be appropriate for the site, allowing for elevated sulphate concentrations within Made Ground soils.

Recommendations for further works

Based on the findings of the ground investigation, the following recommendations are made:

1) Implement a clean and inert capping layer of suitable thickness in all areas of soft landscaping.

2) It is recommended that construction workers are provided with appropriate PPE and sanitary facilities with reference to the environmental testing results presented herein and within Appendix C.

3) Contact specialist piling contractors to determine the suitability and carrying capacity of their piles in the ground conditions pertaining to site.

10.2 UXO Report

Curtins commissioned 1st Line Defence to conduct Detailed Unexploded Ordnance (UXO) Risk Assessment for the proposed works at the Great Northern Warehouse site, Manchester.

The assessment report was issued in July 2018 referenced ‘DA6764-00 Detailed UXO Risk Assessment for Great Northern Warehouse’

1st Line Defence has assessed that there is a Low Risk from items of unexploded German aerial delivered and Allied ordnance across the site.

The Recommended Risk Mitigation Measures to support the proposed works at the Great Northern Warehouse site include.

- Site Specific UXO Awareness Briefings to all personnel conducting intrusive works.

11.0 Civils

The total site area is approximately 1.4 hectares and following scrutiny of the UK Government Flood Map for Planning maps it has been identified that the existing site lies within an area classified as Flood Zone 1 (low risk of flooding from rivers and sea).



Figure 11.0: Flood Map for Planning (© Crown Copyright)

Following scrutiny of the UK Government Long Term Flood Risk Assessment for Locations in England surface water flood maps and risk of flooding from reservoirs maps, it has been determined that the existing site lies within an area which is classified as being partially at risk of flooding from surface water and does not lie within the maximum extents of reservoir flood risk.

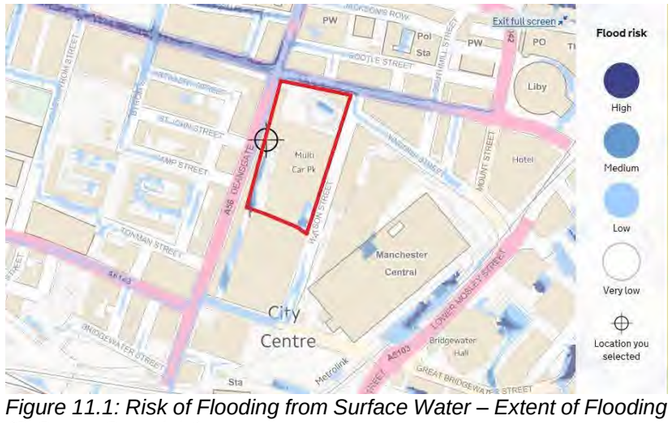


Figure 11.1: Risk of Flooding from Surface Water – Extent of Flooding (© Crown Copyright)

The site is located within the Manchester Conurbation Core Critical Drainage Area; since the site is larger than 1 hectare in Flood Zone 1, lies within a critical drainage area, and is partially at risk from surface water flooding, a Flood Risk Assessment (FRA) is required to support a planning application also taking into consideration the management of surface water run-off.
The Flood Risk Assessment should be prepared in accordance with the National Planning Policy framework document (NPPF) and the Planning Practice Guidance.

In April 2015, the Government made changes to the National Planning Policy Framework which made Sustainable Urban Drainage Systems (SuDS) a material consideration in the determination of planning applications for major developments. Therefore, a Detailed Drainage Strategy, incorporating the use of SuDS has been prepared for the development. External areas are currently proposed to utilise permeable construction and raingardens.

Existing Watercourses

The River Medlock (which is a 'main river') is located approximately 320m south-west of the site.

The River Irwell is located approximately 450m north-west of the site at its closest point, and it flows in a south-westerly direction towards the town of Runcorn. From approximately 1km north of the site, at its confluence with the River Irk (a 'main river'), the downstream section of the River Irwell is known as the 'Manchester Ship Canal' and is privately maintained. Upstream from this point, the River Irwell is a 'main river'.

The Rochdale Canal (Canal & River Trust) begins approximately 460m south-west of the site.

'Lost' Watercourses

A hidden (or 'lost') watercourse appears to flow along the southern boundary of the site, based on SFRA mapping however this is the abandoned Manchester and Salford Junction of the Bridgewater Canal.

The canal officially closed in 1922 with the section east of Watson Street being infilled and the western section used with reduced capacity until 1936 when it was officially abandoned. During WW2, the canal was drained, reinforced and used as an air raid shelter.

It is worth noting that as the proposals are to potentially utilise this space in the future, the water-tightness of the cut off would need to be accessed to ensure it is not at risk from flooding.

Existing Drainage

The public sewer utility records are available for the site; refer to Figure 11.2.

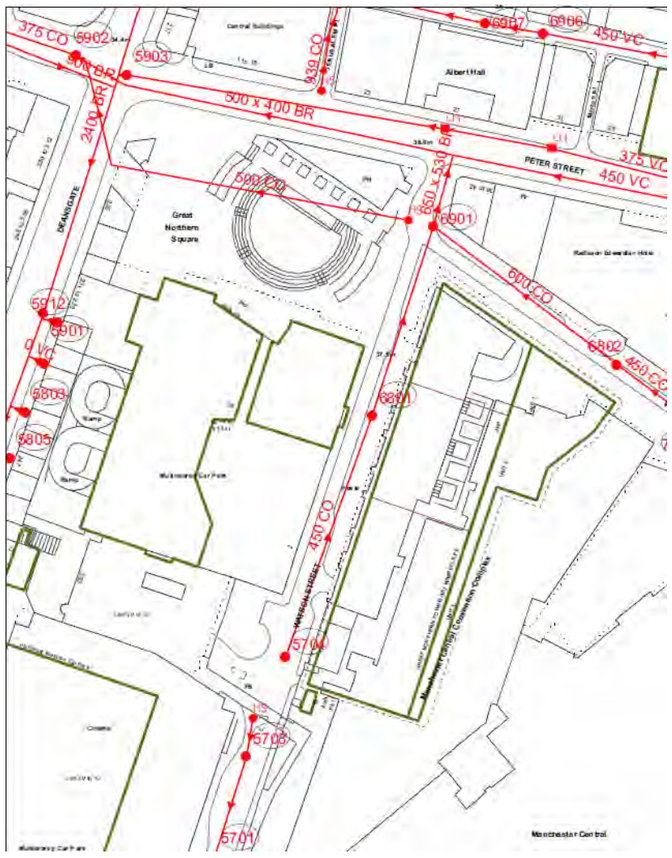


Figure 11.2: Extract from United Utilities Asset Record

The records indicate that there is a 500mm public combined sewer running across the northern area of the site. The 500mm diameter sewer was proved to be redundant and formally abandoned in 2018, however it has not been removed from United Utilities records yet, clarification by UU will be required.

The public sewer records indicate that the following public sewers are located within the vicinity of the site:

There is a 500 x 400 public combined sewer running adjacent to the northern site boundary within Peter Street, flowing in a westerly direction.

There is a 375mm public combined sewer within Peter Street which flows in a westerly direction.

There is a 2400mm public combined sewer flows in a southerly direction within Deansgate, adjacent to the western site boundary.
To the east of the site, a 450mm public combined sewer flows within Watson Street in a northerly direction. Near to the north-east site boundary, at the junction of Watson Street with Windmill Street, the public combined sewer increases in size to 650 x 530mm.

A public combined sewer flows from adjacent to the south-east corner of the site in a southerly direction along Watson Street.

There are several private foul, surface water and combined drains within the site boundary.

All existing internal drainage is to be confirmed therefore an additional CCTV survey will be required for internal building drainage.
It is also recommended to resurvey the existing retained private external drainage to confirm the condition of pipes to be retained through development.

Proposed Surface Water Drainage

Any new development site drainage should be designed in accordance with current best practice to provide adequate capacity not to flood for the critical 1 in 30-year storm event and flood water generated for up to the critical 1 in 100 year plus climate change storm event shall be constrained within the areas on site so not to cause damage to buildings, essential services or adjoining developments and services.

The new surface water drainage is proposed where new buildings and the new external areas are proposed.

The proposed flow rates are to be restricted to a maximum of 50% of the pre-development flow rates with an allowance of climate change for the proposed 100-year event. United Utilities has advised (email from 23.08.22) that based on Wallingford Method surface water for new surface water drainage should be limited to 47l/s.
LLFA has been contacted regarding flow rates, however no response has been received yet.

The required attenuation will be provided within raingardens, oversized pipes and permeable pavement subbase. The proposed raingardens and permeable pavement subbase will additionally provide water quality treatment.

The new surface water drainage system is proposed to discharge into the existing combined public sewer to the north-west corner of the site and will be subject to a Section 106 Application with United Utilities.

The existing buildings (Hub, Warehouse, Terraces) on site are to utilise existing drainage connections, however the existing retained surface water drainage should be modelled to investigate if it has sufficient capacity and where this is insufficient it may require additional connections to a attenuated system.

Proposed Foul Water Drainage

The existing buildings on site are to utilise existing drainage connections. The existing foul water drainage may require to be upsized to accommodate additional flows from the development.

New drains are proposed where new buildings are proposed.

The proposed foul drainage from the site is proposed to discharge into the existing combined public sewer to the north-west corner of the site and will be subject to a Section 106 Application with United Utilities.

All proposed drainage is assumed to remain private.

The foul water pump station will be required for the terraces basement areas.

Proposed External Works

External finishes within the site boundary to be confirmed by the Landscape Architect.

The external areas are proposed to be underlain by a permeable stone or void layer to provide surface water attenuation. Construction details will be subject to loading requirements.

External areas within the Highway Boundary (footpaths) will be subject to agreement with Manchester City Council and will need to be carried out under a Section 278 Agreement.

12.0 Opportunities and Risks

12.2 Key Project Opportunities

Basement Plant Area

Construct the retaining wall around the hub as a traditional reinforced concrete wall. This would require co-ordination in terms of working space and adjacent services. Temporary retaining walls such as a sheet piled wall would not be feasible as due to the level of the sandstone.

Warehouse

Re-use existing lift shafts and pits.

Further co-ordination of floor voids to minimise trimming / arch tying requirements.

Survey Information

Drainage

The existing surface water for the existing buildings may not have sufficient capacity and therefore may require to be reconnected to new surface water drainage system, which will have impact on attenuation.

The existing foul water serving existing buildings may not have sufficient capacity and will require to be upsized.

The below ground existing structure is unconfirmed and may impact on location and depth of proposed drainage.

Structure

We are assuming that the existing structure complies to current standards.

12.3 Key Project Risks

The following key residual risks have been identified and though not exhaustive will need to be managed as the design process progresses:

Geotechnical

Contamination – Across the Deansgate Terrace area, there is potential for contamination within the made ground from historical uses including a tannery, lead mill, goods station. Whilst risk to end users is low allowance should be made for the removal of localised hot spots of contamination.

Ground Conditions – Whilst we have a good degree of understanding of the rock quality and levels, due to works undertaken locally to the site, and previous reports undertaken, further intrusive Site Investigation works are required to confirm the current assumptions.

Existing Obstructions – There is a risk that the new foundations will clash with existing ground obstructions. Allowance should be made for localised removal.

Appendices

Appendix A	**Extract from 'The Engineer' September 1898**
	Description of New Goods Station, Great Northern Railway
Appendix B	**Structural General Arrangements**
Appendix C	**Proposed Drainage Drawings**

Appendix A **Extract from 'The Engineer' September 1898**

Description of New Goods Station, Great Northern Railway

transport of horses, she having been fitted for stalling 130 on the main deck, and eight officers' horses on the upper deck. To provide for their comfort, they being as a rule very bad sailors, she was rigged with three iron pole masts, with stump top-masts, without yards of any kind; all the sails carried being rigged fore and aft, and only just sufficient to prevent rolling. When infantry only were carried, the horse stalls were removed, and the main deck easily converted to their accommodation.

The propelling machinery of the Assistance, supplied and fitted by Messrs. Humphrys, Tennant, and Co., of Deptford, consisted of a pair of inverted direct-acting surface-condensing compound engines of 200 nominal



Fig. 112—Torpedo Boat for Danish Navy, by Yarrow and Co., built in 1876

horse-power, the low-pressure cylinder being 80in. diameter, and the high-pressure 42in., with a piston stroke of 3ft. 6in. Steam was supplied by four two-furnaced boilers, weighted to a pressure of 60 lb. to the square inch, and having a total heating surface of 4330 square feet.

The engines drove a three-bladed Hirsch screw 18ft diameter and 18ft. pitch. On her full-power trial on the mile, the mean of six runs made gave a speed of ship of 12 knots an hour, which was considered a highly satisfactory result, and the engines worked with remarkable smoothness and regularity throughout, entirely free from hot bearings. The ship answered her helm with great promptness, she being steered by Mr. Macfarlane Gray's automatic steering gear, this being supplemented by hand gear turning right and left-handed screws, for use in case of accident to the steam gear. The anchors were raised and lowered by a Harfield steam windlass, the engine of which also worked a capstan on the forecastle for catting them. As a troopship, the fitting of the Assistance left little to be desired, she having spacious quarters for a crew of 112 all told, and excellent accommodation for 800 troops and 130 women and children.

Although the year 1875 brought prominently into notice the addition of another firm—Messrs. Yarrow and Co.—of fast steam launch and torpedo boat builders on the Thames, it did not add to the number of existing shipbuilders on that river, as it was in that year that the shipyard and engine works of Messrs. J. and W. Dudgeon were closed, owing, among other causes, to the death of one of the partners, and the illness of the other, the engine works passing into the occupation of the Electric Power and Storage Company, and the shipyard being utilised as a petroleum store. During the existence of the shipyard and engine works, many fine and notable vessels with their propelling machinery had been constructed therein, only a few of which we have noticed in our articles, as many of them were very fully described, and some illustrated, in the issues of our journal at the time of their production, and have therefore not needed repetition. We may, however, here mention that the firm of Messrs. J. and W. Dudgeon, while existent, built in all, at Limehouse and Cubitt Town, 134 vessels of all descriptions.

So far as the shipbuilding and marine engineering interests of the Thames river were concerned, we think it may without dispute be said that the fourth decade of the Victorian reign, 1867—1877, was a record one for those interests, as within its limits not only had some of the finest ships that ever floated on its waters been constructed, but there were more in number and types than had ever been previously recorded. It is, however, remarkable that within the decade, especially in its last years, so many of the ships ordered by foreign Powers, and constructed in Thames shipyards, should have changed ownership either on or before completion. Of these may be noticed the fine ships Misoudiye and Memdouhiye, built by the Thames Ironworks Company; the Orion and Bellisle by Messrs. Samuda Brothers; the unfortunate Independenzia, and others—all, we believe, purchased by our own Government—ships that were fully noticed in our issues at the time of their completion and needing no further reference here.

The last year—1877—of this decade is, however, particularly noticeable as the one in which the Foo-soo, the first ironclad built in England for the Japanese Government, was constructed by Messrs. Samuda, of Poplar. As she embodied some special features in her construction, a brief description of her may be of interest.

The Foo-soo was an iron armour-clad twin-screw frigate, 220ft. long and 48ft. beam, designed by the present Sir E. J. Reed, C.B., and built to carry—with only 3700 tons displacement—side armour from 7in. to 9in. thick, with guns, stores, &c., at a speed of about 13 knots an hour. In her construction her designer introduced a new system of framing, the frames being continuous from keel to main deck, and instead of the usual armour-shelf, a strong longitudinal girder, well supported by brackets, was worked upon the outside of the frames, at the proper height and projecting beyond them. Upon this bracketed girder the armour and wood backing were placed, giving as a result exceptional strength where the lower edge of the armour was connected with the frames. The ship had iron decks, and was built in thirty-two watertight compartments. She was armed with four 15¼-ton, and two 5½-ton breech-loading Krupp guns, so arranged as to command the whole horizon.

The propelling machinery of the Foo-soo, supplied by Messrs. Jno. Penn and Sons, consisted of two pairs of trunk engines on the compound principle. The contract power of these, and speed of ship, were 3500 indicated horse, and 12¾ knots respectively, but on the official trial the speed of ship realised was 13·16 knots, and the power developed by the engines when making 93 revolutions, the steam pressure being 59 lb. per square inch, was 3734 indicated horse; thus exceeding the contract in both cases, in engine power especially by 234 horses.

The Foo-soo was barque-rigged, and could cruise any distance under sail alone, while her bunker capacity—360 tons—enabled her to steam 4500 knots at a 10-knot speed. Possession of this ship—by purchase—was desired by the British Government, but the Japanese Admiralty altogether refused to entertain any application with that intent, notwithstanding very liberal offers beyond her cost price were made by more than one Government.

The year 1877 is also notable as the one in which torpedo boats were first built on the Thames for the British Government; Messrs. Thornycroft and Co. and Messrs. Yarrow and Co. having each in that year completed the first boats of that type ordered for the British Navy. The first boat built by Messrs. Thornycroft and Co. was the Lightning—fully described and illustrated in our issue of May 18th, 1877—a vessel 84ft. long over all by 10ft. 10in. beam, and drawing about 5ft. of water, at which draught she was guaranteed by her builders to do 18 knots an hour on trial. Her engines, which were similar to those of the French boat, were capable of indicating 350-horse power. Being intended for use in a rough sea if necessary, and in order that she might keep the sea for some time, her cabin and crew accommodation were on a larger scale than in any of the boats previously constructed by her builders.

The boat was armed with the Whitehead torpedo, projected by means of a discharging apparatus, the torpedo itself being charged with compressed air for its propulsion. To those interested in the arrangement of this first of the British torpedo boats we would refer them to the issue of our journal previously indicated.

The first boats delivered to the Admiralty by Messrs. Yarrow and Co. were two in number, constructed in 1877, and were each 86ft. long and 11ft. beam, built of galvanised mild steel. They had compound surface-condensing engines with a locomotive boiler; the air, circulating, and feed pumps being driven independently. The indicated horse-power was about 420, and the speed on trial 20¾ knots an hour. These boats were armed with spar torpedoes, each of which consisted of a long steel spar carrying a torpedo at its end, which was lowered when approaching the enemy, so as to explode under her bottom or against her side. The torpedo itself was a metal case containing a highly explosive compound, such as gun-cotton or dynamite, which was fired either by contact or electrically at the moment of impact. As the Whitehead torpedo—which was self-propelling—had at this date (1877) been introduced, the spar torpedo was destined soon to become a thing of the past, or, if retained, it would be for the purpose of destroying booms stretched across harbour entrances, mooring buoys, or isolated unprotected vessels.

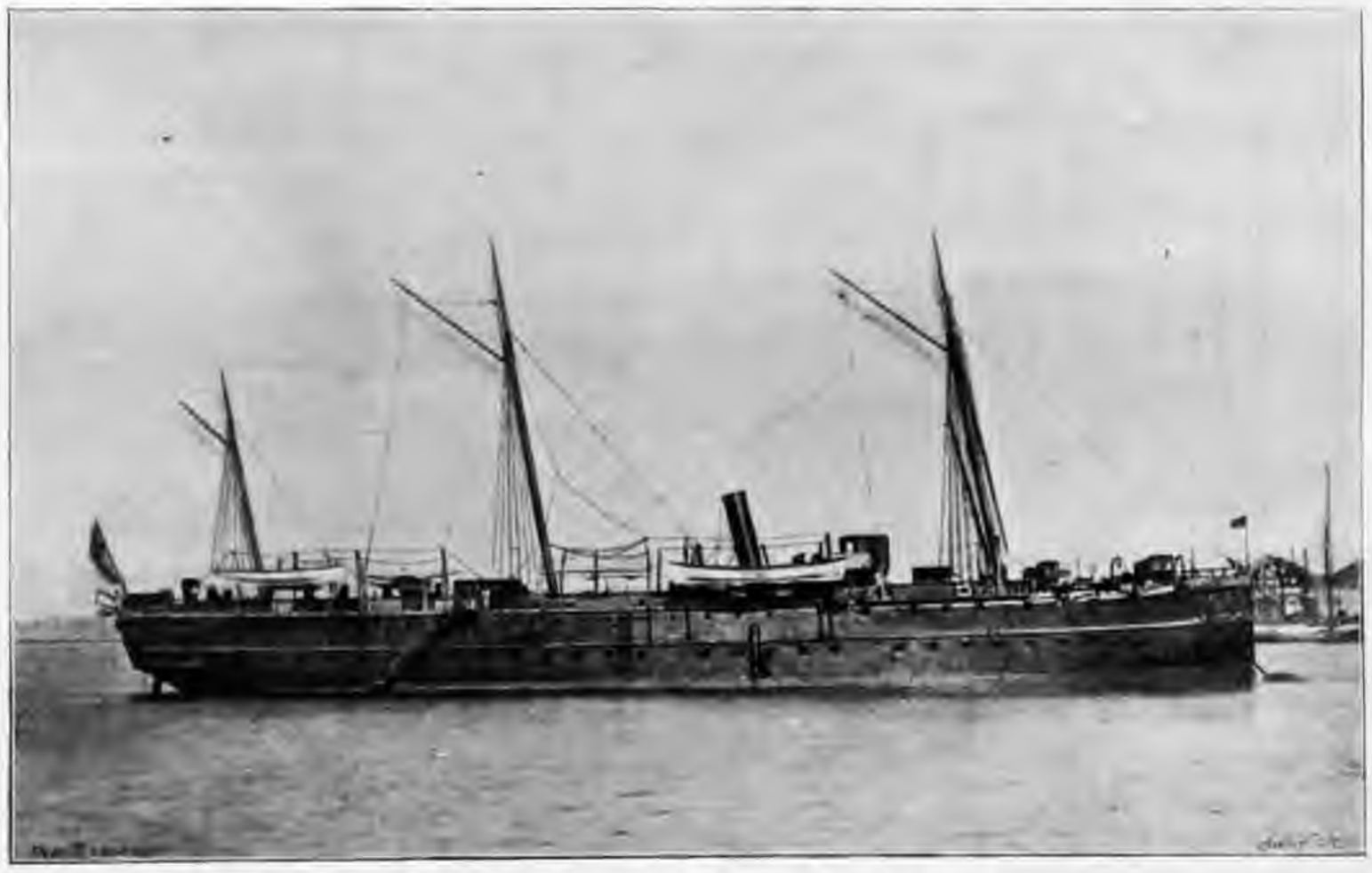


Fig. 113—H.M.S. Assistance, built by Messrs. R. and H. Green, 1875

NEW GOODS STATION, GREAT NORTHERN RAILWAY, MANCHESTER.

WE publish this week a series of engraving and plans representing the new goods station and its approaches, which are in course of construction near Deansgate-street, Manchester, by the Great Northern Railway Company, and a part of which was opened for traffic on the 1st of July, practically fifteen months from the date of its commencement.

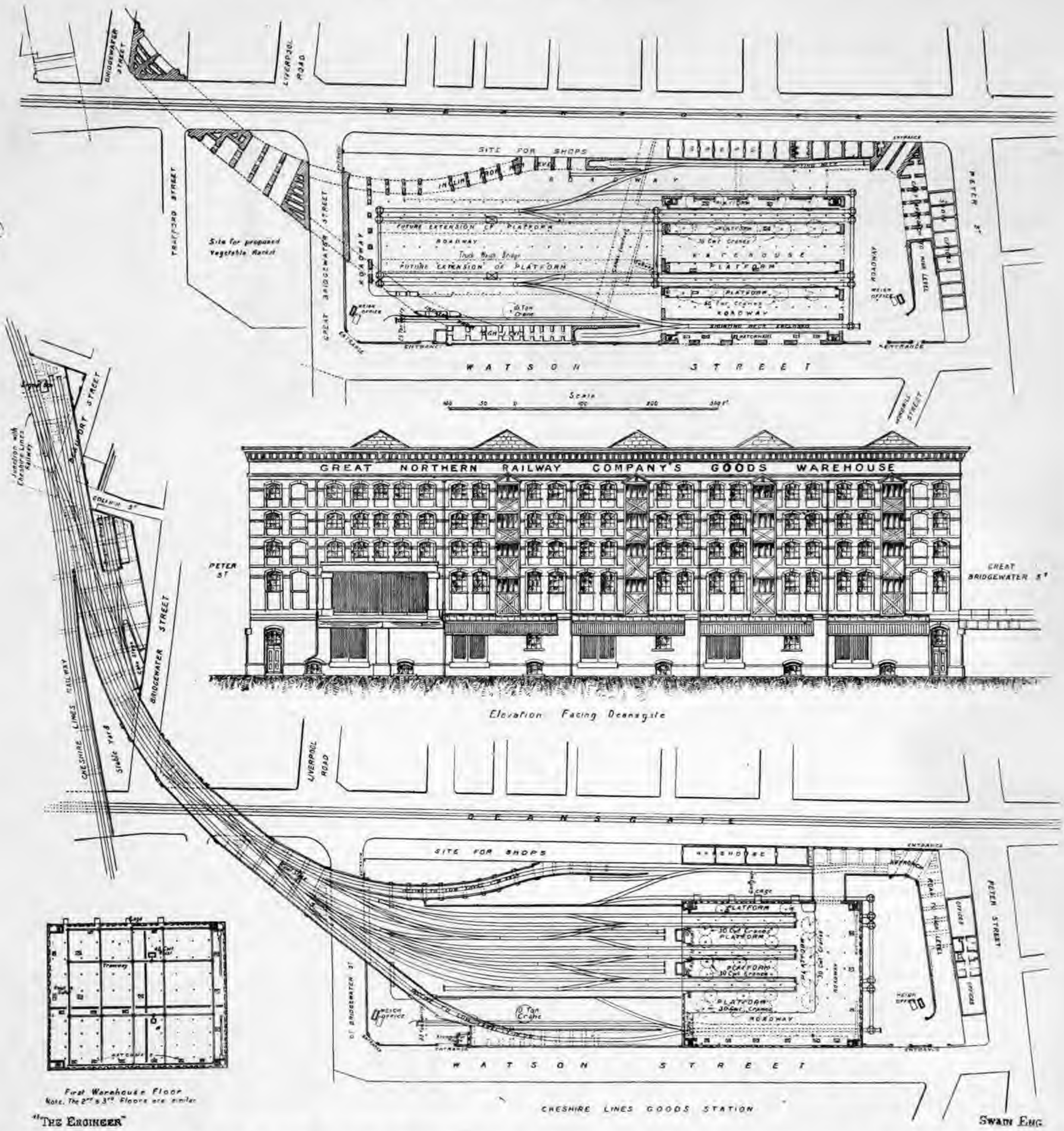
It is necessary, before describing the characteristics and progress of this undertaking, to recapitulate briefly the reasons which have led the Great Northern Railway to open up so vast a goods depôt on its own account in the north-west capital of England. They are as follows:—For the past forty years or more the company has had no independent outlet or inlet for its traffic from Manchester and the surrounding district. As aptly put by the *Manchester Guardian* on the opening day, its interests in regard to the collection, carriage, and distribution of goods in this part of the country have been left in the hands of the Manchester, Sheffield, and Lincolnshire Railway Company, now known as the Great Central Railway Company, and in the hands of the agents of that company, Messrs. Thompson, M'Kay, and Co., Limited, the well-known carriers. Great Northern traffic for the east, south, and west of England has been worked through the Ducie-street depôt, and transferred to the Great Northern line at Retford by Great Central officials, wagons, and engines. Traffic to the West Riding of Yorkshire was similarly conveyed to Ardsley, and the Midland traffic was conveyed by trains engined by the Great Central sometimes right through to Nottingham.

When, however, the Great Central Railway Company decided to open up direct and independent communication with London, the Great Northern Company thought that the time had come to determine the agreement for interchange of traffic which had existed so long between them, and the result has been the erection of the gigantic station or depôt in Deansgate, which is the subject of the present paper, and upon which nearly one million sterling has already been spent. This station is connected with the Cheshire lines by an approach viaduct, and as the joint arrangement for the use of these lines still holds good, by the new scheme the Great Northern Railway can make up its own goods trains in its own station at Deansgate, and run them by its own engines to the places before mentioned, where they join the Great Northern line proper.

The work which has been accomplished already is of considerable magnitude. Although only two out of the five floors of the depôt, the high and low-level stations, are actually in use at the present time, the approach viaduct and the high and low-level yards outside the station are in a very forward state, and practically complete in many respects. Parliamentary authority for the construction of the work was obtained in 1895, and the contracts were let in the latter end of 1896, but the undertaking was not taken thoroughly in hand until

NEW GOODS STATION, GREAT NORTHERN RAILWAY, MANCHESTER

MR. W. T. FOXLEE, M. INST. C.E., ENGINEER



late in the spring of last year. Moreover, the strike in the engineers' trade greatly delayed the execution of the work. Its progress, therefore, up to the present time is very remarkable.

The designs for the new buildings and the approach viaduct, with all their accessories, were prepared by Mr. W. T. Foxlee, M. Inst. C.E., who has also carried out the execution of the works, the designs having been afterwards approved by the engineer-in-chief of the Great Northern Railway, Mr. A. Ross, M. Inst. C.E., who subsequently took office in the company. Mr. W. T. Foxlee has been ably seconded by his two assistant engineers, Mr. J. A. Thornton, A.M. Inst. C.E., and Mr. F. W. Hunt, who have been untiring in their efforts to push on the work. The contractors for the work generally were Messrs. Robert Neill and Sons, of Manchester; the steel work, of which 12,000 tons were required, being supplied by Messrs. Heenan and Froude, of Newton Heath; Sir William Arrol and Co., of Glasgow; and Messrs. Keay, of Birmingham. The hydraulic machinery—notably the cranes and hoists—have been chiefly supplied by Sir William Armstrong, Whitworth, and Co., and a portion by Messrs. Musker, of Bootle, and Messrs. Higginbottom and Mannock, of Manchester. Some idea of the magnitude of the work may be obtained from the following data: 800 men have been almost continuously employed upon it; about 100,000 tons of material have been excavated for the foundations; and 25,000,000 bricks, 50,000 tons of concrete, 12,000 tons of mild steel, and about a million and a-half of granite sets and hardwood blocks have been required. If the rivets used in the steel work were laid end to end they would reach to a distance of sixty-five miles.

The work of demolition which had to be effected in the vicinity of Deansgate was enormous. About nine acres of streets and houses, including Alport's brass foundry, and a host of hotels, inns, and public-houses, a chapel, burial ground, central school, and other institutions were swept away or bridged over, the value of the land being nearly two-thirds of a million sterling. From Peter-street to Great Bridgewater-street, and from Deansgate to Watson-street, the whole space is absorbed entirely in the depôt and the high and low-level yards. Beyond this the approach viaduct has also cleared extensive spaces, though the main streets have been left open beneath girder and brick bridges. The front of the Great Northern Railway Company's premises facing Deansgate is to be allotted for thirty-two shops of good style and appearance, an engraving of which will appear in our columns. The site which remains from the demolition of the chapel and burying ground it is proposed to utilise as a potato and vegetable market.

The general plan of the new station and its approaches can be seen from the accompanying engravings of the high and low-level portions of it. Mr. Foxlee prepared for the chairman and directors of the Great Northern Railway several alternative schemes for dealing with the goods traffic, the effort being to secure as extensive a working space for lines, platforms, and sidings, as well as for warehouse accommodation, as the ground available would afford. The plan ultimately adopted was to have two separate goods stations, one over the other, with high and low-level yards, for marshalling trains and accommodating the wagons, outside the building. Communication between the high and low-level yards is effected by means of an incline, on either side, descending at a gradient of 1 in 28. At the lower end of each incline is a level shunting neck, into which eight wagons can be pushed by the shunting engine, whilst the points leading to the low-level yard are turned. There is room in this siding for more than eight wagons, but it is considered that eight is a suitable number to deal with on the incline. Thus, trains can be marshalled with the utmost rapidity, the loaded wagons being drawn out, by means of hydraulic capstans, from the low-level station into the low-level yard, from thence shunted by the shunting engine, eight at a time, up to the high-level yard, and made up into trains at once, starting along the viaduct to the junction from there. It is, of course, with the high-level yard that the approach viaduct communicates. When we compare this plan, for working two independent floors or stations, with that adopted at the London-road goods station, Manchester, where the wagons are raised one by one through an opening in the floor by a hydraulic lift, the advantages gained by the new method are apparent. It must be remembered that the two inclines will deal with sixteen wagons simultaneously. Over 500 wagons can be accommodated upon the two levels of the Deansgate Station, and upon the high and low-level yards, at one time. Within the stations themselves there is line and platform accommodation for sixty wagons upon the high-level and eighty wagons upon the low-level. Upon the high-level yard there are ten sets of rails and sidings,

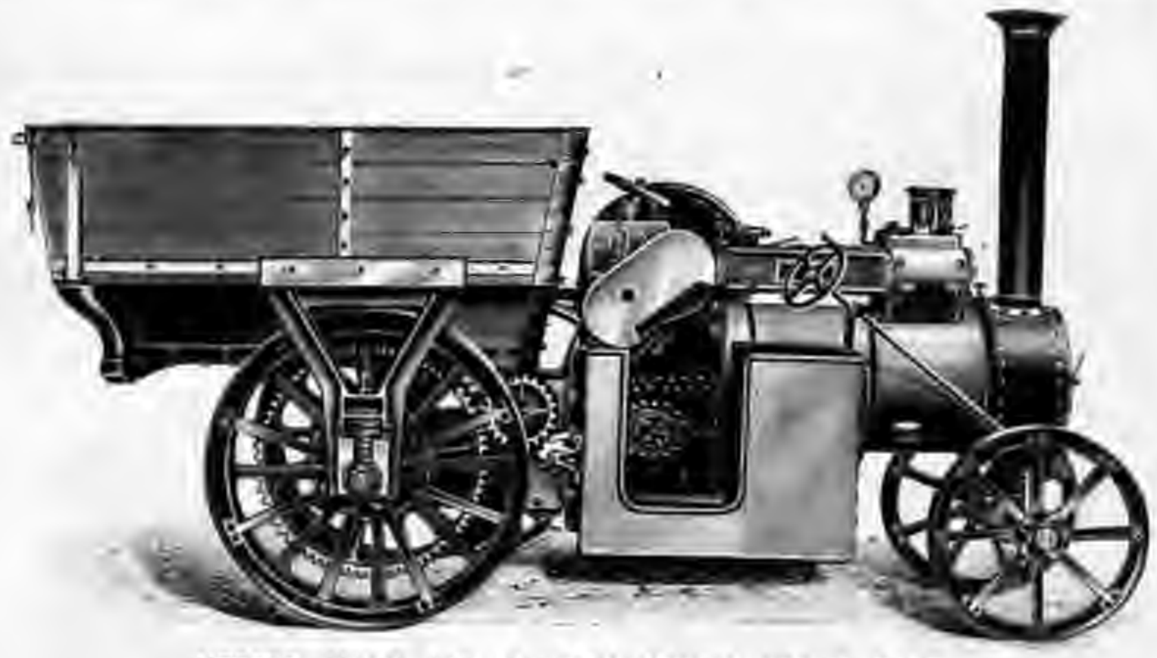
as can be seen from the engraved plan, independently of the inclines. It is from the high-level, therefore, that it is proposed to run the London traffic, as trains can be made up irrespective of destination and run straight off. The goods traffic for mixed destinations will be made up on the low level, and the wagons will be subsequently marshalled on the high level in their proper order.

The approach viaduct, the inclines, and the shunting necks are shown upon the low-level plan. In order to get head room beneath the inclines, where they sweep across the roadway of the low-level yard, instead of brick arches as elsewhere, main girders of steel are employed with "trough girders" to connect them, within which the sleepers for the rails are laid. Detailed drawings of these trough girders will be given later on. A photograph of the western incline, with the shunting engine upon the branch leading to low-level yard, is given on page 230. The viaduct itself is composed partly of brick arches and partly of steel girder bridges, as may be seen by one of the photographs engraved to-day, showing the girder bridge over Great Bridgewater street, and two of the brick arches. The Deansgate-street girder bridge, or rather one girder of it, is the subject of another photograph engraved. Drawings of it will also be given. The main girders are 124ft. 7in. in total length, with a span of 112ft. 4in., and a depth of 10ft. 6in. The ends rest on circular steel rockers, which lie within steel forgings, the rubbing plate below being faced with phosphor bronze, this having been found the best material for the bed to slide on. This is a plan which was adopted by Mr. E. Andrews, Mem. Inst. C.E., on the South-Western Railway bridge at Barnes. The thickness of each plate in the top and bottom flanges of the girders is ⅞in. Two plates at extremities, up to seven in the part where greatest strength is required, are employed. Cast iron bed and rubbing plates are used for other girder bridges. An ornamental face has been designed for the Deansgate-street bridge to satisfy the municipal authorities.

The high-level yard, which is outside the station, is built upon a series of steel stanchions supporting steel girders, between which 9in. brick jack arches are turned. The stanchions are practically H steel girders set on end, and at their bases are cast iron guards to protect them from injury. Details of these guards will be published, as they are of special design. The stanchions rest upon granite blocks which are laid upon concrete foundations going down to the sandstone rock. The jack arches are covered with concrete, and asphalted to prevent their leaking. Details of drainage, filling in of arches, asphalting, &c., will be given hereafter. Thus the whole of the low-level yard is practically roofed in, and it is proposed to extend platforms from end to end of it at a future time, in order to increase the loading-up facilities. There is a truck weighbridge on either side. Four lines of rails are on the low-level yard, with turntables at their extremities both ways, and hydraulic capstans for shunting. The girders on the outside of the high-level yard have a thick band of Derbyshire grit resting upon the top, and on this a brick parapet wall is built.

The station or goods depôt itself is seen in the plan upon the right side. It is entirely of fireproof construction, being practically a series of storeys built of mild steel stanchions with connecting girders, cast iron junction boxes being employed to join them, and cross girders, with jack arches turned between them, forming the floors. The walls are constructed in a most substantial manner, the lower portion consisting of blue brickwork in cement and the upper portion of hard local red bricks relieved by blue-brick bands. The brickwork of the station is wholly in cement. The steel stanchions rest on large granite bases, which are bedded upon blue-brick and concrete foundations going down to the solid rock, as is also the case with the walls. Each stanchion is calculated to sustain a weight of 650 tons, when the warehouses and stations are fully loaded. We give a photograph on page 230 which represents the constructive arrangements of stanchions and girders very clearly. The elevation of the station, towards Deansgate, as it will be when completed, is also shown. It is 267ft. long, 217ft. wide, and the height of the whole five storeys, when finished, will be 75ft. above street level. The lowest floor is, of course, the low-level station. This has four lines of rails running into it, with turntables at both ends, outside. There are four platforms, with offices for the accommodation of the checking clerks. Spacious roadways, paved with Australian Jarrah hard wood blocks, as is the case with all the internal roadways of the depôt, open both from the north and south entrances of the building, which are between blue-brick piers, forming the walls. These last are 8½ to 8 bricks thick. At the southern end of the station they are connected beneath the surface of the ground by inverted arches, in the event of any subsequent disturbance of the foundations being necessary. The side walls consist of piers rather less thick. As will be seen on page 230, upon the platforms are fifteen 30-cwt. hydraulic cranes, for loading and unloading trucks. Jack arches are turned everywhere for the floors, when the height renders this practicable, even beneath the platforms; the object being to reduce charges for maintenance, these being, of course, correspondingly heavy, when a quantity of paint-work has to be periodically renewed. On the Watson-street side of the station, openings between piers lead into a covered roadway. Over this are six hatches, which communicate by hydraulic hoists with the warehouses above. Lorries can draw in here, and load or unload under shelter. The entrances at the four corners of the premises embraced by the station, low-level yard, and their accessories, are seen in the low-level plan, as well as the piers of the sloping approach which leads from the corner where Watson-street and Peter-street join to the high-level station. The main entrance is a double one out of Deansgate.

The high level station is entered by the sloping approach—which, like all the outside roads of the depôt, is paved with granite setts—from the Deansgate side. A broad roadway, as marked in the plan, extends round two sides of the building within it; but it is intended to reduce the width of that which lies to the east for an additional platform. There are, as at present arranged, to be six sets of lines, and five platforms adjoining them, with no less than twenty-five cranes. Four exterior hydraulic cages will be worked from stagings resting on steel cantilevers on the Deansgate side. They will communicate with the three warehouse floors above the high-level station, as well as the hatchways and hoists on the Watson-street side; there are also two 40-cwt. hoists and additional hatchways, which communicate from floor to floor. The cages have counterweights to assist the hydraulic power. The steel cantilevers will also form the support for a roof, which will extend over



MESSRS. MANN AND CHARLESWORTH'S STEAM CART

the exterior siding, marked in the low-level plan; loading and unloading will therefore be performed under shelter.

One of the three similar warehouse floors which will surmount the high-level station is given in the plan, showing the cages, hoists, and hatches which are associated with it and with the other floors. A series of tramways, with trucks and turntables, will be arranged upon these for facilitating the removal of goods from one part of the warehouse to another. This naturally leads to a point which must now be alluded to. An important feature of the building has yet to be described. It will be noticed, in both plans, that hoists are marked as "leading to canal," on the south side. This is the Bridgewater Canal, a branch of which, shown in dotted lines in the low-level plan, runs in a canal cut through the sandstone 35ft. or 40ft. below the approach to the low-level station. It is proposed to have two subways opened, associated with the hoists before alluded to, running direct to the tow-path of the canal branch, which is to have a wide "gare" excavated and arched over, lines being led along it for trucks similar to those used on the warehouse floors, so that goods arriving by canal can be hoisted up to the stations, or to either of the warehouse floors, without breaking bulk. This is an excellent idea, as it will make this Great Northern depôt the first railway warehouse in Manchester in direct communication with the Ship Canal. Mr. Foxlee has provided against any possible subsidence of the low-level yard lying over the site of the canal by laying a large quantity of cast iron girders, bedded in concrete, right across the line at a great depth beneath. These will effectually protect the crown of the canal arch.

It should have been mentioned that the new stations and warehouses, as well as the adjoining yards and approaches, are all lighted with electricity, the power being supplied by the Manchester Corporation. Excellent stables have been constructed for about eighty horses beneath the approach viaduct arches, near Bridgewater-street. The stables are paved with "Cliff's granitic paving," which is scored with indented lines for facilitating drainage. It looks very nice and clean.

About one half of the station premises was opened upon the 1st of July, the first lurry load arriving at 6.20 a.m. By the evening the surrounding streets were lined with lurries and trolleys waiting for their turn to unload, but Mr. L. Brightman, the district goods manager, and his staff of 350 men, were well able to cope with the traffic, and the first goods train steamed out exactly at the time appointed, which was between 5 p.m. and 6 p.m.

During the progress of the work the Right Hon. W. L. Jackson, M.P., chairman of the Great Northern Railway Company; several other members of the board of directors; Mr. Charles Steel, the general manager; Mr. A. Ross, chief engineer; Mr. R. H. Twelvetrees, chief goods manager; and Mr. J. Alexander, superintendent of the line, have frequently visited the scene and taken much interest in it. Mr. E. Coward, the local director, has been constantly on the ground, and Mr. Alexander, Mr. A. Ross, and Mr. Twelvetrees were unwearied in their efforts to make the opening day a success. The new Deansgate station and its approach viaduct may be described as a marvel in mild steel, and its successful opening in so short a period after its commencement reflects the highest credit upon Mr. Foxlee, who is responsible for the design and carrying out of it, as well as upon the administrative powers of the engineer-in-chief. We hope to give interesting details of the work another week.

THE LAVIANO ASPHALT.—Mount Laviano is one of the principal peaks of the Apennines in the province of Salerno. It rises to a height of some 5500ft. above the sea. It is of limestone, in many parts saturated by asphaltic bitumen, and in some places above the calcareous strata sandstone full of asphalt occurs. The quality of the product is of the first class, and capable of being used for any of the numerous purposes for which asphalt is applicable. The establishment owned by the Neapolitan Mining Company is worked by 600-horse water-power at Olevano, and their stores for local sales are at Naples. The present mine is at a height of 4500ft., and the products are carried by mules to the village of Laviano, whence they are taken in carts to the workshop at Olevano.

STEAM CART.

In our report of the Royal Agricultural Society's Show at Birmingham we mentioned a steam cart exhibited by Messrs. Mann and Charlesworth, Leeds, and designed to work within the restrictions of the Motor Cars Act. The engine was at the time scarcely completed, and practically no trial of it had been made. We have now pleasure in putting a small illustration of it before our readers. It consists, it will be seen, of a little traction engine, over the back wheels of which fits a wagon body of special form, and provided with an independent pair of wheels of its own. When, however, the cart is in the position shown in the cut its wheels are outside, and concentric with the engine wheels, which are of the same diameter, and to which they are attached by a few steel pins readily removable. They then become driving wheels instead of mere trailers, and the great width of wheel face so gained prevents damage to the road, and obviates the necessity of using cross strips. The wagon can be tipped, and is provided with a windlass for pulling it back to the normal position.

The engine, which can be used as an ordinary traction or portable when desired, is of compound type and is fitted with Mann and Charlesworth's single eccentric reversing gear. No pitch chains are used, the transmission being through cast steel toothed wheel gearing. The boiler, of ordinary locomotive type, is coke fired from one side, as seen in the cut, a water tank balancing the driving platform on the other side. By the use of a small condenser and superheater all visible vapour is prevented, and the condenser serves also as a feed heater. With a load of four tons this little cart has easily ascended, we are assured, an incline of 1 in 6.

Coming within the motor car regulations, it can travel in charge of one man, and need not be accompanied by a steersman or flagman. It is not affected by any restrictions of working hours, or prohibition of going over bridges, but can run during all hours of the day or night upon any public highway, whether in town or country. No licence is required so long as it is used exclusively for the conveyance of goods. It is allowed to run at an increased speed, varying according to the weight of the vehicle.

DOCKYARD NOTES.

THE Japanese armoured cruiser Asama, launched not so very long since at Elswick, is expected to start for Japan at the end of the year, and her sister ship will follow soon afterwards. One or both will call at Devonport to coal, and will no doubt excite considerable interest there, as they represent a good deal that is novel in construction, and the type that is most likely to be the cruiser of the future. The big protected cruiser appears to have had its day; indeed, neither Rossias nor Diadems appear likely to remain in favour. Naval opinion seems to demand that future cruisers shall embody all the best features of these two opposing types. A few years ago this would have been deemed impossible. If Santiago proved anything, it augured very badly for the Rossia type of ship with only a water-line belt as protection. Her antithesis, the Diadem and Terrible types, come in for criticism, because of their vulnerable water-lines. Hence the evolution of the cruiser that is to all intents and purposes a swift second-class battleship.

THE second-class battleship Edinburgh is reported due shortly at Portsmouth to act as tender to the Excellent, gunnery school. It is not stated whether she will replace the Hero, the present tender, or be additional to her. Both ships carry the old 45-ton 12in. breech-loaders, pieces carried only in their sisters and in the Collingwood. Ten years ago this piece was a wonderful gun, but now it is very much out of date, and of comparatively feeble power. The classing of the Collingwood, which carries four of them, as a first-class battleship, can only be due to a patriotic desire to swell our list of first-class ships she is totally unfitted for that *rôle*. As for the Edinburgh, her fighting value is small, though possibly she would do better than the Collingwood, since such armour as she has is liberally laid on. But the new 10in. wire guns in her turrets, and the saving thus effected bestowed on a narrow belt forward, at the expense, if necessary, of her 6in. guns also, would make her far more efficient. She is, however, so slow, and such a "coal-eater," that a reconstruction is very unlikely.

ON the subject of "coal-eaters," the squadron going to Bristol contains representative vessels with powers that way. It was generally reported as the reason why they did not participate in the summer cruise of the reserve squadron, and apparently with truth. From time to time reports have been circulated about their engines giving out, but these have not been correct; the ships have generally managed to do their speeds very well, which, seeing they are by no means new vessels, and that they have the disadvantage of low freeboards, says much for them. But they steer only indifferently well, burn much more coal than our more modern Majestics and Royal Sovereigns, and have been unlucky in suffering from more than their share of minor mishaps when in active commission in the Mediterranean. Their turrets, too, have at times caused dissatisfaction in working, those of the Trafalgar being popularly supposed to have sunk some three-quarters of an inch. Altogether, though looked upon by many naval men as still the finest fighting-ship type in the service, they are rather in disrepute otherwise. Both were built in the Royal Dockyards.

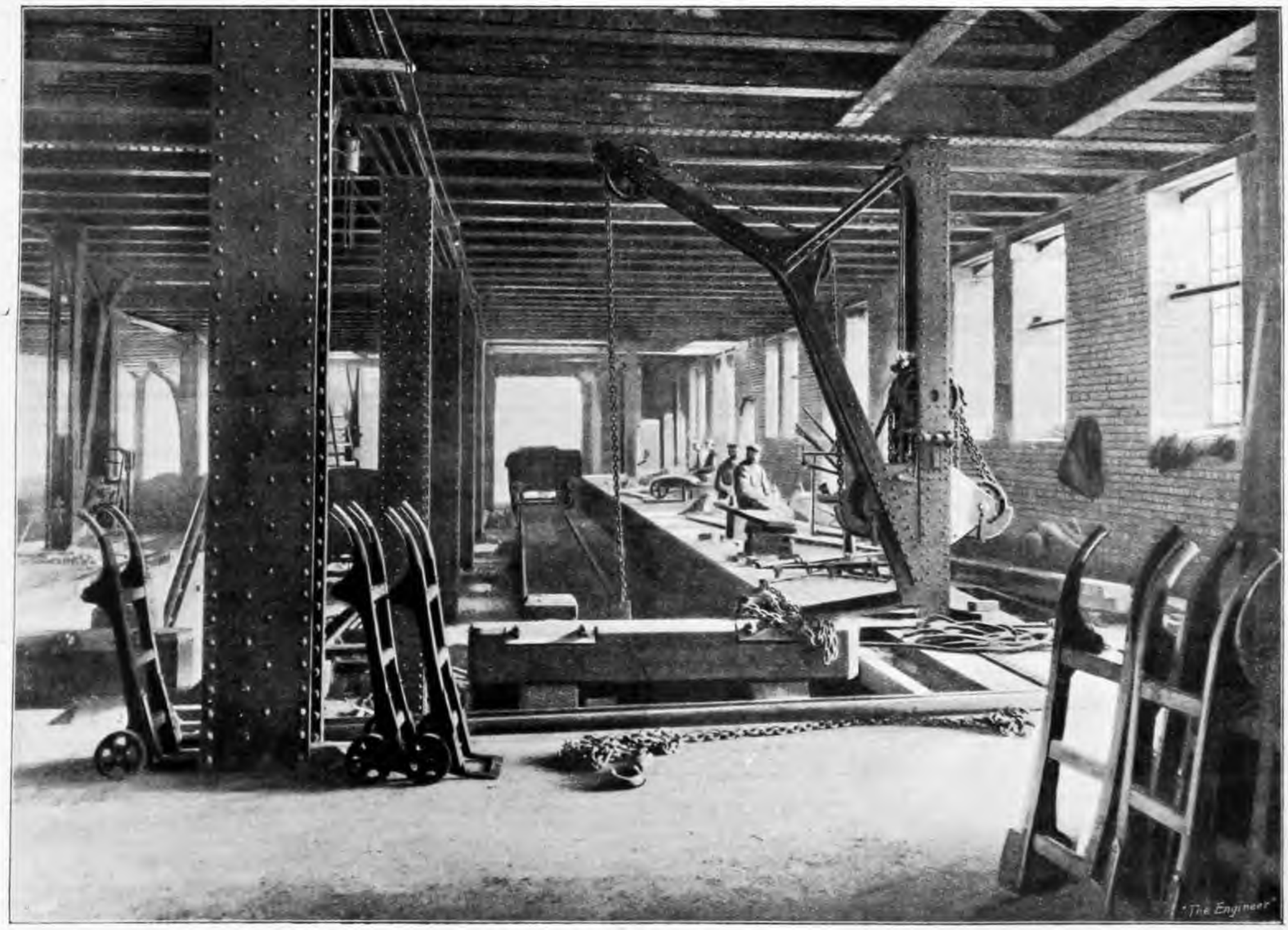
THE Victoria disaster, and the debatable value of the 110-ton gun, are responsible for such dissatisfaction as there is with the Sanspareil. Her unarmoured 6in. battery is also not liked. The Thunderer, being but a small second-class vessel, cannot quarrel with her *rôle* of port guardship. The

NEW GOODS STATION, GREAT NORTHERN RAILWAY, MANCHESTER

MR W. T. FOXLEE, M. INST. C.E., ENGINEER



WESTERN INCLINED PLANE TO LOW-LEVEL YARD



NTERIOR OF HIGH-LEVEL SHOWING ARRANGEMENT OF PLATFORM

Appendix B Structural General Arrangements

Appendix C Proposed Drainage Drawings

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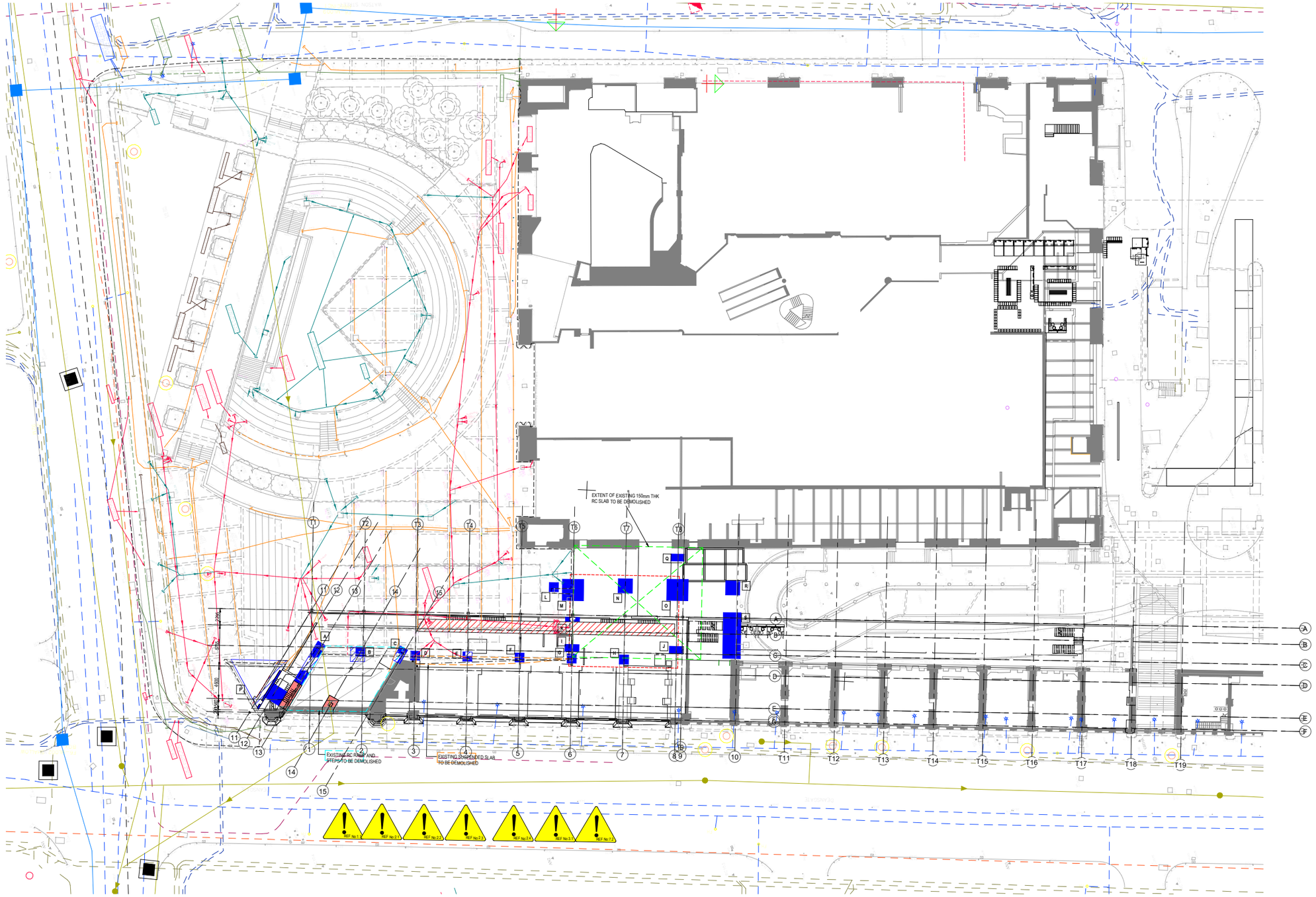
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SITE CONSTRAINTS PLAN

SCALE: 1 : 200

GENERAL NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
4. FOR GENERAL NOTES REFER TO DRAWING.

NOTE
- EXISTING STRUCTURE HAS BEEN INTERPRETED FROM ARUP ARCHIVE DRAWINGS FOR THE 1990's MODIFICATIONS/REFURB WORK. ALL SET OUT AND SIZE OF EXISTING STRUCTURE IS TO BE CONFIMED ON SITE.
- EXISTING SERVICES TAKEN FROM SEP SURVEY DRAWING 512020.
- ALL SERVICES TO BE CONFIRMED ON SITE.

KEY

- EXISTING REINFORCED CONCRETE PAD FOUNDATIONS TO BE BROKEN DOWN AS REQUIRED TO FORM NEW GROUND FLOOR/EXTERNAL WORKS.
- EXISTING REINFORCED CONCRETE PAD FOUNDATIONS TO BE REMOVED TO FACILITATE NEW CONSTRUCTION
- INDICATES LOCATION OF ORIGINAL FOUNDATIONS WHICH SUPPORTED WAGON RAMP COLUMNS. FOUNDATION TYPE AND DETAILS UNKNOWN. FURTHER INVESTIGATIONS REQUIRED TO DETERMINE IMPACT ON PROPOSED FOUNDATION LAYOUT.
- DENOTES CURTINS C&S RESPONSIBILITY BOUNDARY.
- DENOTES EXISTING STRUCTURE TO BE RETAINED.
- DENOTES EXISTING RC FOUNDATIONS TO BE RETAINED.

SEP DRAWING S12020 LEGEND

LEGEND

FROM STATUTORY AUTHORITY PLANS

RESIDUAL HAZARD REGISTER (RELATES TO CIVIL/STRUCTURAL MATTERS ONLY) MUST BE READ IN CONJUNCTION WITH CURTINS RESIDUAL REGISTER 064582-CTN-00-XX-HA-x-10001. HAZARDS THAT SHOULD BE OBVIOUS TO A COMPETENT CONTRACTOR HAVE NOT BEEN INDICATED ON THIS DRAWING. SHOULD ADDITIONAL HAZARDS BE IDENTIFIED, THE CONTRACTOR SHOULD NOTIFY ALL RELEVANT PROJECT TEAM MEMBERS.

HAZARD REF No.	ITEM (FEATURE, ELEMENT OR ACTIVITY)	RESIDUAL HAZARD
REF No.2.2	CONSTRUCTION - DEMOLITION AND NEW WORKS NEAR TO LIVE FOOTWAYS AND OCCUPIED BUILDING	ATTENTION IS DRAWN TO THE CLOSE PROXIMITY OF LIVE FOOTWAYS, ADJACENT LIVE PUBLIC SPACE AND OCCUPIED BUILDINGS. CONTRACTOR MUST ERECT APPROPRIATE BARRIERS AND HOARDINGS. CONTRACTOR TO AGREE WORKING HOURS AND METHOD STATEMENTS TO PROTECT THE PUBLIC AGAINST INTERACTION WITH THE WORKS.
REF No.2.1	VIBRATION DURING CONSTRUCTION/PILING WORKS	RISK OF DAMAGE TO EXISTING STRUCTURES DUE TO VIBRATIONS FROM PILING OR THE GENERAL CONSTRUCTION WORKS METHODOLOGIES SHOULD CONSIDER GROUND VIBRATIONS AND THEIR EFFECTS ON ADJACENT STRUCTURES.
REF No.2.2	CONSTRUCTION - EXISTING BELOW GROUND OBSTRUCTION	THERE ARE A NUMBER OF CONSTRAINTS WHICH POSE A RISK TO THE EXCAVATIONS, PILING AND CONSTRUCTION WORKS INCLUDING (i.e. UXO, ARCHEOLOGICAL RISKS, EXISTING FOUNDATIONS AND SERVICES). REFERENCE SHOULD BE MADE TO THE UXO RISK ASSESSMENT REPORT BY "1st LINE OF DEFENSE' ALONG WITH CURTINS CONSTRAINTS DRAWING - 064582-CUR-01-ZZ-DR-S-20010.

HAZARD REF No.	ITEM (FEATURE, ELEMENT OR ACTIVITY)	RESIDUAL HAZARD
REF No.1.1	GROUND CONTAMINATION	POTENTIAL RISK TO HANDLING CONTAMINATED SUBSTANCES AND ACMs. REFERENCE SHOULD BE MADE TO CURTINS PHASE 2 SITE INVESTIGATION REPORT - 608997-CUR-00-XX-RP-001-V02.
REF No.2.4	CONSTRUCTION - UNMAPPED SERVICES	POTENTIAL FOR UNMAPPED SERVICES, OBSTRUCTIONS AND HISTORIC STRUCTURES NOT SHOWN ON THIS DRAWING. ALL DEMOLITION, EXCAVATION AND ENABLING WORKS MUST CONSIDER THIS CAREFULLY. ALL UNDERGROUND SERVICES MUST BE IDENTIFIED AND LOCATED BY THE MAIN CONTRACTOR PRIOR TO DEMOLITION.
REF No.3.1	CONSTRUCTION - EXCAVATIONS AND FOUNDATIONS	EXCAVATIONS CLOSE TO EXISTING FOUNDATIONS AND STRUCTURAL ELEMENTS MUST CONSIDER THE RISK OF INSTABILITY. NO EXCAVATION IS TO UNDERMINE THE EXISTING FOUNDATIONS. THE MAIN CONTRACTOR TO SUBMIT A DETAILED AND ROBUST METHODOLOGY OUTLINING HOW TEMPORARY INSTABILITY OF STRUCTURAL COMPONENTS IS TO BE MANAGED.
REF No.7.1	CRANE SUB-BASE	ANY PROPOSED PLANT TRACKING LINES AND MOBILE CRANE LOCATION MUST BE REVIEWED BY THE CONTRACTORS TEMPORARY WORKS TEAM FOR INSTABILITY OF THE FOUNDING STRATA AND OR NEW/EXISTING STRUCTURE. CARE MUST BE TAKEN NOT TO SURCHARGE EXISTING STRUCTURES IN THE VICINITY AND A SUITABLE CORDON MUST BE MAINTAINED. THE METHODOLOGY MUST BE SUBMITTED FOR REVIEW BY SE.

EXISTING FOUNDATION LEGEND			
TYPE	DIMENSIONS	TOP OF CONCRETE	FORMATION LEVEL
A	**x1.2x0.5m	34.400m TBC	TBC
B	2.0x2.0x1.2m	35.200m	32.000m
C	2.225x1.2x1.2m	35.400m TBC	32.000m TBC
D	1.3x1.3x**m	35.400m	32.000m
E	1.3x1.3x**m	35.400m	32.000m
F	1.3x1.3x**m	35.400m	32.000m
G	1.3x1.3x**m	35.400m	32.000m
H	1.3x1.3x**m	35.400m	32.000m
I	2.0x1.0x0.60m	35.400m	34.000m
J	2.0x1.0x0.60m	35.400m	32.000m
K	2.0x1.0x0.60m	35.400m	34.000m
L	1.3x1.3x0.45m	35.400m	34.000m
M	3.0x3.0x0.75m	35.400m	34.000m
N	2.0x2.0x0.60m	35.400m	34.000m
O	3.0x3.0x0.75m	35.400m	34.000m
P	6.7x6.7x**m	29.600m	29.300m
Q	2.0x1.0x0.60m	35.400m	34.000m
R	**x**x**m	35.400m	34.000m
S	**x**x**m	35.400m	32.000m
DEPTH AND LEVELS TO EXISTING FOUNDATIONS TO BE CONFIRMED ON SITE DURING THE OPENING UP WORKS			
FOUNDATIONS SIZES AND CONSTRUCTION TO BE CONFIRMED ON SITE DURING THE OPENING UP WORKS			

Rev.	Description:	Date:	By:	Chkd:
P01	STAGE 2 ISSUE	31/08/22	AC	DB

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Status:

Project:

GREAT NORTHERN WAREHOUSE

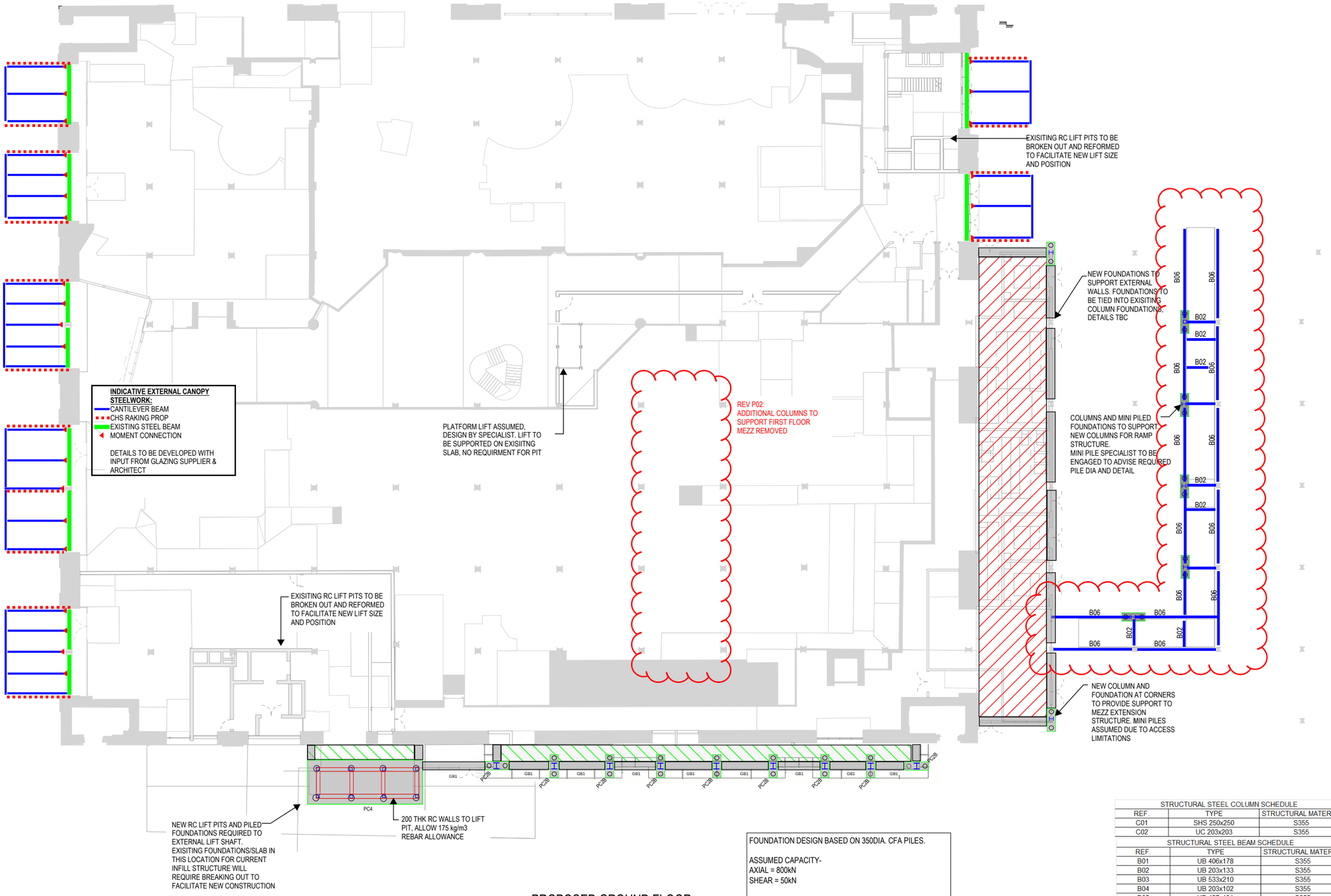
Drg Title:

SITE CONSTRAINTS PLAN

Size:	Date:	Drawn By:	Designed By:	Checked By:
A0	AUG 22	AC	DB	DB

Scale: As indicated

Project No:	Originator:	Zone:	Level:	Type:	Discipline:	Category / Number:	Rev:
064582 -	CUR -	Z0 -	XX -	DR -	S -	20700 -	P01



PROPOSED GROUND FLOOR

SCALE: 1 : 175

FOUNDATION DESIGN BASED ON 350DIA. CFA PILES.

ASSUMED CAPACITY-
AXIAL = 800kN
SHEAR = 50kN

PILING CONTRACTOR TO BE ENGAGED TO CONFIRM CAPACITIES.

PILE CAP SCHEDULE		
REF.	DIMENSIONS	REBAR ALLOWANCE
PC2B	1700x650x1000DP	200Kg/m3
PC4	1000DP	200Kg/m3

STRUCTURAL STEEL COLUMN SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
C01	SHS 250x250	S355
C02	UC 203x203	S355

STRUCTURAL STEEL BEAM SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
B01	UB 406x178	S355
B02	UB 203x133	S355
B03	UB 533x210	S355
B04	UB 203x102	S355
B05	UB 457x191	S355
B06	UB 356x171	S355
B07	UB 305x165	S355
B08	SHS 200X200	S355
B09	RHS 200x100	S355
B10	UB 610x229	S355

GROUND BEAM SCHEDULE		
REF.	DIMENSIONS	REBAR ALLOWANCE
GB1	600x600DP	200Kg/m

GENERAL NOTES:

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3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
4. FOR GENERAL NOTES REFER TO DRAWING.

CONTRACTOR TO MAKE ALLOWANCES FOR:

1. PRECLUSION OF WATER DURING CONSTRUCTION.
2. TEMPORARY EARTHWORKS & EXCAVATION SUPPORT.
3. TEMPORARY SUPPORT & STABILITY OF ALL EXISTING ELEMENTS DURING DEMOLITION & REMEDIAL WORKS.
4. VERIFICATION OF LOCATIONS OF ALL BELOW GROUND SERVICES & OBSTRUCTIONS PRIOR TO UNDERTAKING OF ANY WORKS.
5. REMOVAL OF ALL OBSTRUCTIONS PRIOR TO PILING WORKS.
6. SURVEYING OF ALL NEW TO EXISTING INTERFACES TO VERIFY HISTORIC RECORDS WHICH HAVE FORMED THE BASIS OF DESIGN.
7. TESTING & VERIFICATION OF ANY EXISTING ELEMENTS AS REQUIRED BY THE STRUCTURAL ENGINEER.
8. END PLATED CONNECTIONS TO ALL BEAMS

STAGE 2 W.I.P. NOTES:

- STRUCTURAL PHILOSOPHY ONLY.
- STRUCTURAL ELEMENTS SUBJECT TO DESIGN DEVELOPMENT.
- PERIMETER DETAIL SUBJECT TO CONFIRMATION OF CLADDING PERFORMANCE CRITERIA

WAREHOUSE STRUCTURAL PHILOSOPHY:

- EXISITING PRIMARY AND SECONDARY BEAMS RESTRAINING COLUMNS TO BE RETAINED
- ALL NEW STEEL TO BE GRADE S355
- CONNECTIONS TO EXISITING STEEL TBC SUBJECT DESIGN DEVELOPMENT FURTHER TO SURVEYS TO CONFIRM EXISITING STEEL COMPOSITION
- ALLOW FOR TIE RODS ADJACENT TO LARGE OPENINGS AT 2m CENTRES

LEGEND

- INDICATES LOCATION OF VERTICAL BRACING
- INDICATES PROPOSED 200 THK GROUND BEARING REINFORCED CONCRETE SLAB GRADE RC32/40 WITH 2 LAYERS A393 MESH 1 TOP, 1 BTM.
- INDICATES PROPOSED 175 THK GROUND BEARING REINFORCED CONCRETE SLAB GRADE RC32/40 WITH 2 LAYERS A252 MESH 1 TOP, 1 BTM.

THIS DRAWING IS BASED ON INFORMATION RECEIVED 12.08.22

Rev:	Description:	Date:	By:	Chkd:
P02	CANOPY STEELWORK ADDED AND REVISED AS CLOUDED	18.11.22	KC	DB
P01	ISSUED FOR STAGE 2	31.08.22	KC	DB

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Status: STAGE 2 ISSUE

Project: GREAT NORTHERN WAREHOUSE

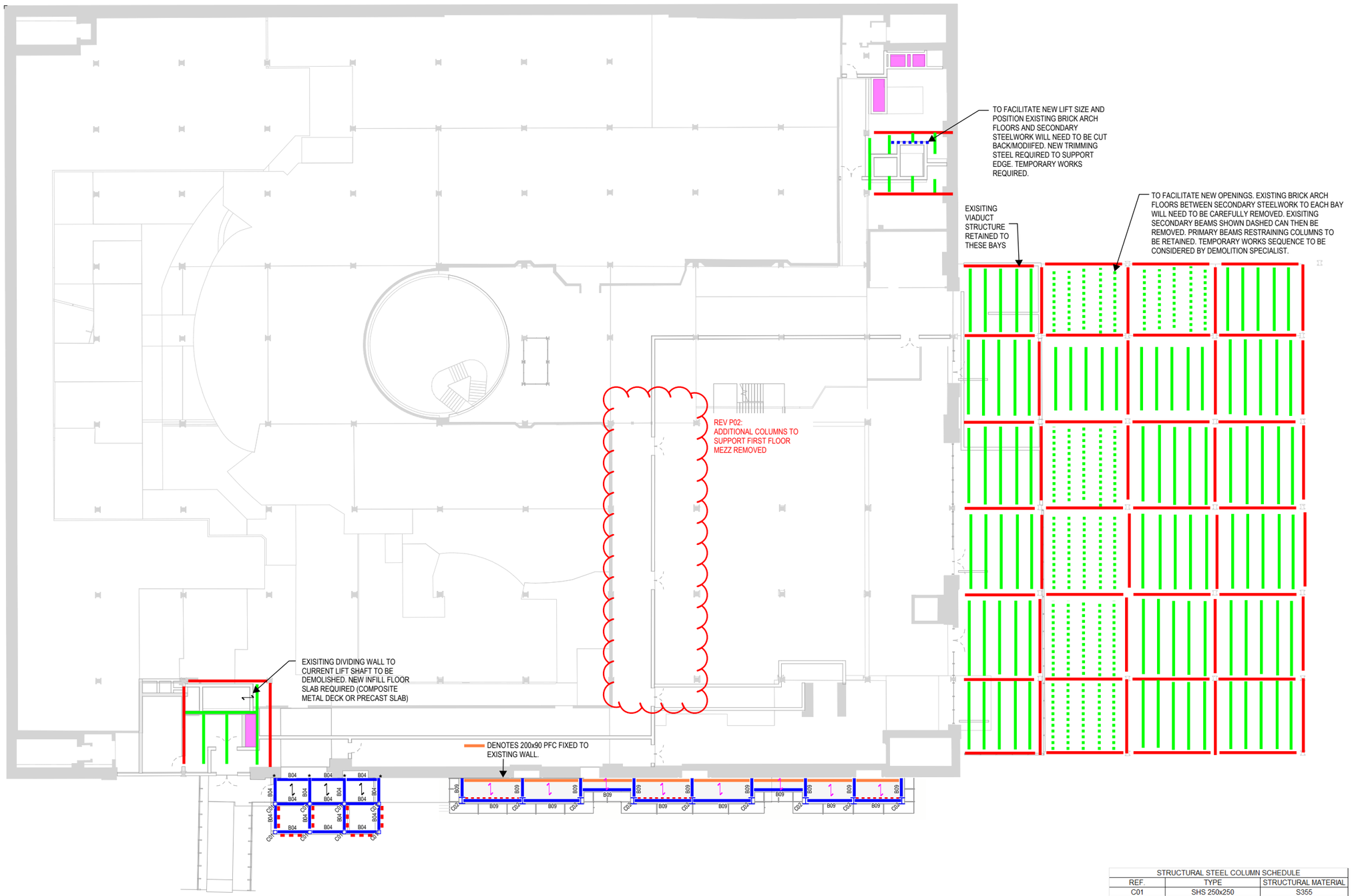
Drg Title: WAREHOUSE GROUND FLOOR STRUCTURAL INTERVENTION GA

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	31/08/22	KC	DB	DB

Scale: As indicated

Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
064582 -	CUR -	Z2 -	00 -	DR -	S -	20100 -	P02

Model Name:XXXXXX-CUR-ZZ-XX-M3-S-00001



PROPOSED FIRST FLOOR

SCALE: 1 : 175

GENERAL NOTES:

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CONTRACTOR TO MAKE ALLOWANCES FOR:

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7. TESTING & VERIFICATION OF ANY EXISTING ELEMENTS AS REQUIRED BY THE STRUCTURAL ENGINEER.
8. END PLATED CONNECTIONS TO ALL BEAMS

STAGE 2 W.I.P. NOTES:

- STRUCTURAL PHILOSOPHY ONLY.
- STRUCTURAL ELEMENTS SUBJECT TO DESIGN DEVELOPMENT.
- PERIMETER DETAIL SUBJECT TO CONFIRMATION OF CLADDING PERFORMANCE CRITERIA

WAREHOUSE STRUCTURAL PHILOSOPHY:

- EXISITING PRIMARY AND SECONDARY BEAMS RESTRAINING COLUMNS TO BE RETAINED
- ALL NEW STEEL TO BE GRADE S355
- CONNECTIONS TO EXISITING STEEL TBC SUBJECT DESIGN DEVELOPMENT FURTHER TO SURVEYS TO CONFIRM EXISITING STEEL COMPOSITION
- ALLOW FOR TIE RODS ADJACENT TO LARGE OPENINGS AT 2m CENTRES

LEGEND

- INDICATES EXISTING PRIMARY STEEL BEAMS
- INDICATES EXISTING SECONDARY STEEL BEAMS
- INDICATES NEW STEEL BEAMS
- INDICATES NEW STEEL BEAMS TRIMMING EXISTING STRUCTURE
- INDICATES VERTICAL BRACING
- INDICATES VOID IN EXISTING FLOOR
- INDICATES NEW VOID FOR RISER. BRICK ARCH TO BE LOCALLY REMOVED WITH EXISITING STEELWORK RETAINED
- INDICATES SPAN OF 160mm THK SMD CONCRETE COMPOSITE FLOOR
- INDICATES SPAN OF LIGHTWEIGHT ROOF DECK

* DENOTES SUPPORTS VIA CONNECTION INTO EXISTING MASONRY. DETAIL TO BE DEVELOPED.

THIS DRAWING IS BASED ON INFORMATION RECEIVED 12.08.22

STRUCTURAL STEEL COLUMN SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
C01	SHS 250x250	S355
C02	UC 203x203	S355

STRUCTURAL STEEL BEAM SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
B01	UB 406x178	S355
B02	UB 203x133	S355
B03	UB 533x210	S355
B04	UB 203x102	S355
B05	UB 457x191	S355
B06	UB 356x171	S355
B07	UB 305x165	S355
B08	SHS 200X200	S355
B09	RHS 200x100	S355
B10	UB 610x229	S355

Rev:	Description:	Date:	By:	Chkd:
P02	VIADUCT OPENINGS REDUCED AND REVISED AS CLOUDED	18.11.22	KC	DB
P01	ISSUED FOR STAGE 2	31.08.22	KC	DB

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Status: STAGE 2 ISSUE

Project: GREAT NORTHERN WAREHOUSE

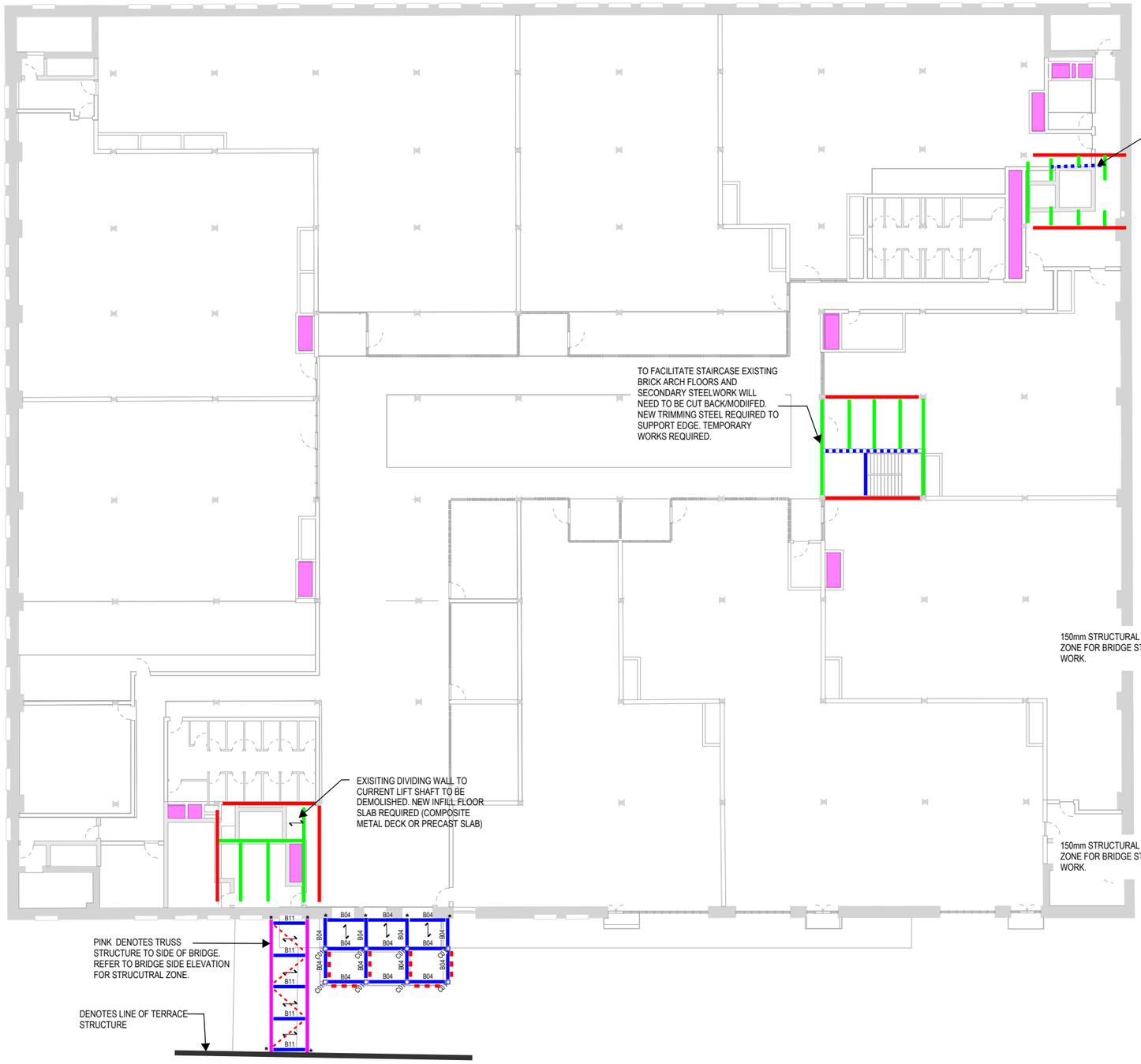
Drg Title: WAREHOUSE FIRST FLOOR STRUCTURAL INTERVENTION GA

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	31/08/22	KC	DB	DB

Scale: As indicated

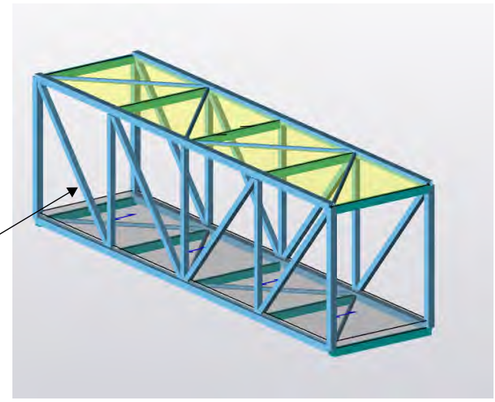
Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
064582 -	CUR -	Z2 -	01 -	DR -	S -	20102 -	P02

Model Name:XXXXXX-CUR-ZZ-XX-M3-S-00001

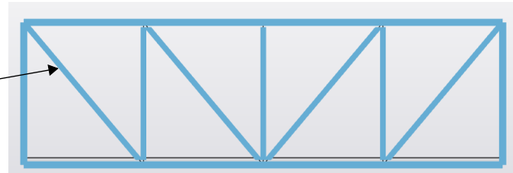


PROPOSED SECOND FLOOR

SCALE: 1 : 175



BRIDGE STRUCTURE - 3D VIEW



BRIDGE STRUCTURE - SIDE ELEVATION

STRUCTURAL STEEL COLUMN SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
C01	SHS 250x250	S355
C02	UC 203x203	S355
STRUCTURAL STEEL BEAM SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
B01	UB 406x178	S355
B02	UB 203x133	S355
B03	UB 533x210	S355
B04	UB 203x102	S355
B05	UB 457x191	S355
B06	UB 356x171	S355
B07	UB 305x165	S355
B08	SHS 200X200	S355
B09	RHS 200x100	S355
B10	UB 610x229	S355

GENERAL NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
4. FOR GENERAL NOTES REFER TO DRAWING.

CONTRACTOR TO MAKE ALLOWANCES FOR:

1. PRECLUSION OF WATER DURING CONSTRUCTION.
2. TEMPORARY EARTHWORKS & EXCAVATION SUPPORT.
3. TEMPORARY SUPPORT & STABILITY OF ALL EXISTING ELEMENTS DURING DEMOLITION & REMEDIAL WORKS.
4. VERIFICATION OF LOCATIONS OF ALL BELOW GROUND SERVICES & OBSTRUCTIONS PRIOR TO UNDERTAKING OF ANY WORKS.
5. REMOVAL OF ALL OBSTRUCTIONS PRIOR TO PILING WORKS.
6. SURVEYING OF ALL NEW TO EXISTING INTERFACES TO VERIFY HISTORIC RECORDS WHICH HAVE FORMED THE BASIS OF DESIGN.
7. TESTING & VERIFICATION OF ANY EXISTING ELEMENTS AS REQUIRED BY THE STRUCTURAL ENGINEER.
8. END PLATED CONNECTIONS TO ALL BEAMS

STAGE 2 W.I.P. NOTES:

- STRUCTURAL PHILOSOPHY ONLY.
- STRUCTURAL ELEMENTS SUBJECT TO DESIGN DEVELOPMENT.
- PERIMETER DETAIL SUBJECT TO CONFIRMATION OF CLADDING PERFORMANCE CRITERIA

WAREHOUSE STRUCTURAL PHILOSOPHY:

- EXISITING PRIMARY AND SECONDARY BEAMS RESTRAINING COLUMNS TO BE RETAINED
- ALL NEW STEEL TO BE GRADE S355
- CONNECTIONS TO EXISITING STEEL TBC SUBJECT DESIGN DEVELOPMENT FURTHER TO SURVEYS TO CONFIRM EXISITING STEEL COMPOSITION
- ALLOW FOR TIE RODS ADJACENT TO LARGE OPENINGS AT 2m CENTRES

LEGEND

- INDICATES EXISTING PRIMARY STEEL BEAMS
- INDICATES EXISTING SECONDARY STEEL BEAMS
- INDICATES NEW STEEL BEAMS
- INDICATES NEW STEEL BEAMS TRIMMING EXISTING STRUCTURE
- INDICATES VERTICAL/HORIZONTAL BRACING
- INDICATES VOID IN EXISTING FLOOR
- INDICATES NEW VOID FOR RISER. BRICK ARCH TO BE LOCALLY REMOVED WITH EXISITING STEELWORK RETAINED
- INDICATES SPAN OF 160mm THK SMD CONCRETE COMPOSITE FLOOR

* DENOTES SUPPORTS VIA CONNECTION INTO EXISTING MASONRY. DETAIL TO BE DEVELOPED.

THIS DRAWING IS BASED ON INFORMATION RECEIVED 12.08.22

Rev:	Description:	Date:	By:	Chkd:
P02	BRIDGE STRUCTURE ADDED	18.11.22	KC	DB
P01	ISSUED FOR STAGE 2	31.08.22	KC	DB

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Status: STAGE 2 ISSUE

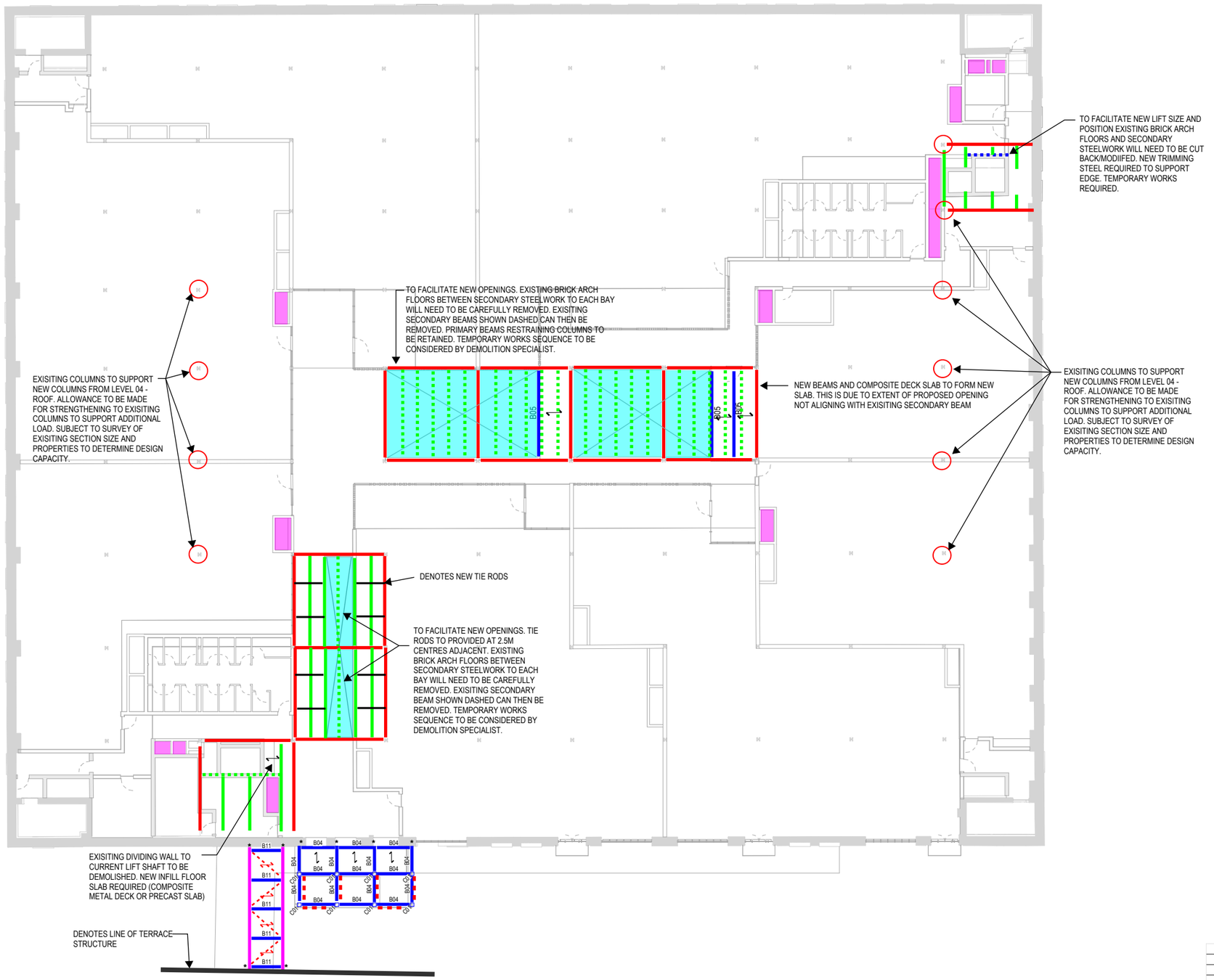
Project: GREAT NORTHERN WAREHOUSE

Drg Title: WAREHOUSE SECOND FLOOR STRUCTURAL INTERVENTION GA

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	31/08/22	KC	DB	DB
Scale: As indicated				

Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
064582 -	CUR -	Z2 -	02 -	DR -	S -	20104 -	P02

Model Name:XXX:XXX-CUR-ZZ-XX-M3-S-00001



PROPOSED THIRD FLOOR

SCALE: 1 : 175

GENERAL NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
4. FOR GENERAL NOTES REFER TO DRAWING.

CONTRACTOR TO MAKE ALLOWANCES FOR:

1. PRECLUSION OF WATER DURING CONSTRUCTION.
2. TEMPORARY EARTHWORKS & EXCAVATION SUPPORT.
3. TEMPORARY SUPPORT & STABILITY OF ALL EXISTING ELEMENTS DURING DEMOLITION & REMEDIAL WORKS.
4. VERIFICATION OF LOCATIONS OF ALL BELOW GROUND SERVICES & OBSTRUCTIONS PRIOR TO UNDERTAKING OF ANY WORKS.
5. REMOVAL OF ALL OBSTRUCTIONS PRIOR TO PILING WORKS.
6. SURVEYING OF ALL NEW TO EXISTING INTERFACES TO VERIFY HISTORIC RECORDS WHICH HAVE FORMED THE BASIS OF DESIGN.
7. TESTING & VERIFICATION OF ANY EXISTING ELEMENTS AS REQUIRED BY THE STRUCTURAL ENGINEER.
8. END PLATED CONNECTIONS TO ALL BEAMS

STAGE 2 W.I.P. NOTES:

- STRUCTURAL PHILOSOPHY ONLY.
- STRUCTURAL ELEMENTS SUBJECT TO DESIGN DEVELOPMENT.
- PERIMETER DETAIL SUBJECT TO CONFIRMATION OF CLADDING PERFORMANCE CRITERIA

WAREHOUSE STRUCTURAL PHILOSOPHY:

- EXISITING PRIMARY AND SECONDARY BEAMS RESTRAINING COLUMNS TO BE RETAINED
- ALL NEW STEEL TO BE GRADE S355
- CONNECTIONS TO EXISITING STEEL TBC SUBJECT DESIGN DEVELOPMENT FURTHER TO SURVEYS TO CONFIRM EXISITING STEEL COMPOSITION
- ALLOW FOR TIE RODS ADJACENT TO LARGE OPENINGS AT 2m CENTRES

LEGEND

- INDICATES EXISTING PRIMARY STEEL BEAMS
- INDICATES EXISTING SECONDARY STEEL BEAMS
- INDICATES EXISTING SECONDARY STEEL BEAMS TO BE REMOVED
- INDICATES NEW STEEL BEAMS
- INDICATES NEW STEEL BEAMS TRIMMING EXISTING STRUCTURE
- INDICATES VERTICAL BRACING
- INDICATES NEW VOID IN EXISTING FLOOR
- INDICATES NEW VOID FOR RISER. BRICK ARCH TO BE LOCALLY REMOVED WITH EXISITING STEELWORK RETAINED
- INDICATES SPAN OF 160mm THK SMD CONCRETE COMPOSITE FLOOR
- INDICATES SPAN OF LIGTH WEIGHT ROOF DECK

THIS DRAWING IS BASED ON INFORMATION RECEIVED 12.08.22

* DENOTES SUPPORTS VIA CONNECTION INTO EXISTING MASONRY. DETAIL TO BE DEVELOPED.

Rev:	Description:	Date:	By:	Chkd:
P02	BRIDE STRUCTURE ADDED	18.11.22	KC	DB
P01	ISSUED FOR STAGE 2	31.08.22	KC	DB

STRUCTURAL STEEL COLUMN SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
C01	SHS 250x250	S355
C02	UC 203x203	S355

STRUCTURAL STEEL BEAM SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
B01	UB 406x178	S355
B02	UB 203x133	S355
B03	UB 533x210	S355
B04	UB 203x102	S355
B05	UB 457x191	S355
B06	UB 356x171	S355
B07	UB 305x165	S355
B08	SHS 200X200	S355
B09	RHS 200x100	S355
B10	UB 610x229	S355

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Status: STAGE 2 ISSUE

Project: GREAT NORTHERN WAREHOUSE

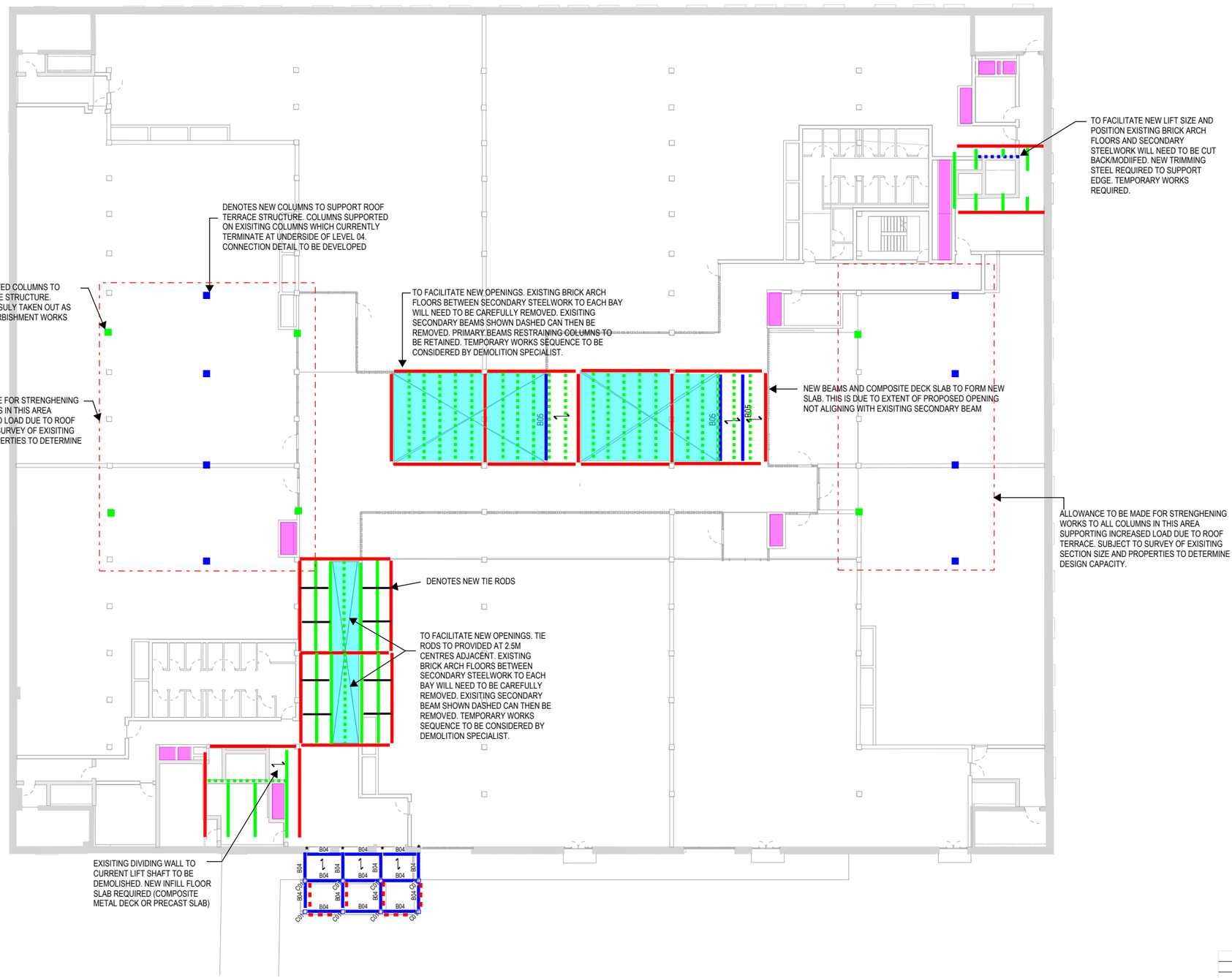
Drg Title: WAREHOUSE THIRD FLOOR STRUCTURAL INTERVENTION GA

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	31/08/22	KC	DB	DB

Scale: As indicated

Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
064582	CUR	Z2	03	DR	S	20105	P02

Model Name:XXXXXX-CUR-ZZ-XX-M3-S-00001



PROPOSED FOURTH FLOOR

SCALE: 1 : 175

STRUCTURAL STEEL COLUMN SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
C01	SHS 250x250	S355
C02	UC 203x203	S355

STRUCTURAL STEEL BEAM SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
B01	UB 406x178	S355
B02	UB 203x133	S355
B03	UB 533x210	S355
B04	UB 203x102	S355
B05	UB 457x191	S355
B06	UB 356x171	S355
B07	UB 305x165	S355
B08	SHS 200X200	S355
B09	RHS 200x100	S355
B10	UB 610x229	S355

GENERAL NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
4. FOR GENERAL NOTES REFER TO DRAWING.

CONTRACTOR TO MAKE ALLOWANCES FOR:

1. PRECLUSION OF WATER DURING CONSTRUCTION.
2. TEMPORARY EARTHWORKS & EXCAVATION SUPPORT.
3. TEMPORARY SUPPORT & STABILITY OF ALL EXISTING ELEMENTS DURING DEMOLITION & REMEDIAL WORKS.
4. VERIFICATION OF LOCATIONS OF ALL BELOW GROUND SERVICES & OBSTRUCTIONS PRIOR TO UNDERTAKING OF ANY WORKS.
5. REMOVAL OF ALL OBSTRUCTIONS PRIOR TO PILING WORKS.
6. SURVEYING OF ALL NEW TO EXISTING INTERFACES TO VERIFY HISTORIC RECORDS WHICH HAVE FORMED THE BASIS OF DESIGN.
7. TESTING & VERIFICATION OF ANY EXISTING ELEMENTS AS REQUIRED BY THE STRUCTURAL ENGINEER.
8. END PLATED CONNECTIONS TO ALL BEAMS

STAGE 2 W.I.P. NOTES:

- STRUCTURAL PHILOSOPHY ONLY.
- STRUCTURAL ELEMENTS SUBJECT TO DESIGN DEVELOPMENT.
- PERIMETER DETAIL SUBJECT TO CONFIRMATION OF CLADDING PERFORMANCE CRITERIA

WAREHOUSE STRUCTURAL PHILOSOPHY:

- EXISITING PRIMARY AND SECONDARY BEAMS RESTRAINING COLUMNS TO BE RETAINED
- ALL NEW STEEL TO BE GRADE S355
- CONNECTIONS TO EXISITING STEEL TBC SUBJECT DESIGN DEVELOPMENT FURTHER TO SURVEYS TO CONFIRM EXISITING STEEL COMPOSITION
- ALLOW FOR TIE RODS ADJACENT TO LARGE OPENINGS AT 2m CENTRES

LEGEND

- INDICATES EXISTING PRIMARY STEEL BEAMS
- INDICATES EXISTING SECONDARY STEEL BEAMS
- INDICATES EXISTING SECONDARY STEEL BEAMS TO BE REMOVED
- INDICATES NEW STEEL BEAMS
- INDICATES NEW STEEL BEAMS TRIMMING EXISTING STRUCTURE
- INDICATES VERTICAL BRACING
- INDICATES NEW VOID IN EXISTING FLOOR
- INDICATES NEW VOID FOR RISER. BRICK ARCH TO BE LOCALLY REMOVED WITH EXISITING STEELWORK RETAINED
- INDICATES SPAN OF 160mm THK SMD CONCRETE COMPOSITE FLOOR

* DENOTES SUPPORTS VIA CONNECTION INTO EXISTING MASONRY. DETAIL TO BE DEVELOPED.

THIS DRAWING IS BASED ON INFORMATION RECEIVED 12.08.22

Rev:	Description:	Date:	By:	Chkd:
P02	ADDITIONAL COLUMNS OMITTED TO SUIT ROOF UPDATES	18.11.22	KC	DB
P01	ISSUED FOR STAGE 2	31.08.22	KC	DB

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Status: STAGE 2 ISSUE

Project: GREAT NORTHERN WAREHOUSE

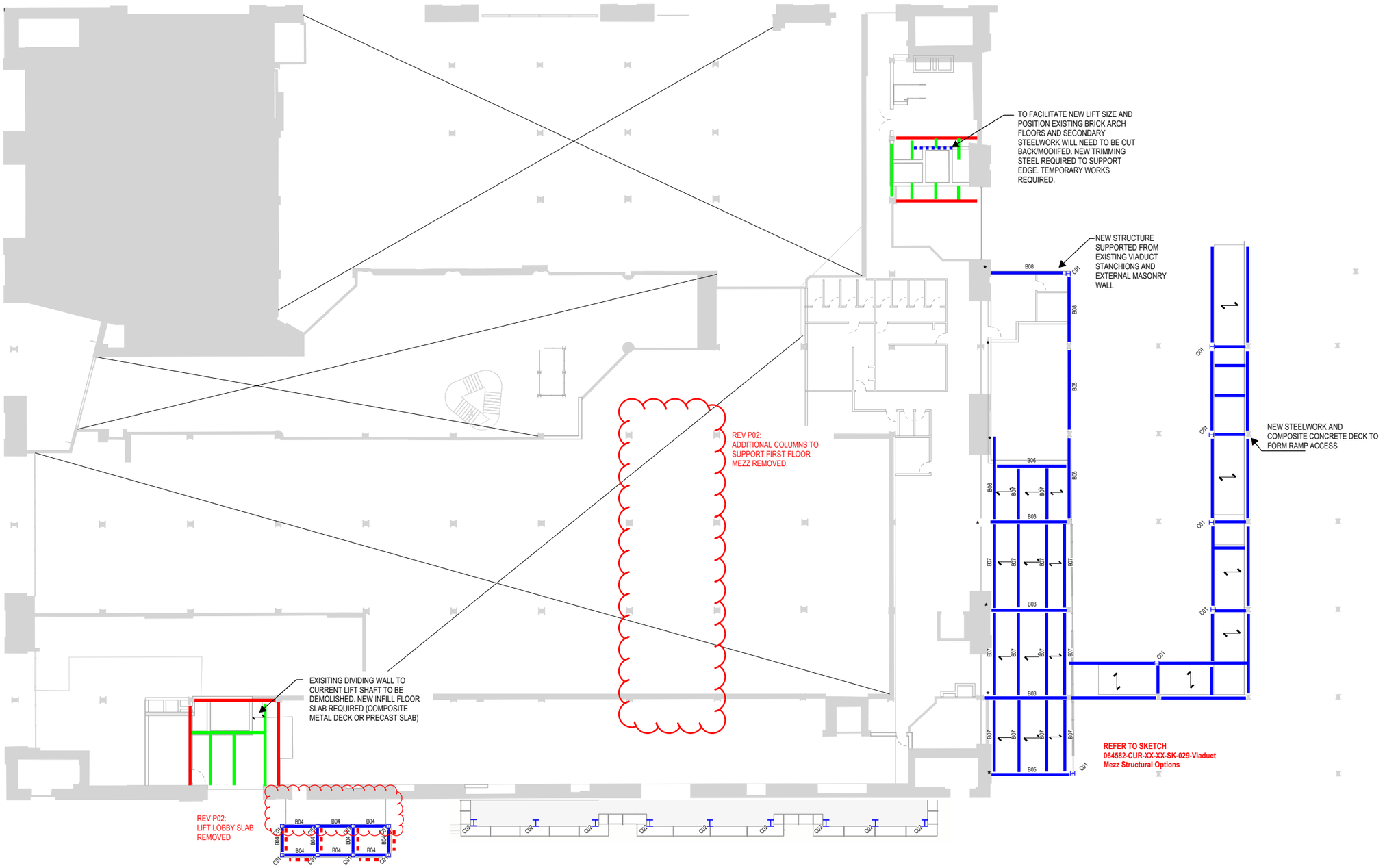
Drg Title: WAREHOUSE FOURTH FLOOR STRUCTURAL INTERVENTION GA

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	31/08/22	KC	DB	DB

Scale: As indicated

Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
064582 -	CUR -	Z2 -	04 -	DR -	S -	20106 -	P02

Model Name:XXXXX-CUR-ZZ-XX-M3-S-00001



PROPOSED GROUND FLOOR MEZZANINE

SCALE: 1 : 175

GENERAL NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
4. FOR GENERAL NOTES REFER TO DRAWING.

CONTRACTOR TO MAKE ALLOWANCES FOR:

1. PRECLUSION OF WATER DURING CONSTRUCTION.
2. TEMPORARY EARTHWORKS & EXCAVATION SUPPORT.
3. TEMPORARY SUPPORT & STABILITY OF ALL EXISTING ELEMENTS DURING DEMOLITION & REMEDIAL WORKS.
4. VERIFICATION OF LOCATIONS OF ALL BELOW GROUND SERVICES & OBSTRUCTIONS PRIOR TO UNDERTAKING OF ANY WORKS.
5. REMOVAL OF ALL OBSTRUCTIONS PRIOR TO PILING WORKS.
6. SURVEYING OF ALL NEW TO EXISTING INTERFACES TO VERIFY HISTORIC RECORDS WHICH HAVE FORMED THE BASIS OF DESIGN.
7. TESTING & VERIFICATION OF ANY EXISTING ELEMENTS AS REQUIRED BY THE STRUCTURAL ENGINEER.
8. END PLATED CONNECTIONS TO ALL BEAMS

STAGE 2 W.I.P. NOTES:

- STRUCTURAL PHILOSOPHY ONLY.
- STRUCTURAL ELEMENTS SUBJECT TO DESIGN DEVELOPMENT.
- PERIMETER DETAIL SUBJECT TO CONFIRMATION OF CLADDING PERFORMANCE CRITERIA

WAREHOUSE STRUCTURAL PHILOSOPHY:

- EXISITING PRIMARY AND SECONDARY BEAMS RESTRAINING COLUMNS TO BE RETAINED
- ALL NEW STEEL TO BE GRADE S355
- CONNECTIONS TO EXISITING STEEL TBC SUBJECT DESIGN DEVELOPMENT FURTHER TO SURVEYS TO CONFIRM EXISITING STEEL COMPOSITION
- ALLOW FOR TIE RODS ADJACENT TO LARGE OPENINGS AT 2m CENTRES

LEGEND

- INDICATES EXISTING PRIMARY STEEL BEAMS
- INDICATES EXISTING SECONDARY STEEL BEAMS
- INDICATES NEW STEEL BEAMS
- INDICATES NEW STEEL BEAMS TRIMMING EXISTING STRUCTURE
- INDICATES VERTICAL BRACING
- INDICATES VOID IN EXISTING FLOOR
- INDICATES NEW VOID FOR RISER. BRICK ARCH TO BE LOCALLY REMOVED WITH EXISITING STEELWORK RETAINED
- INDICATES SPAN OF 160mm THK SMD CONCRETE COMPOSITE FLOOR

* DENOTES SUPPORTS VIA CONNECTION INTO EXISTING MASONRY. DETAIL TO BE DEVELOPED.

THIS DRAWING IS BASED ON INFORMATION RECEIVED 12.08.22

STRUCTURAL STEEL COLUMN SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
C01	SHS 250x250	S355
C02	UC 203x203	S355

STRUCTURAL STEEL BEAM SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
B01	UB 406x178	S355
B02	UB 203x133	S355
B03	UB 533x210	S355
B04	UB 203x102	S355
B05	UB 457x191	S355
B06	UB 356x171	S355
B07	UB 305x165	S355
B08	SHS 200X200	S355
B09	RHS 200x100	S355
B10	UB 610x229	S355

Rev:	Description:	Date:	By:	Chkd:
P02	REVISED AS CLOUDED	18.11.22	KC	DB
P01	ISSUED FOR STAGE 2	31.08.22	KC	DB

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Status: STAGE 2 ISSUE

Project: GREAT NORTHERN WAREHOUSE

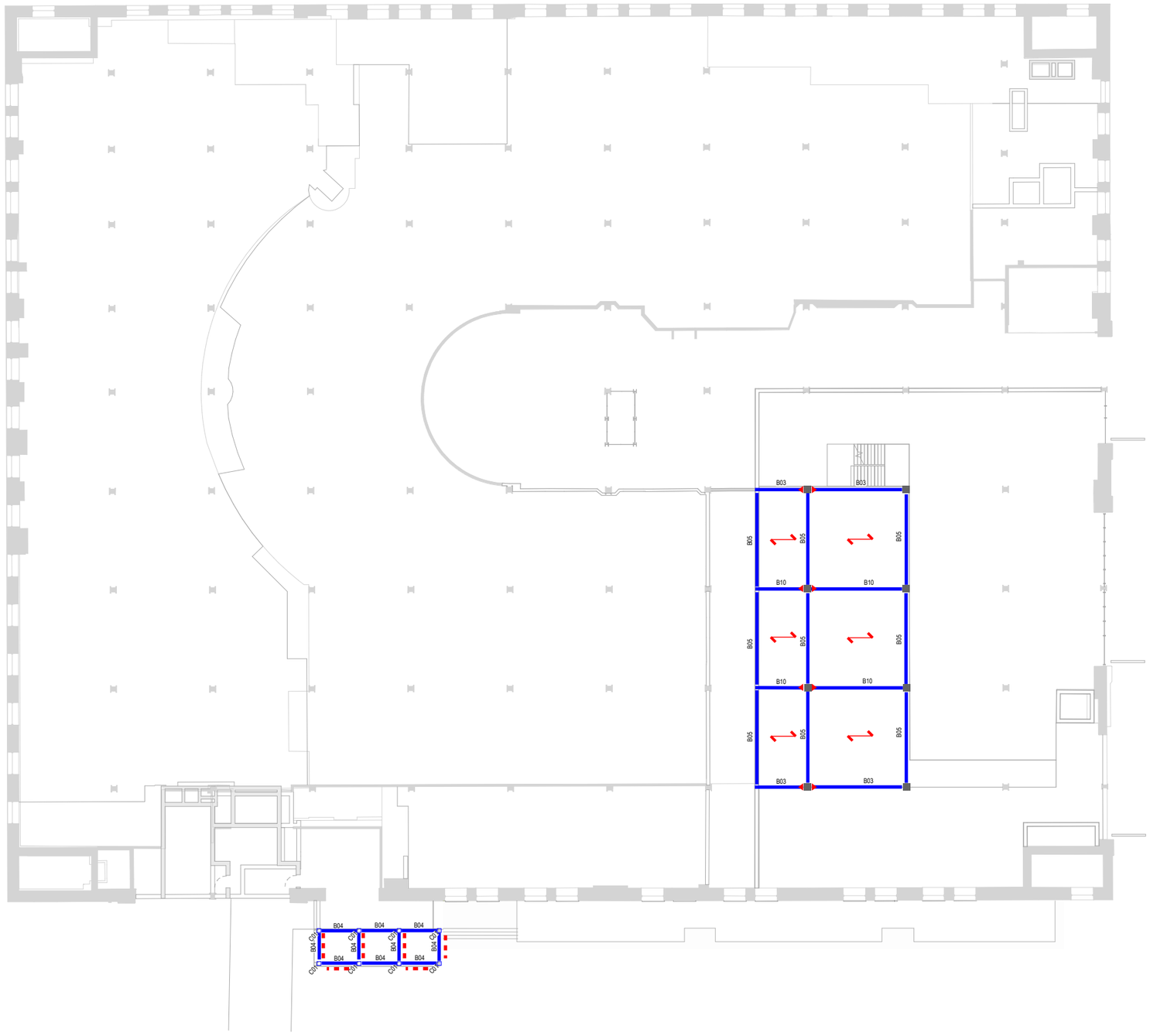
Drg Title: WAREHOUSE GROUND FLOOR MEZZANINE STRUCTURAL INTERVENTION GA

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	31/08/22	KC	DB	DB

Scale: As indicated

Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
064582 -	CUR -	Z2 -	M0 -	DR -	S -	20101 -	P02

Model Name:XXXXXX-CUR-ZZ-XX-M3-S-00001



PROPOSED FIRST FLOOR MEZZANINE

SCALE: 1 : 175

GENERAL NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
4. FOR GENERAL NOTES REFER TO DRAWING.

CONTRACTOR TO MAKE ALLOWANCES FOR:

1. PRECLUSION OF WATER DURING CONSTRUCTION.

2. TEMPORARY EARTHWORKS & EXCAVATION SUPPORT.

3. TEMPORARY SUPPORT & STABILITY OF ALL EXISTING ELEMENTS DURING DEMOLITION & REMEDIAL WORKS.

4. VERIFICATION OF LOCATIONS OF ALL BELOW GROUND SERVICES & OBSTRUCTIONS PRIOR TO UNDERTAKING OF ANY WORKS.

5. REMOVAL OF ALL OBSTRUCTIONS PRIOR TO PILING WORKS.

6. SURVEYING OF ALL NEW TO EXISTING INTERFACES TO VERIFY HISTORIC RECORDS WHICH HAVE FORMED THE BASIS OF DESIGN.

7. TESTING & VERIFICATION OF ANY EXISTING ELEMENTS AS REQUIRED BY THE STRUCTURAL ENGINEER.

8. END PLATED CONNECTIONS TO ALL BEAMS

STAGE 2 W.I.P. NOTES:

- STRUCTURAL PHILOSOPHY ONLY.
- STRUCTURAL ELEMENTS SUBJECT TO DESIGN DEVELOPMENT.
- PERIMETER DETAIL SUBJECT TO CONFIRMATION OF CLADDING PERFORMANCE CRITERIA

WAREHOUSE STRUCTURAL PHILOSOPHY:

- EXISITING PRIMARY AND SECONDARY BEAMS RESTRAINING COLUMNS TO BE RETAINED
- ALL NEW STEEL TO BE GRADE S355
- CONNECTIONS TO EXISITING STEEL TBC SUBJECT DESIGN DEVELOPMENT FURTHER TO SURVEYS TO CONFIRM EXISITING STEEL COMPOSITION
- ALLOW FOR TIE RODS ADJACENT TO LARGE OPENINGS AT 2m CENTRES

LEGEND

- INDICATES NEW STEEL BEAM
- INDICATES SPAN OF LIGHTWEIGHT METSEC FLOOR. ALLOW FOR 302.M.20 C JOIST @ 400 C/C.
- INDICATES EXISTING COLUMN TO SUPPORT NEW METSEC STRUCTURE
- INDICATES SPAN OF 160THK SMD CONCRETE COMPOSITE FLOOR
- DENOTES MOMENT CONNECTION
- INDICATES SPAN OF LIGHTWEIGHT TIMBER ROOF JOISTS

THIS DRAWING IS BASED ON INFORMATION RECEIVED 12.08.22

STRUCTURAL STEEL COLUMN SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
C01	SHS 250x250	S355
C02	UC 203x203	S355

STRUCTURAL STEEL BEAM SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
B01	UB 406x178	S355
B02	UB 203x133	S355
B03	UB 533x210	S355
B04	UB 203x102	S355
B05	UB 457x191	S355
B06	UB 356x171	S355
B07	UB 305x165	S355
B08	SHS 200X200	S355
B09	RHS 200x100	S355
B10	UB 610x229	S355

Rev:	Description:	Date:	By:	Chkd:
P02	COLUMNS REMOVED FROM MEZZ STRUCTURE AND CANTILEVERS ADDED	18.11.22	KC	DB
P01	ISSUED FOR STAGE 2	31.08.22	KC	DB

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Status: STAGE 2 ISSUE

Project: GREAT NORTHERN WAREHOUSE

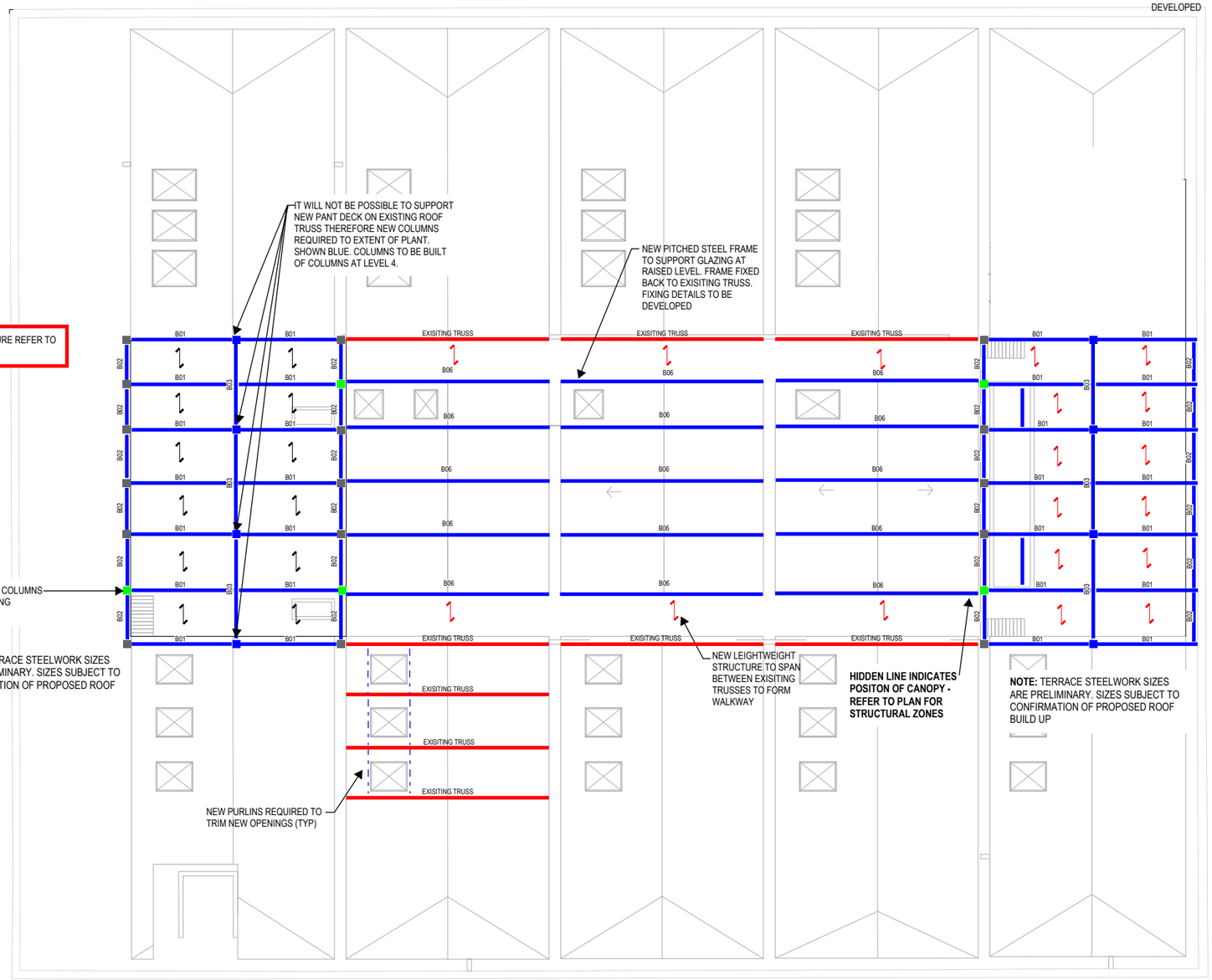
Drg Title: WAREHOUSE FIRST FLOOR MEZZANINE STRUCTURAL INTERVENTION GA

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	31/08/22	KC	DB	DB

Scale: As indicated

Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
064582 -	CUR -	Z2 -	M1 -	DR -	S -	20103 -	P02

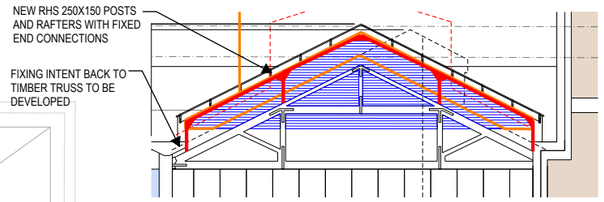
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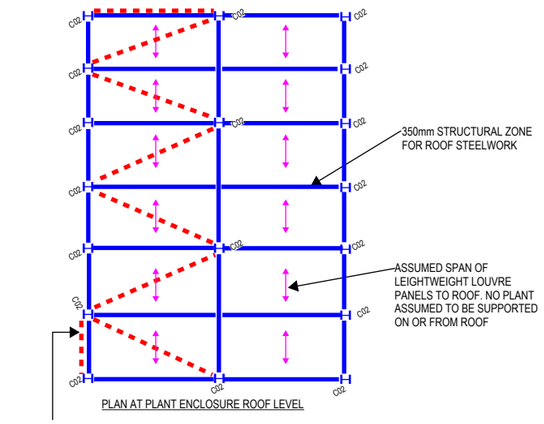
NOTE: EXISITING PURLINS ASSUMED TO BE RETAINED TO SUPPORT NEW ROOF FINISHES. WEIGHT OF NEW FINISHES IS CURRENTLY UNKNOWN. IF FINISHES ARE HEAVIER THAN EXISITING FINISHES PURLINS WILL NEED TO BE ASSESSED TO SUPPORT INCREASED LOAD. PURLINS MAY REQUIRE STRENGTHENING/REPLACEMENT. SUITABLE CONTINGENCY ALLOWANCE TO BE MADE

PROPOSED ROOF

SCALE: 1 : 175



SECTION SHOWING NEW PITCHED STEEL FRAME TO SUPPORT GLAZING



PLAN AT PLANT ENCLOSURE ROOF LEVEL

HIDDEN LINE DENOTES VERTICAL AND HORIZONTAL BRACING.

STRUCTURAL STEEL COLUMN SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
C01	SHS 250x250	S355
C02	UC 203x203	S355

STRUCTURAL STEEL BEAM SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
B01	UB 406x178	S355
B02	UB 203x133	S355
B03	UB 533x210	S355
B04	UB 203x102	S355
B05	UB 457x191	S355
B06	UB 356x171	S355
B07	UB 305x165	S355
B08	SHS 200X200	S355
B09	RHS 200x100	S355
B10	UB 610x229	S355

GENERAL NOTES:

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3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
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CONTRACTOR TO MAKE ALLOWANCES FOR:

1. PRECLUSION OF WATER DURING CONSTRUCTION.
2. TEMPORARY EARTHWORKS & EXCAVATION SUPPORT.
3. TEMPORARY SUPPORT & STABILITY OF ALL EXISTING ELEMENTS DURING DEMOLITION & REMEDIAL WORKS.
4. VERIFICATION OF LOCATIONS OF ALL BELOW GROUND SERVICES & OBSTRUCTIONS PRIOR TO UNDERTAKING OF ANY WORKS.
5. REMOVAL OF ALL OBSTRUCTIONS PRIOR TO PILING WORKS.
6. SURVEYING OF ALL NEW TO EXISTING INTERFACES TO VERIFY HISTORIC RECORDS WHICH HAVE FORMED THE BASIS OF DESIGN.
7. TESTING & VERIFICATION OF ANY EXISTING ELEMENTS AS REQUIRED BY THE STRUCTURAL ENGINEER.
8. END PLATED CONNECTIONS TO ALL BEAMS

STAGE 2 W.I.P. NOTES:

- STRUCTURAL PHILOSOPHY ONLY.
- STRUCTURAL ELEMENTS SUBJECT TO DESIGN DEVELOPMENT.
- PERIMETER DETAIL SUBJECT TO CONFIRMATION OF CLADDING PERFORMANCE CRITERIA

WAREHOUSE STRUCTURAL PHILOSOPHY:

- EXISITING PRIMARY AND SECONDARY BEAMS RESTRAINING COLUMNS TO BE RETAINED
- ALL NEW STEEL TO BE GRADE S355
- CONNECTIONS TO EXISITING STEEL TBC SUBJECT DESIGN DEVELOPMENT FURTHER TO SURVEYS TO CONFIRM EXISITING STEEL COMPOSITION
- ALLOW FOR TIE RODS ADJACENT TO LARGE OPENINGS AT 2m CENTRES

LEGEND

- INDICATES EXISTING PRIMARY STRUCTURE
- INDICATES EXISTING SECONDARY STEEL BEAMS
- INDICATES EXISTING SECONDARY STEEL BEAMS TO BE REMOVED
- INDICATES NEW STEEL BEAMS
- INDICATES NEW STEEL BEAMS TRIMMING EXISTING STRUCTURE
- INDICATES VERTICAL BRACING
- INDICATES NEW VOID IN EXISTING FLOOR
- INDICATES NEW VOID FOR RISER. BRICK ARCH TO BE LOCALLY REMOVED WITH EXISITING STEELWORK RETAINED
- INDICATES SPAN OF 160mm THK SMD CONCRETE COMPOSITE FLOOR
- INDICATES SPAN OF LEIGHTWEIGHT TIMBER FLOOR AND JOISTS OR METSEC JOISTS TO TERRACE AREA AND WALWAYS

THIS DRAWING IS BASED ON INFORMATION RECEIVED 12.08.22

Rev:	Description:	Date:	By:	Chkd:
P02	PLANT ENCLOSURE STRUCTURE ADDED.	18.11.22	KC	DB
P01	ISSUED FOR STAGE 2	31.08.22	KC	DB

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Status: STAGE 2 ISSUE

Project: GREAT NORTHERN WAREHOUSE

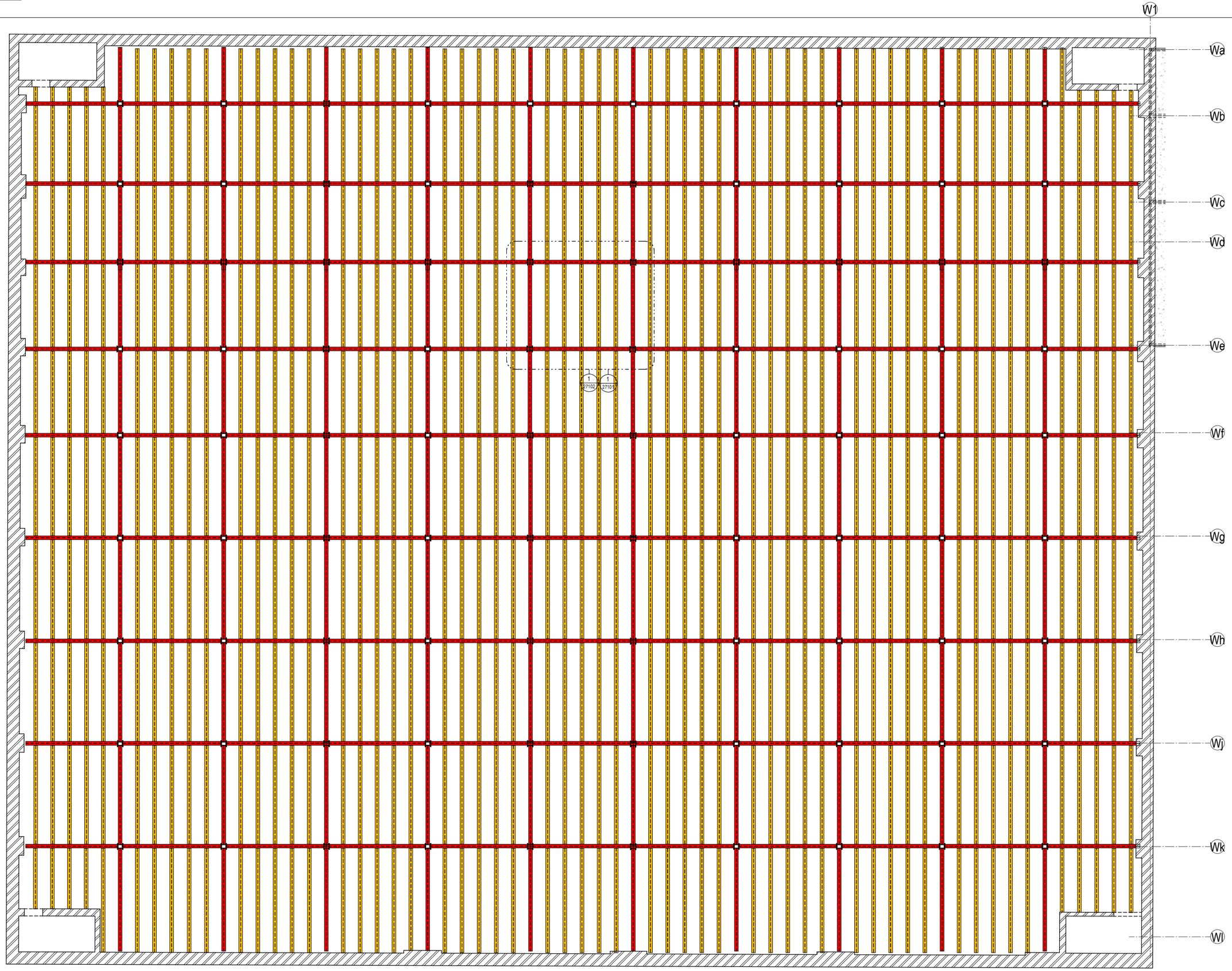
Drg Title: WAREHOUSE ROOF FLOOR STRUCTURAL INTERVENTION GA

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	31/08/22	KC	DB	DB

Scale: As indicated

Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
064582 -	CUR -	Z2 -	RF -	DR -	S -	20107 -	P02

Model Name:XXXXXX-CUR-ZZ-XX-M3-S-00001



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DENOTES BEAMS TO BE RETAINED

DENOTES POTENTIAL BEAMS TO BE REMOVED, BUT WITH STRUCTURAL MODIFICATIONS

NOT FOR CONSTRUCTION

WAREHOUSE TYPICAL BEAM LAYOUT

SCALE: 1 : 125

Rev:	Description:	Date:	By:	Chkd:
P1	STAGE 2 ISSUE	31/08/22	AC	DB

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Status: STAGE 2

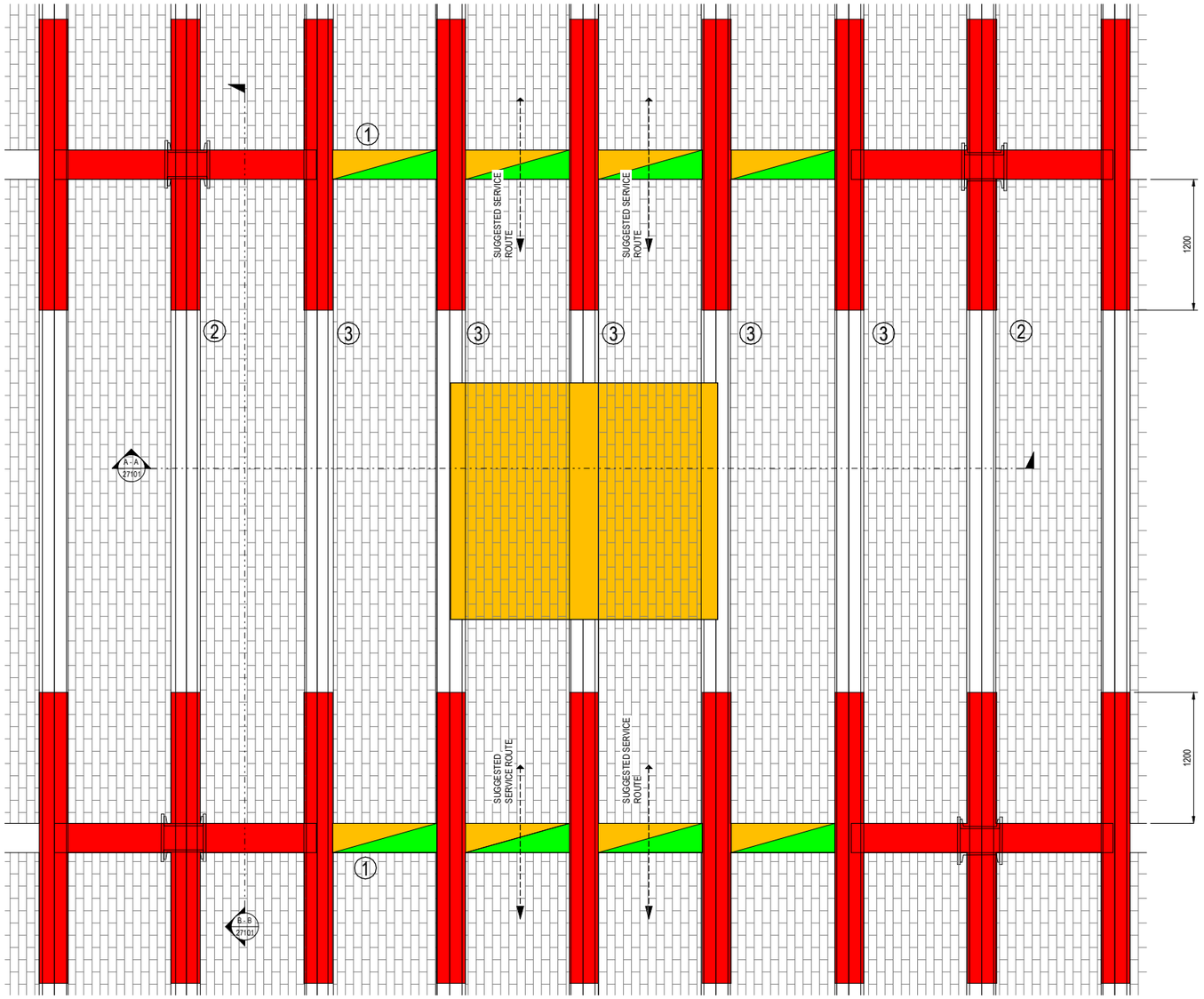
Project: GREAT NORTHERN WAREHOUSE

Drg Title: STRUCTURAL PRINCIPLES MODIFICATION ASSESSMENT OF EXISTING STRUCTURAL FLOOR PLATE

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	AUG 22	AC	DB	VC

Scale: As indicated

Project No:	Originator:	Zone:	Level:	Type:	Discipline:	Category / Number:	Rev:
064582 -	CUR -	Z2 -	XX -	DR -	S -	27100 -	P1



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AVOID STRUCTURAL INTRUSIVE WORKS (IF POSSIBLE)

WORKS WOULD NEED DETAILED ASSESSMENT/STRENGTHENING WORKS

MINIMAL STRUCTURAL IMPACT

(1) PRIMARY BEAM ON GRID

(2) SECONDARY BEAM ON GRID

(3) SECONDARY BEAM OFF GRID

WHERE MULTIPLE BAYS ARE TO BE REMOVED BEAMS TYPE 1 & 2 ARE TO BE RETAINED

ALL PRIMARY BEAMS TO BE RETAINED AT ALL LEVELS, PLUS SECONDARY BEAMS WHERE THEY FRAME DIRECTLY INTO EXISTING COLUMNS.

NOTE :-

THE INTEGRITY OF THE WAREHOUSE AS A WHOLE IS DEPENDANT UPON A HIGH DEGREE OF DIAPHRAGM ACTION AT ALL FLOORS LEVELS.

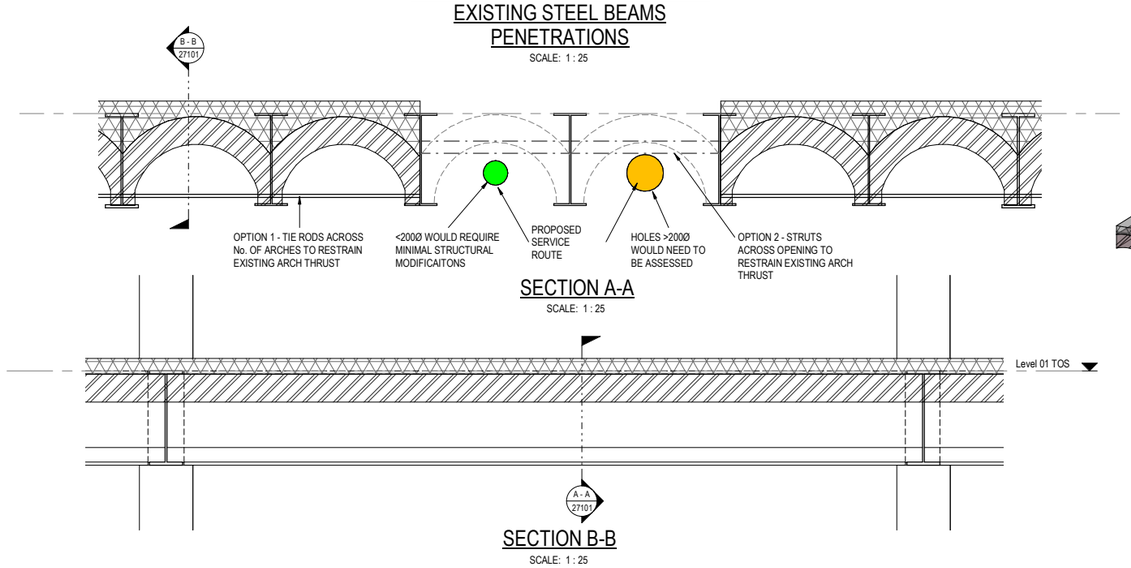
- ALL PRIMARIES TO REMAIN INTACT.

- SECONDARIES TO BE RETAINED WHEREVER POSSIBLE AND INTEGRATED INTO RISER SPACES

NOT FOR CONSTRUCTION

WAREHOUSE TYPICAL ENLARGED EXISTING STEEL BEAMS PENETRATIONS

SCALE: 1 : 25

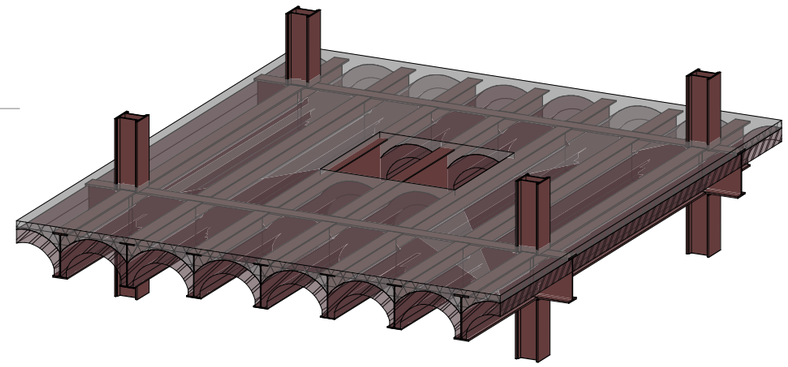


SECTION A-A

SCALE: 1 : 25

SECTION B-B

SCALE: 1 : 25



3D VIEW

Rev:	Description:	Date:	By:	Chkd:
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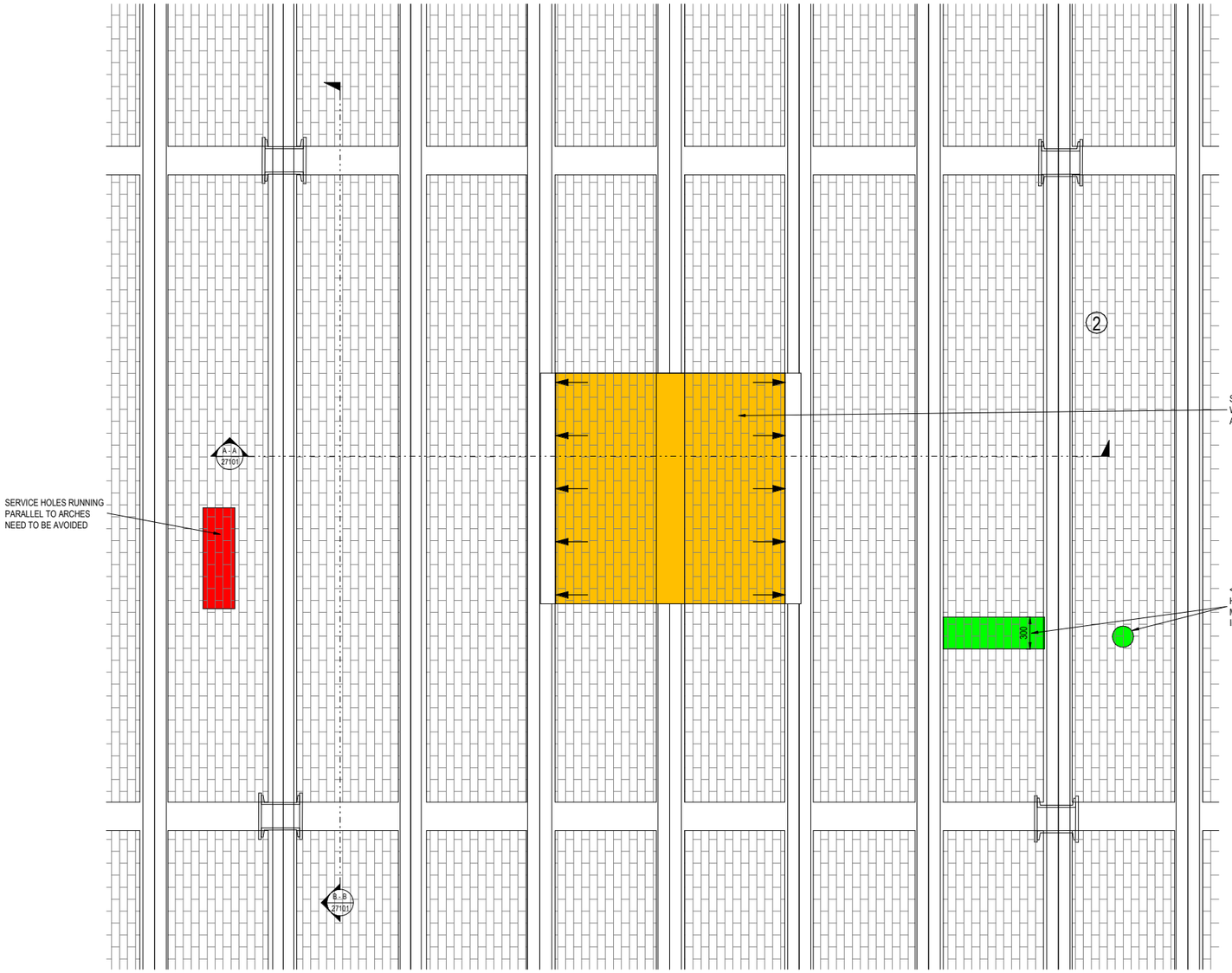
Status: STAGE 2

Project: GREAT NORTHERN WAREHOUSE

Drg Title: STRUCTURAL PRINCIPLES SERVICE ROUTE ASSESSMENT ON EXISTING STRUCTURAL FLOOR BEAMS

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	AUG 22	AC	DB	VC
Scale: As indicated				

Project No:	Originator:	Zone:	Level:	Type:	Discipline:	Category / Number:	Rev:
064582 -	CUR -	Z2 -	XX -	DR -	S -	27101 -	P1



TYPICAL ENLARGED PLAN BRICK ARCH PENETRATIONS

SCALE: 1 : 25

GENERAL NOTES:

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AVOID STRUCTURAL INTRUSIVE WORKS (IF POSSIBLE)

WORKS WOULD NEED DETAILED ASSESSMENT/STRENGTHENING WORKS

MINIMAL STRUCTURAL IMPACT

NOTE :-

THE INTEGRITY OF THE WAREHOUSE AS A WHOLE IS DEPENDANT UPON A HIGH DEGREE OF DIAPHRAGM ACTION AT ALL FLOORS LEVELS.

- ALL PRIMARIES TO REMAIN INTACT.

- SECONDARIES TO BE RETAINED WHEREVER POSSIBLE AND INTEGRATED INTO RISER SPACES

NOT FOR CONSTRUCTION

Rev:	Description:	Date:	By:	Chkd:
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Status: STAGE 2

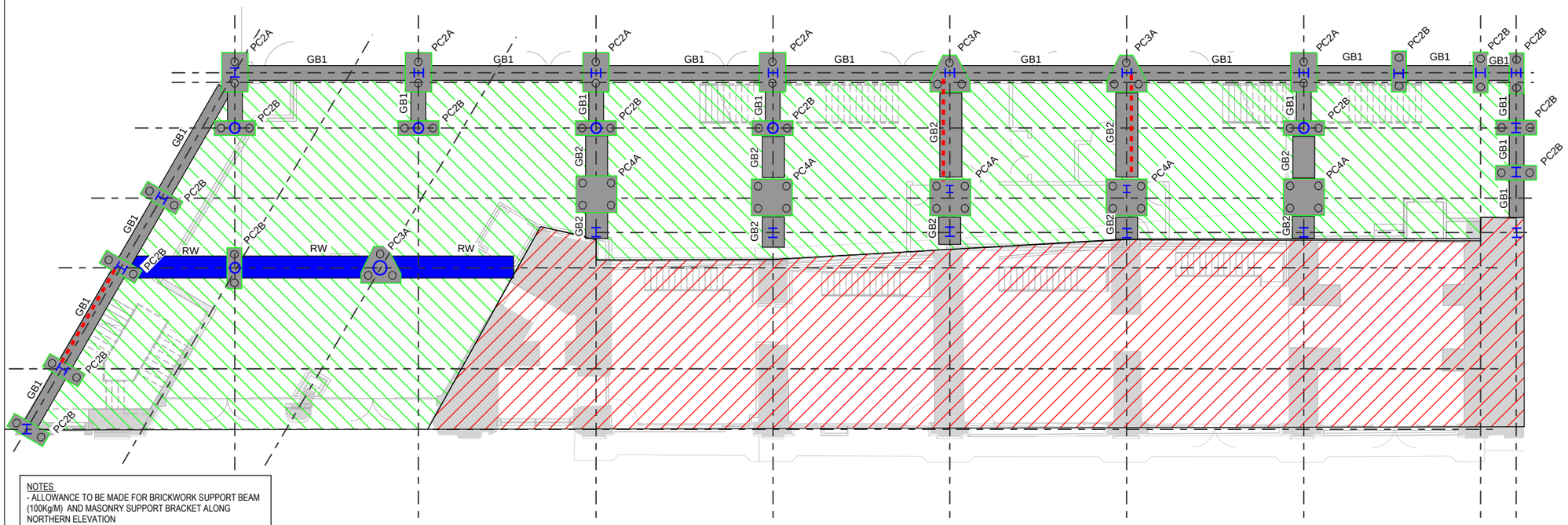
Project: GREAT NORTHERN WAREHOUSE

Drg Title: STRUCTURAL PRINCIPLES
SERVICE ROUTE ASSESSMENT ON EXISTING BRICK ARCH PENETRATIONS

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	AUG 22	AC	DB	VC

Scale: 1 : 25

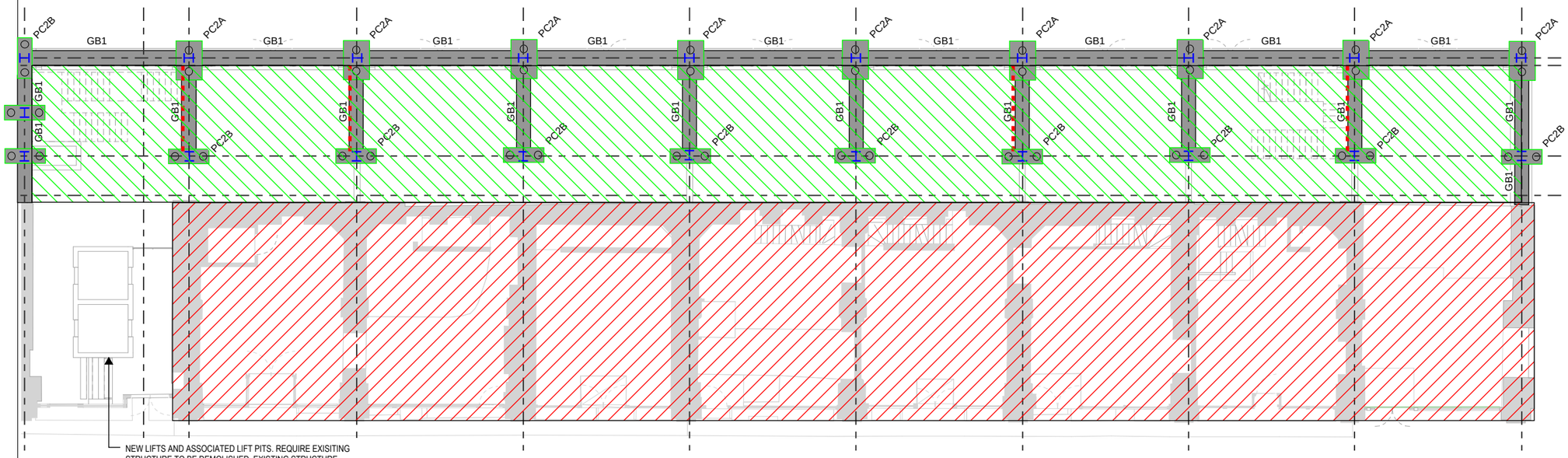
Project No:	Originator:	Zone:	Level:	Type:	Discipline:	Category / Number:	Rev:
064582 -	CUR -	Z2 -	XX -	DR -	S -	27102 -	P1



NOTES
- ALLOWANCE TO BE MADE FOR BRICKWORK SUPPORT BEAM (100Kg/M) AND MASONRY SUPPORT BRACKET ALONG NORTHERN ELEVATION
- ALLOWANCE TO BE MADE FOR RETAINING WALL ALONG NORTHERN ELEVATION TO ACCOUNT FOR LEVEL DIFFERENCE

PROPOSED GROUND FLOOR 1

SCALE: 1 : 100



NEW LIFTS AND ASSOCIATED LIFT PITS. REQUIRE EXISITING STRUCTURE TO BE DEMOLISHED. EXISTING STRUCTURE DETAILS TO BE DETERMINED VIA SURVEY.
NEW FOUNDATION SCHEME TO BE DEVELOPED, ALLOWANCE TO BE MADE FOR MINI PILES TO SUPPORT PILE CAP

RC WALLS REQUIRED TO FORM LIFT WALL. NEW RC STAIRS TO BE SUPPORTED FROM LIFT WALLS AND EXISITING MASONRY STRUCTURE

NEW GROUND FLOOR RC SLAB REQUIRED

PROPOSED GROUND FLOOR 2

SCALE: 1 : 100

FOUNDATION DESIGN BASED ON 350DIA. CFA PILES.

ASSUMED CAPACITY-
AXIAL = 800kN
SHEAR = 50kN

PILING CONTRACTOR TO BE ENGAGED TO CONFIRM CAPACITIES.

PILE CAP SCHEDULE		
REF.	DIMENSIONS	REBAR ALLOWANCE
PC2A	1700x1050x1000DP	200Kg/m^3
PC2B	1700x650x1000DP	200Kg/m^3
PC3A	1560x630x1000DP	200Kg/m^3

GROUND BEAM SCHEDULE		
REF.	DIMENSIONS	REBAR ALLOWANCE
GB1	600x600DP	200Kg/m^3

RETAINING WALL SCHEDULE			
REF.	BASE THK	STEM THK	REBAR ALLOWANCE
RW	300	200	200Kg/m^3

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CONTRACTOR TO MAKE ALLOWANCES FOR:

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8. END PLATED CONNECTIONS TO ALL BEAMS

STAGE 2 W.I.P. NOTES:

- STRUCTURAL PHILOSOPHY ONLY.
- STRUCTURAL ELEMENTS SUBJECT TO DESIGN DEVELOPMENT.
- PERIMETER DETAIL SUBJECT TO CONFIRMATION OF CLADDING PERFORMANCE CRITERIA

TERRACE STRUCTURAL PHILOSOPHY:

- FOUNDATIONS TO BE PILED
- ALL STEEL TO BE GRADE S355
- COLUMN SIZES SUBJECT TO GRID RESOULTION

FOUNDATION NOTES:

- FOUNDATION DESIGN IS PRELIMINARY.
- DESIGN IS SUBJECT TO DEVELOPMENT, GRID RESOLUTION, CONFIRMATION OF CONSTRUCTION BUILD UPS AND LOAD TAKE-DOWN
- REFERENCE SHOULD BE MADE TO CURTINS PHASE 2 SITE INVESTIGATIONS REPORT FOR DETAILS OF BELOW GROUND INFORMATION.
- CONSIDERATION SHOULD BE MADE FOR SPECIALIST REGARDING BELOW GROUND PROTECTION AGAINST RADON WITHIN BASEMENTS.

LEGEND

- INDICATES LOCATION OF VERTICAL BRACING
- DENOTES EXISTING RETAINED STRUCTURE
- INDICATES PROPOSED 175 THK GROUND BEARING REINFORCED CONCRETE SLAB GRADE RC32/40 WITH 2 LAYERS A252 MESH 1 TOP, 1 BTM.

THIS DRAWING IS BASED ON INFORMATION RECEIVED 12.08.22

Rev:	Description:	Date:	By:	Chkd:
P02	CANTILEVER GROUND BEAM ADDED	18.11.22	KC	DB
P01	ISSUED FOR STAGE 2	31.08.22	KC	DB

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Project:
GREAT NORTHERN WAREHOUSE

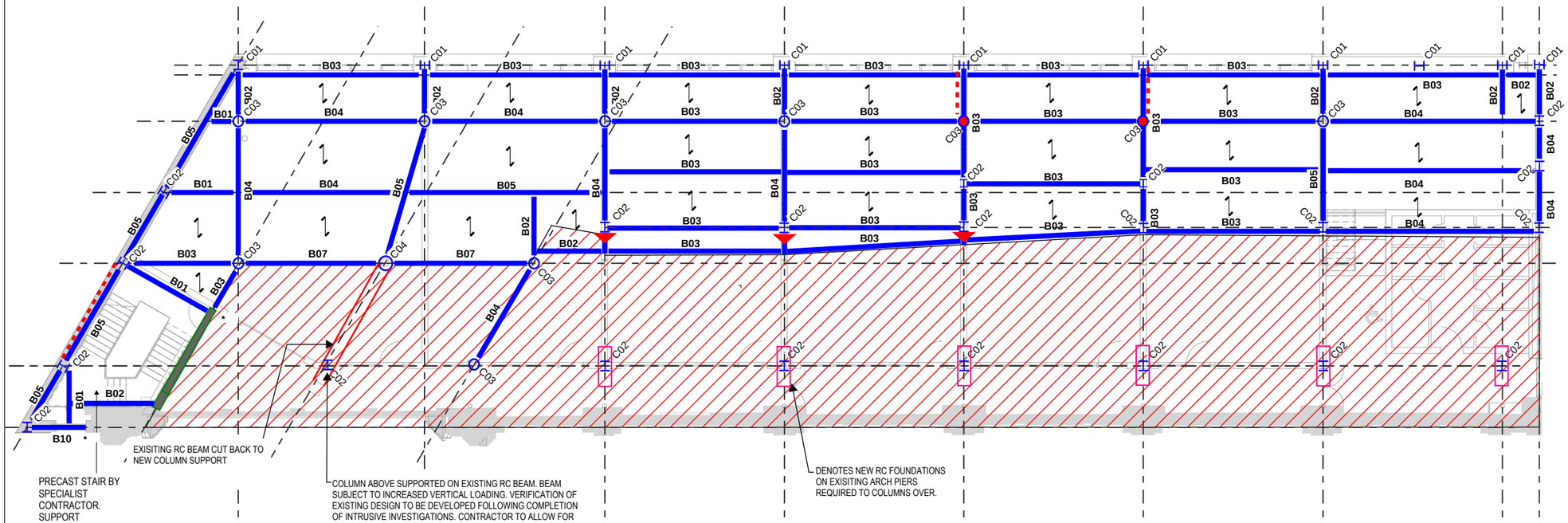
Drg Title:
TERRACE A GROUND FLOOR STRUCTURAL INTERVENTION GA

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	31/08/22	KC	DB	DB
Scale: As indicated				

Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
064582 -	CUR -	Z3A -	00 -	DR -	S -	20100 -	P02

Model Name:XXXXXX-CUR-ZZ-XX-M3-S-00001

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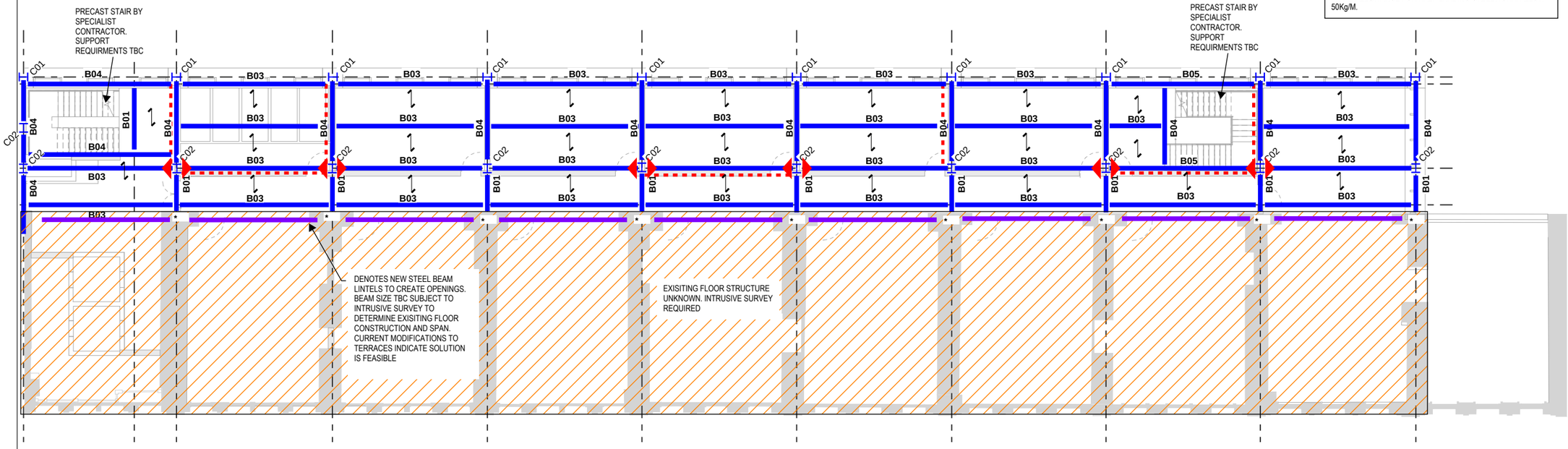


PROPOSED FIRST FLOOR 1

SCALE: 1 : 100

NOTES
-MAKE ALLOWANCE FOR CLADDING SUPPORT BEAM TO FULL EAST ELEVATION. ALLOW 125 Kg/M.

-MAKE ALLOWANCE FOR HALF LANDING STEELWORK. ALLOW 50Kg/M.



PROPOSED FIRST FLOOR 2

SCALE: 1 : 100

STRUCTURAL STEEL COLUMN SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
C01	UC 305x305	S355
C02	UC 203x203	S355
C03	CHS219x10.0	S355
C04	CHS323.9x10.0	S355

STRUCTURAL STEEL BEAM SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
B01	UB 203x133	S355
B02	UB 254x146	S355
B03	UB 305x165	S355
B04	UB 356x171	S355
B05	UB 406x178	S355
B06	UC 203x203	S355
B07	RHS 300x200	S355
B08	RHS 400x200	S355
B09	RHS 500x300	S355
B10	SHS 200x200	S355
B11	RHS 200x150	S355
B12	UB 457x191	S355

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- ALL STEEL TO BE GRADE S355
- COLUMN SIZES SUBJECT TO GRID RESOULTION

FOUNDATION NOTES:

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LEGEND

- INDICATES VERTICAL BRACING
- INDICATES SPAN OF 130mm THK SMD CONCRETE COMPOSITE FLOOR
- DENOTES MOMENT CONNECTION
- DENOTES EXISTING 1st FLOOR RC SLAB. DEPTH CURRENTLY UNKNOWN. SURVEY REQUIRED TO CONFIRM DEPTH AND SET OUT.

* DENOTES SUPPORTS VIA CONNECTION INTO EXISTING MASONRY PIER. DETAIL TO BE DEVELOPED. EXACT DETAIL TBC FOLLOWING COMPLETION OF DEMO & ON SITE MEASURE.

ALLOWANCE TO BE MADE FOR 19mm DIA x 100mm LONG SHEAR STUDS AT EACH TROUGH LOCATION & @ 300c/c WHERE PARALLEL TO ALL BEAMS.
ALLOW FOR B12 TRANSVERSE BAR AT EACH STUD LOCATIONS.

ALLOWANCE TO BE MADE FOR PENETRATIONS TO BEAM WEBS FOR SERVICE DISTRIBUTION. DETAILS TO BE DEVELOPED AND COORDINATED WITH M&E DESIGNER

Rev:	Description:	Date:	By:	Chkd:
P02	UPDATED TO SUIT ROOF TERRACE PROPOSALS	18.11.22	KC	DB
P01	ISSUED FOR STAGE 2	25.08.22	KC	DB

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Status:
STAGE 2 ISSUE

Project:
GREAT NORTHERN WAREHOUSE

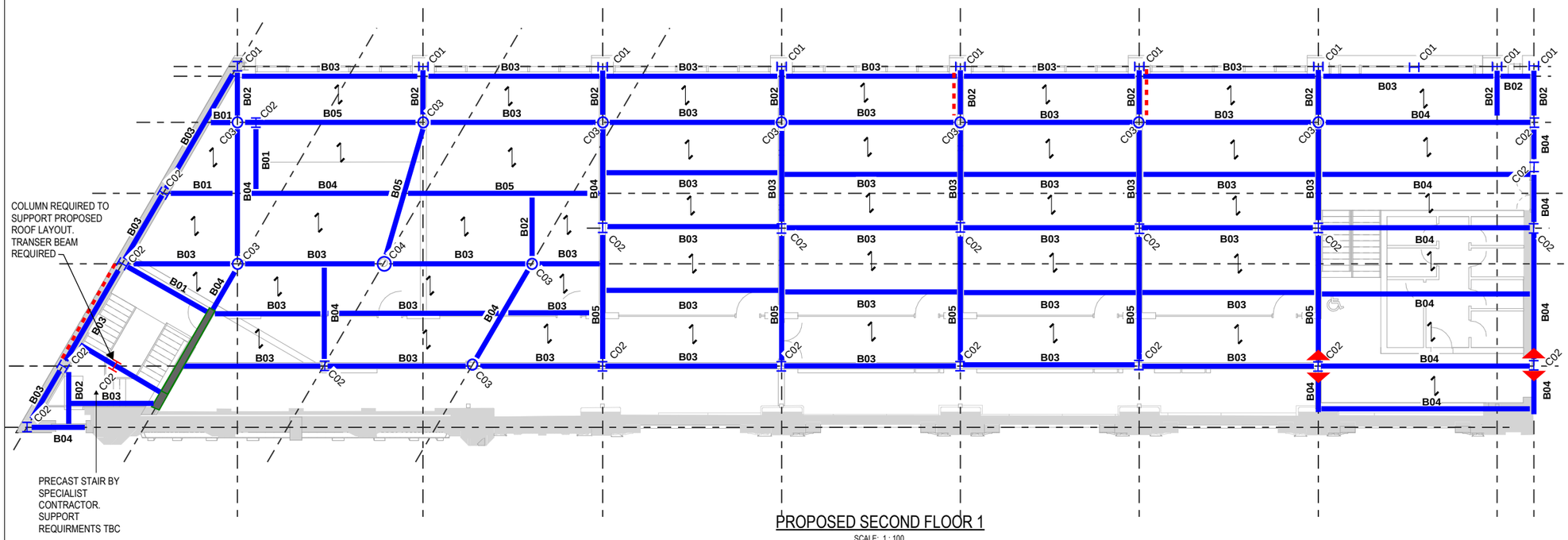
Drg Title:
TERRACE A FIRST FLOOR STRUCTURAL INTERVENTION GA

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	31/08/22	KC	DB	DB
Scale: As indicated				

Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
064582 -	CUR -	Z3A -	01 -	DR -	S -	20101 -	P02

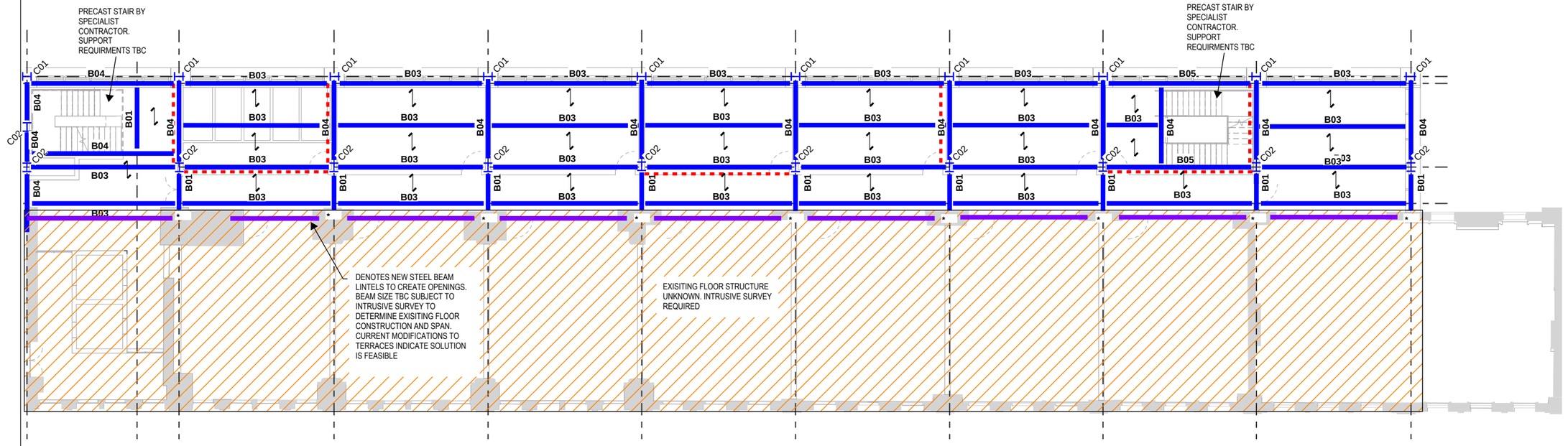
Model Name:XXXXXX-CUR-ZZ-XX-M3-S-00001

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PROPOSED SECOND FLOOR 1

SCALE: 1 : 100



PROPOSED SECOND FLOOR 2

SCALE: 1 : 100

GENERAL NOTES:

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3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
4. FOR GENERAL NOTES REFER TO DRAWING.

CONTRACTOR TO MAKE ALLOWANCES FOR:

1. PRECLUSION OF WATER DURING CONSTRUCTION.
2. TEMPORARY EARTHWORKS & EXCAVATION SUPPORT.
3. TEMPORARY SUPPORT & STABILITY OF ALL EXISTING ELEMENTS DURING DEMOLITION & REMEDIAL WORKS.
4. VERIFICATION OF LOCATIONS OF ALL BELOW GROUND SERVICES & OBSTRUCTIONS PRIOR TO UNDERTAKING OF ANY WORKS.
5. REMOVAL OF ALL OBSTRUCTIONS PRIOR TO PILING WORKS.
6. SURVEYING OF ALL NEW TO EXISTING INTERFACES TO VERIFY HISTORIC RECORDS WHICH HAVE FORMED THE BASIS OF DESIGN.
7. TESTING & VERIFICATION OF ANY EXISTING ELEMENTS AS REQUIRED BY THE STRUCTURAL ENGINEER.
8. END PLATED CONNECTIONS TO ALL BEAMS

STAGE 2 W.I.P. NOTES:

- STRUCTURAL PHILOSOPHY ONLY.
- STRUCTURAL ELEMENTS SUBJECT TO DESIGN DEVELOPMENT.
- PERIMETER DETAIL SUBJECT TO CONFIRMATION OF CLADDING PERFORMANCE CRITERIA

TERRACE STRUCTURAL PHILOSOPHY:

- FOUNDATIONS TO BE PILED
- ALL STEEL TO BE GRADE S355
- COLUMN SIZES SUBJECT TO GRID RESOULTION

FOUNDATION NOTES:

- FOUNDATION DESIGN IS PRELIMINARY.
- DESIGN IS SUBJECT TO DEVELOPMENT, GRID RESOLUTION, CONFIRMATION OF CONSTRUCTION BUILD UPS AND LOAD TAKE-DOWN
- REFERENCE SHOULD BE MADE TO CURTINS PHASE 2 SITE INVESTIGATIONS REPORT FOR DETAILS OF BELOW GROUND INFORMATION.
- CONSIDERATION SHOULD BE MADE FOR SPECIALIST REGARDING BELOW GROUND PROTECTION AGAINST RADON WITHIN BASEMENTS.

LEGEND

- INDICATES VERTICAL BRACING
- INDICATES SPAN OF 130mm THK SMD CONCRETE COMPOSITE FLOOR
- DENOTES MOMENT CONNECTION

* DENOTES SUPPORTS VIA CONNECTION INTO EXISTING MASONRY PIER. DETAIL TO BE DEVELOPED. EXACT DETAIL TBC FOLLOWING COMPLETION OF DEMO & ON SITE MEASURE.

ALLOWANCE TO BE MADE FOR 19mm DIA x 100mm LONG SHEAR STUDS AT EACH TROUGH LOCATION & @ 300c/c WHERE PARALLEL TO ALL BEAMS.
ALLOW FOR B12 TRANSVERSE BAR AT EACH STUD LOCATIONS.

ALLOWANCE TO BE MADE FOR PENETRATIONS TO BEAM WEBS FOR SERVICE DISTRIBUTION. DETAILS TO BE DEVELOPED AND COORDINATED WITH M&E DESIGNER

Rev:	Description:	Date:	By:	Chkd:
P02	UPDATED TO SUIT ROOF TERRACE PROPOSALS	18.11.22	KC	DB
P01	ISSUED FOR STAGE 2	25.08.22	KC	DB

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Status: STAGE 2 ISSUE

Project: GREAT NORTHERN WAREHOUSE

Drg Title: TERRACE A SECOND FLOOR STRUCTURAL INTERVENTION GA

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	31/08/22	KC	DB	DB
Scale: As indicated				

Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
064582 -	CUR -	Z3A -	02 -	DR -	S -	20102 -	P02

Model Name:XXX-XXX-CUR-ZZ-XX-M3-S-00001

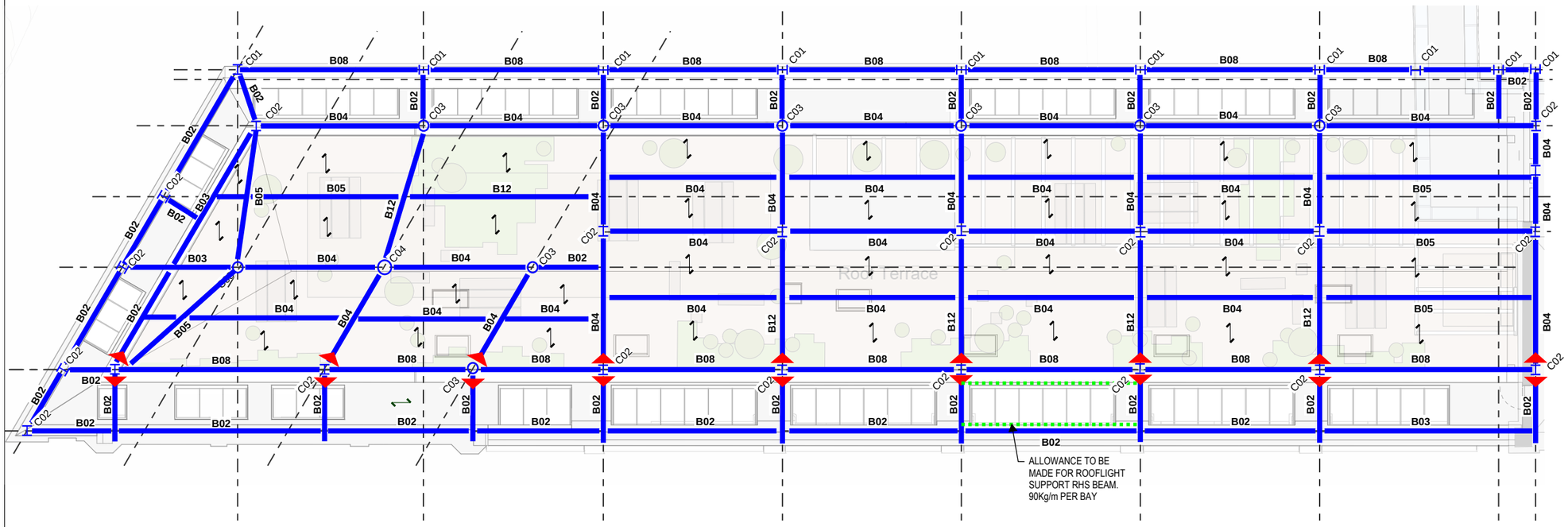
STRUCTURAL STEEL COLUMN SCHEDULE

REF.	TYPE	STRUCTURAL MATERIAL
C01	UC 305x305	S355
C02	UC 203x203	S355
C03	CHS219x10.0	S355
C04	CHS323.9x10.0	S355

STRUCTURAL STEEL BEAM SCHEDULE

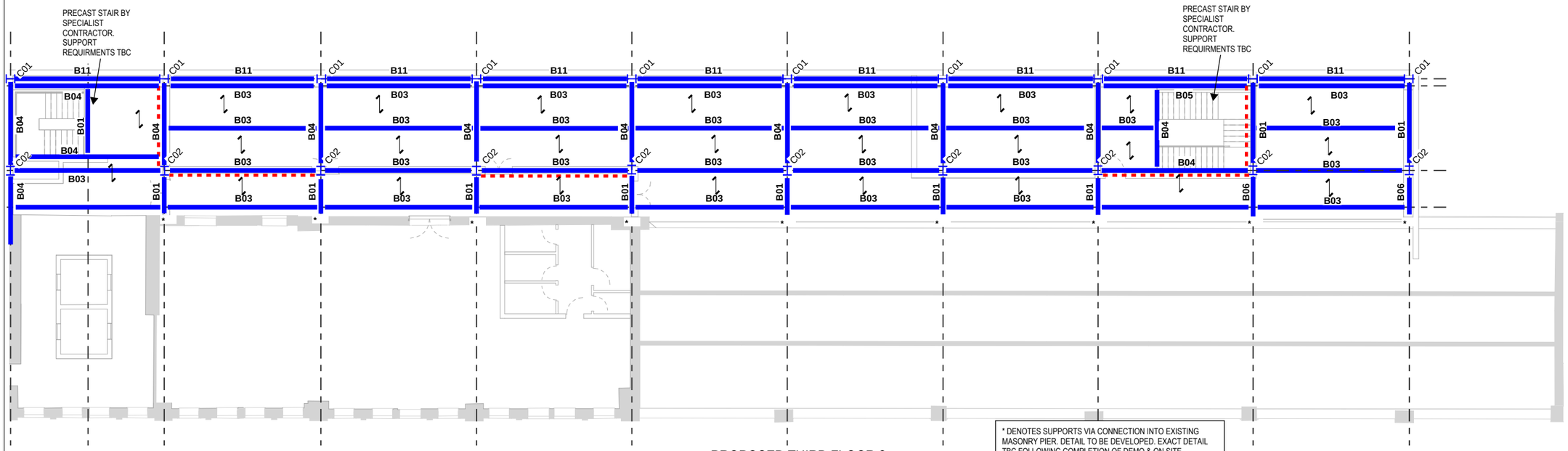
REF.	TYPE	STRUCTURAL MATERIAL
B01	UB 203x133	S355
B02	UB 254x146	S355
B03	UB 305x165	S355
B04	UB 356x171	S355
B05	UB 406x178	S355
B06	UC 203x203	S355
B07	RHS 300x200	S355
B08	RHS 400x200	S355
B09	RHS 500x300	S355
B10	SHS 200x200	S355
B11	RHS 200x150	S355
B12	UB 457x191	S355

THIS DRAWING IS BASED ON
INFORMATION RECEIVED 12.08.22



PROPOSED ROOF 1

SCALE: 1 : 100



PROPOSED THIRD FLOOR 2

SCALE: 1 : 100

* DENOTES SUPPORTS VIA CONNECTION INTO EXISTING MASONRY PIER. DETAIL TO BE DEVELOPED. EXACT DETAIL TBC FOLLOWING COMPLETION OF DEMO & ON SITE MEASURE.

ALLOWANCE TO BE MADE FOR 19mm DIA x 100mm LONG SHEAR STUDS AT EACH TROUGH LOCATION & @ 300c/c WHERE PARALLEL TO ALL BEAMS.
ALLOW FOR B12 TRANSVERSE BAR AT EACH STUD LOCATIONS.

ALLOWANCE TO BE MADE FOR PENETRATIONS TO BEAM WEBS FOR SERVICE DISTRIBUTION. DETAILS TO BE DEVELOPED AND COORDINATED WITH M&E DESIGNER

STRUCTURAL STEEL COLUMN SCHEDULE

REF.	TYPE	STRUCTURAL MATERIAL
C01	UC 305x305	S355
C02	UC 203x203	S355
C03	CHS219x10.0	S355
C04	CHS323.9x10.0	S355

STRUCTURAL STEEL BEAM SCHEDULE

REF.	TYPE	STRUCTURAL MATERIAL
B01	UB 203x133	S355
B02	UB 254x146	S355
B03	UB 305x165	S355
B04	UB 356x171	S355
B05	UB 406x178	S355
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B07	RHS 300x200	S355
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B12	UB 457x191	S355

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4. VERIFICATION OF LOCATIONS OF ALL BELOW GROUND SERVICES & OBSTRUCTIONS PRIOR TO UNDERTAKING OF ANY WORKS.
5. REMOVAL OF ALL OBSTRUCTIONS PRIOR TO PILING WORKS.
6. SURVEYING OF ALL NEW TO EXISTING INTERFACES TO VERIFY HISTORIC RECORDS WHICH HAVE FORMED THE BASIS OF DESIGN.
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8. END PLATED CONNECTIONS TO ALL BEAMS

STAGE 2 W.I.P. NOTES:

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- STRUCTURAL ELEMENTS SUBJECT TO DESIGN DEVELOPMENT.
- PERIMETER DETAIL SUBJECT TO CONFIRMATION OF CLADDING PERFORMANCE CRITERIA

TERRACE STRUCTURAL PHILOSOPHY:

- FOUNDATIONS TO BE PILED
- ALL STEEL TO BE GRADE S355
- COLUMN SIZES SUBJECT TO GRID RESOULTION

FOUNDATION NOTES:

- FOUNDATION DESIGN IS PRELIMINARY.
- DESIGN IS SUBJECT TO DEVELOPMENT, GRID RESOLUTION, CONFIRMATION OF CONSTRUCTION BUILD UPS AND LOAD TAKE-DOWN
- REFERENCE SHOULD BE MADE TO CURTINS PHASE 2 SITE INVESTIGATIONS REPORT FOR DETAILS OF BELOW GROUND INFORMATION.
- CONSIDERATION SHOULD BE MADE FOR SPECIALIST REGARDING BELOW GROUND PROTECTION AGAINST RADON WITHIN BASEMENTS.

LEGEND

- INDICATES VERTICAL BRACING
- INDICATES HORIZONTAL BRACING
- INDICATES SPAN OF 130mm THK SMD CONCRETE FLOOR
- INDICATES SPAN DIRECTION OF 202Z18 METSEC SLEEVED PURLINS @ 1200mm c/c. RAFTER STAYS AT ALTERNATE PURLINS & ANTI-SAG RODS TO MANUFACTURERS DETAILS.
- DENOTES MOMENT CONNECTION

THIS DRAWING IS BASED ON
INFORMATION RECEIVED 12.08.22

Rev:	Description:	Date:	By:	Chkd:
P02	UPDATED TO SUIT ROOF TERRACE PROPOSALS	18.11.22	KC	DB
P01	ISSUED FOR STAGE 2	25.08.22	KC	DB

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Status:
STAGE 2 ISSUE

Project:
GREAT NORTHERN WAREHOUSE

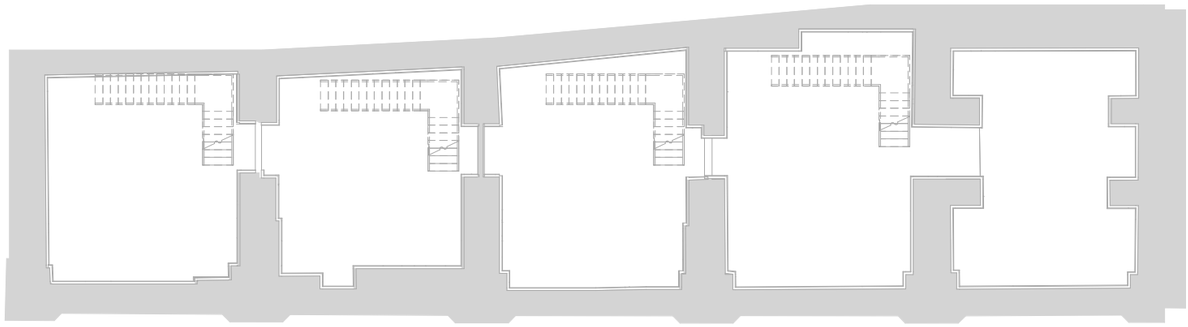
Drg Title:
TERRACE A THIRD FLOOR STRUCTURAL INTERVENTION GA

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	31/08/22	KC	DB	DB

Scale: As indicated

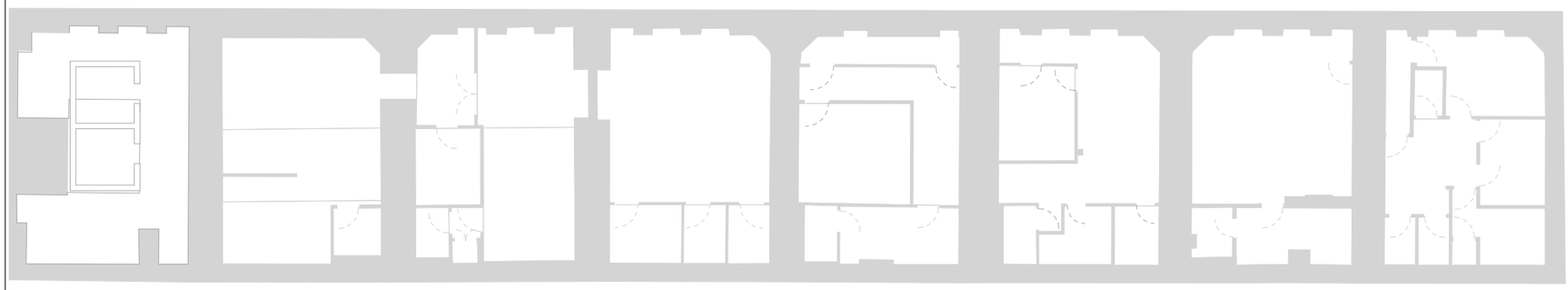
Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
064582	CUR	Z3A	03	DR	S	20103	P02

Model Name:XXX-XXX-CUR-ZZ-XX-M3-S-00001



PROPOSED BASEMENT 1

SCALE: 1 : 100



PROPOSED BASEMENT 2

SCALE: 1 : 100

GENERAL NOTES:

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CONTRACTOR TO MAKE ALLOWANCES FOR:

1. PRECLUSION OF WATER DURING CONSTRUCTION.

2. TEMPORARY EARTHWORKS & EXCAVATION SUPPORT.

3. TEMPORARY SUPPORT & STABILITY OF ALL EXISTING ELEMENTS DURING DEMOLITION & REMEDIAL WORKS.

4. VERIFICATION OF LOCATIONS OF ALL BELOW GROUND SERVICES & OBSTRUCTIONS PRIOR TO UNDERTAKING OF ANY WORKS.

5. REMOVAL OF ALL OBSTRUCTIONS PRIOR TO PILING WORKS.

6. SURVEYING OF ALL NEW TO EXISTING INTERFACES TO VERIFY HISTORIC RECORDS WHICH HAVE FORMED THE BASIS OF DESIGN.

7. TESTING & VERIFICATION OF ANY EXISTING ELEMENTS AS REQUIRED BY THE STRUCTURAL ENGINEER.

8. END PLATED CONNECTIONS TO ALL BEAMS

STAGE 2 W.I.P. NOTES:

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- STRUCTURAL ELEMENTS SUBJECT TO DESIGN DEVELOPMENT.
- PERIMETER DETAIL SUBJECT TO CONFIRMATION OF CLADDING PERFORMANCE CRITERIA

TERRACE STRUCTURAL PHILOSOPHY:

- FOUNDATIONS TO BE PILED
- ALL STEEL TO BE GRADE S355
- COLUMN SIZES SUBJECT TO GRID RESOULTION

FOUNDATION NOTES:

- FOUNDATION DESIGN IS PRELIMINARY.
- DESIGN IS SUBJECT TO DEVELOPMENT, GRID RESOLUTION, CONFIRMATION OF CONSTRUCTION BUILD UPS AND LOAD TAKE-DOWN
- REFERENCE SHOULD BE MADE TO CURTINS PHASE 2 SITE INVESTIGATIONS REPORT FOR DETAILS OF BELOW GROUND INFORMATION.
- CONSIDERATION SHOULD BE MADE FOR SPECIALIST REGARDING BELOW GROUND PROTECTION AGAINST RADON WITHIN BASEMENTS.

THIS DRAWING IS BASED ON INFORMATION RECEIVED 12.08.22

Rev:	Description:	Date:	By:	Chkd:
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Status:

STAGE 2 ISSUE

Project:

GREAT NORTHERN WAREHOUSE

Drg Title:

TERRACE A BASEMENT STRUCTURAL INTERVENTION GA

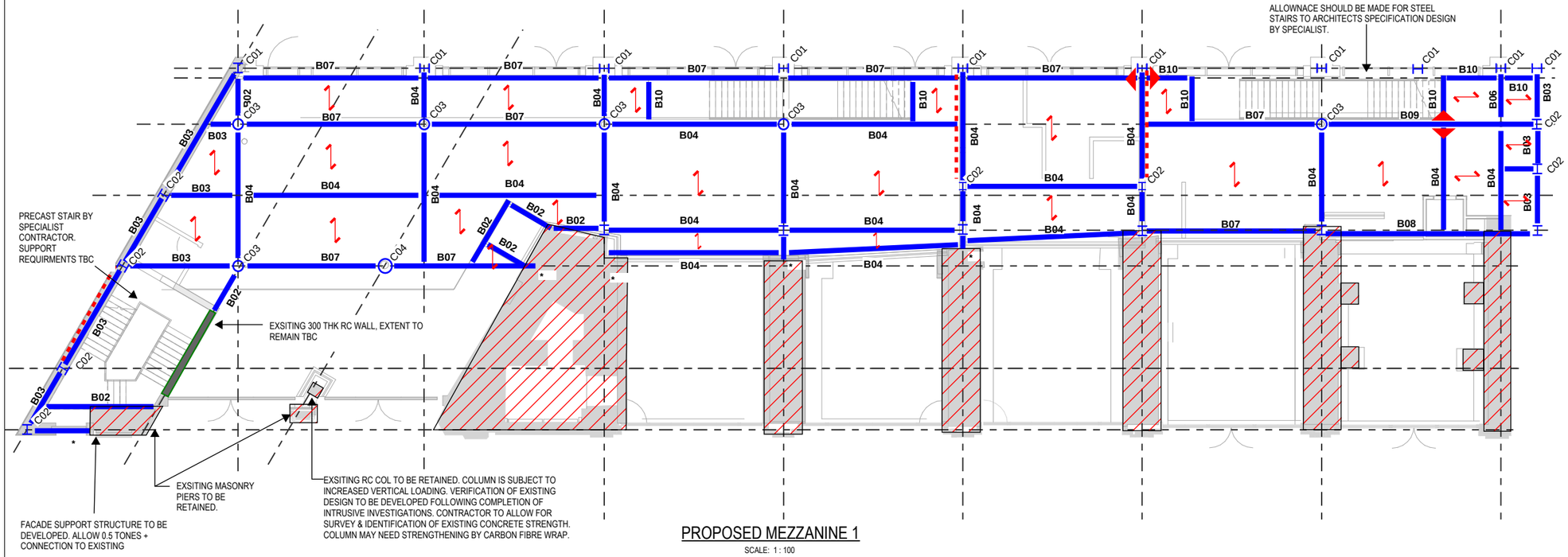
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A1	31/08/22	KC	DB	DB

Scale: As indicated

Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
064582 -	CUR -	Z3A -	B1 -	DR -	S -	20080 -	P01

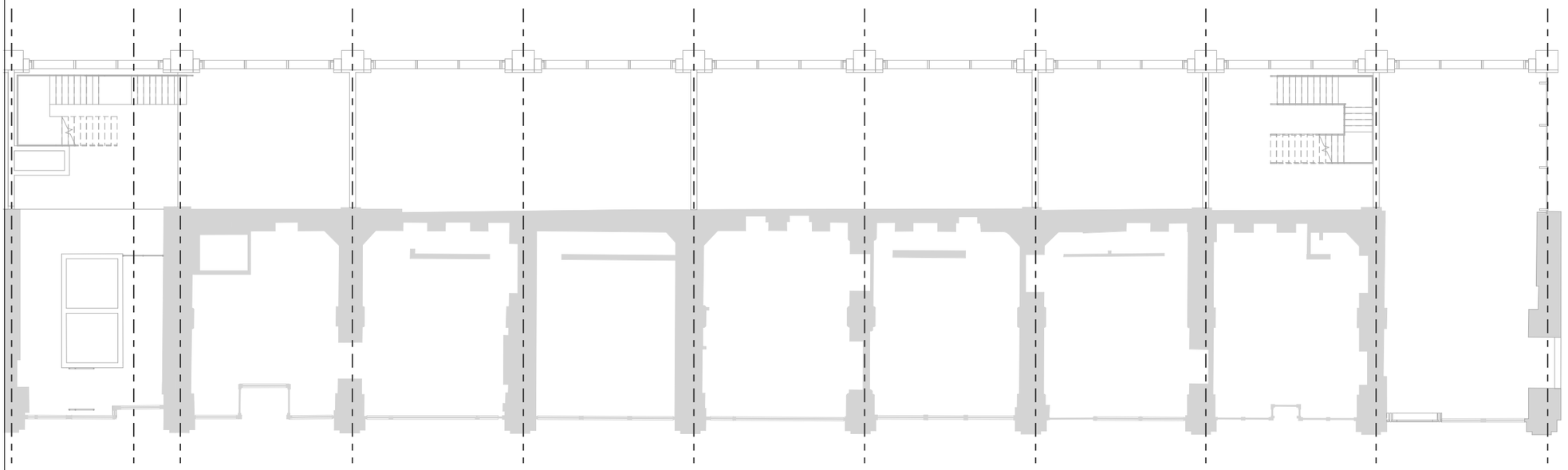
Model Name:XXXXXX-CUR-ZZ-XX-M3-S-00001

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PROPOSED MEZZANINE 1

SCALE: 1 : 100



PROPOSED MEZZANINE 2

SCALE: 1 : 100

STRUCTURAL STEEL COLUMN SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
C01	UC 305x305	S355
C02	UC 203x203	S355
C03	CHS219x10.0	S355
C04	CHS323.9x10.0	S355

STRUCTURAL STEEL BEAM SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
B01	UB 203x133	S355
B02	UB 254x146	S355
B03	UB 305x165	S355
B04	UB 356x171	S355
B05	UB 406x178	S355
B06	UC 203x203	S355
B07	RHS 300x200	S355
B08	RHS 400x200	S355
B09	RHS 500x300	S355
B10	SHS 200x200	S355
B11	RHS 200x150	S355
B12	UB 457x191	S355

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CONTRACTOR TO MAKE ALLOWANCES FOR:

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3. TEMPORARY SUPPORT & STABILITY OF ALL EXISTING ELEMENTS DURING DEMOLITION & REMEDIAL WORKS.
4. VERIFICATION OF LOCATIONS OF ALL BELOW GROUND SERVICES & OBSTRUCTIONS PRIOR TO UNDERTAKING OF ANY WORKS.
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7. TESTING & VERIFICATION OF ANY EXISTING ELEMENTS AS REQUIRED BY THE STRUCTURAL ENGINEER.
8. END PLATED CONNECTIONS TO ALL BEAMS

STAGE 2 W.I.P. NOTES:

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- STRUCTURAL ELEMENTS SUBJECT TO DESIGN DEVELOPMENT.
- PERIMETER DETAIL SUBJECT TO CONFIRMATION OF CLADDING PERFORMANCE CRITERIA

TERRACE STRUCTURAL PHILOSOPHY:

- FOUNDATIONS TO BE PILED
- ALL STEEL TO BE GRADE S355
- COLUMN SIZES SUBJECT TO GRID RESOULTION

FOUNDATION NOTES:

- FOUNDATION DESIGN IS PRELIMINARY.
- DESIGN IS SUBJECT TO DEVELOPMENT, GRID RESOLUTION, CONFIRMATION OF CONSTRUCTION BUILD UPS AND LOAD TAKE-DOWN
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- CONSIDERATION SHOULD BE MADE FOR SPECIALIST REGARDING BELOW GROUND PROTECTION AGAINST RADON WITHIN BASEMENTS.

LEGEND

- INDICATES VERTICAL BRACING
- INDICATES SPAN OF 130mm THK SMD CONCRETE FLOOR
- INDICATES SPAN OF LIGHTWEIGHT METSEC FLOOR. ALLOW FOR 202.M.18 C JOIST @ 400 C/C.
- DENOTES MOMENT CONNECTION
- DENOTES EXISTING RETAINED STRUCTURE

* DENOTES SUPPORTS VIA CONNECTION INTO EXISTING MASONRY PIER. DETAIL TO BE DEVELOPED. EXACT DETAIL TBC FOLLOWING COMPLETION OF DEMO & ON SITE MEASURE.

ALLOWANCE TO BE MADE FOR 19mm DIA x 100mm LONG SHEAR STUDS AT EACH TROUGH LOCATION & @ 300c/c WHERE PARALLEL TO ALL BEAMS.
ALLOW FOR B12 TRANSVERSE BAR AT EACH STUD LOCATIONS.

ALLOWANCE TO BE MADE FOR PENETRATIONS TO BEAM WEBS FOR SERVICE DISTRIBUTION. DETAILS TO BE DEVELOPED AND COORDINATED WITH M&E DESIGNER

Rev:	Description:	Date:	By:	Chkd:
P02	UPDATED TO SUIT ROOF TERRACE PROPOSALS	18.11.22	KC	DB
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Status:

STAGE 2 ISSUE

Project:

GREAT NORTHERN WAREHOUSE

Drg Title:

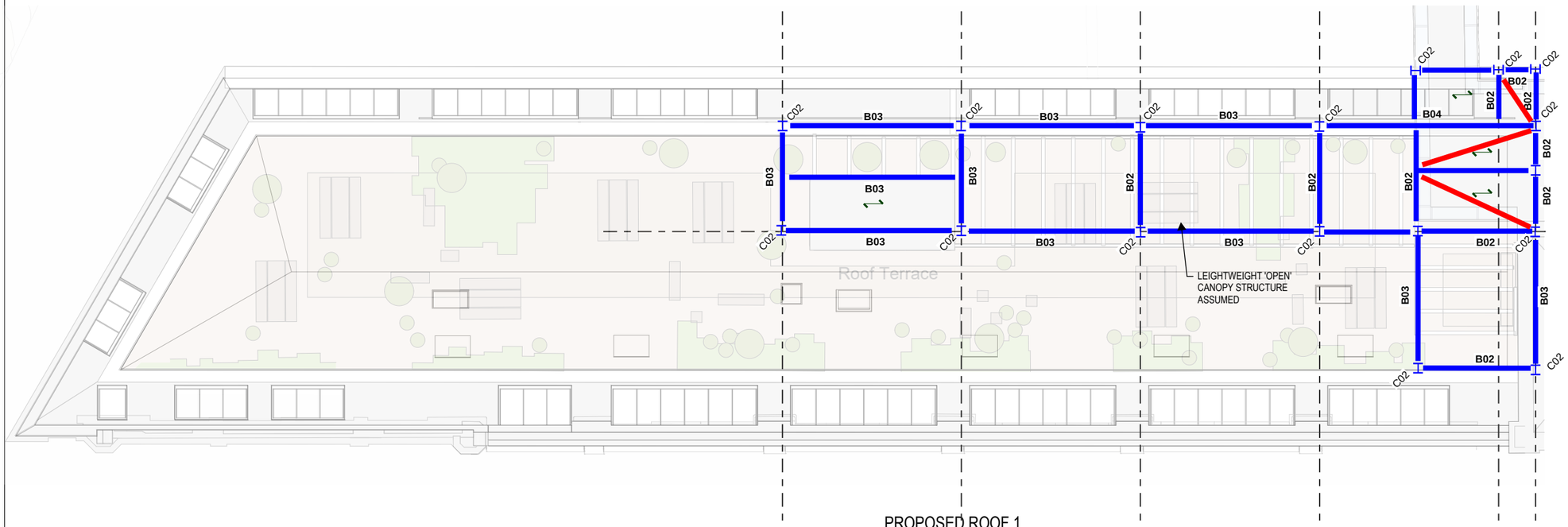
TERRACE A MEZZANINE STRUCTURAL INTERVENTION GA

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	31/08/22	KC	DB	DB
Scale: 1 : 100				

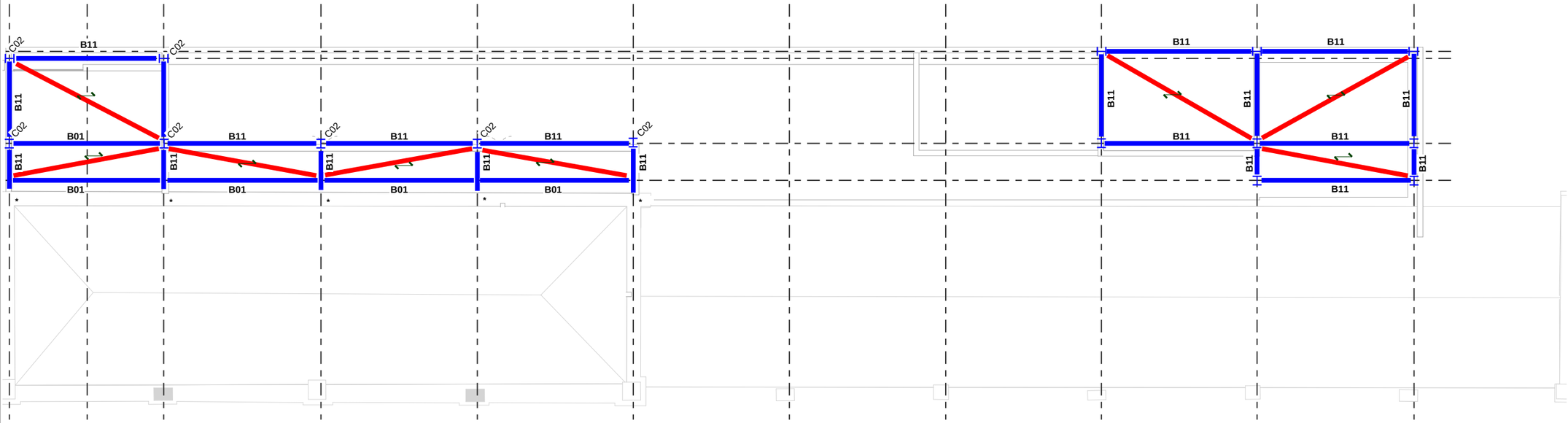
Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
064582	CUR	Z3A	M0	DR	S	20099	P02

Model Name:XXXXXX-CUR-ZZ-XX-M3-S-00001

THIS DRAWING IS BASED ON
INFORMATION RECEIVED 12.08.22



PROPOSED ROOF 1
SCALE: 1 : 100



PROPOSED ROOF 2
SCALE: 1 : 100

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ALLOWANCE TO BE MADE FOR 19mm DIA x 100mm LONG SHEAR STUDS AT EACH TROUGH LOCATION & @ 300c/c WHERE PARALLEL TO ALL BEAMS.
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ALLOWANCE TO BE MADE FOR PENETRATIONS TO BEAM WEBS FOR SERVICE DISTRIBUTION. DETAILS TO BE DEVELOPED AND COORDINATED WITH M&E DESIGNER

STRUCTURAL STEEL COLUMN SCHEDULE

REF.	TYPE	STRUCTURAL MATERIAL
C01	UC 305x305	S355
C02	UC 203x203	S355
C03	CHS219x10.0	S355
C04	CHS323.9x10.0	S355

STRUCTURAL STEEL BEAM SCHEDULE

REF.	TYPE	STRUCTURAL MATERIAL
B01	UB 203x133	S355
B02	UB 254x146	S355
B03	UB 305x165	S355
B04	UB 356x171	S355
B05	UB 406x178	S355
B06	UC 203x203	S355
B07	RHS 300x200	S355
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B10	SHS 200x200	S355
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4. VERIFICATION OF LOCATIONS OF ALL BELOW GROUND SERVICES & OBSTRUCTIONS PRIOR TO UNDERTAKING OF ANY WORKS.
5. REMOVAL OF ALL OBSTRUCTIONS PRIOR TO PILING WORKS.
6. SURVEYING OF ALL NEW TO EXISTING INTERFACES TO VERIFY HISTORIC RECORDS WHICH HAVE FORMED THE BASIS OF DESIGN.
7. TESTING & VERIFICATION OF ANY EXISTING ELEMENTS AS REQUIRED BY THE STRUCTURAL ENGINEER.
8. END PLATED CONNECTIONS TO ALL BEAMS

STAGE 2 W.I.P. NOTES:

- STRUCTURAL PHILOSOPHY ONLY.
- STRUCTURAL ELEMENTS SUBJECT TO DESIGN DEVELOPMENT.
- PERIMETER DETAIL SUBJECT TO CONFIRMATION OF CLADDING PERFORMANCE CRITERIA

TERRACE STRUCTURAL PHILOSOPHY:

- FOUNDATIONS TO BE PILED
- ALL STEEL TO BE GRADE S355
- COLUMN SIZES SUBJECT TO GRID RESOULTION

FOUNDATION NOTES:

- FOUNDATION DESIGN IS PRELIMINARY.
- DESIGN IS SUBJECT TO DEVELOPMENT, GRID RESOLUTION, CONFIRMATION OF CONSTRUCTION BUILD UPS AND LOAD TAKE-DOWN
- REFERENCE SHOULD BE MADE TO CURTINS PHASE 2 SITE INVESTIGATIONS REPORT FOR DETAILS OF BELOW GROUND INFORMATION.
- CONSIDERATION SHOULD BE MADE FOR SPECIALIST REGARDING BELOW GROUND PROTECTION AGAINST RADON WITHIN BASEMENTS.

LEGEND

- INDICATES VERTICAL BRACING
- INDICATES HORIZONTAL BRACING
- INDICATES SPAN OF 130mm THK SMD CONCRETE FLOOR
- INDICATES SPAN DIRECTION OF 202Z18 METSEC SLEEVED PURLINS @ 1200mm c/c. RAFTER STAYS AT ALTERNATE PURLINS & ANTI-SAG RODS TO MANUFACTURERS DETAILS.
- DENOTES MOMENT CONNECTION

Rev:	Description:	Date:	By:	Chkd:
P02	UPDATED TO SUIT ROOF TERRACE PROPOSALS	18.11.22	KC	DB
P01	ISSUED FOR STAGE 2	25.08.22	KC	DB

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Status:
STAGE 2 ISSUE

Project:
GREAT NORTHERN WAREHOUSE

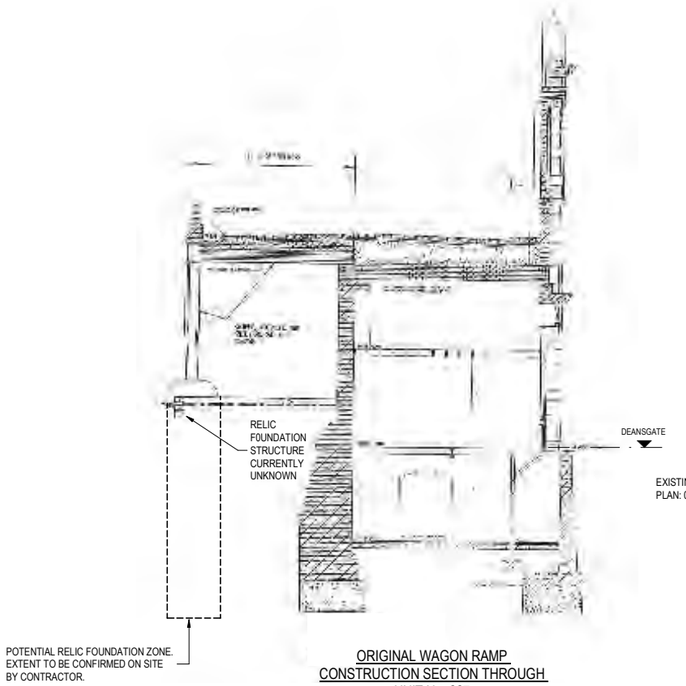
Drg Title:
TERRACE A ROOF STRUCTURAL INTERVENTION GA

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	31/08/22	KC	DB	DB

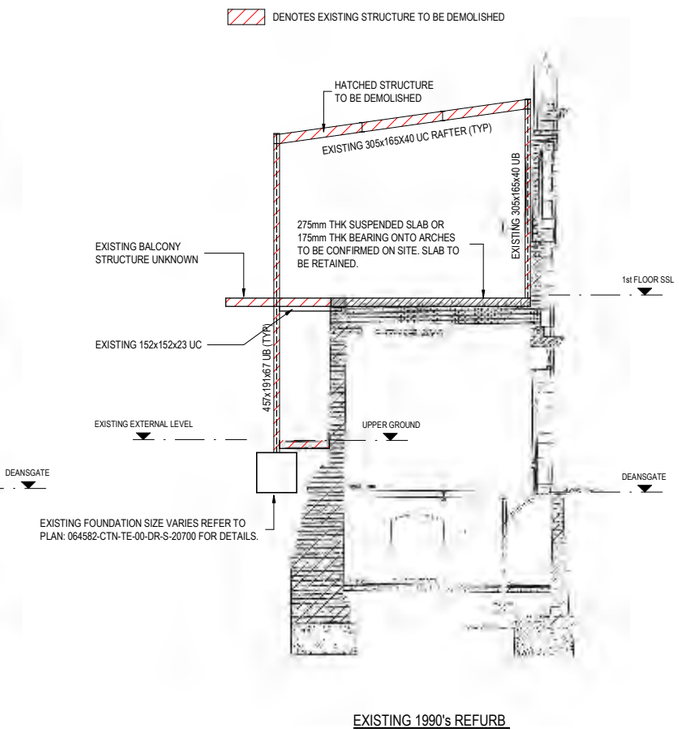
Scale: As indicated

Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
064582	CUR	Z3A	RF	DR	S	20105	P02

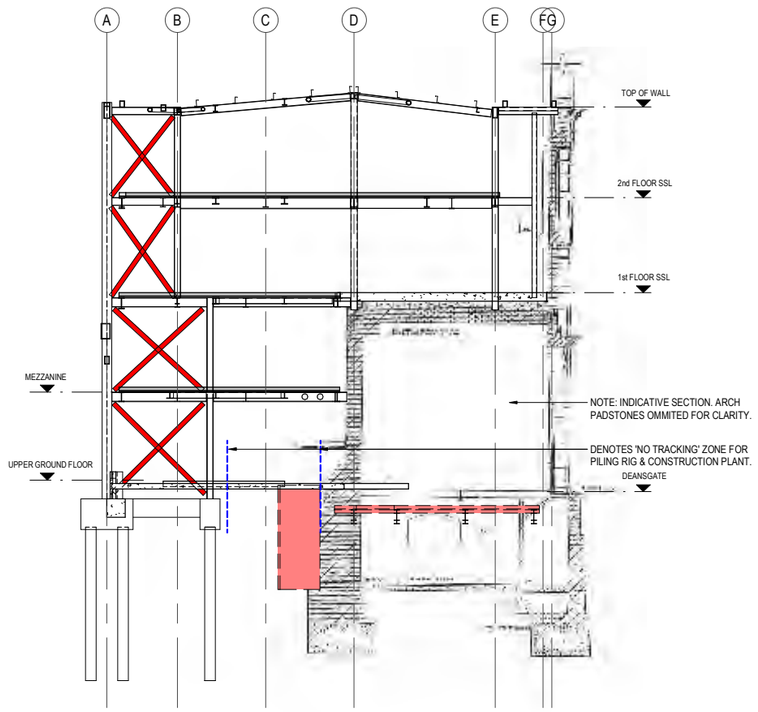
Model Name:XXX-XXX-CUR-ZZ-XX-M3-S-00001



ORIGINAL WAGON RAMP
CONSTRUCTION SECTION THROUGH
UNIT No. 227



EXISTING 1990's REFURB
CONSTRUCTION SECTION THROUGH
UNIT No. 227



PROPOSED CONSTRUCTION
SECTION ON GRIDLINE 5

RESIDUAL HAZARD REGISTER (RELATES TO CIVIL/STRUCTURAL MATTERS ONLY) MUST BE READ IN CONJUNCTION WITH CURTINS RESIDUAL REGISTER 064582-CTN-00-XX-HA-x-10001. HAZARDS THAT SHOULD BE OBVIOUS TO A COMPETENT CONTRACTOR HAVE NOT BEEN INDICATED ON THIS DRAWING, SHOULD ADDITIONAL HAZARDS BE IDENTIFIED, THE CONTRACTOR SHOULD NOTIFY ALL RELEVANT PROJECT TEAM MEMBERS.

HAZARD REF No.	ITEM (FEATURE, ELEMENT OR ACTIVITY)	RESIDUAL HAZARD
REF No.1.1	GROUND CONTAMINATION	POTENTIAL RISK TO HANDLING CONTAMINATED SUBSTANCES AND ACM's. REFERENCE SHOULD BE MADE TO CURTINS PHASE 2 SITE INVESTIGATION REPORT:- 608997-CUR-00-XX-RP-001-V02.
REF No.2.1	VIBRATION DURING CONSTRUCTION/PILING WORKS	RISK OF DAMAGE TO EXISTING STRUCTURES DUE TO VIBRATIONS FROM PILING OR THE GENERAL CONSTRUCTION WORKS METHODOLOGIES SHOULD CONSIDER GROUND VIBRATIONS AND THEIR EFFECTS ON ADJACENT STRUCTURES.
REF No.2.2	CONSTRUCTION - EXISTING BELOW GROUND OBSTRUCTION	THERE ARE A NUMBER OF CONSTRAINTS WHICH POSE A RISK TO THE EXCAVATIONS, PILING AND CONSTRUCTION WORKS INCLUDING (i.e. UXO, ARCHEOLOGICAL RISKS, EXISTING FOUNDATIONS AND SERVICES). REFERENCE SHOULD BE MADE TO THE UXO RISK ASSESSMENT REPORT BY '1st LINE OF DEFENSE' ALONG WITH CURTINS CONSTRAINTS DRAWING:- 064582-CUR-01-ZZ-DR-S-20700.
REF No.2.3	CONSTRUCTION - DEMOLITION AND NEW WORKS NEAR TO LIVE FOOTWAYS AND OCCUPIED BUILDING	ATTENTION IS DRAWN TO THE CLOSE PROXIMITY OF LIVE FOOTWAYS, ADJACENT LIVE PUBLIC SPACE AND OCCUPIED BUILDINGS. CONTRACTOR MUST ERECT APPROPRIATE BARRIERS AND HOARDINGS. CONTRACTOR TO AGREE WORKING HOURS AND METHOD STATEMENTS TO PROTECT THE PUBLIC AGAINST INTERACTION WITH THE WORKS.
REF No.2.4	CONSTRUCTION - UNMAPPED SERVICES	POTENTIAL FOR UNMAPPED SERVICES, OBSTRUCTIONS AND HISTORIC STRUCTURES NOT SHOWN ON THIS DRAWING. ALL DEMOLITION, EXCAVATION AND ENABLING WORKS MUST CONSIDER THIS CAREFULLY. ALL UNDERGROUND SERVICES MUST BE IDENTIFIED AND LOCATED BY THE MAIN CONTRACTOR PRIOR TO DEMOLITION.

HAZARD REF No.	ITEM (FEATURE, ELEMENT OR ACTIVITY)	RESIDUAL HAZARD
REF No.3.1	CONSTRUCTION - EXCAVATIONS AND FOUNDATIONS	EXCAVATIONS CLOSE TO EXISTING FOUNDATIONS AND STRUCTURAL ELEMENTS MUST CONSIDER THE RISK OF INSTABILITY. NO EXCAVATION IS TO UNDERMINE THE EXISTING FOUNDATIONS. THE MAIN CONTRACTOR TO SUBMIT A DETAILED AND ROBUST METHODOLOGY OUTLINING HOW TEMPORARY INSTABILITY OF STRUCTURAL COMPONENTS IS TO BE MANAGED.
REF No.5.1	DEMOLITION OF EXISTING NON-ORIGINAL STEEL FRAME	DURING THE DEMOLITION AND MODIFICATION WORKS TO THE EXISTING STRUCTURAL ELEMENTS THERE IS A RISK OF INSTABILITY. MAIN CONTRACTOR MUST SUBMIT THEIR PROPOSED DEMOLITION AND PROPPING SEQUENCING CAREFULLY CONSIDERING THIS ISSUE AND SUBMIT THEIR PROPOSALS FOR REVIEW BY THE SE PRIOR TO COMMENCEMENTS.
REF No.7.1	ERECTING STRUCTURE AND PLACING COMPONENTS	THE PRIMARY FRAME HAS BEEN DESIGNED WITH PERMANENT STABILITY IN MIND. TEMPORARY BRACING MAY BE REQUIRED TO PROVIDE STABILITY DURING CONSTRUCTION. THIS REQUIREMENT IS TO BE CAREFULLY CONSIDERED BY THE STEELWORK SUBCONTRACTOR IN LINE WITH THEIR PROPOSED CONSTRUCTION SEQUENCE.
REF No.7.2	CRANE SUB-BASE	ANY PROPOSED PLANT TRACKING LINES AND MOBILE CRANE LOCATION MUST BE REVIEWED BY THE CONTRACTORS TEMPORARY WORKS TEAM FOR INSTABILITYOF THE FOUNDING STRATA AND OR NEW/EXISTING STRUCTURE. CARE MUST BE TAKEN NOT TO SURCHARGE EXISTING STRUCTURES IN THE VICINITY AND A SUITABLE CORDON MUST BE MAINTAINED. THE METHODOLOGY MUST BE SUBMITTED FOR REVIEW BY SE.

GENERAL NOTES:

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2. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
4. FOR GENERAL NOTES REFER TO DRAWING No. 064582-CUR-01-XX-DR-S-20001

NOTE: SECTIONS ARE INDICATIVE AND NOT TO SCALE. DO NOT SCALE FROM THIS DRAWING.

NOTE: EXISTING AND ORIGINAL FOUNDATION INFORMATION HAS BEEN TAKEN FROM ARCHIVE DRAWINGS. STRUCTURE TO BE CONFIRMED ON SITE.

NOTE
EXISTING STRUCTURE HAS BEEN INTERPRETED FROM ARUP ARCHIVE DRAWINGS FOR THE 1990's MODIFICATIONS/REFURB WORK. ALL SET OUT AND SIZE OF EXISTING STRUCTURE IS TO BE CONFIMED ON SITE

Rev:	Description:	Date:	By:	Chkd:
P01	STAGE 2 ISSUE	31/08/22	AC	DB

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Status: STAGE 2

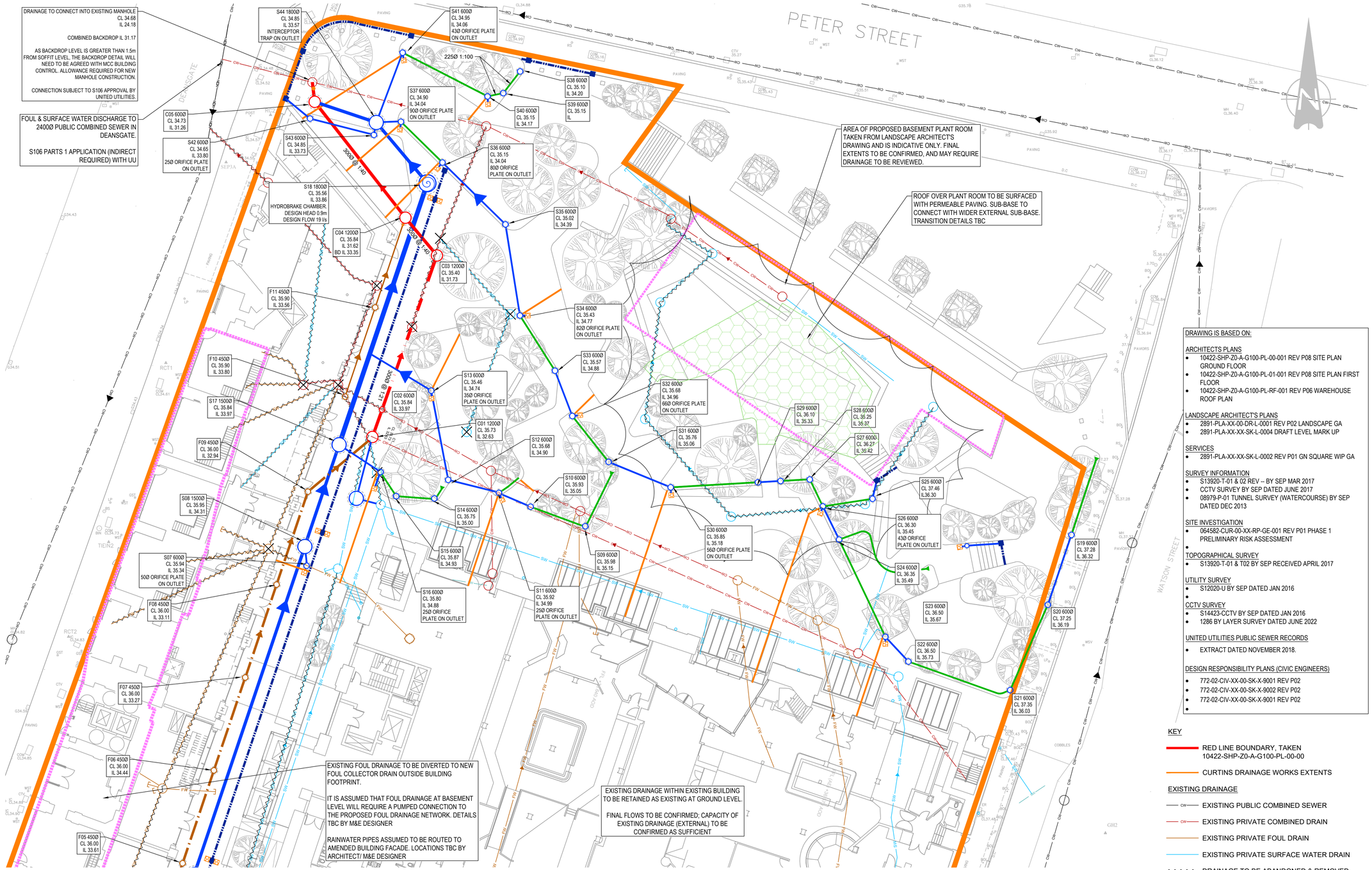
Project: GREAT NORTHERN WAREHOUSE PHASE 1

Drg Title: SITE CONSTRAINT SECTIONS

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	AUG 22	MH	DB	DB

Scale: As indicated

Project No:	Originator:	Zone:	Level:	Type:	Discipline:	Category / Number:	Rev:
064582	CUR	Z3A	XX	DR	S	21300	P01



GENERAL NOTES:

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2. DESIGN BASED ON TOPOGRAPHICAL SURVEY AND CCTV SURVEY INFORMATION AVAILABLE AT THE TIME OF DESIGN.
3. ALL EXISTING SEWERS, CONNECTIONS, PIPE SIZES AND INVERT LEVELS TO BE CONFIRMED BY CONTRACTOR PRIOR TO COMMENCEMENT OF WORKS TO ENSURE CONNECTIVITY. ANY VARIANCE FROM THE INFORMATION SHOWN SHOULD BE REPORTED TO THE ENGINEER FOR REVIEW.
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7. ALL EXISTING SERVICES TO BE LOCATED PRIOR TO COMMENCEMENT OF ANY DRAINAGE WORKS, AND WHERE NECESSARY PROTECTION OR DIVERSIONS TO BE UNDERTAKEN TO AVOID CONFLICT WITH THE PROPOSED WORK.
8. ALL RAINWATER AND FOUL POP UPS LOCATIONS AND SIZES ARE TO BE CONFIRMED BY THE ARCHITECT AND M&E ENGINEER.
9. COVER LEVELS, GULLY POSITIONS, AND BUILDINGS LOCATION ARE APPROXIMATE AND SHALL BE CONFIRMED BY ARCHITECT/ LANDSCAPE ARCHITECT.
10. ALL PIPE DIAMETERS GIVEN ARE NOMINAL INTERNAL PIPE DIAMETERS. THESE ARE TO BE CONFIRMED ONCE A DETAILED CAPACITY CHECK HAS BEEN UNDERTAKEN AT A LATER DESIGN STAGE.
11. OUTFALL CONNECTION(S) SUBJECT TO AGREEMENT WITH THE APPROVING AUTHORITY.

DRAWING IS BASED ON:

ARCHITECTS PLANS
- 10422-SHP-Z0-A-G100-PL-00-001 REV P08 SITE PLAN GROUND FLOOR
- 10422-SHP-Z0-A-G100-PL-01-001 REV P08 SITE PLAN FIRST FLOOR
- 10422-SHP-Z0-A-G100-PL-RF-001 REV P06 WAREHOUSE ROOF PLAN

LANDSCAPE ARCHITECT'S PLANS
- 2891-PLA-XX-00-DR-L-0001 REV P02 LANDSCAPE GA
- 2891-PLA-XX-XX-SK-L-0004 DRAFT LEVEL MARK UP

SERVICES
- 2891-PLA-XX-XX-SK-L-0002 REV P01 GN SQUARE WIP GA

SURVEY INFORMATION
- S13920-T-01 & 02 REV -- BY SEP MAR 2017
- CCTV SURVEY BY SEP DATED JUNE 2017
- 08979-P-01 TUNNEL SURVEY (WATERCOURSE) BY SEP DATED DEC 2013

SITE INVESTIGATION
- 064582-CUR-00-XX-RP-GE-001 REV P01 PHASE 1 PRELIMINARY RISK ASSESSMENT
-

TOPOGRAPHICAL SURVEY
- S13920-T-01 & T02 BY SEP RECEIVED APRIL 2017

UTILITY SURVEY
- S12020-U BY SEP DATED JAN 2016
-

CCTV SURVEY
- S14423-CCTV BY SEP DATED JAN 2016
- 1286 BY LAYER SURVEY DATED JUNE 2022

UNITED UTILITIES PUBLIC SEWER RECORDS
- EXTRACT DATED NOVEMBER 2018.

DESIGN RESPONSIBILITY PLANS (CIVIC ENGINEERS)
- 772-02-CIV-XX-00-SK-X-9001 REV P02
- 772-02-CIV-XX-00-SK-X-9002 REV P02
- 772-02-CIV-XX-00-SK-X-9001 REV P02
-

KEY

- RED LINE BOUNDARY, TAKEN 10422-SHP-Z0-A-G100-PL-00-00
- CURTINS DRAINAGE WORKS EXTENTS

EXISTING DRAINAGE
- EXISTING PUBLIC COMBINED SEWER
- EXISTING PRIVATE COMBINED DRAIN
- EXISTING PRIVATE FOUL DRAIN
- EXISTING PRIVATE SURFACE WATER DRAIN
- DRAINAGE TO BE ABANDONED & REMOVED

PROPOSED DRAINAGE
- PROPOSED COMBINED DRAINAGE
- PROPOSED FOUL DRAINAGE
- PROPOSED SURFACE WATER DRAINAGE
- PROPOSED PERFORATED SURFACE WATER DRAIN IN LANDSCAPED AREA
- PROPOSED LINEAR DRAINAGE - GATIC CASTSLOT TREADSAFE OR SIMILAR APPROVED.
- PERMEABLE SURFACING ON PLANT ROOM ROOF.
- DIFFUSER UNIT IN PERMEABLE SUB-BASE.
- CHECK DAM IN PERMEABLE SUB-BASE.
- EXTENT OF PLANT ROOM AREA (INDICATIVE ONLY - EXACT EXTENTS TBC)
- EXTENT OF UNDERGROUND CANAL ROUTE (INDICATIVE)

SURFACE WATER DRAINAGE DESIGN PHILOSOPHY

OUTFALL LOCATIONS
THE SURFACE WATER FOR THE PROPOSED BUILDING & EXTENSIONS TO THE 2400Ø PUBLIC COMBINED SEWER IN DEANSGATE, AS PER ADVICE RECEIVED FROM UNITED UTILITIES.

IT IS NOT CONSIDERED THAT INFILTRATION WILL BE SUITABLE FOR THIS SCHEME. HOWEVER, FURTHER TESTING MAY BE REQUIRED TO DEMONSTRATE THIS TO THE LLFA & UNITED UTILITIES.

LEVELS INDICATE THAT PUMPING WILL NOT BE REQUIRED.

PROPOSED FLOW RATES:
EXISTING FLOWS AS SHOWN IN TABLE 1.

THE MAXIMUM DISCHARGE OR THE 1-YEAR STORM IS 41 l/s, BASED ON A REDUCTION OF 50% FROM EXISTING FLOWS.

UNITED UTILITIES HAVE STATED THE MAXIMUM DISCHARGE RATE FROM THE SITE IS 47 l/s. THEREFORE, THIS DISCHARGE RATE HAS BEEN SET FOR THE 30 & 100-YEAR STORMS.

THIS IS BASED ON A 50% REDUCTION OF BROWNFIELD FLOWS FOR THE PROPOSED AREA (0.77hA), USING THE MODIFIED RATIONAL METHOD.

THE MAXIMUM DISCHARGE RATE IS TO BE AGREED WITH THE LLFA.

THE DRAINAGE HAS BEEN DESIGNED TO INCLUDE A 45% ALLOWANCE FOR CLIMATE CHANGE, IN ACCORDANCE WITH LLFA REQUIREMENTS

ATTENUATION REQUIREMENTS:

THE ATTENUATION STORAGE IS TO BE PROVIDED BY:
- PERMEABLE SUB-BASE TO EXTERNAL PAVING
- FILTER DRAINS
- OVERSIZED PIPEWORK.

NOTE - FURTHER STORAGE ELEMENTS, SUCH AS CELLULAR TANKS, MAY BE REQUIRED IF THE PROPOSED STORAGE METHODS CAN NOT PROVIDE SUFFICIENT VOLUME.

SUSTAINABLE DRAINAGE:
SuDS TREATMENT IS PROVIDED BY THE RAIN GARDENS AND FILTER DRAINS, AND ALSO BY PERMEABLE SUB-BASE, IF USED.

FINAL SuDS PROPOSALS ARE SUBJECT TO FURTHER CO-ORDINATION AT DETAILED DESIGN STAGE.

A S106 (PART 1) APPLICATION WILL NEED TO BE SUBMITTED TO UNITED UTILITIES. A PART 2 APPLICATION WILL NOT BE REQUIRED.

FOUL WATER DRAINAGE DESIGN PHILOSOPHY

THE SURFACE WATER FOR THE PROPOSED BUILDING & EXTENSIONS TO THE 2400Ø PUBLIC COMBINED SEWER IN DEANSGATE, AS PER ADVICE RECEIVED FROM UNITED UTILITIES.

FLOW RATES
TERRACE AREA
FW PEAK FLOW RATE: 13.7 l/s BASED ON 383.7 DISCHARGE UNITS, AS PER M&E DESIGNER INFORMATION.

WAREHOUSE BUILDING (ADDITIONAL DRAINAGE)
FW PEAK FLOW RATE: 6.5 l/s BASED ON 87 DISCHARGE UNITS, AS PER M&E DESIGNER INFORMATION.
FOUL DRAINAGE AT HIGHER LEVELS, AND IS TO BE CONNECTED TO EXISTING ABOVE GROUND DRAINAGE.
UNDERGROUND DRAINAGE NETWORK CAPACITY TO BE CHECKED FOR SUFFICIENCY

BASEMENTS
LEVELS INDICATE THAT THE EXISTING BASEMENT AREAS WILL REQUIRE PUMPING TO DISCHARGE FOUL DRAINAGE.
FURTHER SURVEY WORKS MAY BE REQUIRED IN ORDER TO CONFIRM IF THERE IS ANY EXISTING GRAVITY DRAINAGE FROM THIS AREA.

A S106 (PART 1) APPLICATION WILL NEED TO BE SUBMITTED TO UNITED UTILITIES. A PART 2 APPLICATION WILL NOT BE REQUIRED.

TABLE 1: EXISTING AND PROPOSED DISCHARGE RATES

CATCHMENT	IMPERMEABLE AREA (Ha)	DISCHARGE FLOW RATES (l/s)		
		1-YR EVENT	30-YR EVENT	100-YR EVENT*
AREA E1	0.610	65	128	149
AREA E2	0.160	17	38	45
AREA E3	0.256	AS EXISTING - EXCLUDED FROM CALCULATIONS		
AREA E4	0.291	AS EXISTING - EXCLUDED FROM CALCULATIONS		
AREA E5	0.191	AS EXISTING - EXCLUDED FROM CALCULATIONS		
TOTAL IMPERMEABLE AREA (FOR DISCHARGE RATE CALCULATIONS)	**0.770**	**82**	**166**	**194**
		INCLUDES 50% REDUCTION IN ACCORDANCE WITH MCC REQUIREMENTS		
ALLOWABLE DISCHARGE		**41**	**83**	**97**
*PROPOSED INCLUDES FOR 45% CLIMATE CHANGE ALLOWANCE				

Rev:	Description:	Date:	By:	Chkd:
P01	DRAFT PLANNING ISSUE	28.10.22	ATL	MW

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Status: SUITABLE FOR INFORMATION — S2

Project: GREAT NORTHERN WAREHOUSE

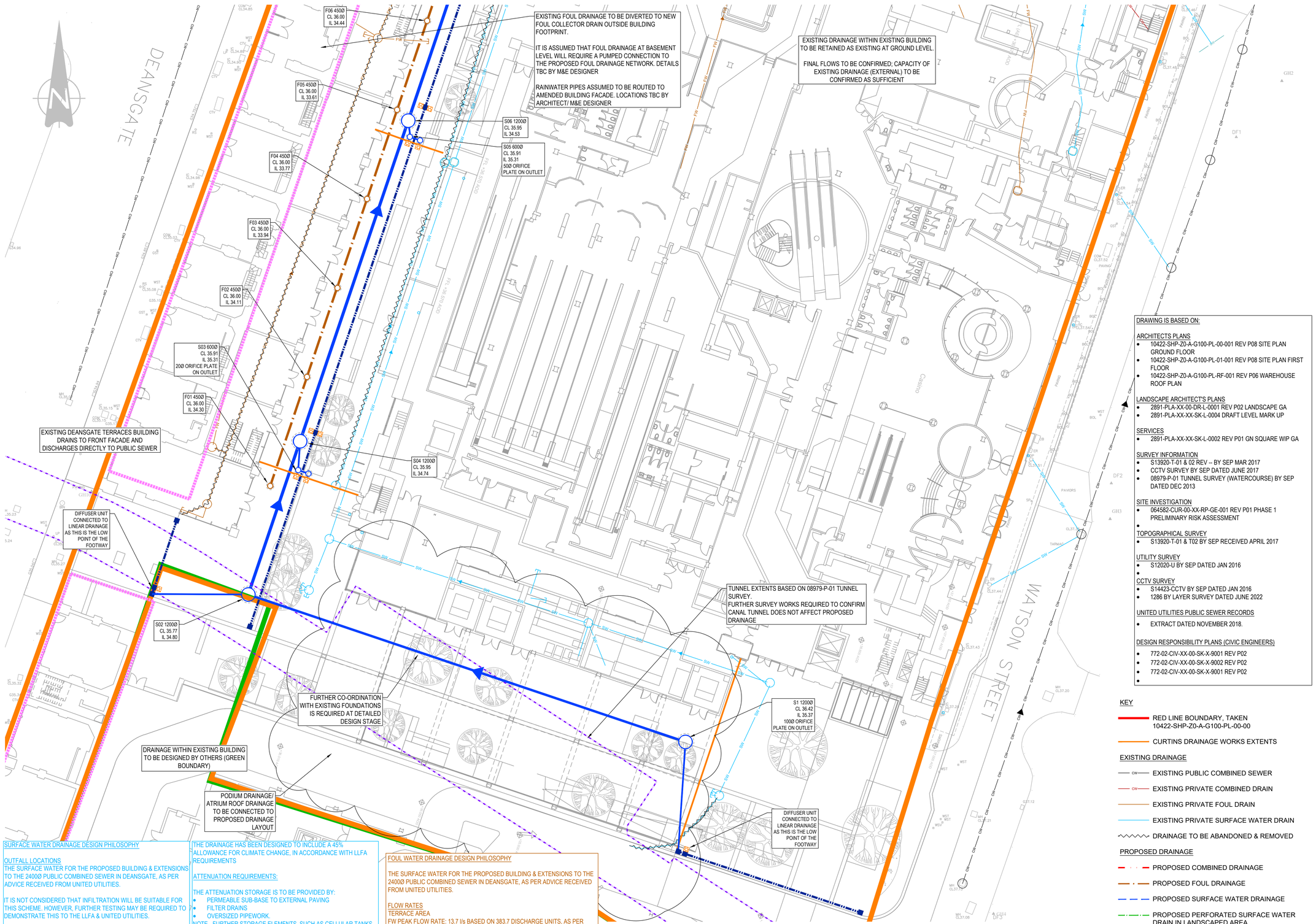
Drg Title: PROPOSED DRAINAGE STRATEGY SHEET 1

Drawn By	Designed By	Checked By
ATL	ATL	MW
	Date: 28/10/22	Scales @ A1: 1:200

Project No - Originator - Function - Spatial - Form - Discipline - Number: 064582 - CUR - XX - XX - D - C - 92001

Revision: P01

\\mafs02\Projects\064001 - 065000\064582 Phase 1 & 2 Great Northern Warehouse\2MS 4 Production\B Models & Drawings_Civil-C\ADI\



GENERAL NOTES:

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11. OUTFALL CONNECTION(S) SUBJECT TO AGREEMENT WITH THE APPROVING AUTHORITY.

DRAWING IS BASED ON:

ARCHITECTS PLANS
- 10422-SHP-Z0-A-G100-PL-00-001 REV P08 SITE PLAN GROUND FLOOR
- 10422-SHP-Z0-A-G100-PL-01-001 REV P08 SITE PLAN FIRST FLOOR
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SERVICES
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SURVEY INFORMATION
- S13920-T-01 & 02 REV -- BY SEP MAR 2017
- CCTV SURVEY BY SEP DATED JUNE 2017
- 08979-P-01 TUNNEL SURVEY (WATERCOURSE) BY SEP DATED DEC 2013

SITE INVESTIGATION
- 064582-CUR-00-XX-RP-GE-001 REV P01 PHASE 1 PRELIMINARY RISK ASSESSMENT

TOPOGRAPHICAL SURVEY
- S13920-T-01 & T02 BY SEP RECEIVED APRIL 2017

UTILITY SURVEY
- S12020-U BY SEP DATED JAN 2016

CCTV SURVEY
- S14423-CCTV BY SEP DATED JAN 2016
- 1286 BY LAYER SURVEY DATED JUNE 2022

UNITED UTILITIES PUBLIC SEWER RECORDS
- EXTRACT DATED NOVEMBER 2018.

DESIGN RESPONSIBILITY PLANS (CIVIC ENGINEERS)
- 772-02-CIV-XX-00-SK-X-9001 REV P02
- 772-02-CIV-XX-00-SK-X-9002 REV P02
- 772-02-CIV-XX-00-SK-X-9001 REV P02

KEY
- RED LINE BOUNDARY, TAKEN 10422-SHP-Z0-A-G100-PL-00-00
- CURTINS DRAINAGE WORKS EXTENTS

EXISTING DRAINAGE
- EXISTING PUBLIC COMBINED SEWER
- EXISTING PRIVATE COMBINED DRAIN
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THE MAXIMUM DISCHARGE OR THE 1-YEAR STORM IS 41 l/s, BASED ON A REDUCTION OF 50% FROM EXISTING FLOWS.

UNITED UTILITIES HAVE STATED THE MAXIMUM DISCHARGE RATE FROM THE SITE IS 47 l/s. THEREFORE, THIS DISCHARGE RATE HAS BEEN SET FOR THE 30 & 100-YEAR STORMS.

THIS IS BASED ON A 50% REDUCTION OF BROWNFIELD FLOWS FOR THE PROPOSED AREA (0.77hA), USING THE MODIFIED RATIONAL METHOD.

THE MAXIMUM DISCHARGE RATE IS TO BE AGREED WITH THE LLFA.

THE DRAINAGE HAS BEEN DESIGNED TO INCLUDE A 45% ALLOWANCE FOR CLIMATE CHANGE, IN ACCORDANCE WITH LLFA REQUIREMENTS

ATTENUATION REQUIREMENTS:

THE ATTENUATION STORAGE IS TO BE PROVIDED BY:
- PERMEABLE SUB-BASE TO EXTERNAL PAVING
- FILTER DRAINS
- OVERSIZED PIPEWORK.

NOTE - FURTHER STORAGE ELEMENTS, SUCH AS CELLULAR TANKS, MAY BE REQUIRED IF THE PROPOSED STORAGE METHODS CAN NOT PROVIDE SUFFICIENT VOLUME.

SUSTAINABLE DRAINAGE:
SuDS TREATMENT IS PROVIDED BY THE RAIN GARDENS AND FILTER DRAINS, AND ALSO BY PERMEABLE SUB-BASE, IF USED.

FINAL SuDS PROPOSALS ARE SUBJECT TO FURTHER CO-ORDINATION AT DETAILED DESIGN STAGE.

A S106 (PART 1) APPLICATION WILL NEED TO BE SUBMITTED TO UNITED UTILITIES. A PART 2 APPLICATION WILL NOT BE REQUIRED.

FOUL WATER DRAINAGE DESIGN PHILOSOPHY

THE SURFACE WATER FOR THE PROPOSED BUILDING & EXTENSIONS TO THE 2400Ø PUBLIC COMBINED SEWER IN DEANSGATE, AS PER ADVICE RECEIVED FROM UNITED UTILITIES.

FLOW RATES
TERRACE AREA
FW PEAK FLOW RATE: 13.7 l/s BASED ON 383.7 DISCHARGE UNITS, AS PER M&E DESIGNER INFORMATION.

WAREHOUSE BUILDING (ADDITIONAL DRAINAGE)
FW PEAK FLOW RATE: 6.5 l/s BASED ON 87 DISCHARGE UNITS, AS PER M&E DESIGNER INFORMATION.
FOUL DRAINAGE AT HIGHER LEVELS, AND IS TO BE CONNECTED TO EXISTING ABOVE GROUND DRAINAGE.
UNDERGROUND DRAINAGE NETWORK CAPACITY TO BE CHECKED FOR SUFFICIENCY

BASEMENTS
LEVELS INDICATE THAT THE EXISTING BASEMENT AREAS WILL REQUIRE PUMPING TO DISCHARGE FOUL DRAINAGE.
FURTHER SURVEY WORKS MAY BE REQUIRED IN ORDER TO CONFIRM IF THERE IS ANY EXISTING GRAVITY DRAINAGE FROM THIS AREA.

A S106 (PART 1) APPLICATION WILL NEED TO BE SUBMITTED TO UNITED UTILITIES. A PART 2 APPLICATION WILL NOT BE REQUIRED.

TABLE 1: EXISTING AND PROPOSED DISCHARGE RATES

CATCHMENT	IMPERMEABLE AREA (Ha)	DISCHARGE FLOW RATES (l/s)		
		1-YR EVENT	30-YR EVENT	100-YR EVENT*
AREA E1	0.610	65	128	149
AREA E2	0.160	17	38	45
AREA E3	0.256	AS EXISTING - EXCLUDED FROM CALCULATIONS		
AREA E4	0.291	AS EXISTING - EXCLUDED FROM CALCULATIONS		
AREA E5	0.191	AS EXISTING - EXCLUDED FROM CALCULATIONS		
TOTAL IMPERMEABLE AREA (FOR DISCHARGE RATE CALCULATIONS)	**0.770**	**82**	**166**	**194**
		INCLUDES 50% REDUCTION IN ACCORDANCE WITH MCC REQUIREMENTS		
ALLOWABLE DISCHARGE		**41**	**83**	**97**

*PROPOSED INCLUDES FOR 45% CLIMATE CHANGE ALLOWANCE

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Status: SUITABLE FOR INFORMATION — S2

Project: GREAT NORTHERN WAREHOUSE

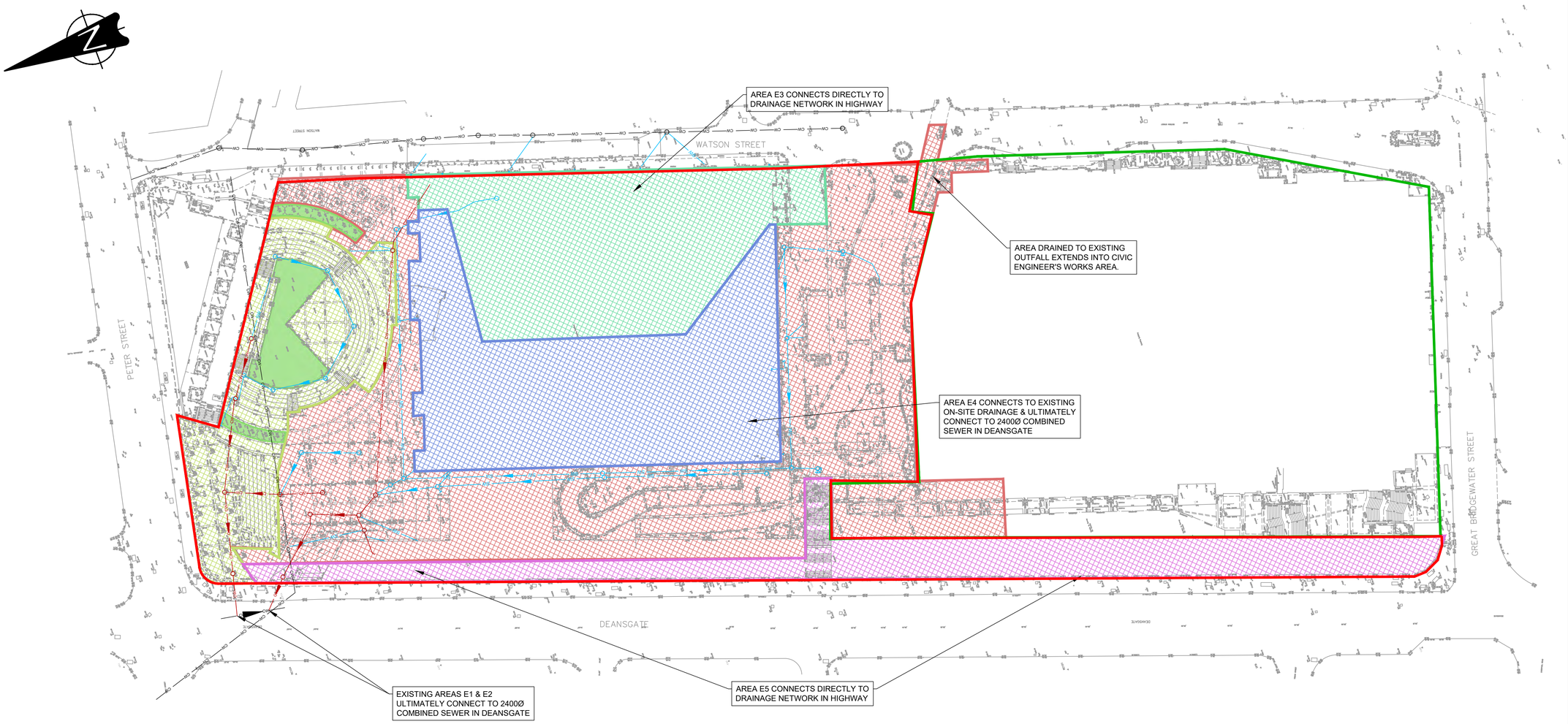
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Drawn By	Designed By	Checked By
ATL	ATL	MW
	Date: 28/10/22	Scales @ A1: 1:200

Project No - Originator - Function - Spatial - Form - Discipline - Number: 064582 - CUR - XX - XX - D - C - 92002

Revision: P01

\\mafs02\Projects\064001 - 065000\064582 Phase 1 & 2 Great Northern Warehouse\ORS 4 Production\4B Models & Drawings_Civil\C\CAD\



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2. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
4. FOR GENERAL NOTES REFER TO DRAWING.

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- EXISTING IMPERMEABLE AREA E2:
- EXISTING IMPERMEABLE AREA E3:
  THIS AREA CONSISTS OF EXISTING ROOF DRAINAGE THAT DRAINS DIRECTLY TO SEWERS IN WATSON STREET. CONNECTIONS ARE TO BE RETAINED, AND THEREFORE THIS AREA HAS BEEN EXCLUDED FROM DRAINAGE CALCULATIONS.
- EXISTING IMPERMEABLE AREA E4:
  THIS AREA CONSISTS OF EXISTING ROOF DRAINAGE THAT DRAINS VIA THE EXISTING DRAINAGE NETWORK ON THE SITE, AND OUTFALLS TO THE EXISTING PUBLIC SEWER IN DEANSGATE. CONNECTIONS ARE TO BE RETAINED, AND THEREFORE THIS AREA HAS BEEN EXCLUDED FROM DRAINAGE CALCULATIONS.
  THE EXISTING PRIVATE DRAINAGE WITHIN THE SITE WILL REQUIRE A DIVERSION.
- EXISTING IMPERMEABLE AREA E5:
  THIS AREA CONSISTS OF EXISTING ROOF DRAINAGE THAT DRAINS DIRECTLY TO SEWERS IN DEANSGATE. CONNECTIONS ARE TO BE RETAINED, AND THEREFORE THIS AREA HAS BEEN EXCLUDED FROM DRAINAGE CALCULATIONS.
- EXISTING PERMEABLE AREA: 0.04 Ha
  THIS AREA DOES NOT DRAIN TO THE EXISTING DRAINAGE NETWORK, AND HAS THEREFORE BEEN EXCLUDED FROM CALCULATIONS.
- CW — EXISTING PUBLIC COMBINED SEWER
- CW — EXISTING PRIVATE COMBINED DRAINAGE
- SW — EXISTING PRIVATE SURFACE WATER DRAINAGE
- FW — EXISTING PRIVATE FOUL DRAINAGE

TABLE 1: EXISTING AND PROPOSED DISCHARGE RATES

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ALLOWABLE DISCHARGE		**41**	**83**	**97**
*PROPOSED INCLUDES FOR 45% CLIMATE CHANGE ALLOWANCE				

DRAWING BASED ON:

TOPOGRAPHICAL SURVEY
- S13920-T-01 & T02 BY SEP RECEIVED APRIL 2017

UTILITY SURVEY
- S12020-U BY SEP DATED JAN 2016
-

CCTV SURVEY
- S14423-CCTV BY SEP DATED JAN 2016
- 1286 BY LAYER SURVEY DATED JUNE 2022

UNITED UTILITIES PUBLIC SEWER RECORDS
- EXTRACT DATED NOVEMBER 2018.

DESIGN RESPONSIBILITY PLANS (CIVIC ENGINEERS)
- 772-02-CIV-XX-00-SK-X-9001 REV P02
- 772-02-CIV-XX-00-SK-X-9002 REV P02
- 772-02-CIV-XX-00-SK-X-9001 REV P02

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Project: GREAT NORTHERN WAREHOUSE, MANCHESTER

Drg Title: EXISTING DRAINAGE CATCHMENTS

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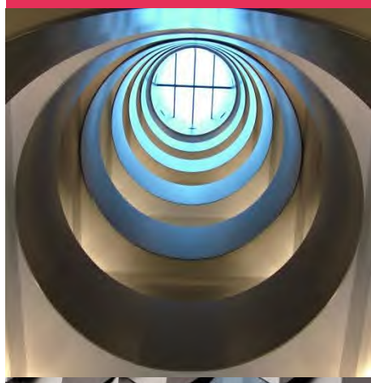
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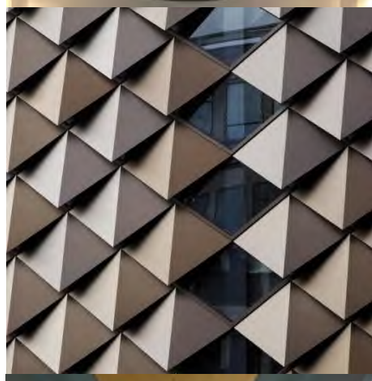
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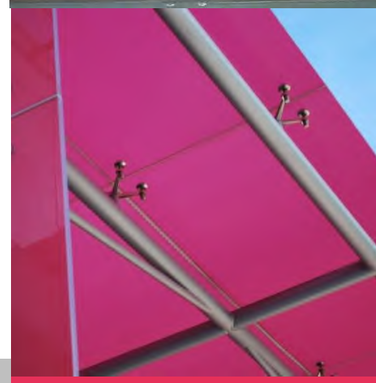
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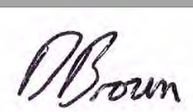
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Author	Signature	Date
Declan Brown MEng (Hons) **Senior Engineer**		31/08/22

Reviewed	Signature	Date

1.0 Contents

1.0 Executive Summary 4
Great Northern Square 4
Great Northern Warehouse 4
Deansgate Terraces 4
2.0 Introduction 4
3.0 The Site 6
3.1 Site Location 6
3.2 Existing Utilities, Services and Drainage 6
3.4 Existing Structures 6
3.3.1 Great Northern Warehouse 7
3.3.2 Highline (Historical High Level Yard) 7
3.3.3 Deansgate Terraces 8
3.3.4 Pavilion 8
3.3.5 Great Northern Square 9
3.4 Demolition 9
3.3 Responsibility Plan 10
4.0 Constraints 11
4.1 Listed Structures 11
4.2 Great Northern Warehouse 11
5.0 The Project 12
5.1 Great Northern Square 12
5.2 Great Northern Warehouse 12
5.3 Deansgate Terraces 12
5.3 The Highline 12
6.0 Substructure Proposals 13
6.1 Deansgate Terraces 13
6.2 Basement Plant Room 13
6.3 Viaduct Proposals 14
6.4 Warehouse 14
7.0 Superstructure Proposals 15
7.1 Great Northern Warehouse 15
7.2 Deansgate Terraces 15
7.3 Viaduct Proposals 16
8.0 Design Criteria 17
8.1 Design Life 17
8.2 Design Loads 17
8.2.1 Permanent Loads 17
8.2.2 Variable Loads 17
8.2.3 Wind Loads 17
8.2.4 Effective Horizontal Forces 17
8.2.5 Vehicle Surcharge / Lateral Earth Pressures 18
8.2.6 Accidental Loads 18
8.2.7 Snow Loads 18
8.3 Serviceability 18
8.3.1 Gravity Load Deflections 18
8.3.2 Horizontal Movements 18
8.4 Fire Protection 18
8.4.1 Great Northern Warehouse 18
8.4.2 Deansgate Terraces 18
8.5 Natural Frequency and Dynamic Response 18
8.6 Disproportionate Collapse 18
8.6.1 Great Northern Warehouse 18
8.6.3 Deansgate Terraces 18
8.6.4 Waterproofing 18
9.0 Design Standards 19
10.0 Geotechnical 20
10.1 Phase 2 Site Investigation 20
10.2 UXO Report 21
11.0 Civils 22
12.0 Opportunities and Risks 24
12.2 Key Project Opportunities 24
12.3 Key Project Risks 24
Appendices 25

1.0 Executive Summary

This report outlines the structural options for the proposed development in conjunction with the site constraints.

The scheme information contained within this report has been developed to provide cost advice at planning stage but development of the design in conjunction with the design team is required through the next stages.

The potential structural forms have been developed to provide a basis for integrating the proposed structure with the existing structures on site and other constraints in conjunction with the project team discussions with the Statutory Consultees and construction supply chain market forces.

Site Location

The site comprises the former Great Northern Railway Goods Warehouse, Deansgate Terrace which were the former railway yard shops and offices and the public realm to the North of the Warehouses.

The site is bound by Peter Street to the north, Watson Street to the east, a leisure complex and Great Bridgewater Street to the south and Deansgate to the west.

Development Proposals

Great Northern Square

The sunken amphitheatre is to be demolished and a single storey basement constructed in it place. Within the basement there is to be a plant room containing water storage and sprinkler tanks. The basement also has space available for community use or storage. Escape from the Pavilion basement is also to be incorporated into the proposals.

The roof of the structure is to support an intensive green roof.

Great Northern Warehouse

The ground and first floors are to be retained as commercial uses with a change of use for levels 02 to 04 to be made from car park to office use.

Part of Level 01 is to be re-configured to create a Co-working / events space within the Warehouse which requires the incorporation of a new mezzanine floor.

A central section of Levels 03 & 04 is to be ‘opened-up’ and the roof covering replaced with glazing to create a three storey high central atrium.

New plant terraces are introduced at roof level, requiring the local removal of existing roof trusses and new structure to provide the required support.

The existing glazed ‘high line’ structure linking to the leisure box is to be demolished and level 01 is to be converted into a terrace. Elements of the existing floor structure are to be removed to provide a visual link to the lower level. The existing primary structural beams and columns are to be retained to celebrate the structure.

A new mezzanine floor is to be constructed between ground and level 01 to provide bicycle store for the office units, via access provided via an external ramp.

At ground level plant rooms and commercial units are to be provided.

A external new lift structure is required to service the warehouse floors from a new ground floor reception area.. A new link bridge provides access between the Warehouse and Terrace office units at level 01.

Deansgate Terraces

The proposals are to create a new north-south pedestrianised street to the rear of Deangate Terraces.

A new two / three storey extension is proposed to the rear of the northern extent of the Deansgate Terraces with retail units at ground floor and office units over.

Listed Buildings

There are listed structures within the development site boundary:

- The Warehouse is a Grade II* listed building
- Deansgate Terraces are Grade II listed
- The remains of the Salford & Manchester Junction Canal, benath the Site and running west Deansgate is separately listed as Grade II.

Our philosophy been to minimise the structural intervention works to all of the listed structures but still achieve the benefit of the re-development and re-use of the site to secure the long-term future of the listed structure.
In order to achieve this we have looked at various options as to how the development can integrate with the existing, this is covered in Section 4.0

2.0 Introduction

Curtins consulting have been commissioned by GNW Developments Limited to provide civil and structural engineering services in connection with the Great Northern Warehouse development.

This document provides a Concept Design study that includes outline proposals for the structural design.

These structural solutions have been generated to aid the assimilation of the impact on the adjacent structures provide a basis for discussion around:

- Managing the impact on the existing structures from a historical perspective
- Understanding the risks associated with building adjacent to existing structures
- Site construction logistics
- Inform cost plan prior to Planning Submission

The architectural scheme proposals are presented elsewhere and they have not been included here to avoid confusion.

Factual information, including, where stated, a visual inspection of the site, has been obtained from a variety of sources. Curtins presume the third party data to be reliable, but have not independently confirmed this; therefore, Curtins cannot and does not guarantee the authenticity or reliability of third party information it has relied upon.

The findings and opinions provided in this document are given in good faith and are subject to the limitations and constraints imposed by the methods and information sources described in this report. Further information, ground investigation, construction activities, change of site use, or the passage of time may reveal conditions that were not indicated in the data presented and therefore could not have been considered in the preparation of the report.

Where such information might impact upon stated opinions, Curtins reserves the right to modify the opinions expressed in this report.

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Figure 2.0:
3D Historical View of Development Site

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3.0 The Site

3.1 Site Location

The site is bound by Peter Street to the north, Watson Street to the east, a leisure complex and Great Bridgewater Street to the south and Deansgate to the west. Site grid reference SJ835978



Figure 3.0: Aerial Photograph (© Google)

3.2 Existing Utilities, Services and Drainage

WSP have produced a combined services layout. The majority of the utility services are shown to be located within Watson, Peters Street and Deansgate.

There are gas and electricity cables running within the site. These run from Watson Street which enter the Warehouse centrally along the southern elevation.

The sewer records indicate a 500mm diameter combined sewer running under Great Northern Square. The 500mm diameter sewer was proved to be redundant and formally abandoned in 2018, however it has not been removed from United Utilities records. ,therefore clarification by United Utilities will be required.

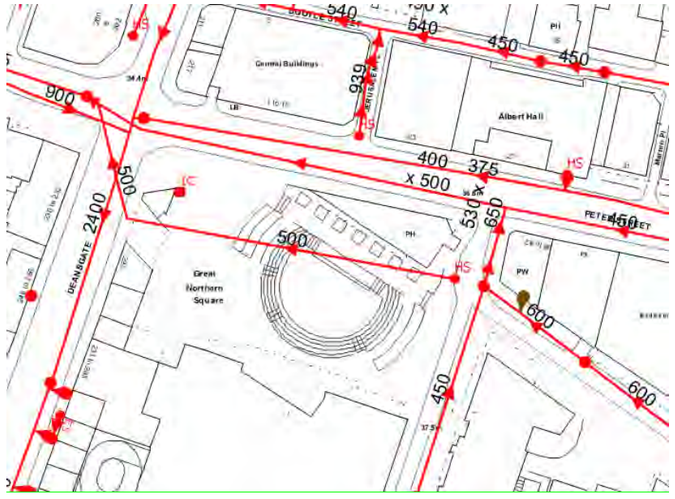


Figure 3.1: Extract from UU Sewer Records

The existing drainage is discussed in further detail in section 11 of this report.

A below ground drainage survey of the site drainage was undertaken in June 2017. The private site drainage was proved to discharge in to the 2400mm diameter combined sewer in Deansgate. An additional CCTV survey will be required for internal building drainage.
It is also recommended to resurvey the existing retained private external drain to confirm the condition of retained pipes.

3.4 Existing Structures

The development site comprises five distinct Buildings/Zones:

- Great Northern Warehouse
- Highline Link Structure over the viaduct
- Deansgate Terraces
- Pavilion
- Great Northern Square

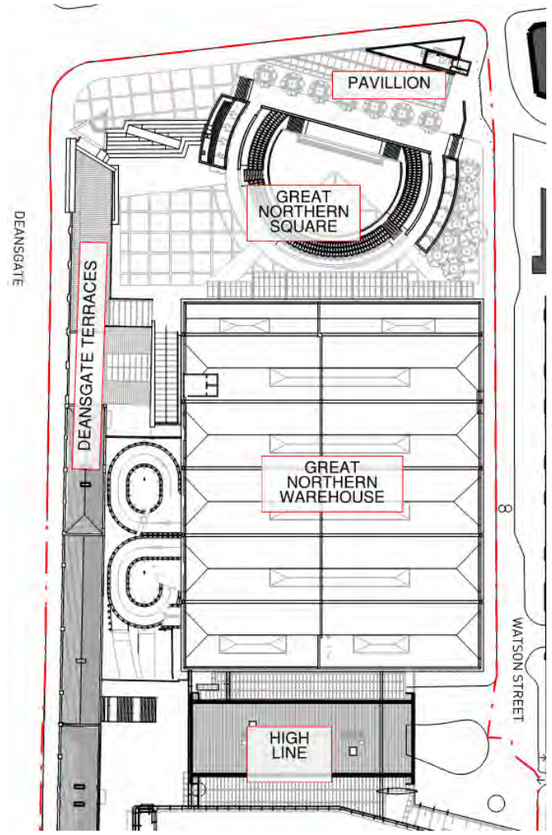


Figure 3.2: Existing Site Buildings

3.3.1 Great Northern Warehouse

The Warehouse is a Grade II* listed building.

The construction of the Warehouse began in 1897 and was completed circa 1900.

The main warehouse comprises a five-storey building approximately 81.4m (267ft) long and 66.1m (217ft) wide. The two lower levels of the building were previously used as rail and road depots. The upper three levels were used to store goods such as malt, grain, paper, cloth, rags, cotton and case goods.

The high-level depot linked directly with the Great Northern rail line with the low-level depot being linked to the high-level rail line via two number inclines to the east and west of the viaduct.

Both levels were also linked to the road network, with an approach ramp constructed to the north and west of the warehouse to provide road access to the high-level depot.

Refer to Appendix A for historical plans of the Goods Station.

The following is the description of the building structural form from 'The Engineer' dated September 1898.

'It is entirely of fireproof construction, practically a series of storeys built of mild steel stanchions with connecting girders, cast iron junction boxes being employed to join them, and cross girders, with jack arches turned between them, forming the floors. The walls are constructed in a most substantial manner, the lower portion consisting of blue brickwork in cement and the upper portion of hard local red bricks relieved by blue band bricks. The brickwork of the station is wholey in cement.

The steel stanchions rest on large granite bases, which are bedded upon blue-brick and concrete foundations going down to solid rock, as is also the case with the walls.

Each Stanchion is calculated to sustain a weight of 650 tons, when the warehouse and the stations are fully loaded.'

The upper floors comprise of 9" inch brick jack arches spanning between mild steel riveted plated girders and mild steel stanchions. The brick arches are believed to be capped with concrete.

The roof structure comprises a series of traditional Queen post timber trusses supported by the external masonry piers and internal columns which historically were located at the end of each truss. The trusses support timber purlins, supporting timber rafters, supporting timber battens, supporting tiles.

The building was refurbished in 1999 as part of the Morrison Merlin works. The building currently houses leisure units including a casino, restaurant and a bowling alley at ground and first floor with the top three storeys utilised as a car park.

To provide access into the upper car parking levels two one-way ramps (entry and exit) were constructed to the west of the warehouse. These required a series of new openings to be formed between the existing piers.

To allow for vehicular movements at third floor level a significant number of the stanchions supporting the timber trusses needed to be removed within the proposed car parking aisles. Steel beams were installed to transfer the roof loads to the adjacent columns.

The columns above third floor are significantly smaller that the columns on the lower levels, we believe that concrete surrounds were added to the columns above third floor to provide protection against vehicular collision, but also to provide support to the new transfer beams.

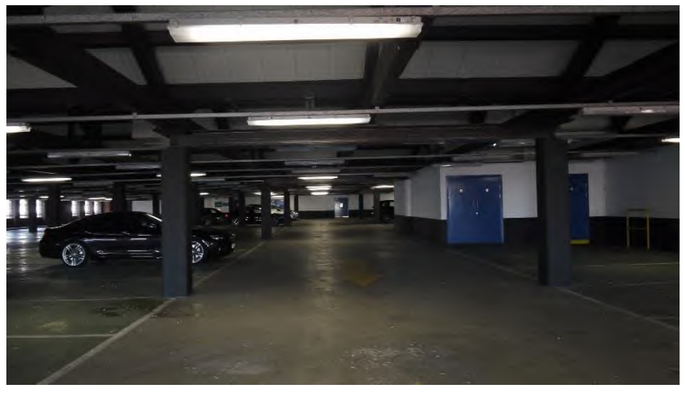


Figure 3.3: Column removal installation of transfer beams



Figure 3.4: Concrete surround supporting transfer beams?

3.3.2 Viaduct (Historical High Level Yard)

A significant length of the historic yard has been demolished. There is now only approximately 28m length structure remaining to the south of the Great Northern Warehouse.

The following is the description of the building structural form from 'The Engineer' dated September 1898.

'The high-level yard, which is outside the station, is built upon a series of steel stanchions supporting steel girders, between which 9" brick jack arches are turned.

The stanchions are practically H steel girders set on end, and at their bases are cast iron guards to protect them from injury.

The stanchions rest upon granite blocks which are laid upon concrete foundations going down to sandstone rock.

The jack arches are covered in concrete, and asphalted to prevent their leaking.

The girders on the outside of the high-level yard have a thick band of Derbyshire Grit resting upon the top, and on this a brick parapet wall is built.'

Approximately 10m below ground under the Highline runs the Bridgewater canal. The canal was cut through the sandstone.

The Engineer noted that ' *Mr Foxlee has provided against any possible subsidence of the low-level yard lying over the site of the canal by laying a large quantity of cast iron girders, bedded in concrete, right*

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across the line at great depth beneath. These will effectually protect the crown of the arch of the canal.'

The canal is now drained and was used as an air-raid shelter during the wars. Access is currently provided by a stair access from within the warehouse building.

A modern single storey glazed steel frame sits on top of the historic structure. It is believed to of been constructed in 2002 as part of the Morrison Merlin works. This provides a covered link between the warehouse and the cinema to the south.

This structure is approximately 6m high. The structure is a steel frame comprising large circular hollow sections which are located onto the original columns below. The columns appear to cantilever from the deck with the roof glazing supported on trusses supported off branches from head of the column.



Figure 3.5: Glazed Atrium

3.3.3 Deansgate Terraces

The historical structure was constructed as part of the original depot circa 1900 and is Grade II listed.

The northern section of the terraces comprise the old single storey road approach ramp, which is a series of brick arches that provided vehicular access into the level 01 depot.

A modern steel framed extension was constructed in 1999 to the rear of the units, this extended the structure towards the warehouse by approximately 1.5m and provide a single storey over the arches.

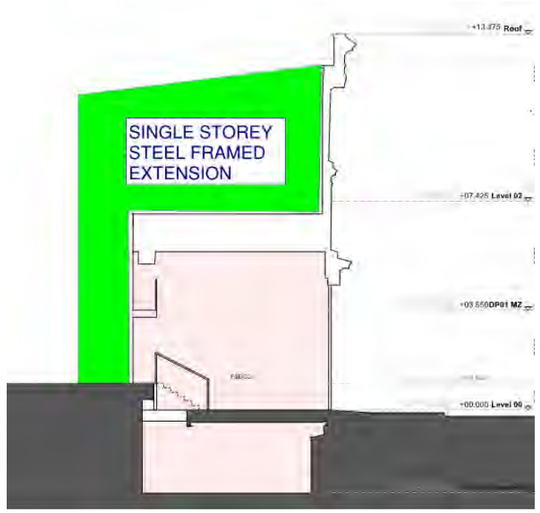


Figure 3.6: Deansgate Terrace Section – Old Approach

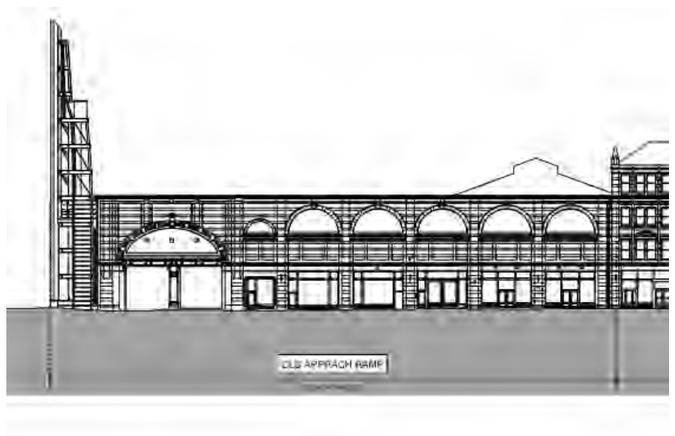


Figure 3.7: Deansgate Terrace Elevation – Old Approach

The southern section of the terrace comprise a three/four storey load bearing masonry structure with concrete floors. At ground floor there are retail units, historically the upper floors were used as a part of the warehouse facilities.



Figure 3.8: Deansgate Terrace Elevation – Old Approach

A basement runs under the full length of the terraces. It is assumed that the load bearing walls are bearing onto the underlying sandstone strata.

3.3.4 Pavilion

The following information is taken from the Site Constraints report undertaken by Arup, dated February 2014 and our own visual inspections.

The building was constructed in 1999. The building comprises a two-storey structure over a single storey basement.

The superstructure comprises a steel framed building with supporting in-situ concrete slabs on a composite metal deck. Stability is provided by a combination of frame action and a reinforced concrete stair and lift core.

The internal steel columns extend to basement level and are supported by pad footings which are founded onto the underlying sandstone strata.

The basement is formed using reinforced concrete walls which are supported by strip footings and propped at the head by the ground floor slab. Where the basement links with the low-level portion of the amphitheatre the external steel frame continues to the basement level. Refer to Figure 3.9.

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3.3.5 Great Northern Square

The Great Northern Square comprises a public realm. The central area comprises a sunken amphitheatre. It is assumed that the existing steps are bedded onto a sloping concrete slab with a down-stand toe at the base of the steps.

This assumption would need to be tested during the next stage of works.

The remaining area comprises a number of steps, ramps and retaining walls to manage the fall across the site from Watson Street to Deansgate.



Figure 3.9: Great Northern Square

3.4 Demolition

There are a number of existing structures which are to be demolished to make way for the proposed development these are:

- Glazed atrium structure over Highline and modern extension at level 01.
- Concrete steps and deck to end of Deansgate Terraces
- Car park entry and egress ramps
- Link block between Deansgate Terraces and Warehouse
- Steel framed extension to northern section of the terraces
- Sunken amphitheatre

The existing buildings, and their foundations and any buried obstructions are to be cleared to make way for the new development.

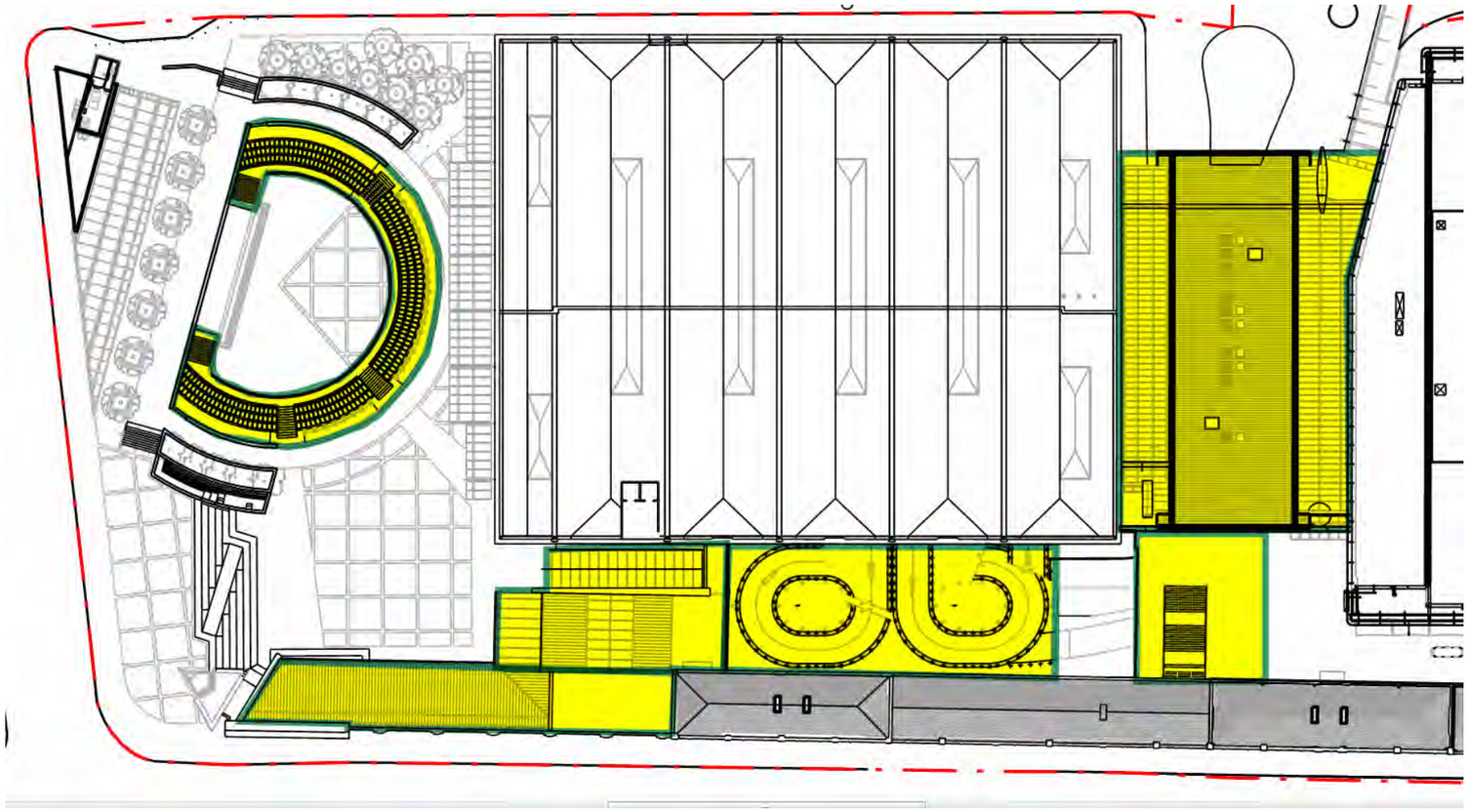


Figure 3.10: Structures to be demolished

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3.3 Responsibility Plan

Curtins are responsible for the Civil and Structural design of the structure contained within the area highlighted orange on the plan below.

Civic Engineers are responsible for the Leisure Box structure and ancillary areas which are highlighted green below.

Within the hatched area Civic engineers are responsible for structure relating to the leisure box. Curtins are responsible for structure supporting the atrium deck at first floor.

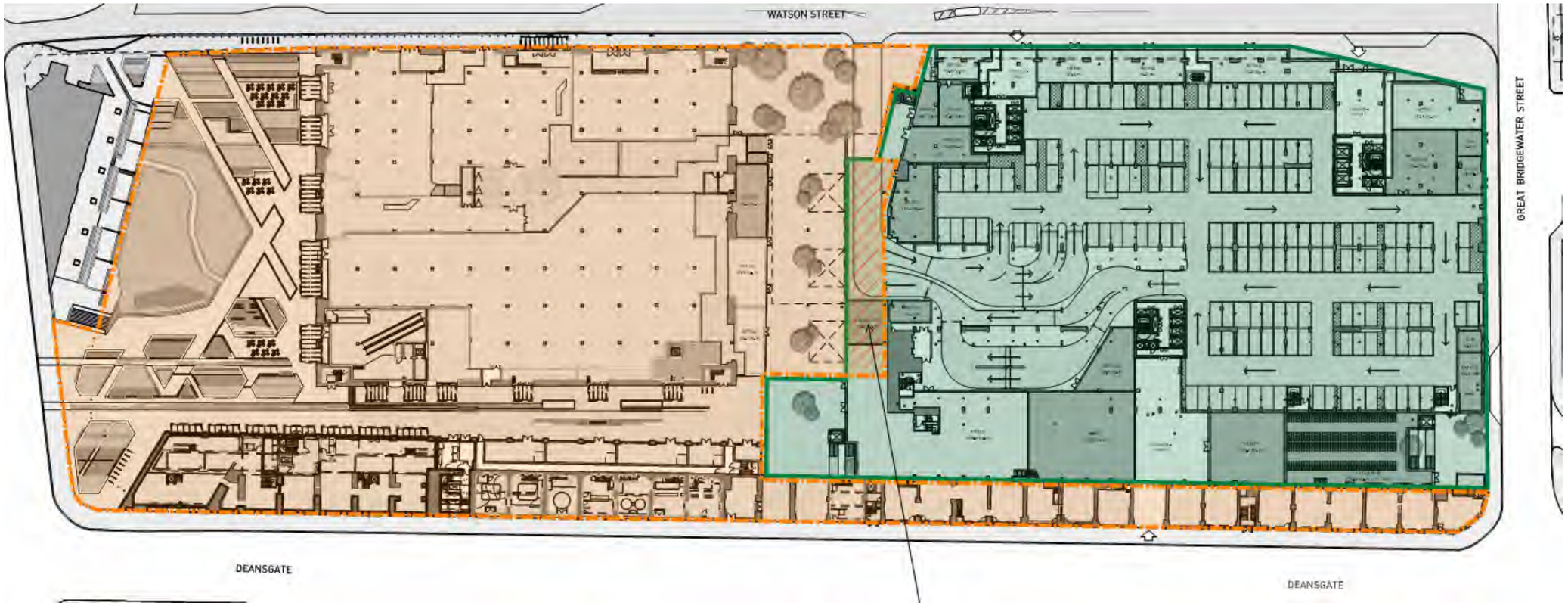


Figure 3.11: Extract from Civic drawing 772-02-CIV-XX-00-SK-X-9001 showing C&S responsibility plan

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4.0 Constraints

4.1 Listed Structures

The Stephen Levrant Heritage Architecture Report 'Great Northern Warehouse, Manchester: Opportunities and Constraints' dated December 2014 highlights the following aspects of the listed buildings have been noted to be of high significance

Grade II Warehouse:*

- External elevations
- Roof structure
- Surviving stone staircases
- Windows
- Fenestration pattern and former carriage ramp and track openings.
- Structural elements including brick jack-arches and columns (not including modern casings)

Grade II Deansgate mews buildings

- Uniformed west elevation including roof scape
- Group value
- Fenestration pattern including shop front openings
- Blind arcading detailing denoting the former screen wall to the former vehicular ramp

4.2 Great Northern Warehouse

Curtins have worked with the team to try and minimise the structural intervention works required to the existing Grade II* listed building.

A set of structural principles were established with the team at an early stage to ensure that the fabric, load bearing capacity and the stability of the remaining structure is maintained both permanently and during the construction of the works.

The main principles were:

1. Due to the sectional nature of the internal steel frame (storey height columns which are connected to each other and the primary floor beams by a cast iron junction) it was advised that the primary beams which brace the columns should be maintained if at all possible. This ensures the column restraint at each floor is unaffected and therefore the load bearing capacity is not compromised.



Figure 4.0: Connection junction at floor

2. Where possible the openings should run parallel with the secondary beams to avoid the removal of the secondary beams with the associated additional temporary works and trimming steel.

3. Horizontal holes through webs can be provided but would be ideally limited to a diameter of 200mm, larger opening could be formed but stiffeners would be required.

4. In all cases the edge of the opening must be at least 175mm above the underside / below the top of the beam to avoid the riveted angle sections connecting the web / flange plate. The horizontal location would need to be co-ordinated also to avoid the vertical web stiffeners.



Figure 4.1: Web stiffeners / angle connection

5. Openings should not be formed within 1200mm of the end of the beams.

6. Individual vertical holes up to 300 diameter are acceptable within the jack arches. Although openings greater that 200mm may require a steel sleeve.

7. Service risers would ideally run perpendicular to the secondary beams.

8. Where large openings are required, due to the nature of jack arches generating a lateral thrust at springing level, tie rods would be required were long openings are created in the floor plate.

Refer to drawings in Appendix B for further information.

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5.0 The Project

5.1 Great Northern Square

The sunken amphitheatre is to be demolished and a single storey basement constructed in its place. Within the basement there is to be a plant room containing water storage and sprinkler tanks. The basement also has space available for community use or storage. Escape from the Pavilion basement is also to be incorporated into the proposals.

The roof of the structure is to support an intensive green roof and associated external landscaping.

5.2 Great Northern Warehouse

The ground and first floors are to be retained as commercial with the change of use for levels 02 to 04 to be made from car park to office use.

Level 01 is to be re-configured to create a Co-working / events space within the Warehouse which requires the incorporation of a new mezzanine floor.

A central section of Levels 03 & 04 is to be 'opened-up' and the roof covering replaced with glazing to create a three storey high central atrium.

New plant terraces are introduced at roof level, requiring the local removal of existing roof trusses and new structure to provide the required support.

An external new lift structure is required to service the warehouse floors. A new link bridge provides access between the Warehouse and Terrace office units at level 01.

5.3 Deansgate Terraces

The proposals are to create a new north-south pedestrianised street to the rear of Deangate Terraces.

A new two / three storey extension is proposed to the rear of Deansgate Terraces with retail units at ground floor and office units over.

5.3 The Viaduct

The existing glazed structure link to the leisure box is to be demolished and level 01 is to be converted into a roof garden / public terrace.

Elements of the existing floor structure are to be removed to provide a visual link to the lower level. The existing primary structural beams and columns are to be retained.

A new mezzanine floor is to be constructed between ground and level 01 to provide bicycle storage facilities for the office units.

At ground level plant rooms and commercial units are to be provided.



Figure 5.2: Proposed Roof Terrace

6.0 Substructure Proposals

6.1 Deansgate Terraces

The Phase 2 site investigation undertaken by Curtins in October 2018 determined that the ground conditions consist of *Made Ground overlaying Manchester Marls Formation (sandstone*).

The sandstone was encountered at depths between 6.10m – 8.75m bgl (26.18m – 29.55m AOD).

Due to significant thickness of made ground across the site and relative shallow depth to the sandstone bedrock we are recommending that proposed columns are supported on a piled foundation with the piles socketed into the underlying sandstone. As the terraces have a basement, the piles adjacent to the basement will need to be sleeved or set back to avoid surcharging the existing basement. Due to the presence of made ground a

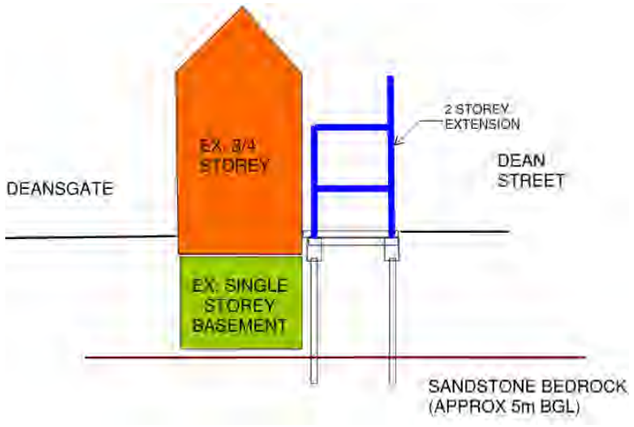


Figure 6.0: Foundation Solution

Alternative Foundation Solution

6.2 Basement Plant Room

The whole structure will be described in this section. The structure is to comprise a reinforced concrete frame. The current layout is in abeyance pending confirmation of M&E spatial requirements. Nevertheless the structural intent outlined in this section is expected to still be applicable if the plan extent of the basement is changed. Any changes to the overall depth of construction would need to be reassessed.

Retaining Wall

In relation to the construction sequence for the hub, we are recommending that a retaining wall is installed to the rear of the existing steps, the existing steps are then demolished and the basement excavated.

To avoid temporary propping we would also recommend that the wall is designed as a cantilever.

A cantilevered sheet piled wall would not be able to driven into the sandstone, therefore we are recommending a contiguous piled wall using a CFA pile. For the retained height of 3m a 450mm diameter pile would be required.

All ground obstructions would need to be removed within the line of the piles.

A liner wall is suggested to the face of the contiguous piled wall. This could also provide the required tanking with the addition of a waterproofing additive in the concrete mix subject to confirmation of the required environment grade to BS8102.

Foundations

The current available information indicates that the existing pavilion building is founded on pad foundations bearing onto the sandstone strata.

We are therefore proposing that the proposed columns are supported by traditional pad foundations bearing onto the underlying bearing strata which we are estimating is 2.0m below the proposed basement level.

An allowable bearing of 500kN/m2 has been allowed in the design.

From available information we have co-ordinated the location of the proposed columns with the foundation information we have for the pavilion foundations. Balance beams have been provided to enable off set foundations adjacent to the pavilion.

Ground Floor Slab

Due to the fact the site was excavated to form the sunken amphitheatre which means the made ground at basement level has previously been significantly surcharged, we would suggest that a ground floor slab is suitable.

We are suggesting a 200thk reinforced concrete slab with no joints. An additive could be included in the concrete mix to provide waterproofing requirements if required.

Changes in levels with the basement floor can be dealt with by creating folds in the ground floor slab.

Roof Structure

To minimise the construction depths the proposed construction is a traditionally reinforced concrete flat slab supported by reinforced concrete columns.

The slab is supported 300mm square columns at approximately 6m x 6m centres. The thickness of the roof slab is 300mm

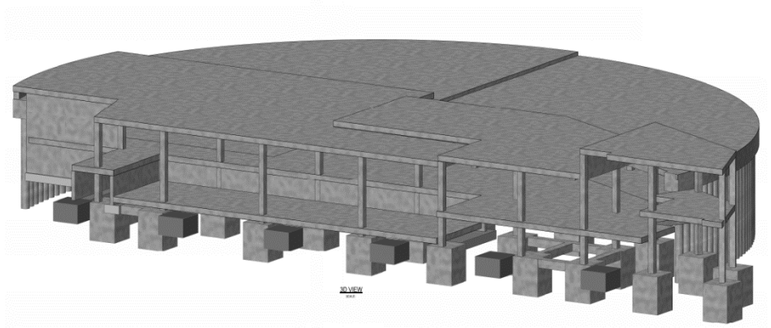


Figure 6.1: 3D View of Basement Plant

Alternative Solutions

A steel frame solution was developed but was discounted due to the depth of the structural zone required for the roof and the resulting additional excavation required.

A traditional reinforced concrete retaining wall could be considered.

The issue relates to the working space and the local drainage which would need to be protected.

6.3 Viaduct Proposals

It is expected that the ground conditions comprise the following:

Made Ground overlaying Chester Pebble Bed Formation (sandstone)

The sandstone is believed to be approximately at 30mAOD, which is circa 6.0m below proposed ground levels.

We are therefore recommending that proposed columns are supported on a piled foundation with the piles socketed into the underlying sandstone.

Piles up to 275mm diameter require a 3.5m clearance, the actual clearance is approximately 5m. This pile size is expected to be large enough for the required loads, but this is subject to detailed SI and sub-contractor input.

The drained Bridge-water canal runs under the Highline, the proposed columns have been co-ordinated to avoid surcharging the canal but also to try and avoid the beams cast in concrete which are described in the historical information. Intrusive works are required to determine locations.

As this area was previously a rail depot we are suggesting that a ground bearing floor slab would be suitable. This is needs to be validated by the Phase 2 Geo-Environmental report.

6.4 Warehouse

Foundations will be required for the proposed external lift core and new single storey retail units.

Due to the expected depth of the sandstone we are recommending piled foundations are provided.

The existing foundations have been determined to be suitable to support the change of use proposed with the building and the load from the proposed mezzanine floors.

Refer to Appendix B for Structural drawings

7.0 Superstructure Proposals

7.1 Great Northern Warehouse

The works have been co-ordinated with the general structural principles noted in Section 5.0.

The main requirement to maintain the primary beams has been achieved by the team.

The change of use from a warehouse to office does not have any structural implications as the proposed imposed loads and the additional superimposed dead loads are less.

Where there are large bays of existing floor plates are to be infilled, we understand the intent is to adopt a precast coffered – vaulted slab to replicate the structural form of the jack arches. These precast slabs would be supported on the bottom flange of a new steel beam, set out to match adjacent bays. The practicalities of the appropriate size of the units for installation would need to be addressed at the next stage, the other option would be to cast in-situ.

For the smaller openings we would recommend an in-situ reinforced concrete slab on a composite metal deck, depending on whether this would be aesthetically acceptable.

Where the large openings are required perpendicular to the secondary beam new trimming beams will need to be installed. Once the beams have been surveyed and flange thickness and material grade confirmed we will undertake a detailed design to determine the required strengthening works to the existing beams at the edge of the openings.

The proposal to opening up the third and fourth floors has been assessed. The preliminary design suggests that remaining floor plate will still provide the required diaphragm action. Further detailed design will be required to confirm.

The proposals to provide a vent at the atrium roof has also been considered. The suggested structural proposal is to provide a frame supported off the existing trusses. The replacement of the slate roof with lightweight materials will provide a similar loading and therefore loads and the existing load paths are unaltered.

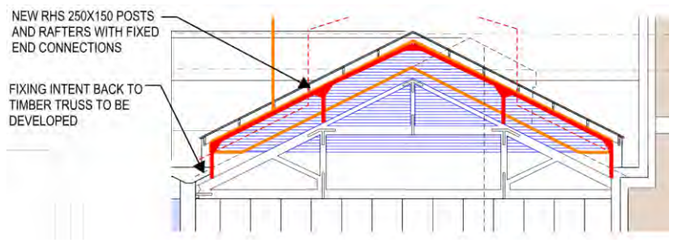


Figure 7.1: Framing over existing truss to atrium area

This frame will need to be braced and further works are required to understand the height of the raised section of roof and to develop the details to provide an aesthetically acceptable solution.

The addition of the terraces at roof level requires additional structure. The recommended structural proposal is to provide additional columns from level 04 (supported on existing columns which terminate at the underside of this level) and reinstate the column locations which have been removed for car park aisle access.

The introduction of additional columns reduces the required spans for the terrace structure which in turn reduces the required beam depth. The columns supporting additional load due to the introduction of the terraces will need to be assessed to determine if strengthening works are required. This assessment will be undertaken at the next stage once surveys are undertaken to confirm existing member sizes and material properties.

The steel columns above level 04 currently have concrete surrounds assumed for the protection from the collision of cars. The intent is to remove the concrete surround to all the columns. For the majority of the columns this is considered acceptable without any structural further works.



Figure 7.2: Transfer Beams supporting roof trusses

7.2 Deansgate Terraces

There are two distinctive zones for the Terraces.

Northern Terrace (old approach ramp)

The structural philosophy is to maintain as much of the existing structure which works with the Architectural space planning requirements. To minimise the overall works and temporary propping requirements to the northern parapet, we are proposing that the existing concrete slab over the arches and the majority of the concrete frame to the northern section are maintained.

The steel frame installed in the 1990's is to be demolished to allow the new extension to be constructed.

The structural challenges relate to the available structural zones. The structural zone at level 02 is limited to 450mm and the mezzanine is limited to 375mm.

To achieve these zones and provide the required open plan areas through the retail space the structural options are either a concrete or steel frame.

A concrete frame was discounted due to the inefficiencies relating to a structure being a single span and the large openings required at mezzanine floor.

The recommended construction comprises a steel frame to form the new levels adjacent to and over the existing arches.

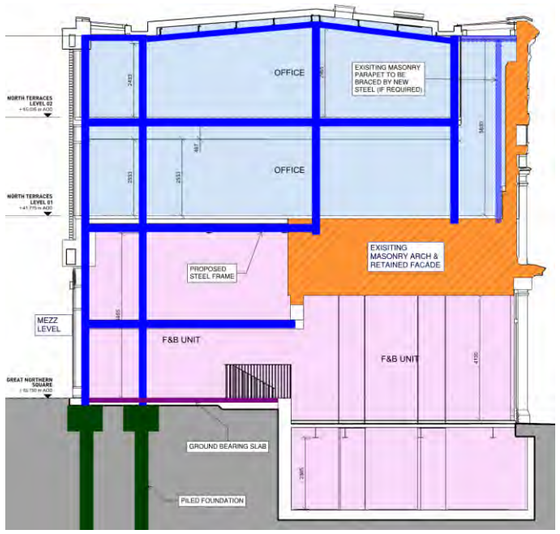


Figure 7.3: General Structural Proposals

Stability is provided by the floor plates acting as horizontal diaphragms to distribute the laterally applied loads back to the vertical bracing, the moment frames, and the existing structure. Steel bracing is provided within the roof plate to act as a wind girder.

To minimise the weight and to allow for future flexibility in relation to new openings within the mezzanine floor a lightweight solution comprising of cold rolled joist spanning into the side of a steel beam is recommended.



Figure 7.4: Lightweight floor support on hot rolled steel

The structure at Level 01 and 02 comprises a 160thk reinforced concrete slab on a re-entrant composite metal deck.

The slab will provide an intrinsic fire rating of 60 mins, but the steel frame will require fire protection.

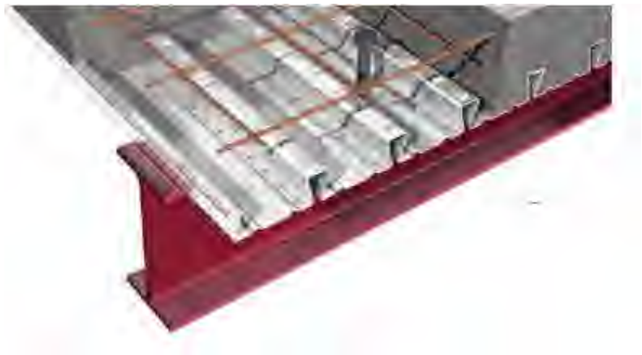


Figure 7.5: Re-entrant composite metal deck on hot rolled steel

The proposed external cladding comprises a combination of traditional brickwork restrained by a SFS spanning vertically between the floors and a curtain walling system. Where required masonry support angles are to be provided to support the external leaf of masonry.

Where the new frame bears onto the existing structure, we have assessed the historical loads, compared these to the new loads to ensure the existing structure is not subject to any additional loads.

Southern Terrace

The proposals are for a two-storey extension to the rear of the terraces.

To provide the required open plan areas through the retail space the structural options are either a concrete or steel frame.

The most practical solution is a steel frame. The current proposals are an independent steel frame which supports a reinforced concrete in-situ slab on a composite metal deck at level 01, 02 and 03 and roof terrace at Level 04.

Stability is provided by bracing and tying back to the existing structure.

It may be possible to span the new floors onto the existing structure and this will be assessed in the next stage of works.

7.3 Viaduct Proposals

The project proposals require the existing glazed ‘high line’ structure link to the leisure box is to be demolished and level 01 is to be converted into a roof garden / public terrace.

Elements of the existing floor structure are to be removed to provide a visual link to the lower level. The existing primary structural beams and columns are to be retained.

A new mezzanine floor is to be constructed between ground and level 01 to provide bicycle storage facilities for the office units.

At ground level plant rooms and commercial units are to be provided.

The proposals are to provide a steel frame, connected to the existing columns under the existing deck, with an in-situ concrete floor on a composite metal deck. Stability is provided by bracing from the existing deck.

Due to the fact the deck sits under the existing structure, lifting and placing precast planks is not practical solution, therefore an in-situ slab on a composite metal deck has been proposed.

A new access ramp is required for bicycle access to the dedicated store at mezzanine level. The ramp will be formed by new structural steel framing supported on the existing stanchions and new columns. The new columns will require foundations. Mini pile foundations are deemed appropriate due the relatively small loads and the limitations on access under the Level 1 viaduct structure.

The underside of the decking should be given additional protection in the form of a pre-applied coating or epoxy paint applied in-situ. Such an additional layer of protection has the advantage that it can be regularly inspected and remedial work undertaken if required.

Refer to Appendix B for Structural drawings

8.0 Design Criteria

8.1 Design Life

The building structure is to have a design life of 50 years in accordance with Category 4 to BS EN 1990.

Some structural elements, such as those with concrete wearing surfaces and corrosion protection will require periodic inspection and maintenance.

8.2 Design Loads

8.2.1 Permanent Loads

Dead loads (DL) take into consideration the basic self-weight of floor slabs, structural walls and columns; in effect the self-weight of the building shell before finishes are applied.

Superimposed dead loads (SDL) refer to the finishes that are applied to the building shell, usually as part of the fit-out. Dead and superimposed dead (uniformly distributed) plan loads assumptions in the permanent case are summarised in the table below:

Warehouse

Location	Super Imposed Dead	
Ground Floor Retail Units	Finishes (75 thk screed) Service & Ceiling	= 1.50 kN/m^2 = 0.50 kN/m^2
Bike Store Mezzanine	Finishes (25mm zone) Service & Ceiling	= 0.65 kN/m^2 = 0.50 kN/m^2
Office Mezzanine	Finishes Raised Access Floor Service & Ceiling	= 0.22kN/m2 = 0.35 kN/m2 = 0.50 kN/m2
Typical Office Levels	Ceiling and Services Raised Access Floor Finishes	= 0.50 kN/m2 = 0.35 kN/m2 = 0.22 kN/m2
Plant Roof Terrace	Waterproofing Insulation Service	= 0.1 kN/m2 = 0.3 kN/m2 = 0.10 kN/m2
Plant Communal Terrace	Finishes (Tiles) 18mm Plywood Waterproofing Insulation Service	= 0.4 kN/m2 = 0.12 kN/m2 = 0.1 kN/m2 = 0.3 kN/m2 = 0.10 kN/m2
Pitched Roof	Finishes (slate) Battens & felt Insulation Purlins Roof deck Services PV (Locally)	= 0.30 kN/m2 = 0.10 kN/m2 = 0.30 kN/m2 = 0.10 kN/m2 = 0.20 kN/m2 = 0.15 kN/m2 = 0.50 kN/m2

Terraces

Location	Super Imposed Dead	
Ground Floor Retail Units	Finishes (75 thk screed) Service & Ceiling	= 1.50 kN/m^2 = 0.50 kN/m^2
Mezzanine	Finishes Plywood Service & Ceiling	= 0.50 kN/m2 = 0.285 kN/m2 = 0.50 kN/m2
Typical Office Levels	Ceiling and Services Raised Access Floor Finishes	= 0.50 kN/m2 = 0.35 kN/m2 = 0.22 kN/m2
Terrace Roof	75thk Paving Slabs Waterproofing Insulation Ceiling and Services	= 1.80 kN/m2 = 0.40 kN/m2 = 0.10 kN/m2 = 0.50 kN/m2
Main Roof	Standing seam roof Purlins Ceiling & Services Roof Glazing (locally)	= 0.40kN/m2 = 0.15kN/m2 = 0.50 kN/m2 = 1.00 kN/m2

Misc

Basement Plant Roof	300 thk Planting material Waterproofing Insulation Services	= 6.00kN/m^2 = 0.60kN/m^2 = 0.10kN/m^2 = 0.25 kN/m^2

Note: The loads are subject to confirmation/development with the design team.

8.2.2 Variable Loads

Location	Imposed
Ground Floor Retail Units Category D1	4.00 kN/m^2
Bike Store Mezzanine	5.00 kN/m^2
Typical Office Levels	Offices (B1) Imposed = 2.50 kN/m^2 Lightweight Partitions = 1.00 kN/m^2 Corridors and Lift Lobbies (C31) Imposed = 3.00 kN/m^2 Staircases (C35) Imposed = 4.00 kN/m^2
Basement Plant Roof	5.00 kN/m^2 (Barriers are to be provided to ensure Vehicles heavier than 5t cannot access the roof)
Roof Terraces	5.00 kN/m^2
Viaduct / Amenities	5.00 kN/m^2
Plant Areas	7.50 kN/m^2
Roof Plant	5.00 kN/m^2
Water Tanks	10.0 kN/m^2 / m height
Roof (inaccessible unless for maintenance and repair) Category H	0.6 kN/m^2

8.2.3 Wind Loads

Wind loads have been determined in accordance with BS EN 1991-1-4.

8.2.4 Effective Horizontal Forces

The new structure will be designed to resist Effective Horizontal forces in accordance with the following:

BS EN 1993-1-1:2005 - Structural Use of Steelwork in Buildings;
BS EN 1992-1-1:2004 - Structural Use of Concrete.

8.2.5 Vehicle Surcharge / Lateral Earth Pressures

An imposed surcharge of 10kN/m² will be applied to the rear of all retaining walls to allow for construction vehicles during the construction works.

The lateral earth pressures will be based on the parameters defined by the Phase II Geo-Environmental Report.

8.2.6 Accidental Loads

Vehicular impact loads will be considered for the columns within the car park in accordance with BS EN 1991-1- 7 and the NA

8.2.7 Snow Loads

The general area design snow loads at roof level have been calculated in accordance with BS EN 1991-1-3.

8.3 Serviceability

8.3.1 Gravity Load Deflections

Deflection of the superstructure floor slabs and beams is considered in four stages:

Dead load deflection due to self-weight of the structure, this load will increase during construction and should not increase significantly any further once construction is complete.

Cladding Load installation of the cladding is usually undertaken once the supporting structure is complete. This provides a watertight envelope in which the internal fit out can be undertaken. During installation the cladding will be lined and levelled therefore the cladding will need to be designed to allow any further movement of the structure.

Superimposed permanent load due to permanent dead loads such as ceiling, raised access floor, and services where the loading will gradually increase as the fit out occurs. Once installed the load is not expected to vary greatly across the structure over a long period of time.

Variable load deflections which are likely to vary not just over the floor area but also between floors. These are loads associated with the imposed loading for the category of building use and include internal partitions and furniture. When considering deflections and creep the imposed loading is proportioned into long term loading, Quasi Permanent and the short term loading, Frequent. It is assumed that 30% of the imposed loading is quasi-permanent and 70% of the load is frequent.

The structure is designed for the flowing deflections:

Deflection Load Case	Internal Slab	Slab Edge
Short Term deflection due to slab self-weight (δ_{ST})	Span/1000	Span/1000
Incremental Deflection (δ_{INC}) Long Term deflection of dead and superimposed dead and cladding + Quasi Permanent imposed (δ_{IMPLT}) + Frequent Imposed (δ_{IMPF})	Span/360	Span/500
Total long term deflection post construction $\delta_{TOT} = (\delta_{INC} + \delta_{ST})$	Span/250	Span/250

8.3.2 Horizontal Movements

Vertical elements providing overall stability to the buildings are designed to limit horizontal deflections under wind loading. The stability system for each building has been developed to limit horizontal displacements resulting from lateral and longitudinal wind forces to attain the following movement criteria. :

Overall sway deflection of the building due to design wind load <H/300, where H = height of the building

These deflection design criteria will need to be considered in the development of the façade and cladding system in addition to normal construction tolerances.

8.4 Fire Protection

The requirements for the fire rating of the structure will be taken from the Fire Engineers Reports. Reference should be made to OFR Consultants information.

8.4.1 Great Northern Warehouse

90 mins protection to new office lift structure and existing units

90 mins protection to floors and supporting columns

8.4.2 Deansgate Terraces

Structural elements are to achieve 90 mins protection.

8.5 Natural Frequency and Dynamic Response

In accordance with BS6472 the following response factor performance criteria is to be achieved for a 'low probability of adverse comment':-

- Commercial / Retail R < 8

8.6 Disproportionate Collapse

8.6.1 Great Northern Warehouse

The building is considered to have a Consequence Class of 2b in accordance with building regulations.

The addition of the accessible terraces at roof level does not increase the existing consequence class of the building.

Discussions with Approved Inspectors are required to agree the approach, but during the next stage we are planning to investigate the connection details of the columns at the floors to demonstrate that there is a positive fixing at the columns (to provide a vertical tie) and investigate the secondary beam connections to review the horizontal tying capability.

8.6.3 Deansgate Terraces

The building is considered to have a Consequence Class of 2a in accordance with Approved Document A of the building regulations.

This will be addressed by providing effective horizontal ties.

8.6.4 Waterproofing

The only area of proposed basement construction is the Basement Plant area. As the intended usage is for plant rooms and storage the basement is assumed to be classified as a Grade 2 environment.

The ground water level is expected to be significantly lower that the basement and therefore generally a single system of protection would be acceptable.

One point to highlight is if the client requires a Grade 3 environment and is looking to obtain NHBC or a Premier Guarantee warranty they will require that a Certified Surveyor in structural waterproofing undertakes the design and it comprises a dual system.

Grade	Example of use of structure[a]	Performance level
1	Car parking; plant rooms (excluding electrical equipment); workshops	Some seepage and damp areas tolerable, dependent on the intended use[b] Local drainage might be necessary to deal with seepage
2	Plant rooms and workshops requiring a dry environment (than Grade 1); storage areas	No water penetration acceptable Damp areas tolerable; ventilation might be required
3	Ventilated residential and commercial areas, including offices, restaurants etc., leisure centres	No water penetration acceptable Ventilation, dehumidification or air conditioning necessary, appropriate to the intended use

[a] The previous edition of the standard referred to Grade 4 environments. However, this grade has not been retained as the only difference from Grade 3 is the performance level related to ventilation, dehumidification or air conditioning (see BS 5454 for recommendations for the storage and exhibition of archival documents). The structural form for Grade 4 could be the same or similar to Grade 3.

[b] Seepage and damp areas for some forms of construction can be quantified by reference to industry standards, such as the ICE's *Specification for piling and embedded retaining walls* [1].

Figure 8.0: Basement Grade BS8102

9.0 Design Standards

The design of structural elements is to be carried out in accordance with the latest editions of the relevant Eurocodes (with accompanying UK national annexes) and Codes of Practice as listed and as appropriate to the form of construction used, but not limited to:

BS EN 1990	Eurocode 0: Basis of structural design
BS EN 1991	Eurocode 1: Actions on structures
BS EN 1992	Eurocode 2: Design of concrete structures
BS EN 1993	Eurocode 3: Design of steel structures
BS EN 1994	Eurocode 4: Design of composite steel and concrete structures
BS EN 1995	Eurocode 5: Design of timber structures
BS EN 1996	Eurocode 6: Design of masonry structures
BS EN 1997	Eurocode 7: Geotechnical design
BS EN 752 2008	Drainage and Sewer Systems Outside Buildings
Building Regulations	Approved Document A - Structure
Building Regulations	Approved Document H – Drainage and Waste Disposal

10.0 Geotechnical

10.1 Phase 2 Site Investigation

A Phase 2 Site Investigation of the site was undertaken by Curtins Consulting dated October 2018 referenced 068997-CUR-00-XX-RP-GE-001

The following summarises the key geotechnical and geo environmental records from the Phase 1 Desk Study.

Current Site Status

The site is bound by Peter Street to the north, Watson Street to the east, a leisure complex and Great Bridgewater Street to the south and Deansgate to the west.

Most of the site is occupied by a multi-storey car park known as the Great Northern Warehouse, accessed of Watson Street. To the north of the site is a wedge-shaped bar and open space, with a sunken amphitheatre and areas of soft landscaping. The remainder of the site is covered by hard standing.

There are several pedestrian accesses into the site off Great Bridgewater Street and off Deansgate, restricted by steps. The area behind the shops on Deansgate is split on levels with planters. The only access to the north of the site is through the Great Northern Warehouse and the multi storey car park.

Summary of Phase 1

The earliest available historical mapping (1850s) indicates the site is occupied by unspecified buildings, which are likely residential dwellings. Lad lane is orientated east-west through the centre of the site. The Great Northern Railway Goods Station was constructed directly south of the site in 1908, and a chimney is located directly southeast of the site, associated with the Great Northern Railway Goods Station. Several small, possibly residential dwellings are present at the north and west of the site. Small units are also present at the centre east.

The site remains in this layout until 1948 when several new units were constructed in the centre of the site, orientated east-west. In the 1980s, the west of the site was redeveloped into a row of small commercial units. By 2000, the units remain in place, however those at the north were demolished and replaced by hardstanding surfaces.
The site is underlain by Made Ground, of unknown composition, superficial deposits comprising glaciofluvial sheet deposits (Secondary A Aquifer) and bedrock comprising the Manchester Marls Formation (Secondary B Aquifer).

There are no groundwater abstractions for potable water supplies within 250m of the site. The nearest surface water feature is the Bridgewater Canal 350m to the south.

Primary potential risks to be investigated during the Phase 2, as well as establishing ground conditions for geotechnical design, included; potential for ground gas, and risks to human health and controlled waters.

Fieldworks undertaken
Fieldworks were carried out between 23rd – 27th July 2018 and comprised three cable percussive boreholes to maximum 8.91m bgl, three window samples to maximum 5.45m bgl, and two hand excavated foundation pits to maximum 2.00m bgl. Ground gas and groundwater monitoring standpipes were installed within BH01 and BH03.

Selected soil samples were scheduled for chemical and geotechnical analysis. Six return ground gas monitoring visits have been undertaken.

Encountered ground conditions
Made Ground was encountered in all exploratory holes with maximum confirmed thickness of between 3.30m – 4.00m. Deposits comprise a surface cover of granite slabs or paviours, underlain by a concrete sub-base. This overlies loose to dense brown, reddish brown, dark brown gravelly fine to coarse SAND. A layer of soft sandy slightly gravelly clay was identified in WS boreholes at the east of the site was encountered directly overlying superficial soils. Anthropogenic gravels are fine to coarse angular to sub angular fragments of brick, concrete, clinker, glass, plastic, rare nails, and rare ash.

Superficial soils range in thickness between 2.40m – 4.75m and comprise medium dense to dense brown and orangish brown slightly clayey slightly gravelly fine and medium sand underlain by stiff to very stiff reddish brown, with occasional grey mottling on fracture lines, slightly sandy slightly gravelly clay. Bedrock was encountered at depths of between 6.10m – 8.75m bgl (26.18m – 29.55m AOD).

Made Ground deposits were recorded as wet from 2.50m bgl in WS01, and superficial soils were recorded as damp in WS02 (5.10m bgl) and BH03 (6.40m bgl). Groundwater level monitoring recorded BH01A and BH03 as dry.

BH03 recorded black bituminous material with a hydrocarbon odour, and a tar odour at 1.00m and 3.00m bgl respectively. No further visual or olfactory evidence of contamination was identified during the investigation.

Environmental laboratory testing and ground gas monitoring results
Slightly elevated concentrations of dibenzo(ah)anthracene were identified in BH01 (0.70m bgl) when compared against Tier 1 thresholds for a Commercial end use. These concentrations may be associated with clinker identified within gravels, as recorded on the exploratory hole log. All other samples tested recorded concentrations of contaminants of concern below Commercial thresholds.

During ground gas monitoring, a maximum concentration of 0.5% v/v carbon dioxide was recorded in BH01A on the second visit. No positive flow was recorded during the monitoring period. Concentrations of methane were recorded at levels below the limit of detection of the monitoring equipment in both wells throughout the monitoring period. The maximum concentration of CO2 and the maximum flow rate result in a calculated GSV of 0.0005 l/hr. With reference to UKWIR Report No. 10/WM/03/21, PE pipes are unlikely to be suitable for the development owing to elevated concentrations of C11 – C20 Mineral oils. Chemical testing results indicate that PVC pipes may be suitable for use. The exact requirements are to be confirmed with the relevant utility supplier.

Ground contamination and Ground Gas Assessment

A **Moderate/Low** to **Low** risk is presented to commercial site end users, construction workers and site visitors from Made Ground soils. A single exceedance of dibenzo(ah)anthracene was recorded in BH01 at 0.70m bgl. This borehole is indicated on development plans to be located beneath hardstanding surfaces, breaking the source-pathway-receptor linkage. With respect to POS thresholds, slightly elevated concentrations of benzo(a)pyrene, benzo(b)fluoranthene and dibenzo(ah)anthracene were recorded in BH01 and WS02 (0.70m and 0.80m bgl respectively. WS02 is located where development plans indicate an area of soft landscaping is to be installed. A suitable thickness of clean and inert capping should be placed in all areas of soft landscaping, to mitigate the risk presented to maintenance workers and site visitors.

A **Very Low** to **Low** risk is presented to controlled waters (groundwater and surface water). Although deposits were recorded as damp in three exploratory holes, post investigation ground water level monitoring recorded both BH01A and BH03 as dry. Given the wider historic industrial land use of Manchester city centre, it is likely that some residual contamination of the underlying aquifer will have occurred. It is considered unlikely that leachable contamination sourced from Made Ground soils will increase the risk to the underlying aquifer.

A **Low** risk is presented to site end users and construction workers from ground gas migration from Made Ground and natural sources. In accordance with an assessment by CIRIA C665, the calculated gas

screening value (GSV) indicates a Characteristic Situation 1 (CS1) classification may be assigned to the site, indicating no gas protection measures are required for the proposed development.

UK Radon Mapping confirms the site is situated in an area where less than 1% of homes are above the radon action level. Where the new development incorporates a basement the advice of a specialist Radon assessor must be obtained.

Geotechnical Assessment

Due to the significant thickness of Made Ground and the relatively shallow depth to the underlying Sandstone bedrock at the site; it is recommended that a piled foundation solution be utilised, end bearing in the sandstone.

As piled foundations are anticipated, a suspended slab is recommended to bear on the pile caps by a network of beams which will minimise any differential settlement between the floor and the piled structure.

Based on laboratory test results, it is considered that a Design Sulphate Class may be taken as DS-2, and an ACEC Class of AC-2 would be appropriate for the site, allowing for elevated sulphate concentrations within Made Ground soils.

Recommendations for further works

Based on the findings of the ground investigation, the following recommendations are made:

1) Implement a clean and inert capping layer of suitable thickness in all areas of soft landscaping.

2) It is recommended that construction workers are provided with appropriate PPE and sanitary facilities with reference to the environmental testing results presented herein and within Appendix C.

3) Contact specialist piling contractors to determine the suitability and carrying capacity of their piles in the ground conditions pertaining to site.

10.2 UXO Report

Curtins commissioned 1st Line Defence to conduct Detailed Unexploded Ordnance (UXO) Risk Assessment for the proposed works at the Great Northern Warehouse site, Manchester.

The assessment report was issued in July 2018 referenced ‘DA6764-00 Detailed UXO Risk Assessment for Great Northern Warehouse’

1st Line Defence has assessed that there is a Low Risk from items of unexploded German aerial delivered and Allied ordnance across the site.

The Recommended Risk Mitigation Measures to support the proposed works at the Great Northern Warehouse site include.

- Site Specific UXO Awareness Briefings to all personnel conducting intrusive works.

11.0 Civils

The total site area is approximately 1.4 hectares and following scrutiny of the UK Government Flood Map for Planning maps it has been identified that the existing site lies within an area classified as Flood Zone 1 (low risk of flooding from rivers and sea).



Figure 11.0: Flood Map for Planning (© Crown Copyright)

Following scrutiny of the UK Government Long Term Flood Risk Assessment for Locations in England surface water flood maps and risk of flooding from reservoirs maps, it has been determined that the existing site lies within an area which is classified as being partially at risk of flooding from surface water and does not lie within the maximum extents of reservoir flood risk.

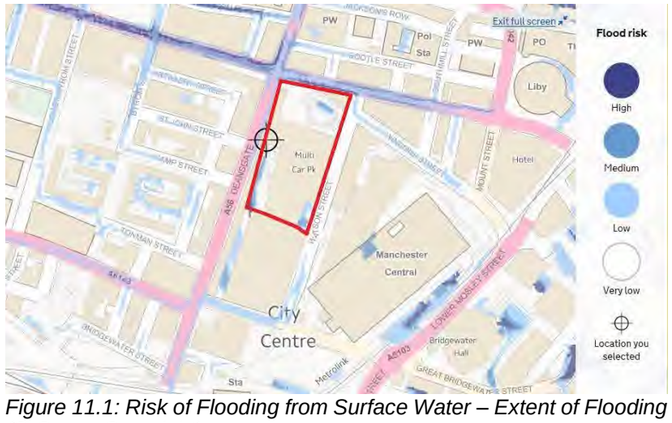


Figure 11.1: Risk of Flooding from Surface Water – Extent of Flooding (© Crown Copyright)

The site is located within the Manchester Conurbation Core Critical Drainage Area; since the site is larger than 1 hectare in Flood Zone 1, lies within a critical drainage area, and is partially at risk from surface water flooding, a Flood Risk Assessment (FRA) is required to support a planning application also taking into consideration the management of surface water run-off.
The Flood Risk Assessment should be prepared in accordance with the National Planning Policy framework document (NPPF) and the Planning Practice Guidance.

In April 2015, the Government made changes to the National Planning Policy Framework which made Sustainable Urban Drainage Systems (SuDS) a material consideration in the determination of planning applications for major developments. Therefore, a Detailed Drainage Strategy, incorporating the use of SuDS has been prepared for the development. External areas are currently proposed to utilise permeable construction and raingardens.

Existing Watercourses

The River Medlock (which is a 'main river') is located approximately 320m south-west of the site.

The River Irwell is located approximately 450m north-west of the site at its closest point, and it flows in a south-westerly direction towards the town of Runcorn. From approximately 1km north of the site, at its confluence with the River Irk (a 'main river'), the downstream section of the River Irwell is known as the 'Manchester Ship Canal' and is privately maintained. Upstream from this point, the River Irwell is a 'main river'.

The Rochdale Canal (Canal & River Trust) begins approximately 460m south-west of the site.

'Lost' Watercourses

A hidden (or 'lost') watercourse appears to flow along the southern boundary of the site, based on SFRA mapping however this is the abandoned Manchester and Salford Junction of the Bridgewater Canal.

The canal officially closed in 1922 with the section east of Watson Street being infilled and the western section used with reduced capacity until 1936 when it was officially abandoned. During WW2, the canal was drained, reinforced and used as an air raid shelter.

It is worth noting that as the proposals are to potentially utilise this space in the future, the water-tightness of the cut off would need to be accessed to ensure it is not at risk from flooding.

Existing Drainage

The public sewer utility records are available for the site; refer to Figure 11.2.

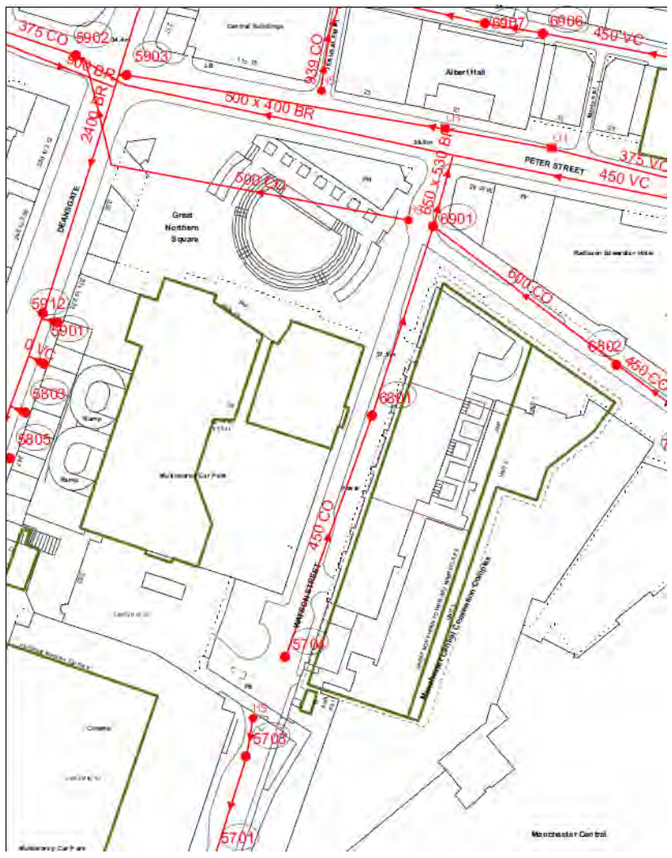


Figure 11.2: Extract from United Utilities Asset Record

The records indicate that there is a 500mm public combined sewer running across the northern area of the site. The 500mm diameter sewer was proved to be redundant and formally abandoned in 2018, however it has not been removed from United Utilities records yet, clarification by UU will be required.

The public sewer records indicate that the following public sewers are located within the vicinity of the site:

There is a 500 x 400 public combined sewer running adjacent to the northern site boundary within Peter Street, flowing in a westerly direction.

There is a 375mm public combined sewer within Peter Street which flows in a westerly direction.

There is a 2400mm public combined sewer flows in a southerly direction within Deansgate, adjacent to the western site boundary.
To the east of the site, a 450mm public combined sewer flows within Watson Street in a northerly direction. Near to the north-east site boundary, at the junction of Watson Street with Windmill Street, the public combined sewer increases in size to 650 x 530mm.

A public combined sewer flows from adjacent to the south-east corner of the site in a southerly direction along Watson Street.

There are several private foul, surface water and combined drains within the site boundary.

All existing internal drainage is to be confirmed therefore an additional CCTV survey will be required for internal building drainage.
It is also recommended to resurvey the existing retained private external drainage to confirm the condition of pipes to be retained through development.

Proposed Surface Water Drainage

Any new development site drainage should be designed in accordance with current best practice to provide adequate capacity not to flood for the critical 1 in 30-year storm event and flood water generated for up to the critical 1 in 100 year plus climate change storm event shall be constrained within the areas on site so not to cause damage to buildings, essential services or adjoining developments and services.

The new surface water drainage is proposed where new buildings and the new external areas are proposed.

The proposed flow rates are to be restricted to a maximum of 50% of the pre-development flow rates with an allowance of climate change for the proposed 100-year event. United Utilities has advised (email from 23.08.22) that based on Wallingford Method surface water for new surface water drainage should be limited to 47l/s.
LLFA has been contacted regarding flow rates, however no response has been received yet.

The required attenuation will be provided within raingardens, oversized pipes and permeable pavement subbase. The proposed raingardens and permeable pavement subbase will additionally provide water quality treatment.

The new surface water drainage system is proposed to discharge into the existing combined public sewer to the north-west corner of the site and will be subject to a Section 106 Application with United Utilities.

The existing buildings (Hub, Warehouse, Terraces) on site are to utilise existing drainage connections, however the existing retained surface water drainage should be modelled to investigate if it has sufficient capacity and where this is insufficient it may require additional connections to a attenuated system.

Proposed Foul Water Drainage

The existing buildings on site are to utilise existing drainage connections. The existing foul water drainage may require to be upsized to accommodate additional flows from the development.

New drains are proposed where new buildings are proposed.

The proposed foul drainage from the site is proposed to discharge into the existing combined public sewer to the north-west corner of the site and will be subject to a Section 106 Application with United Utilities.

All proposed drainage is assumed to remain private.

The foul water pump station will be required for the terraces basement areas.

Proposed External Works

External finishes within the site boundary to be confirmed by the Landscape Architect.

The external areas are proposed to be underlain by a permeable stone or void layer to provide surface water attenuation. Construction details will be subject to loading requirements.

External areas within the Highway Boundary (footpaths) will be subject to agreement with Manchester City Council and will need to be carried out under a Section 278 Agreement.

12.0 Opportunities and Risks

12.2 Key Project Opportunities

Basement Plant Area

Construct the retaining wall around the hub as a traditional reinforced concrete wall. This would require co-ordination in terms of working space and adjacent services. Temporary retaining walls such as a sheet piled wall would not be feasible as due to the level of the sandstone.

Warehouse

Re-use existing lift shafts and pits.

Further co-ordination of floor voids to minimise trimming / arch tying requirements.

12.3 Key Project Risks

The following key residual risks have been identified and though not exhaustive will need to be managed as the design process progresses:

Geotechnical

Contamination – Across the Deansgate Terrace area, there is potential for contamination within the made ground from historical uses including a tannery, lead mill, goods station. Whilst risk to end users is low allowance should be made for the removal of localised hot spots of contamination.

Ground Conditions – Whilst we have a good degree of understanding of the rock quality and levels, due to works undertaken locally to the site, and previous reports undertaken, further intrusive Site Investigation works are required to confirm the current assumptions.

Existing Obstructions – There is a risk that the new foundations will clash with existing ground obstructions. Allowance should be made for localised removal.

Survey Information

Drainage

The existing surface water for the existing buildings may not have sufficient capacity and therefore may require to be reconnected to new surface water drainage system, which will have impact on attenuation.

The existing foul water serving existing buildings may not have sufficient capacity and will require to be upsized.

The below ground existing structure is unconfirmed and may impact on location and depth of proposed drainage.

Structure

We are assuming that the existing structure complies to current standards.

Appendices

Appendix A	**Extract from 'The Engineer' September 1898**
	Description of New Goods Station, Great Northern Railway
Appendix B	**Structural General Arrangements**
Appendix C	**Proposed Drainage Drawings**

Appendix A **Extract from 'The Engineer' September 1898**

Description of New Goods Station, Great Northern Railway

transport of horses, she having been fitted for stalling 130 on the main deck, and eight officers' horses on the upper deck. To provide for their comfort, they being as a rule very bad sailors, she was rigged with three iron pole masts, with stump top-masts, without yards of any kind; all the sails carried being rigged fore and aft, and only just sufficient to prevent rolling. When infantry only were carried, the horse stalls were removed, and the main deck easily converted to their accommodation.

The propelling machinery of the Assistance, supplied and fitted by Messrs. Humphrys, Tennant, and Co., of Deptford, consisted of a pair of inverted direct-acting surface-condensing compound engines of 200 nominal



Fig. 112—Torpedo Boat for Danish Navy, by Yarrow and Co., built in 1876

horse-power, the low-pressure cylinder being 80in. diameter, and the high-pressure 42in., with a piston stroke of 3ft. 6in. Steam was supplied by four two-furnaced boilers, weighted to a pressure of 60 lb. to the square inch, and having a total heating surface of 4330 square feet.

The engines drove a three-bladed Hirsch screw 18ft diameter and 18ft. pitch. On her full-power trial on the mile, the mean of six runs made gave a speed of ship of 12 knots an hour, which was considered a highly satisfactory result, and the engines worked with remarkable smoothness and regularity throughout, entirely free from hot bearings. The ship answered her helm with great promptness, she being steered by Mr. Macfarlane Gray's automatic steering gear, this being supplemented by hand gear turning right and left-handed screws, for use in case of accident to the steam gear. The anchors were raised and lowered by a Harfield steam windlass, the engine of which also worked a capstan on the forecastle for catting them. As a troopship, the fitting of the Assistance left little to be desired, she having spacious quarters for a crew of 112 all told, and excellent accommodation for 800 troops and 130 women and children.

Although the year 1875 brought prominently into notice the addition of another firm—Messrs. Yarrow and Co.—of fast steam launch and torpedo boat builders on the Thames, it did not add to the number of existing shipbuilders on that river, as it was in that year that the shipyard and engine works of Messrs. J. and W. Dudgeon were closed, owing, among other causes, to the death of one of the partners, and the illness of the other, the engine works passing into the occupation of the Electric Power and Storage Company, and the shipyard being utilised as a petroleum store. During the existence of the shipyard and engine works, many fine and notable vessels with their propelling machinery had been constructed therein, only a few of which we have noticed in our articles, as many of them were very fully described, and some illustrated, in the issues of our journal at the time of their production, and have therefore not needed repetition. We may, however, here mention that the firm of Messrs. J. and W. Dudgeon, while existent, built in all, at Limehouse and Cubitt Town, 134 vessels of all descriptions.

So far as the shipbuilding and marine engineering interests of the Thames river were concerned, we think it may without dispute be said that the fourth decade of the Victorian reign, 1867—1877, was a record one for those interests, as within its limits not only had some of the finest ships that ever floated on its waters been constructed, but there were more in number and types than had ever been previously recorded. It is, however, remarkable that within the decade, especially in its last years, so many of the ships ordered by foreign Powers, and constructed in Thames shipyards, should have changed ownership either on or before completion. Of these may be noticed the fine ships Misoudiye and Memdouhiye, built by the Thames Ironworks Company; the Orion and Bellisle by Messrs. Samuda Brothers; the unfortunate Independenzia, and others—all, we believe, purchased by our own Government—ships that were fully noticed in our issues at the time of their completion and needing no further reference here.

The last year—1877—of this decade is, however, particularly noticeable as the one in which the Foo-soo, the first ironclad built in England for the Japanese Government, was constructed by Messrs. Samuda, of Poplar. As she embodied some special features in her construction, a brief description of her may be of interest.

The Foo-soo was an iron armour-clad twin-screw frigate, 220ft. long and 48ft. beam, designed by the present Sir E. J. Reed, C.B., and built to carry—with only 3700 tons displacement—side armour from 7in. to 9in. thick, with guns, stores, &c., at a speed of about 13 knots an hour. In her construction her designer introduced a new system of framing, the frames being continuous from keel to main deck, and instead of the usual armour-shelf, a strong longitudinal girder, well supported by brackets, was worked upon the outside of the frames, at the proper height and projecting beyond them. Upon this bracketed girder the armour and wood backing were placed, giving as a result exceptional strength where the lower edge of the armour was connected with the frames. The ship had iron decks, and was built in thirty-two watertight compartments. She was armed with four 15¼-ton, and two 5½-ton breech-loading Krupp guns, so arranged as to command the whole horizon.

The propelling machinery of the Foo-soo, supplied by Messrs. Jno. Penn and Sons, consisted of two pairs of trunk engines on the compound principle. The contract power of these, and speed of ship, were 3500 indicated horse, and 12¾ knots respectively, but on the official trial the speed of ship realised was 13·16 knots, and the power developed by the engines when making 93 revolutions, the steam pressure being 59 lb. per square inch, was 3734 indicated horse; thus exceeding the contract in both cases, in engine power especially by 234 horses.

The Foo-soo was barque-rigged, and could cruise any distance under sail alone, while her bunker capacity—360 tons—enabled her to steam 4500 knots at a 10-knot speed. Possession of this ship—by purchase—was desired by the British Government, but the Japanese Admiralty altogether refused to entertain any application with that intent, notwithstanding very liberal offers beyond her cost price were made by more than one Government.

The year 1877 is also notable as the one in which torpedo boats were first built on the Thames for the British Government; Messrs. Thornycroft and Co. and Messrs. Yarrow and Co. having each in that year completed the first boats of that type ordered for the British Navy. The first boat built by Messrs. Thornycroft and Co. was the Lightning—fully described and illustrated in our issue of May 18th, 1877—a vessel 84ft. long over all by 10ft. 10in. beam, and drawing about 5ft. of water, at which draught she was guaranteed by her builders to do 18 knots an hour on trial. Her engines, which were similar to those of the French boat, were capable of indicating 350-horse power. Being intended for use in a rough sea if necessary, and in order that she might keep the sea for some time, her cabin and crew accommodation were on a larger scale than in any of the boats previously constructed by her builders.

The boat was armed with the Whitehead torpedo, projected by means of a discharging apparatus, the torpedo itself being charged with compressed air for its propulsion. To those interested in the arrangement of this first of the British torpedo boats we would refer them to the issue of our journal previously indicated.

The first boats delivered to the Admiralty by Messrs. Yarrow and Co. were two in number, constructed in 1877, and were each 86ft. long and 11ft. beam, built of galvanised mild steel. They had compound surface-condensing engines with a locomotive boiler; the air, circulating, and feed pumps being driven independently. The indicated horse-power was about 420, and the speed on trial 20¾ knots an hour. These boats were armed with spar torpedoes, each of which consisted of a long steel spar carrying a torpedo at its end, which was lowered when approaching the enemy, so as to explode under her bottom or against her side. The torpedo itself was a metal case containing a highly explosive compound, such as gun-cotton or dynamite, which was fired either by contact or electrically at the moment of impact. As the Whitehead torpedo—which was self-propelling—had at this date (1877) been introduced, the spar torpedo was destined soon to become a thing of the past, or, if retained, it would be for the purpose of destroying booms stretched across harbour entrances, mooring buoys, or isolated unprotected vessels.

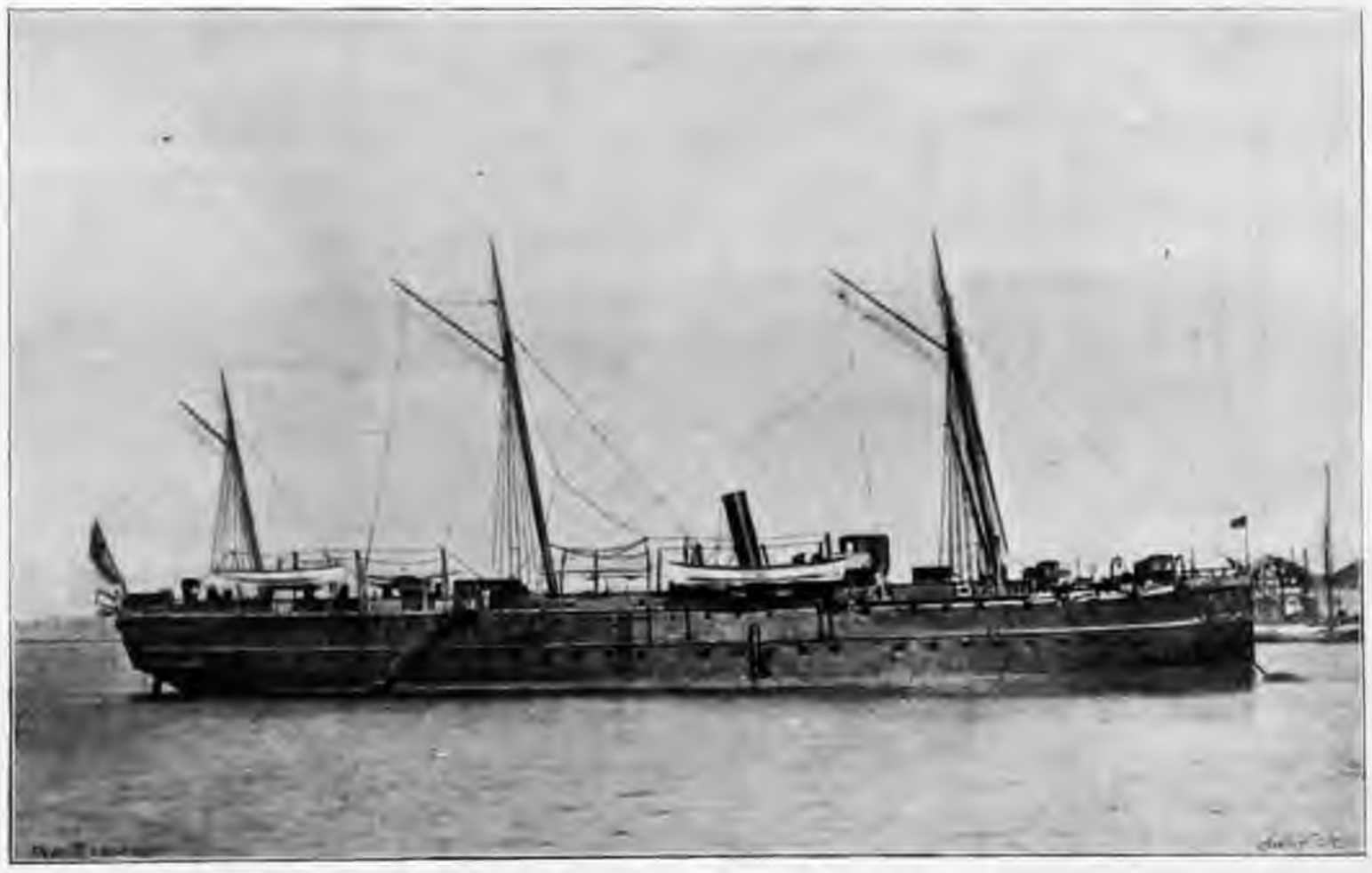


Fig. 113—H.M.S. Assistance, built by Messrs. R. and H. Green, 1875

NEW GOODS STATION, GREAT NORTHERN RAILWAY, MANCHESTER.

WE publish this week a series of engraving and plans representing the new goods station and its approaches, which are in course of construction near Deansgate-street, Manchester, by the Great Northern Railway Company, and a part of which was opened for traffic on the 1st of July, practically fifteen months from the date of its commencement.

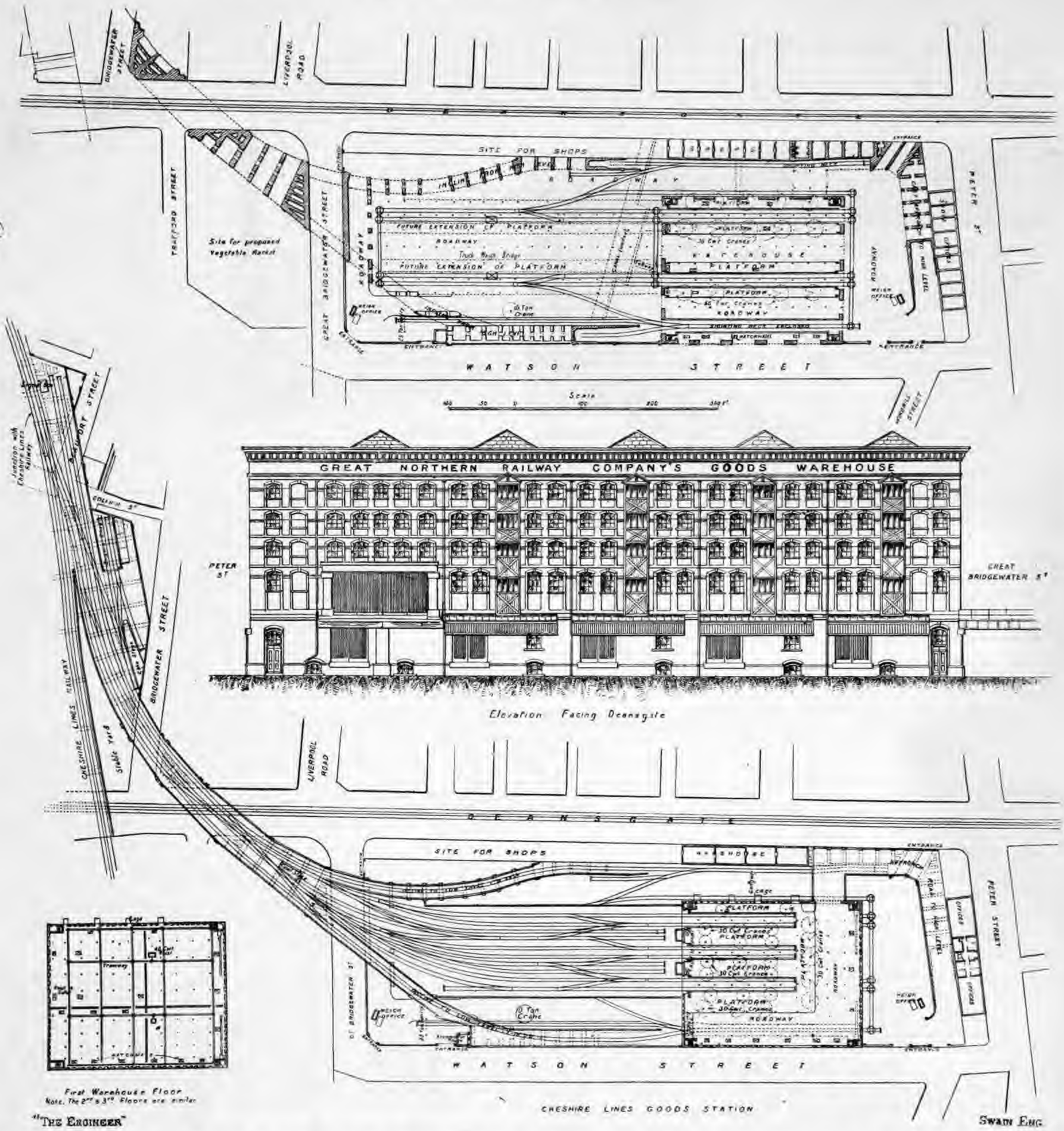
It is necessary, before describing the characteristics and progress of this undertaking, to recapitulate briefly the reasons which have led the Great Northern Railway to open up so vast a goods depôt on its own account in the north-west capital of England. They are as follows:—For the past forty years or more the company has had no independent outlet or inlet for its traffic from Manchester and the surrounding district. As aptly put by the *Manchester Guardian* on the opening day, its interests in regard to the collection, carriage, and distribution of goods in this part of the country have been left in the hands of the Manchester, Sheffield, and Lincolnshire Railway Company, now known as the Great Central Railway Company, and in the hands of the agents of that company, Messrs. Thompson, M'Kay, and Co., Limited, the well-known carriers. Great Northern traffic for the east, south, and west of England has been worked through the Ducie-street depôt, and transferred to the Great Northern line at Retford by Great Central officials, wagons, and engines. Traffic to the West Riding of Yorkshire was similarly conveyed to Ardsley, and the Midland traffic was conveyed by trains engined by the Great Central sometimes right through to Nottingham.

When, however, the Great Central Railway Company decided to open up direct and independent communication with London, the Great Northern Company thought that the time had come to determine the agreement for interchange of traffic which had existed so long between them, and the result has been the erection of the gigantic station or depôt in Deansgate, which is the subject of the present paper, and upon which nearly one million sterling has already been spent. This station is connected with the Cheshire lines by an approach viaduct, and as the joint arrangement for the use of these lines still holds good, by the new scheme the Great Northern Railway can make up its own goods trains in its own station at Deansgate, and run them by its own engines to the places before mentioned, where they join the Great Northern line proper.

The work which has been accomplished already is of considerable magnitude. Although only two out of the five floors of the depôt, the high and low-level stations, are actually in use at the present time, the approach viaduct and the high and low-level yards outside the station are in a very forward state, and practically complete in many respects. Parliamentary authority for the construction of the work was obtained in 1895, and the contracts were let in the latter end of 1896, but the undertaking was not taken thoroughly in hand until

NEW GOODS STATION, GREAT NORTHERN RAILWAY, MANCHESTER

MR. W. T. FOXLEE, M. INST. C.E., ENGINEER



late in the spring of last year. Moreover, the strike in the engineers' trade greatly delayed the execution of the work. Its progress, therefore, up to the present time is very remarkable.

The designs for the new buildings and the approach viaduct, with all their accessories, were prepared by Mr. W. T. Foxlee, M. Inst. C.E., who has also carried out the execution of the works, the designs having been afterwards approved by the engineer-in-chief of the Great Northern Railway, Mr. A. Ross, M. Inst. C.E., who subsequently took office in the company. Mr. W. T. Foxlee has been ably seconded by his two assistant engineers, Mr. J. A. Thornton, A.M. Inst. C.E., and Mr. F. W. Hunt, who have been untiring in their efforts to push on the work. The contractors for the work generally were Messrs. Robert Neill and Sons, of Manchester; the steel work, of which 12,000 tons were required, being supplied by Messrs. Heenan and Froude, of Newton Heath; Sir William Arrol and Co., of Glasgow; and Messrs. Keay, of Birmingham. The hydraulic machinery—notably the cranes and hoists—have been chiefly supplied by Sir William Armstrong, Whitworth, and Co., and a portion by Messrs. Musker, of Bootle, and Messrs. Higginbottom and Mannock, of Manchester. Some idea of the magnitude of the work may be obtained from the following data: 800 men have been almost continuously employed upon it; about 100,000 tons of material have been excavated for the foundations; and 25,000,000 bricks, 50,000 tons of concrete, 12,000 tons of mild steel, and about a million and a-half of granite sets and hardwood blocks have been required. If the rivets used in the steel work were laid end to end they would reach to a distance of sixty-five miles.

The work of demolition which had to be effected in the vicinity of Deansgate was enormous. About nine acres of streets and houses, including Alport's brass foundry, and a host of hotels, inns, and public-houses, a chapel, burial ground, central school, and other institutions were swept away or bridged over, the value of the land being nearly two-thirds of a million sterling. From Peter-street to Great Bridgewater-street, and from Deansgate to Watson-street, the whole space is absorbed entirely in the depôt and the high and low-level yards. Beyond this the approach viaduct has also cleared extensive spaces, though the main streets have been left open beneath girder and brick bridges. The front of the Great Northern Railway Company's premises facing Deansgate is to be allotted for thirty-two shops of good style and appearance, an engraving of which will appear in our columns. The site which remains from the demolition of the chapel and burying ground it is proposed to utilise as a potato and vegetable market.

The general plan of the new station and its approaches can be seen from the accompanying engravings of the high and low-level portions of it. Mr. Foxlee prepared for the chairman and directors of the Great Northern Railway several alternative schemes for dealing with the goods traffic, the effort being to secure as extensive a working space for lines, platforms, and sidings, as well as for warehouse accommodation, as the ground available would afford. The plan ultimately adopted was to have two separate goods stations, one over the other, with high and low-level yards, for marshalling trains and accommodating the wagons, outside the building. Communication between the high and low-level yards is effected by means of an incline, on either side, descending at a gradient of 1 in 28. At the lower end of each incline is a level shunting neck, into which eight wagons can be pushed by the shunting engine, whilst the points leading to the low-level yard are turned. There is room in this siding for more than eight wagons, but it is considered that eight is a suitable number to deal with on the incline. Thus, trains can be marshalled with the utmost rapidity, the loaded wagons being drawn out, by means of hydraulic capstans, from the low-level station into the low-level yard, from thence shunted by the shunting engine, eight at a time, up to the high-level yard, and made up into trains at once, starting along the viaduct to the junction from there. It is, of course, with the high-level yard that the approach viaduct communicates. When we compare this plan, for working two independent floors or stations, with that adopted at the London-road goods station, Manchester, where the wagons are raised one by one through an opening in the floor by a hydraulic lift, the advantages gained by the new method are apparent. It must be remembered that the two inclines will deal with sixteen wagons simultaneously. Over 500 wagons can be accommodated upon the two levels of the Deansgate Station, and upon the high and low-level yards, at one time. Within the stations themselves there is line and platform accommodation for sixty wagons upon the high-level and eighty wagons upon the low-level. Upon the high-level yard there are ten sets of rails and sidings,

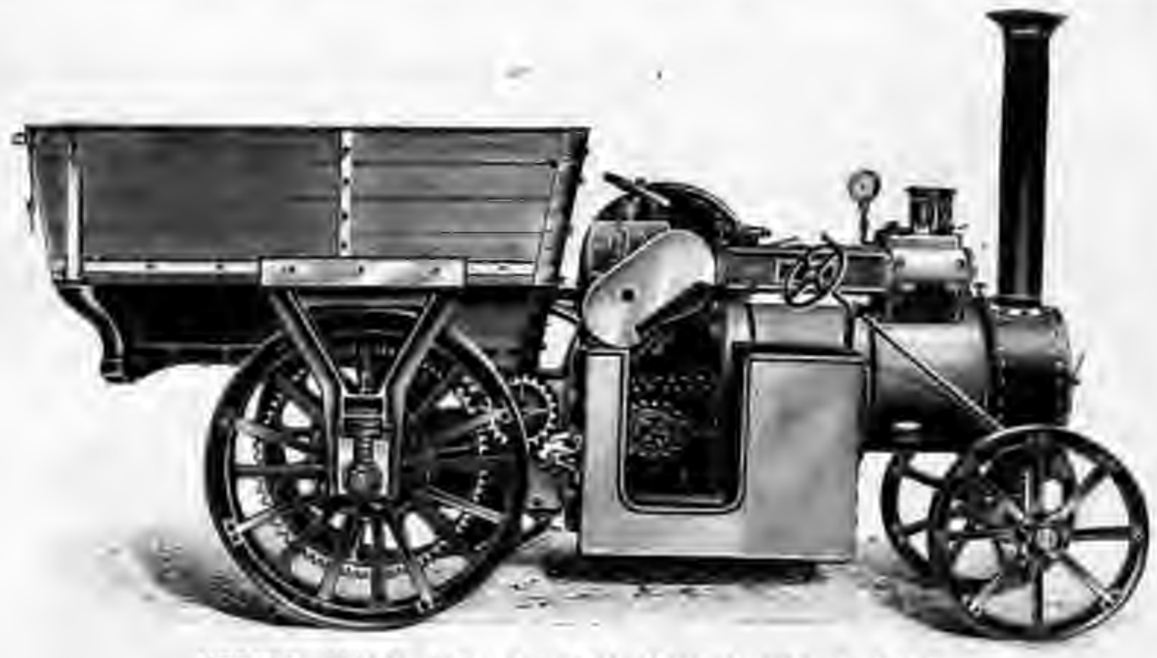
as can be seen from the engraved plan, independently of the inclines. It is from the high-level, therefore, that it is proposed to run the London traffic, as trains can be made up irrespective of destination and run straight off. The goods traffic for mixed destinations will be made up on the low level, and the wagons will be subsequently marshalled on the high level in their proper order.

The approach viaduct, the inclines, and the shunting necks are shown upon the low-level plan. In order to get head room beneath the inclines, where they sweep across the roadway of the low-level yard, instead of brick arches as elsewhere, main girders of steel are employed with "trough girders" to connect them, within which the sleepers for the rails are laid. Detailed drawings of these trough girders will be given later on. A photograph of the western incline, with the shunting engine upon the branch leading to low-level yard, is given on page 230. The viaduct itself is composed partly of brick arches and partly of steel girder bridges, as may be seen by one of the photographs engraved to-day, showing the girder bridge over Great Bridgewater street, and two of the brick arches. The Deansgate-street girder bridge, or rather one girder of it, is the subject of another photograph engraved. Drawings of it will also be given. The main girders are 124ft. 7in. in total length, with a span of 112ft. 4in., and a depth of 10ft. 6in. The ends rest on circular steel rockers, which lie within steel forgings, the rubbing plate below being faced with phosphor bronze, this having been found the best material for the bed to slide on. This is a plan which was adopted by Mr. E. Andrews, Mem. Inst. C.E., on the South-Western Railway bridge at Barnes. The thickness of each plate in the top and bottom flanges of the girders is ⅞in. Two plates at extremities, up to seven in the part where greatest strength is required, are employed. Cast iron bed and rubbing plates are used for other girder bridges. An ornamental face has been designed for the Deansgate-street bridge to satisfy the municipal authorities.

The high-level yard, which is outside the station, is built upon a series of steel stanchions supporting steel girders, between which 9in. brick jack arches are turned. The stanchions are practically H steel girders set on end, and at their bases are cast iron guards to protect them from injury. Details of these guards will be published, as they are of special design. The stanchions rest upon granite blocks which are laid upon concrete foundations going down to the sandstone rock. The jack arches are covered with concrete, and asphalted to prevent their leaking. Details of drainage, filling in of arches, asphalting, &c., will be given hereafter. Thus the whole of the low-level yard is practically roofed in, and it is proposed to extend platforms from end to end of it at a future time, in order to increase the loading-up facilities. There is a truck weighbridge on either side. Four lines of rails are on the low-level yard, with turntables at their extremities both ways, and hydraulic capstans for shunting. The girders on the outside of the high-level yard have a thick band of Derbyshire grit resting upon the top, and on this a brick parapet wall is built.

The station or goods depôt itself is seen in the plan upon the right side. It is entirely of fireproof construction, being practically a series of storeys built of mild steel stanchions with connecting girders, cast iron junction boxes being employed to join them, and cross girders, with jack arches turned between them, forming the floors. The walls are constructed in a most substantial manner, the lower portion consisting of blue brickwork in cement and the upper portion of hard local red bricks relieved by blue-brick bands. The brickwork of the station is wholly in cement. The steel stanchions rest on large granite bases, which are bedded upon blue-brick and concrete foundations going down to the solid rock, as is also the case with the walls. Each stanchion is calculated to sustain a weight of 650 tons, when the warehouses and stations are fully loaded. We give a photograph on page 230 which represents the constructive arrangements of stanchions and girders very clearly. The elevation of the station, towards Deansgate, as it will be when completed, is also shown. It is 267ft. long, 217ft. wide, and the height of the whole five storeys, when finished, will be 75ft. above street level. The lowest floor is, of course, the low-level station. This has four lines of rails running into it, with turntables at both ends, outside. There are four platforms, with offices for the accommodation of the checking clerks. Spacious roadways, paved with Australian Jarrah hard wood blocks, as is the case with all the internal roadways of the depôt, open both from the north and south entrances of the building, which are between blue-brick piers, forming the walls. These last are 8½ to 8 bricks thick. At the southern end of the station they are connected beneath the surface of the ground by inverted arches, in the event of any subsequent disturbance of the foundations being necessary. The side walls consist of piers rather less thick. As will be seen on page 230, upon the platforms are fifteen 30-cwt. hydraulic cranes, for loading and unloading trucks. Jack arches are turned everywhere for the floors, when the height renders this practicable, even beneath the platforms; the object being to reduce charges for maintenance, these being, of course, correspondingly heavy, when a quantity of paint-work has to be periodically renewed. On the Watson-street side of the station, openings between piers lead into a covered roadway. Over this are six hatches, which communicate by hydraulic hoists with the warehouses above. Lorries can draw in here, and load or unload under shelter. The entrances at the four corners of the premises embraced by the station, low-level yard, and their accessories, are seen in the low-level plan, as well as the piers of the sloping approach which leads from the corner where Watson-street and Peter-street join to the high-level station. The main entrance is a double one out of Deansgate.

The high level station is entered by the sloping approach—which, like all the outside roads of the depôt, is paved with granite setts—from the Deansgate side. A broad roadway, as marked in the plan, extends round two sides of the building within it; but it is intended to reduce the width of that which lies to the east for an additional platform. There are, as at present arranged, to be six sets of lines, and five platforms adjoining them, with no less than twenty-five cranes. Four exterior hydraulic cages will be worked from stagings resting on steel cantilevers on the Deansgate side. They will communicate with the three warehouse floors above the high-level station, as well as the hatchways and hoists on the Watson-street side; there are also two 40-cwt. hoists and additional hatchways, which communicate from floor to floor. The cages have counterweights to assist the hydraulic power. The steel cantilevers will also form the support for a roof, which will extend over



MESSRS. MANN AND CHARLESWORTH'S STEAM CART

the exterior siding, marked in the low-level plan; loading and unloading will therefore be performed under shelter.

One of the three similar warehouse floors which will surmount the high-level station is given in the plan, showing the cages, hoists, and hatches which are associated with it and with the other floors. A series of tramways, with trucks and turntables, will be arranged upon these for facilitating the removal of goods from one part of the warehouse to another. This naturally leads to a point which must now be alluded to. An important feature of the building has yet to be described. It will be noticed, in both plans, that hoists are marked as "leading to canal," on the south side. This is the Bridgewater Canal, a branch of which, shown in dotted lines in the low-level plan, runs in a canal cut through the sandstone 35ft. or 40ft. below the approach to the low-level station. It is proposed to have two subways opened, associated with the hoists before alluded to, running direct to the tow-path of the canal branch, which is to have a wide "gare" excavated and arched over, lines being led along it for trucks similar to those used on the warehouse floors, so that goods arriving by canal can be hoisted up to the stations, or to either of the warehouse floors, without breaking bulk. This is an excellent idea, as it will make this Great Northern depôt the first railway warehouse in Manchester in direct communication with the Ship Canal. Mr. Foxlee has provided against any possible subsidence of the low-level yard lying over the site of the canal by laying a large quantity of cast iron girders, bedded in concrete, right across the line at a great depth beneath. These will effectually protect the crown of the canal arch.

It should have been mentioned that the new stations and warehouses, as well as the adjoining yards and approaches, are all lighted with electricity, the power being supplied by the Manchester Corporation. Excellent stables have been constructed for about eighty horses beneath the approach viaduct arches, near Bridgewater-street. The stables are paved with "Cliff's granitic paving," which is scored with indented lines for facilitating drainage. It looks very nice and clean.

About one half of the station premises was opened upon the 1st of July, the first lurry load arriving at 6.20 a.m. By the evening the surrounding streets were lined with lurries and trolleys waiting for their turn to unload, but Mr. L. Brightman, the district goods manager, and his staff of 350 men, were well able to cope with the traffic, and the first goods train steamed out exactly at the time appointed, which was between 5 p.m. and 6 p.m.

During the progress of the work the Right Hon. W. L. Jackson, M.P., chairman of the Great Northern Railway Company; several other members of the board of directors; Mr. Charles Steel, the general manager; Mr. A. Ross, chief engineer; Mr. R. H. Twelvetrees, chief goods manager; and Mr. J. Alexander, superintendent of the line, have frequently visited the scene and taken much interest in it. Mr. E. Coward, the local director, has been constantly on the ground, and Mr. Alexander, Mr. A. Ross, and Mr. Twelvetrees were unwearied in their efforts to make the opening day a success. The new Deansgate station and its approach viaduct may be described as a marvel in mild steel, and its successful opening in so short a period after its commencement reflects the highest credit upon Mr. Foxlee, who is responsible for the design and carrying out of it, as well as upon the administrative powers of the engineer-in-chief. We hope to give interesting details of the work another week.

THE LAVIANO ASPHALT.—Mount Laviano is one of the principal peaks of the Apennines in the province of Salerno. It rises to a height of some 5500ft. above the sea. It is of limestone, in many parts saturated by asphaltic bitumen, and in some places above the calcareous strata sandstone full of asphalt occurs. The quality of the product is of the first class, and capable of being used for any of the numerous purposes for which asphalt is applicable. The establishment owned by the Neapolitan Mining Company is worked by 600-horse water-power at Olevano, and their stores for local sales are at Naples. The present mine is at a height of 4500ft., and the products are carried by mules to the village of Laviano, whence they are taken in carts to the workshop at Olevano.

STEAM CART.

In our report of the Royal Agricultural Society's Show at Birmingham we mentioned a steam cart exhibited by Messrs. Mann and Charlesworth, Leeds, and designed to work within the restrictions of the Motor Cars Act. The engine was at the time scarcely completed, and practically no trial of it had been made. We have now pleasure in putting a small illustration of it before our readers. It consists, it will be seen, of a little traction engine, over the back wheels of which fits a wagon body of special form, and provided with an independent pair of wheels of its own. When, however, the cart is in the position shown in the cut its wheels are outside, and concentric with the engine wheels, which are of the same diameter, and to which they are attached by a few steel pins readily removable. They then become driving wheels instead of mere trailers, and the great width of wheel face so gained prevents damage to the road, and obviates the necessity of using cross strips. The wagon can be tipped, and is provided with a windlass for pulling it back to the normal position.

The engine, which can be used as an ordinary traction or portable when desired, is of compound type and is fitted with Mann and Charlesworth's single eccentric reversing gear. No pitch chains are used, the transmission being through cast steel toothed wheel gearing. The boiler, of ordinary locomotive type, is coke fired from one side, as seen in the cut, a water tank balancing the driving platform on the other side. By the use of a small condenser and superheater all visible vapour is prevented, and the condenser serves also as a feed heater. With a load of four tons this little cart has easily ascended, we are assured, an incline of 1 in 6.

Coming within the motor car regulations, it can travel in charge of one man, and need not be accompanied by a steersman or flagman. It is not affected by any restrictions of working hours, or prohibition of going over bridges, but can run during all hours of the day or night upon any public highway, whether in town or country. No licence is required so long as it is used exclusively for the conveyance of goods. It is allowed to run at an increased speed, varying according to the weight of the vehicle.

DOCKYARD NOTES.

THE Japanese armoured cruiser Asama, launched not so very long since at Elswick, is expected to start for Japan at the end of the year, and her sister ship will follow soon afterwards. One or both will call at Devonport to coal, and will no doubt excite considerable interest there, as they represent a good deal that is novel in construction, and the type that is most likely to be the cruiser of the future. The big protected cruiser appears to have had its day; indeed, neither Rossias nor Diadems appear likely to remain in favour. Naval opinion seems to demand that future cruisers shall embody all the best features of these two opposing types. A few years ago this would have been deemed impossible. If Santiago proved anything, it augured very badly for the Rossia type of ship with only a water-line belt as protection. Her antithesis, the Diadem and Terrible types, come in for criticism, because of their vulnerable water-lines. Hence the evolution of the cruiser that is to all intents and purposes a swift second-class battleship.

THE second-class battleship Edinburgh is reported due shortly at Portsmouth to act as tender to the Excellent, gunnery school. It is not stated whether she will replace the Hero, the present tender, or be additional to her. Both ships carry the old 45-ton 12in. breech-loaders, pieces carried only in their sisters and in the Collingwood. Ten years ago this piece was a wonderful gun, but now it is very much out of date, and of comparatively feeble power. The classing of the Collingwood, which carries four of them, as a first-class battleship, can only be due to a patriotic desire to swell our list of first-class ships she is totally unfitted for that *rôle*. As for the Edinburgh, her fighting value is small, though possibly she would do better than the Collingwood, since such armour as she has is liberally laid on. But the new 10in. wire guns in her turrets, and the saving thus effected bestowed on a narrow belt forward, at the expense, if necessary, of her 6in. guns also, would make her far more efficient. She is, however, so slow, and such a "coal-eater," that a reconstruction is very unlikely.

ON the subject of "coal-eaters," the squadron going to Bristol contains representative vessels with powers that way. It was generally reported as the reason why they did not participate in the summer cruise of the reserve squadron, and apparently with truth. From time to time reports have been circulated about their engines giving out, but these have not been correct; the ships have generally managed to do their speeds very well, which, seeing they are by no means new vessels, and that they have the disadvantage of low freeboards, says much for them. But they steer only indifferently well, burn much more coal than our more modern Majestics and Royal Sovereigns, and have been unlucky in suffering from more than their share of minor mishaps when in active commission in the Mediterranean. Their turrets, too, have at times caused dissatisfaction in working, those of the Trafalgar being popularly supposed to have sunk some three-quarters of an inch. Altogether, though looked upon by many naval men as still the finest fighting-ship type in the service, they are rather in disrepute otherwise. Both were built in the Royal Dockyards.

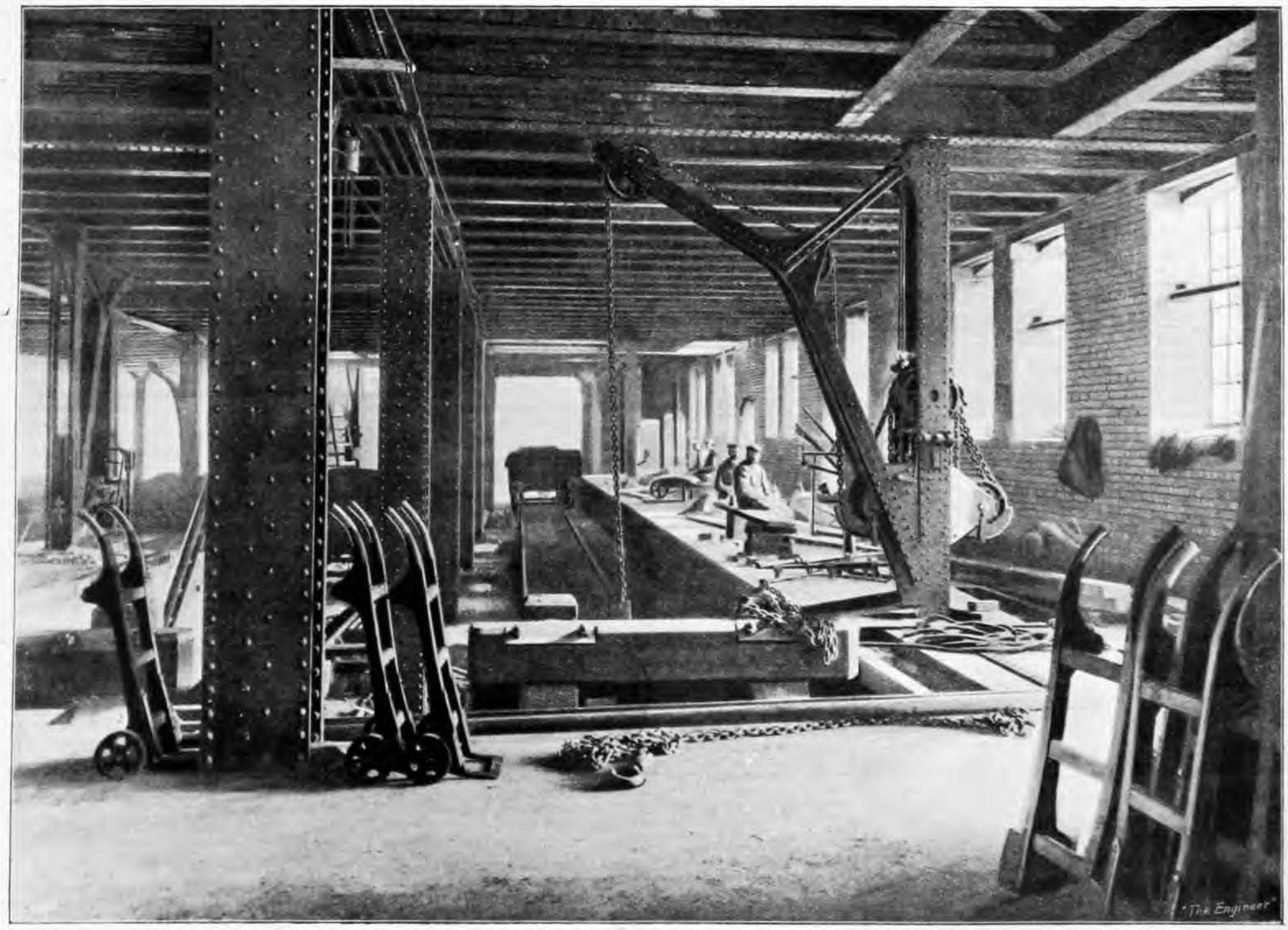
THE Victoria disaster, and the debatable value of the 110-ton gun, are responsible for such dissatisfaction as there is with the Sanspareil. Her unarmoured 6in. battery is also not liked. The Thunderer, being but a small second-class vessel, cannot quarrel with her *rôle* of port guardship. The

NEW GOODS STATION, GREAT NORTHERN RAILWAY, MANCHESTER

MR W. T. FOXLEE, M. INST. C.E., ENGINEER

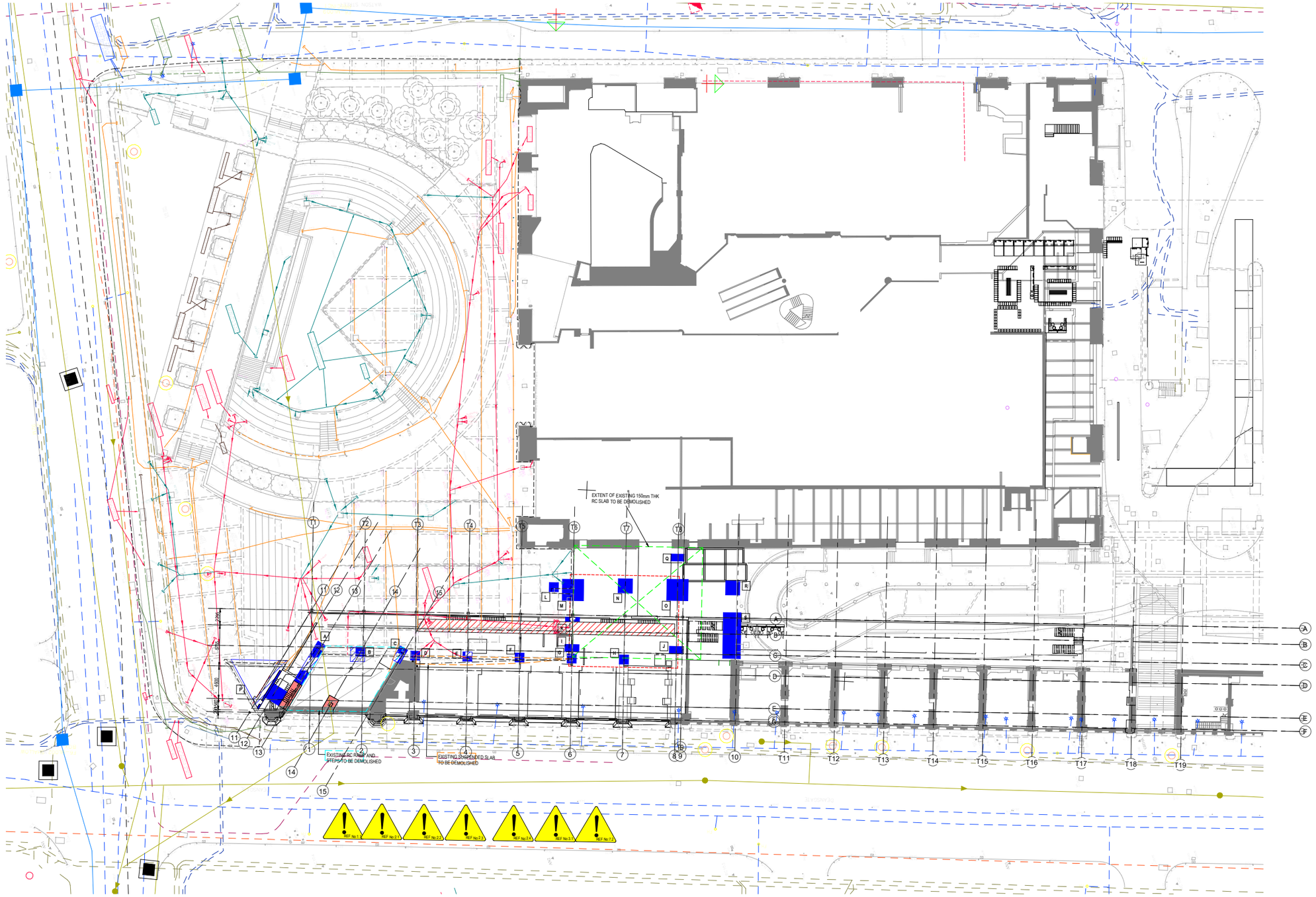


WESTERN INCLINED PLANE TO LOW-LEVEL YARD



NTERIOR OF HIGH-LEVEL SHOWING ARRANGEMENT OF PLATFORM

Appendix B Structural General Arrangements



SITE CONSTRAINTS PLAN

SCALE: 1 : 200

GENERAL NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
4. FOR GENERAL NOTES REFER TO DRAWING.

NOTE
- EXISTING STRUCTURE HAS BEEN INTERPRETED FROM ARUP ARCHIVE DRAWINGS FOR THE 1990's MODIFICATIONS/REFURB WORK. ALL SET OUT AND SIZE OF EXISTING STRUCTURE IS TO BE CONFIMED ON SITE.
- EXISTING SERVICES TAKEN FROM SEP SURVEY DRAWING 512020.
- ALL SERVICES TO BE CONFIRMED ON SITE.

KEY

- EXISTING REINFORCED CONCRETE PAD FOUNDATIONS TO BE BROKEN DOWN AS REQUIRED TO FORM NEW GROUND FLOOR/EXTERNAL WORKS.
- EXISTING REINFORCED CONCRETE PAD FOUNDATIONS TO BE REMOVED TO FACILITATE NEW CONSTRUCTION
- INDICATES LOCATION OF ORIGINAL FOUNDATIONS WHICH SUPPORTED WAGON RAMP COLUMNS. FOUNDATION TYPE AND DETAILS UNKNOWN. FURTHER INVESTIGATIONS REQUIRED TO DETERMINE IMPACT ON PROPOSED FOUNDATION LAYOUT.
- DENOTES CURTINS C&S RESPONSIBILITY BOUNDARY.
- DENOTES EXISTING STRUCTURE TO BE RETAINED.
- DENOTES EXISTING RC FOUNDATIONS TO BE RETAINED.

SEP DRAWING S12020 LEGEND

LEGEND

FROM STATUTORY AUTHORITY PLANS

RESIDUAL HAZARD REGISTER (RELATES TO CIVIL/STRUCTURAL MATTERS ONLY) MUST BE READ IN CONJUNCTION WITH CURTINS RESIDUAL REGISTER 064582-CTN-00-XX-HA-x-10001. HAZARDS THAT SHOULD BE OBVIOUS TO A COMPETENT CONTRACTOR HAVE NOT BEEN INDICATED ON THIS DRAWING. SHOULD ADDITIONAL HAZARDS BE IDENTIFIED, THE CONTRACTOR SHOULD NOTIFY ALL RELEVANT PROJECT TEAM MEMBERS.

HAZARD REF No.	ITEM (FEATURE, ELEMENT OR ACTIVITY)	RESIDUAL HAZARD
REF No.2.2	CONSTRUCTION - DEMOLITION AND NEW WORKS NEAR TO LIVE FOOTWAYS AND OCCUPIED BUILDING	ATTENTION IS DRAWN TO THE CLOSE PROXIMITY OF LIVE FOOTWAYS, ADJACENT LIVE PUBLIC SPACE AND OCCUPIED BUILDINGS. CONTRACTOR MUST ERECT APPROPRIATE BARRIERS AND HOARDINGS. CONTRACTOR TO AGREE WORKING HOURS AND METHOD STATEMENTS TO PROTECT THE PUBLIC AGAINST INTERACTION WITH THE WORKS.
REF No.2.1	VIBRATION DURING CONSTRUCTION/PILING WORKS	RISK OF DAMAGE TO EXISTING STRUCTURES DUE TO VIBRATIONS FROM PILING OR THE GENERAL CONSTRUCTION WORKS METHODOLOGIES SHOULD CONSIDER GROUND VIBRATIONS AND THEIR EFFECTS ON ADJACENT STRUCTURES.
REF No.2.2	CONSTRUCTION - EXISTING BELOW GROUND OBSTRUCTION	THERE ARE A NUMBER OF CONSTRAINTS WHICH POSE A RISK TO THE EXCAVATIONS, PILING AND CONSTRUCTION WORKS INCLUDING (i.e. UXO, ARCHEOLOGICAL RISKS, EXISTING FOUNDATIONS AND SERVICES). REFERENCE SHOULD BE MADE TO THE UXO RISK ASSESSMENT REPORT BY "1st LINE OF DEFENSE' ALONG WITH CURTINS CONSTRAINTS DRAWING - 064582-CUR-01-ZZ-DR-S-20010.

HAZARD REF No.	ITEM (FEATURE, ELEMENT OR ACTIVITY)	RESIDUAL HAZARD
REF No.1.1	GROUND CONTAMINATION	POTENTIAL RISK TO HANDLING CONTAMINATED SUBSTANCES AND ACMs. REFERENCE SHOULD BE MADE TO CURTINS PHASE 2 SITE INVESTIGATION REPORT - 608997-CUR-00-XX-RP-001-V02.
REF No.2.4	CONSTRUCTION - UNMAPPED SERVICES	POTENTIAL FOR UNMAPPED SERVICES, OBSTRUCTIONS AND HISTORIC STRUCTURES NOT SHOWN ON THIS DRAWING. ALL DEMOLITION, EXCAVATION AND ENABLING WORKS MUST CONSIDER THIS CAREFULLY. ALL UNDERGROUND SERVICES MUST BE IDENTIFIED AND LOCATED BY THE MAIN CONTRACTOR PRIOR TO DEMOLITION.
REF No.3.1	CONSTRUCTION - EXCAVATIONS AND FOUNDATIONS	EXCAVATIONS CLOSE TO EXISTING FOUNDATIONS AND STRUCTURAL ELEMENTS MUST CONSIDER THE RISK OF INSTABILITY. NO EXCAVATION IS TO UNDERMINE THE EXISTING FOUNDATIONS. THE MAIN CONTRACTOR TO SUBMIT A DETAILED AND ROBUST METHODOLOGY OUTLINING HOW TEMPORARY INSTABILITY OF STRUCTURAL COMPONENTS IS TO BE MANAGED.
REF No.7.1	CRANE SUB-BASE	ANY PROPOSED PLANT TRACKING LINES AND MOBILE CRANE LOCATION MUST BE REVIEWED BY THE CONTRACTORS TEMPORARY WORKS TEAM FOR INSTABILITY OF THE FOUNDING STRATA AND OR NEW/EXISTING STRUCTURE. CARE MUST BE TAKEN NOT TO SURCHARGE EXISTING STRUCTURES IN THE VICINITY AND A SUITABLE CORDON MUST BE MAINTAINED. THE METHODOLOGY MUST BE SUBMITTED FOR REVIEW BY SE.

EXISTING FOUNDATION LEGEND			
TYPE	DIMENSIONS	TOP OF CONCRETE	FORMATION LEVEL
A	**x1.2x0.5m	34.400m TBC	TBC
B	2.0x2.0x1.2m	35.200m	32.000m
C	2.225x1.2x1.2m	35.400m TBC	32.000m TBC
D	1.3x1.3x**m	35.400m	32.000m
E	1.3x1.3x**m	35.400m	32.000m
F	1.3x1.3x**m	35.400m	32.000m
G	1.3x1.3x**m	35.400m	32.000m
H	1.3x1.3x**m	35.400m	32.000m
I	2.0x1.0x0.60m	35.400m	34.000m
J	2.0x1.0x0.60m	35.400m	32.000m
K	2.0x1.0x0.60m	35.400m	34.000m
L	1.3x1.3x0.45m	35.400m	34.000m
M	3.0x3.0x0.75m	35.400m	34.000m
N	2.0x2.0x0.60m	35.400m	34.000m
O	3.0x3.0x0.75m	35.400m	34.000m
P	6.7x6.7x**m	29.600m	29.300m
Q	2.0x1.0x0.60m	35.400m	34.000m
R	**x**x**m	35.400m	34.000m
S	**x**x**m	35.400m	32.000m
DEPTH AND LEVELS TO EXISTING FOUNDATIONS TO BE CONFIRMED ON SITE DURING THE OPENING UP WORKS			
FOUNDATIONS SIZES AND CONSTRUCTION TO BE CONFIRMED ON SITE DURING THE OPENING UP WORKS			

Rev.	Description:	Date:	By:	Chkd:
P01	STAGE 2 ISSUE	31/08/22	AC	DB

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GREAT NORTHERN WAREHOUSE

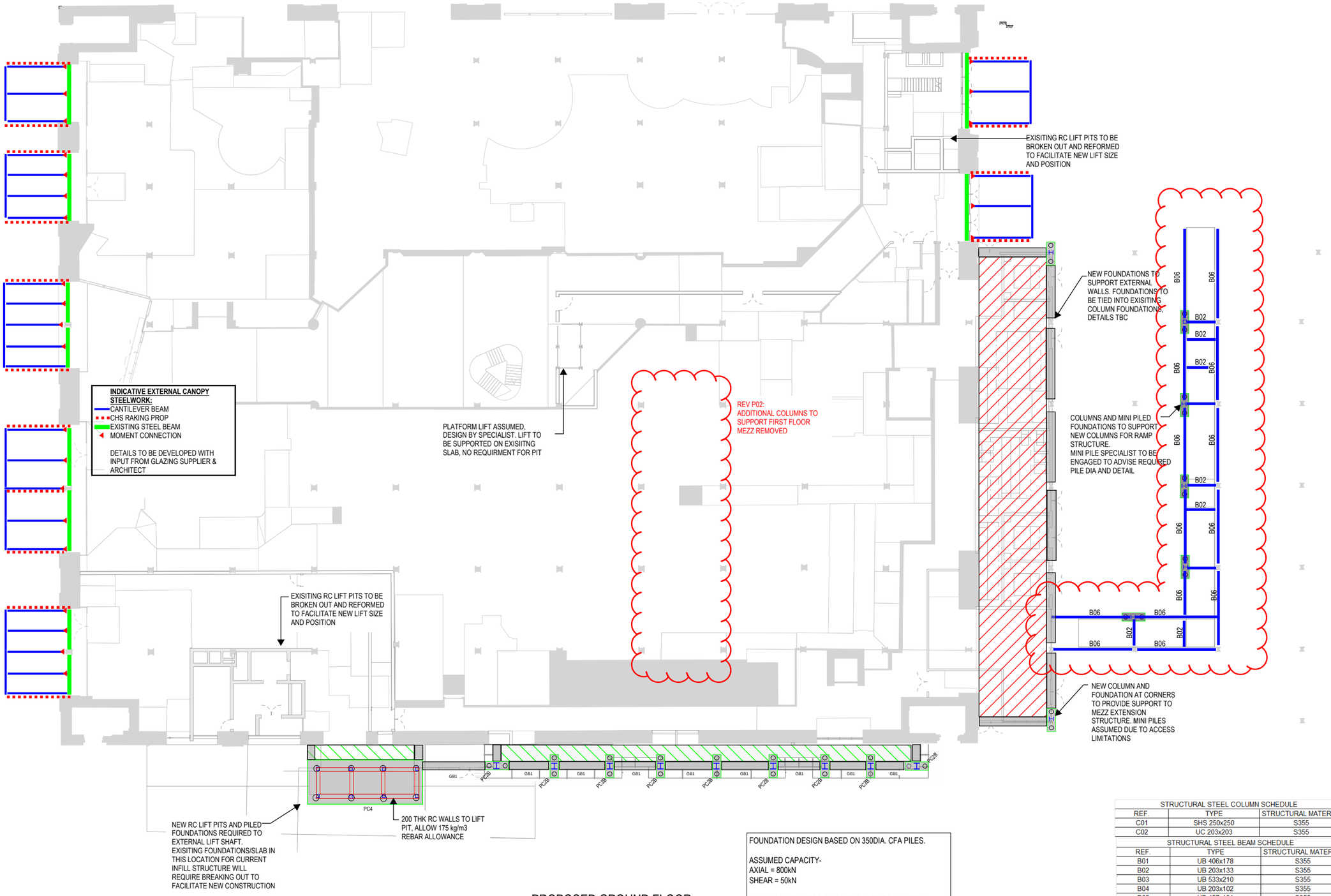
Drg Title:

SITE CONSTRAINTS PLAN

Size:	Date:	Drawn By:	Designed By:	Checked By:
A0	AUG 22	AC	DB	DB

Scale: As indicated

Project No:	Originator:	Zone:	Level:	Type:	Discipline:	Category / Number:	Rev:
064582 -	CUR -	Z0 -	XX -	DR -	S -	20700 -	P01



PROPOSED GROUND FLOOR

SCALE: 1 : 175

FOUNDATION DESIGN BASED ON 350DIA. CFA PILES.

ASSUMED CAPACITY-
AXIAL = 800kN
SHEAR = 50kN

PILING CONTRACTOR TO BE ENGAGED TO CONFIRM CAPACITIES.

PILE CAP SCHEDULE		
REF.	DIMENSIONS	REBAR ALLOWANCE
PC2B	1700x650x1000DP	200Kg/m3
PC4	1000DP	200Kg/m3

STRUCTURAL STEEL COLUMN SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
C01	SHS 250x250	S355
C02	UC 203x203	S355

STRUCTURAL STEEL BEAM SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
B01	UB 406x178	S355
B02	UB 203x133	S355
B03	UB 533x210	S355
B04	UB 203x102	S355
B05	UB 457x191	S355
B06	UB 356x171	S355
B07	UB 305x165	S355
B08	SHS 200X200	S355
B09	RHS 200x100	S355
B10	UB 610x229	S355

GROUND BEAM SCHEDULE		
REF.	DIMENSIONS	REBAR ALLOWANCE
GB1	600x600DP	200Kg/m

GENERAL NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
4. FOR GENERAL NOTES REFER TO DRAWING.

CONTRACTOR TO MAKE ALLOWANCES FOR:

1. PRECLUSION OF WATER DURING CONSTRUCTION.
2. TEMPORARY EARTHWORKS & EXCAVATION SUPPORT.
3. TEMPORARY SUPPORT & STABILITY OF ALL EXISTING ELEMENTS DURING DEMOLITION & REMEDIAL WORKS.
4. VERIFICATION OF LOCATIONS OF ALL BELOW GROUND SERVICES & OBSTRUCTIONS PRIOR TO UNDERTAKING OF ANY WORKS.
5. REMOVAL OF ALL OBSTRUCTIONS PRIOR TO PILING WORKS.
6. SURVEYING OF ALL NEW TO EXISTING INTERFACES TO VERIFY HISTORIC RECORDS WHICH HAVE FORMED THE BASIS OF DESIGN.
7. TESTING & VERIFICATION OF ANY EXISTING ELEMENTS AS REQUIRED BY THE STRUCTURAL ENGINEER.
8. END PLATED CONNECTIONS TO ALL BEAMS

STAGE 2 W.I.P. NOTES:

- STRUCTURAL PHILOSOPHY ONLY.
- STRUCTURAL ELEMENTS SUBJECT TO DESIGN DEVELOPMENT.
- PERIMETER DETAIL SUBJECT TO CONFIRMATION OF CLADDING PERFORMANCE CRITERIA

WAREHOUSE STRUCTURAL PHILOSOPHY:

- EXISITING PRIMARY AND SECONDARY BEAMS RESTRAINING COLUMNS TO BE RETAINED
- ALL NEW STEEL TO BE GRADE S355
- CONNECTIONS TO EXISITING STEEL TBC SUBJECT DESIGN DEVELOPMENT FURTHER TO SURVEYS TO CONFIRM EXISITING STEEL COMPOSITION
- ALLOW FOR TIE RODS ADJACENT TO LARGE OPENINGS AT 2m CENTRES

LEGEND

- INDICATES LOCATION OF VERTICAL BRACING
- INDICATES PROPOSED 200 THK GROUND BEARING REINFORCED CONCRETE SLAB GRADE RC32/40 WITH 2 LAYERS A393 MESH 1 TOP, 1 BTM.
- INDICATES PROPOSED 175 THK GROUND BEARING REINFORCED CONCRETE SLAB GRADE RC32/40 WITH 2 LAYERS A252 MESH 1 TOP, 1 BTM.

THIS DRAWING IS BASED ON INFORMATION RECEIVED 12.08.22

Rev:	Description:	Date:	By:	Chkd:
P02	CANOPY STEELWORK ADDED AND REVISED AS CLOUDED	18.11.22	KC	DB
P01	ISSUED FOR STAGE 2	31.08.22	KC	DB

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Status: STAGE 2 ISSUE

Project: GREAT NORTHERN WAREHOUSE

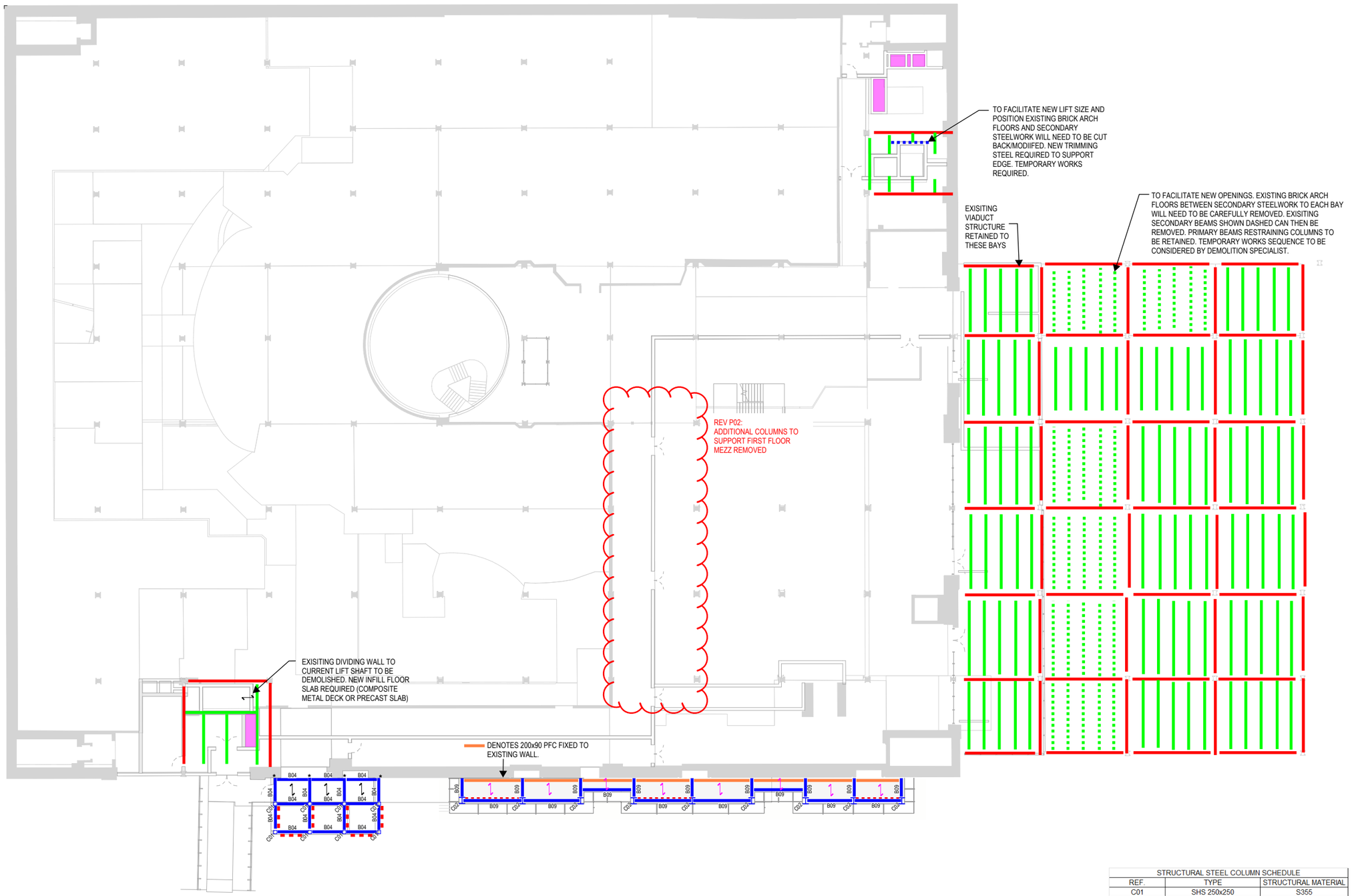
Drg Title: WAREHOUSE GROUND FLOOR STRUCTURAL INTERVENTION GA

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	31/08/22	KC	DB	DB

Scale: As indicated

Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
064582 -	CUR -	Z2 -	00 -	DR -	S -	20100 -	P02

Model Name:XXXXXX-CUR-ZZ-XX-M3-S-00001



PROPOSED FIRST FLOOR

SCALE: 1 : 175

GENERAL NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
4. FOR GENERAL NOTES REFER TO DRAWING.

CONTRACTOR TO MAKE ALLOWANCES FOR:

1. PRECLUSION OF WATER DURING CONSTRUCTION.
2. TEMPORARY EARTHWORKS & EXCAVATION SUPPORT.
3. TEMPORARY SUPPORT & STABILITY OF ALL EXISTING ELEMENTS DURING DEMOLITION & REMEDIAL WORKS.
4. VERIFICATION OF LOCATIONS OF ALL BELOW GROUND SERVICES & OBSTRUCTIONS PRIOR TO UNDERTAKING OF ANY WORKS.
5. REMOVAL OF ALL OBSTRUCTIONS PRIOR TO PILING WORKS.
6. SURVEYING OF ALL NEW TO EXISTING INTERFACES TO VERIFY HISTORIC RECORDS WHICH HAVE FORMED THE BASIS OF DESIGN.
7. TESTING & VERIFICATION OF ANY EXISTING ELEMENTS AS REQUIRED BY THE STRUCTURAL ENGINEER.
8. END PLATED CONNECTIONS TO ALL BEAMS

STAGE 2 W.I.P. NOTES:

- STRUCTURAL PHILOSOPHY ONLY.
- STRUCTURAL ELEMENTS SUBJECT TO DESIGN DEVELOPMENT.
- PERIMETER DETAIL SUBJECT TO CONFIRMATION OF CLADDING PERFORMANCE CRITERIA

WAREHOUSE STRUCTURAL PHILOSOPHY:

- EXISITING PRIMARY AND SECONDARY BEAMS RESTRAINING COLUMNS TO BE RETAINED
- ALL NEW STEEL TO BE GRADE S355
- CONNECTIONS TO EXISITING STEEL TBC SUBJECT DESIGN DEVELOPMENT FURTHER TO SURVEYS TO CONFIRM EXISITING STEEL COMPOSITION
- ALLOW FOR TIE RODS ADJACENT TO LARGE OPENINGS AT 2m CENTRES

LEGEND

- INDICATES EXISTING PRIMARY STEEL BEAMS
- INDICATES EXISTING SECONDARY STEEL BEAMS
- INDICATES NEW STEEL BEAMS
- INDICATES NEW STEEL BEAMS TRIMMING EXISTING STRUCTURE
- INDICATES VERTICAL BRACING
- INDICATES VOID IN EXISTING FLOOR
- INDICATES NEW VOID FOR RISER. BRICK ARCH TO BE LOCALLY REMOVED WITH EXISITING STEELWORK RETAINED
- INDICATES SPAN OF 160mm THK SMD CONCRETE COMPOSITE FLOOR
- INDICATES SPAN OF LIGHTWEIGHT ROOF DECK

* DENOTES SUPPORTS VIA CONNECTION INTO EXISTING MASONRY. DETAIL TO BE DEVELOPED.

THIS DRAWING IS BASED ON INFORMATION RECEIVED 12.08.22

STRUCTURAL STEEL COLUMN SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
C01	SHS 250x250	S355
C02	UC 203x203	S355

STRUCTURAL STEEL BEAM SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
B01	UB 406x178	S355
B02	UB 203x133	S355
B03	UB 533x210	S355
B04	UB 203x102	S355
B05	UB 457x191	S355
B06	UB 356x171	S355
B07	UB 305x165	S355
B08	SHS 200X200	S355
B09	RHS 200x100	S355
B10	UB 610x229	S355

Rev:	Description:	Date:	By:	Chkd:
P02	VIADUCT OPENINGS REDUCED AND REVISED AS CLOUDED	18.11.22	KC	DB
P01	ISSUED FOR STAGE 2	31.08.22	KC	DB

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Status: STAGE 2 ISSUE

Project: GREAT NORTHERN WAREHOUSE

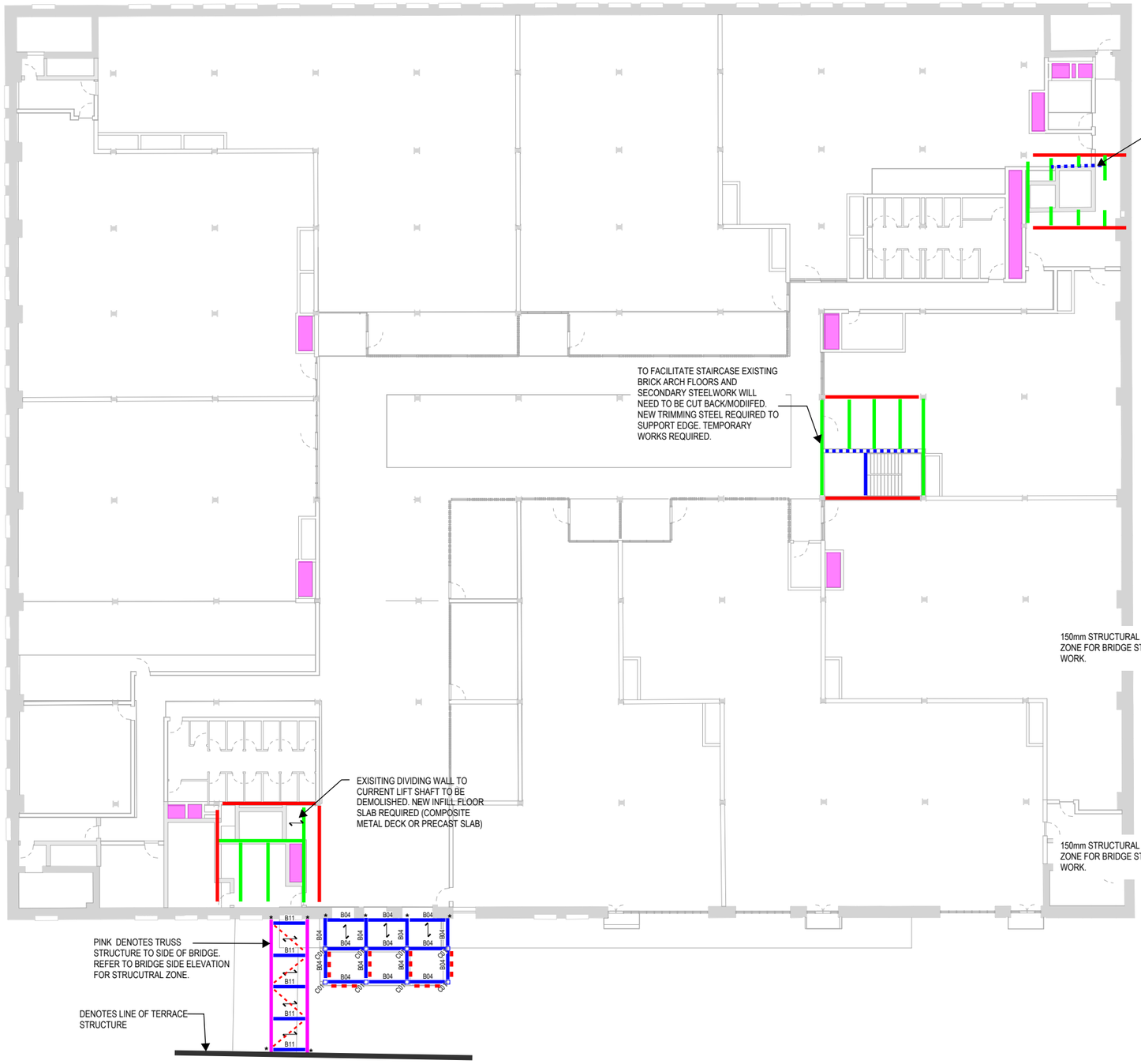
Drg Title: WAREHOUSE FIRST FLOOR STRUCTURAL INTERVENTION GA

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	31/08/22	KC	DB	DB

Scale: As indicated

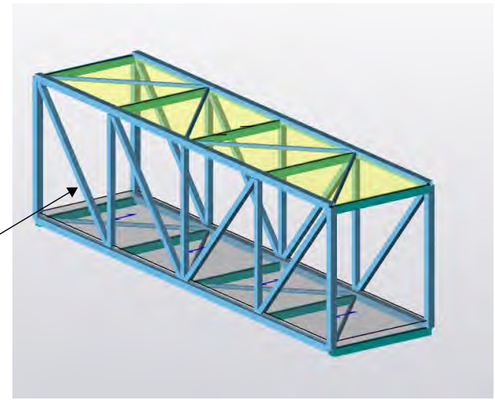
Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
064582 -	CUR -	Z2 -	01 -	DR -	S -	20102 -	P02

Model Name:XXXXXX-CUR-ZZ-XX-M3-S-00001

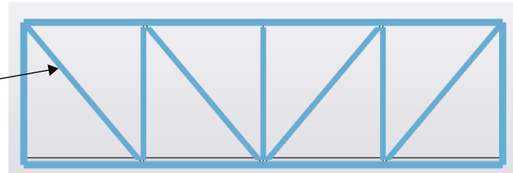


PROPOSED SECOND FLOOR

SCALE: 1 : 175



BRIDGE STRUCTURE - 3D VIEW



BRIDGE STRUCTURE - SIDE ELEVATION

STRUCTURAL STEEL COLUMN SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
C01	SHS 250x250	S355
C02	UC 203x203	S355
STRUCTURAL STEEL BEAM SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
B01	UB 406x178	S355
B02	UB 203x133	S355
B03	UB 533x210	S355
B04	UB 203x102	S355
B05	UB 457x191	S355
B06	UB 356x171	S355
B07	UB 305x165	S355
B08	SHS 200X200	S355
B09	RHS 200x100	S355
B10	UB 610x229	S355

GENERAL NOTES:

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2. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
4. FOR GENERAL NOTES REFER TO DRAWING.

CONTRACTOR TO MAKE ALLOWANCES FOR:

1. PRECLUSION OF WATER DURING CONSTRUCTION.
2. TEMPORARY EARTHWORKS & EXCAVATION SUPPORT.
3. TEMPORARY SUPPORT & STABILITY OF ALL EXISTING ELEMENTS DURING DEMOLITION & REMEDIAL WORKS.
4. VERIFICATION OF LOCATIONS OF ALL BELOW GROUND SERVICES & OBSTRUCTIONS PRIOR TO UNDERTAKING OF ANY WORKS.
5. REMOVAL OF ALL OBSTRUCTIONS PRIOR TO PILING WORKS.
6. SURVEYING OF ALL NEW TO EXISTING INTERFACES TO VERIFY HISTORIC RECORDS WHICH HAVE FORMED THE BASIS OF DESIGN.
7. TESTING & VERIFICATION OF ANY EXISTING ELEMENTS AS REQUIRED BY THE STRUCTURAL ENGINEER.
8. END PLATED CONNECTIONS TO ALL BEAMS

STAGE 2 W.I.P. NOTES:

- STRUCTURAL PHILOSOPHY ONLY.
- STRUCTURAL ELEMENTS SUBJECT TO DESIGN DEVELOPMENT.
- PERIMETER DETAIL SUBJECT TO CONFIRMATION OF CLADDING PERFORMANCE CRITERIA

WAREHOUSE STRUCTURAL PHILOSOPHY:

- EXISITING PRIMARY AND SECONDARY BEAMS RESTRAINING COLUMNS TO BE RETAINED
- ALL NEW STEEL TO BE GRADE S355
- CONNECTIONS TO EXISITING STEEL TBC SUBJECT DESIGN DEVELOPMENT FURTHER TO SURVEYS TO CONFIRM EXISITING STEEL COMPOSITION
- ALLOW FOR TIE RODS ADJACENT TO LARGE OPENINGS AT 2m CENTRES

LEGEND

- INDICATES EXISTING PRIMARY STEEL BEAMS
- INDICATES EXISTING SECONDARY STEEL BEAMS
- INDICATES NEW STEEL BEAMS
- INDICATES NEW STEEL BEAMS TRIMMING EXISTING STRUCTURE
- INDICATES VERTICAL/HORIZONTAL BRACING
- INDICATES VOID IN EXISTING FLOOR
- INDICATES NEW VOID FOR RISER. BRICK ARCH TO BE LOCALLY REMOVED WITH EXISITING STEELWORK RETAINED
- INDICATES SPAN OF 160mm THK SMD CONCRETE COMPOSITE FLOOR

* DENOTES SUPPORTS VIA CONNECTION INTO EXISTING MASONRY. DETAIL TO BE DEVELOPED.

THIS DRAWING IS BASED ON INFORMATION RECEIVED 12.08.22

Rev:	Description:	Date:	By:	Chkd:
P02	BRIDGE STRUCTURE ADDED	18.11.22	KC	DB
P01	ISSUED FOR STAGE 2	31.08.22	KC	DB

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Status: STAGE 2 ISSUE

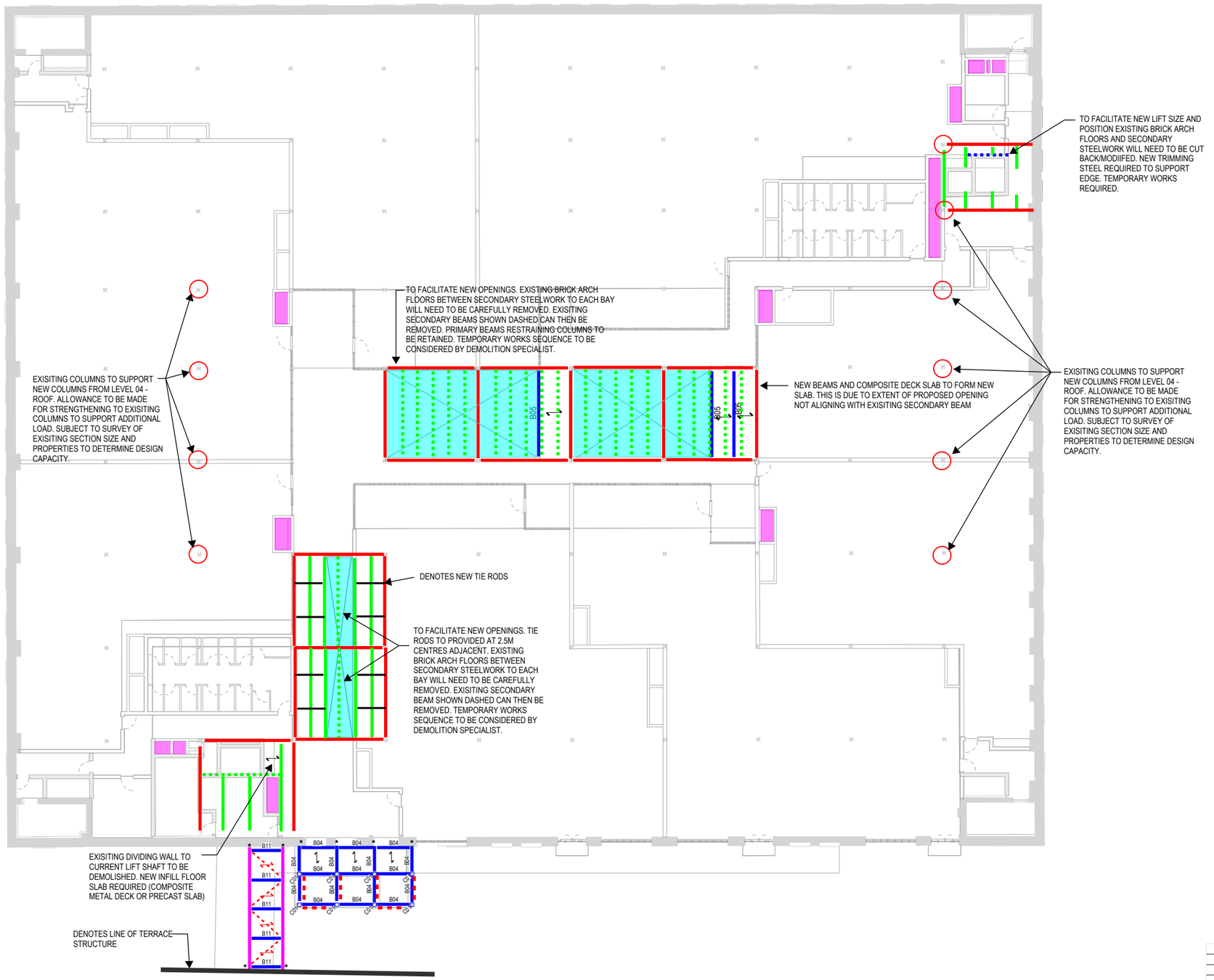
Project: GREAT NORTHERN WAREHOUSE

Drg Title: WAREHOUSE SECOND FLOOR STRUCTURAL INTERVENTION GA

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	31/08/22	KC	DB	DB
Scale: As indicated				

Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
064582 -	CUR -	Z2 -	02 -	DR -	S -	20104 -	P02

Model Name:XXX:XXX-CUR-ZZ-XX-M3-S-00001



PROPOSED THIRD FLOOR

SCALE: 1 : 175

GENERAL NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
4. FOR GENERAL NOTES REFER TO DRAWING.

CONTRACTOR TO MAKE ALLOWANCES FOR:

1. PRECLUSION OF WATER DURING CONSTRUCTION.
2. TEMPORARY EARTHWORKS & EXCAVATION SUPPORT.
3. TEMPORARY SUPPORT & STABILITY OF ALL EXISTING ELEMENTS DURING DEMOLITION & REMEDIAL WORKS.
4. VERIFICATION OF LOCATIONS OF ALL BELOW GROUND SERVICES & OBSTRUCTIONS PRIOR TO UNDERTAKING OF ANY WORKS.
5. REMOVAL OF ALL OBSTRUCTIONS PRIOR TO PILING WORKS.
6. SURVEYING OF ALL NEW TO EXISTING INTERFACES TO VERIFY HISTORIC RECORDS WHICH HAVE FORMED THE BASIS OF DESIGN.
7. TESTING & VERIFICATION OF ANY EXISTING ELEMENTS AS REQUIRED BY THE STRUCTURAL ENGINEER.
8. END PLATED CONNECTIONS TO ALL BEAMS

STAGE 2 W.I.P. NOTES:

- STRUCTURAL PHILOSOPHY ONLY.
- STRUCTURAL ELEMENTS SUBJECT TO DESIGN DEVELOPMENT.
- PERIMETER DETAIL SUBJECT TO CONFIRMATION OF CLADDING PERFORMANCE CRITERIA

WAREHOUSE STRUCTURAL PHILOSOPHY:

- EXISITING PRIMARY AND SECONDARY BEAMS RESTRAINING COLUMNS TO BE RETAINED
- ALL NEW STEEL TO BE GRADE S355
- CONNECTIONS TO EXISITING STEEL TBC SUBJECT DESIGN DEVELOPMENT FURTHER TO SURVEYS TO CONFIRM EXISITING STEEL COMPOSITION
- ALLOW FOR TIE RODS ADJACENT TO LARGE OPENINGS AT 2m CENTRES

LEGEND

- INDICATES EXISTING PRIMARY STEEL BEAMS
- INDICATES EXISTING SECONDARY STEEL BEAMS
- INDICATES EXISTING SECONDARY STEEL BEAMS TO BE REMOVED
- INDICATES NEW STEEL BEAMS
- INDICATES NEW STEEL BEAMS TRIMMING EXISTING STRUCTURE
- INDICATES VERTICAL BRACING
- INDICATES NEW VOID IN EXISTING FLOOR
- INDICATES NEW VOID FOR RISER. BRICK ARCH TO BE LOCALLY REMOVED WITH EXISITING STEELWORK RETAINED
- INDICATES SPAN OF 160mm THK SMD CONCRETE COMPOSITE FLOOR
- INDICATES SPAN OF LIGTH WEIGHT ROOF DECK

THIS DRAWING IS BASED ON INFORMATION RECEIVED 12.08.22

* DENOTES SUPPORTS VIA CONNECTION INTO EXISTING MASONRY. DETAIL TO BE DEVELOPED.

Rev:	Description:	Date:	By:	Chkd:
P02	BRIDE STRUCTURE ADDED	18.11.22	KC	DB
P01	ISSUED FOR STAGE 2	31.08.22	KC	DB

STRUCTURAL STEEL COLUMN SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
C01	SHS 250x250	S355
C02	UC 203x203	S355

STRUCTURAL STEEL BEAM SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
B01	UB 406x178	S355
B02	UB 203x133	S355
B03	UB 533x210	S355
B04	UB 203x102	S355
B05	UB 457x191	S355
B06	UB 356x171	S355
B07	UB 305x165	S355
B08	SHS 200X200	S355
B09	RHS 200x100	S355
B10	UB 610x229	S355

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Status: STAGE 2 ISSUE

Project: GREAT NORTHERN WAREHOUSE

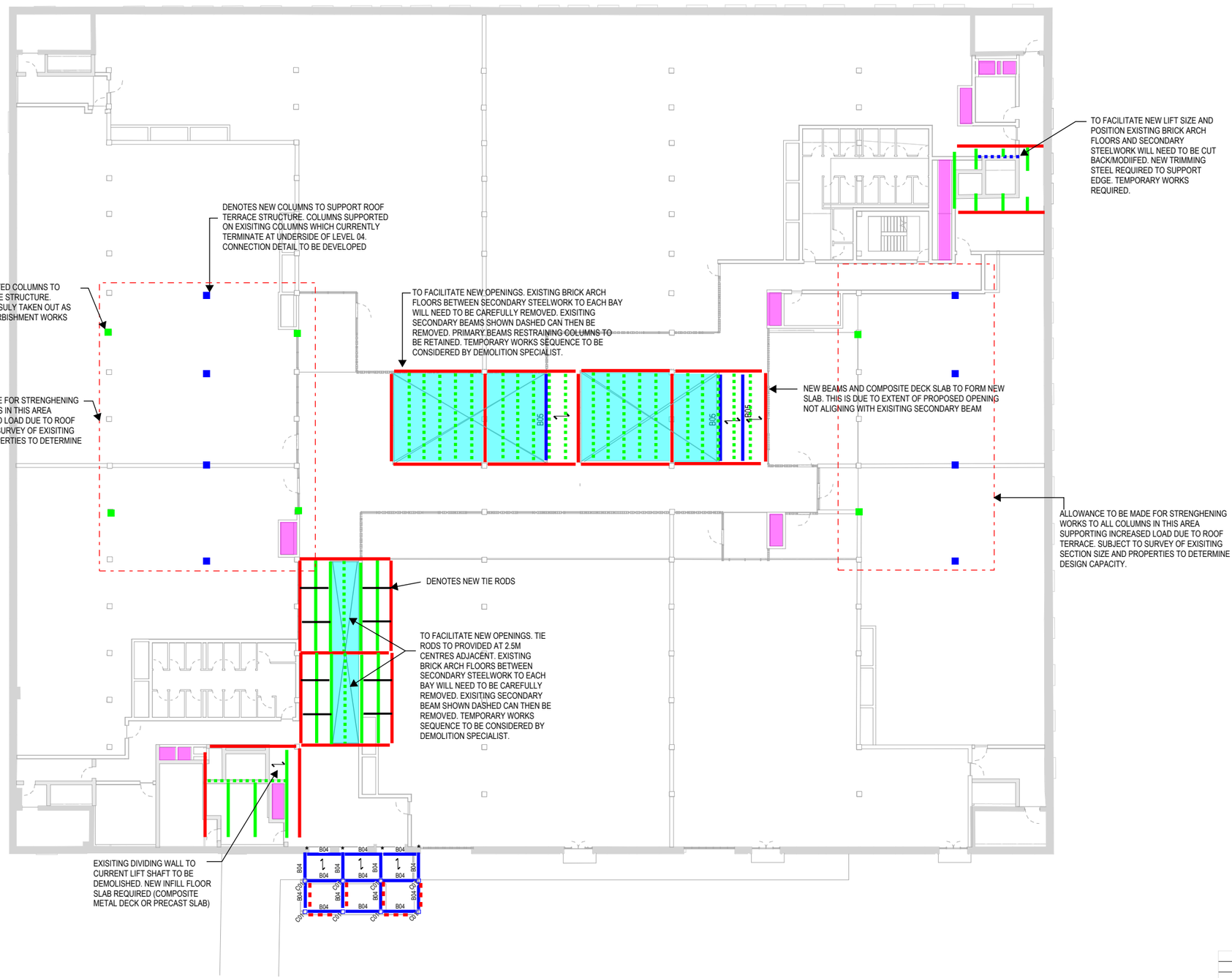
Drg Title: WAREHOUSE THIRD FLOOR STRUCTURAL INTERVENTION GA

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	31/08/22	KC	DB	DB

Scale: As indicated

Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
064582	CUR	Z2	03	DR	S	20105	P02

Model Name:XXXXXX-CUR-ZZ-XX-M3-S-00001



PROPOSED FOURTH FLOOR

SCALE: 1 : 175

STRUCTURAL STEEL COLUMN SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
C01	SHS 250x250	S355
C02	UC 203x203	S355

STRUCTURAL STEEL BEAM SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
B01	UB 406x178	S355
B02	UB 203x133	S355
B03	UB 533x210	S355
B04	UB 203x102	S355
B05	UB 457x191	S355
B06	UB 356x171	S355
B07	UB 305x165	S355
B08	SHS 200X200	S355
B09	RHS 200x100	S355
B10	UB 610x229	S355

GENERAL NOTES:

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3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
4. FOR GENERAL NOTES REFER TO DRAWING.

CONTRACTOR TO MAKE ALLOWANCES FOR:

1. PRECLUSION OF WATER DURING CONSTRUCTION.
2. TEMPORARY EARTHWORKS & EXCAVATION SUPPORT.
3. TEMPORARY SUPPORT & STABILITY OF ALL EXISTING ELEMENTS DURING DEMOLITION & REMEDIAL WORKS.
4. VERIFICATION OF LOCATIONS OF ALL BELOW GROUND SERVICES & OBSTRUCTIONS PRIOR TO UNDERTAKING OF ANY WORKS.
5. REMOVAL OF ALL OBSTRUCTIONS PRIOR TO PILING WORKS.
6. SURVEYING OF ALL NEW TO EXISTING INTERFACES TO VERIFY HISTORIC RECORDS WHICH HAVE FORMED THE BASIS OF DESIGN.
7. TESTING & VERIFICATION OF ANY EXISTING ELEMENTS AS REQUIRED BY THE STRUCTURAL ENGINEER.
8. END PLATED CONNECTIONS TO ALL BEAMS

STAGE 2 W.I.P. NOTES:

- STRUCTURAL PHILOSOPHY ONLY.
- STRUCTURAL ELEMENTS SUBJECT TO DESIGN DEVELOPMENT.
- PERIMETER DETAIL SUBJECT TO CONFIRMATION OF CLADDING PERFORMANCE CRITERIA

WAREHOUSE STRUCTURAL PHILOSOPHY:

- EXISITING PRIMARY AND SECONDARY BEAMS RESTRAINING COLUMNS TO BE RETAINED
- ALL NEW STEEL TO BE GRADE S355
- CONNECTIONS TO EXISITING STEEL TBC SUBJECT DESIGN DEVELOPMENT FURTHER TO SURVEYS TO CONFIRM EXISITING STEEL COMPOSITION
- ALLOW FOR TIE RODS ADJACENT TO LARGE OPENINGS AT 2m CENTRES

LEGEND

- INDICATES EXISTING PRIMARY STEEL BEAMS
- INDICATES EXISTING SECONDARY STEEL BEAMS
- INDICATES EXISTING SECONDARY STEEL BEAMS TO BE REMOVED
- INDICATES NEW STEEL BEAMS
- INDICATES NEW STEEL BEAMS TRIMMING EXISTING STRUCTURE
- INDICATES VERTICAL BRACING
- INDICATES NEW VOID IN EXISTING FLOOR
- INDICATES NEW VOID FOR RISER. BRICK ARCH TO BE LOCALLY REMOVED WITH EXISITING STEELWORK RETAINED
- INDICATES SPAN OF 160mm THK SMD CONCRETE COMPOSITE FLOOR

* DENOTES SUPPORTS VIA CONNECTION INTO EXISTING MASONRY. DETAIL TO BE DEVELOPED.

THIS DRAWING IS BASED ON INFORMATION RECEIVED 12.08.22

Rev:	Description:	Date:	By:	Chkd:
P02	ADDITIONAL COLUMNS OMITTED TO SUIT ROOF UPDATES	18.11.22	KC	DB
P01	ISSUED FOR STAGE 2	31.08.22	KC	DB

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Status: STAGE 2 ISSUE

Project: GREAT NORTHERN WAREHOUSE

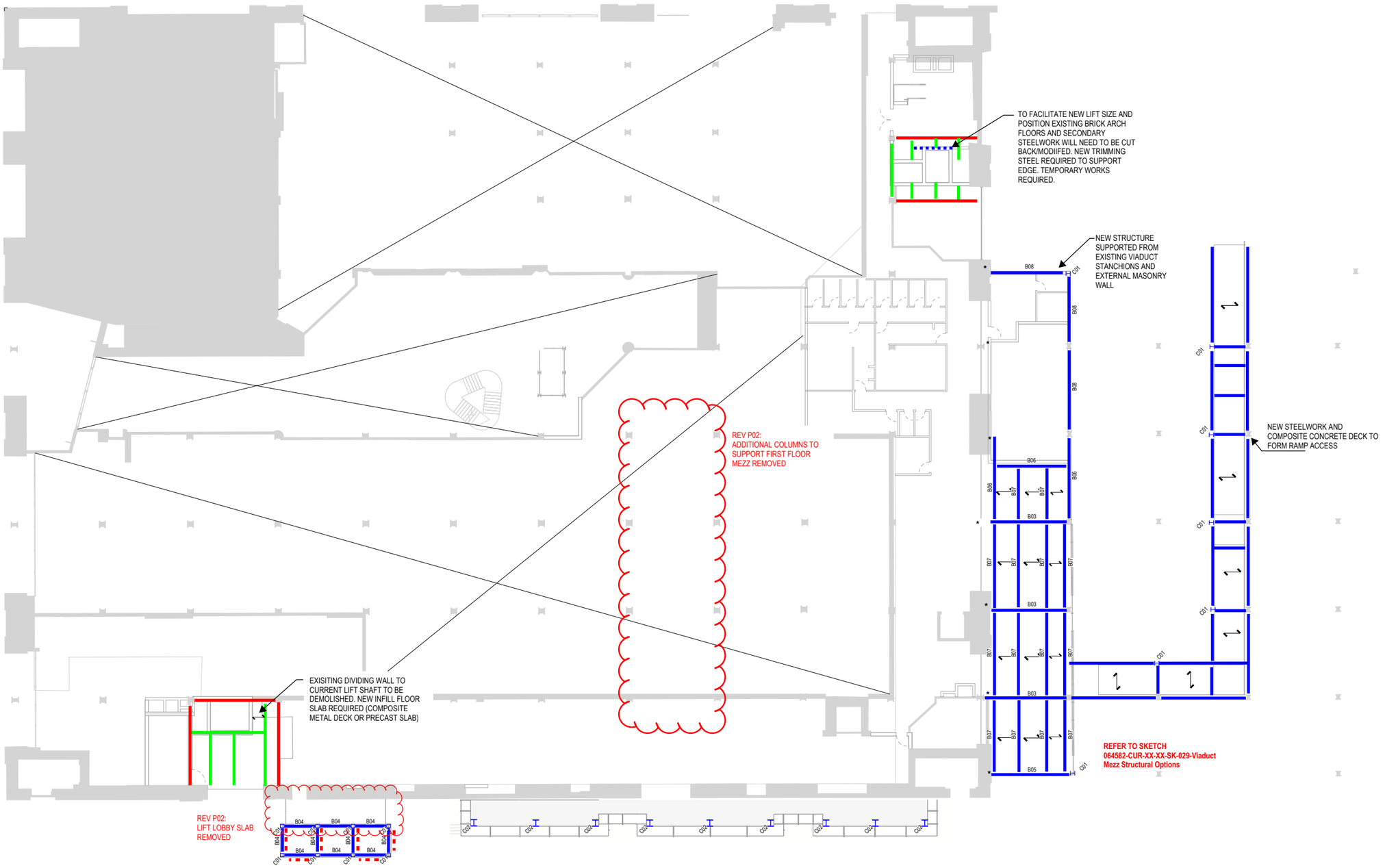
Drg Title: WAREHOUSE FOURTH FLOOR STRUCTURAL INTERVENTION GA

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	31/08/22	KC	DB	DB

Scale: As indicated

Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
064582 -	CUR -	Z2 -	04 -	DR -	S -	20106 -	P02

Model Name:XXXXX-CUR-ZZ-XX-M3-S-00001



PROPOSED GROUND FLOOR MEZZANINE

SCALE: 1 : 175

GENERAL NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
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CONTRACTOR TO MAKE ALLOWANCES FOR:

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2. TEMPORARY EARTHWORKS & EXCAVATION SUPPORT.
3. TEMPORARY SUPPORT & STABILITY OF ALL EXISTING ELEMENTS DURING DEMOLITION & REMEDIAL WORKS.
4. VERIFICATION OF LOCATIONS OF ALL BELOW GROUND SERVICES & OBSTRUCTIONS PRIOR TO UNDERTAKING OF ANY WORKS.
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6. SURVEYING OF ALL NEW TO EXISTING INTERFACES TO VERIFY HISTORIC RECORDS WHICH HAVE FORMED THE BASIS OF DESIGN.
7. TESTING & VERIFICATION OF ANY EXISTING ELEMENTS AS REQUIRED BY THE STRUCTURAL ENGINEER.
8. END PLATED CONNECTIONS TO ALL BEAMS

STAGE 2 W.I.P. NOTES:

- STRUCTURAL PHILOSOPHY ONLY.
- STRUCTURAL ELEMENTS SUBJECT TO DESIGN DEVELOPMENT.
- PERIMETER DETAIL SUBJECT TO CONFIRMATION OF CLADDING PERFORMANCE CRITERIA

WAREHOUSE STRUCTURAL PHILOSOPHY:

- EXISITING PRIMARY AND SECONDARY BEAMS RESTRAINING COLUMNS TO BE RETAINED
- ALL NEW STEEL TO BE GRADE S355
- CONNECTIONS TO EXISITING STEEL TBC SUBJECT DESIGN DEVELOPMENT FURTHER TO SURVEYS TO CONFIRM EXISITING STEEL COMPOSITION
- ALLOW FOR TIE RODS ADJACENT TO LARGE OPENINGS AT 2m CENTRES

LEGEND

- INDICATES EXISTING PRIMARY STEEL BEAMS
- INDICATES EXISTING SECONDARY STEEL BEAMS
- INDICATES NEW STEEL BEAMS
- INDICATES NEW STEEL BEAMS TRIMMING EXISTING STRUCTURE
- INDICATES VERTICAL BRACING
- INDICATES VOID IN EXISTING FLOOR
- INDICATES NEW VOID FOR RISER. BRICK ARCH TO BE LOCALLY REMOVED WITH EXISITING STEELWORK RETAINED
- INDICATES SPAN OF 160mm THK SMD CONCRETE COMPOSITE FLOOR

* DENOTES SUPPORTS VIA CONNECTION INTO EXISTING MASONRY. DETAIL TO BE DEVELOPED.

THIS DRAWING IS BASED ON INFORMATION RECEIVED 12.08.22

STRUCTURAL STEEL COLUMN SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
C01	SHS 250x250	S355
C02	UC 203x203	S355

STRUCTURAL STEEL BEAM SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
B01	UB 406x178	S355
B02	UB 203x133	S355
B03	UB 533x210	S355
B04	UB 203x102	S355
B05	UB 457x191	S355
B06	UB 356x171	S355
B07	UB 305x165	S355
B08	SHS 200X200	S355
B09	RHS 200x100	S355
B10	UB 610x229	S355

Rev:	Description:	Date:	By:	Chkd:
P02	REVISED AS CLOUDED	18.11.22	KC	DB
P01	ISSUED FOR STAGE 2	31.08.22	KC	DB

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Status: STAGE 2 ISSUE

Project: GREAT NORTHERN WAREHOUSE

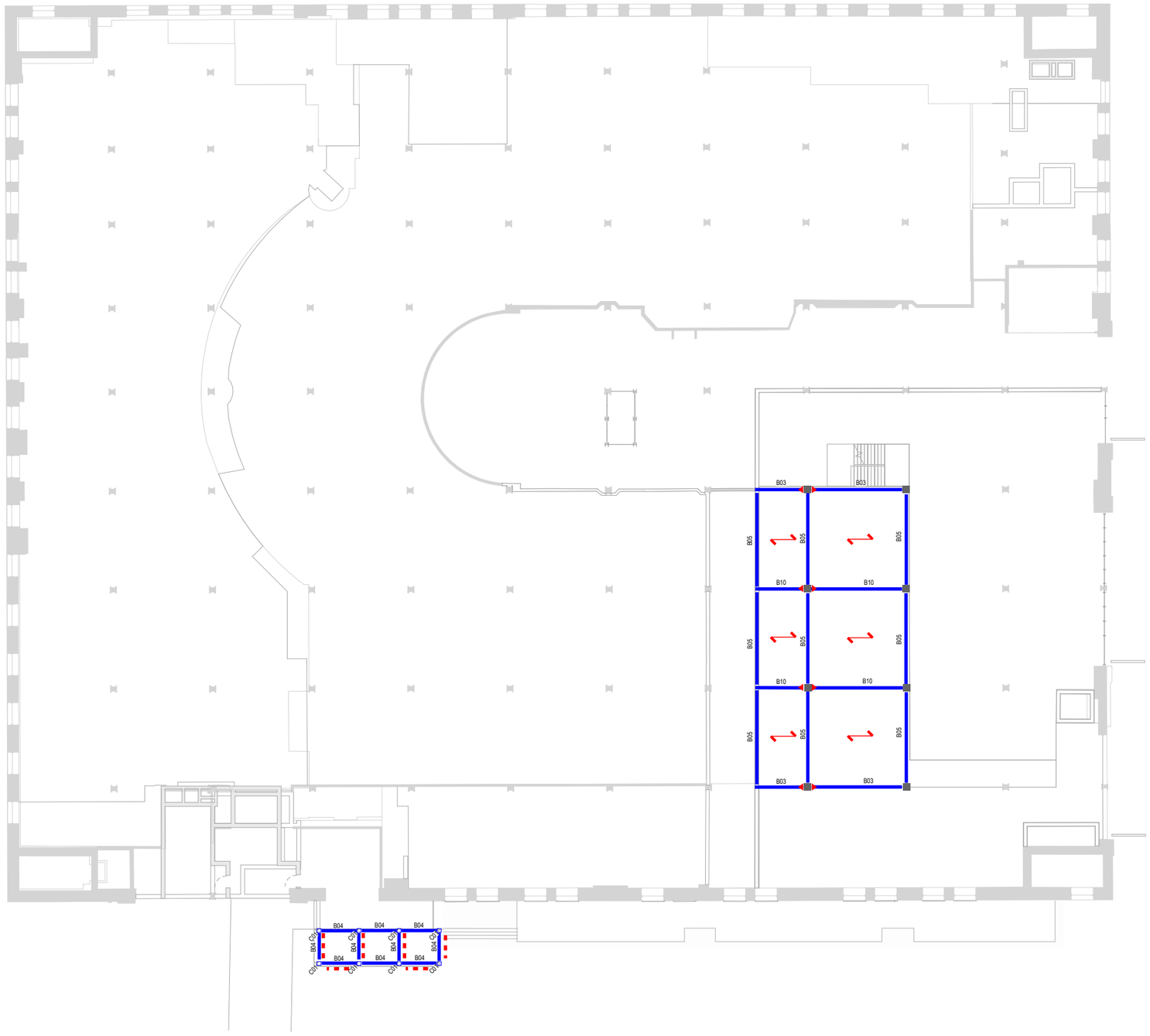
Drg Title: WAREHOUSE GROUND FLOOR MEZZANINE STRUCTURAL INTERVENTION GA

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	31/08/22	KC	DB	DB

Scale: As indicated

Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
064582 -	CUR -	Z2 -	M0 -	DR -	S -	20101 -	P02

Model Name:XXXXXX-CUR-ZZ-XX-M3-S-00001



PROPOSED FIRST FLOOR MEZZANINE

SCALE: 1 : 175

GENERAL NOTES:

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3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
4. FOR GENERAL NOTES REFER TO DRAWING.

CONTRACTOR TO MAKE ALLOWANCES FOR:

1. PRECLUSION OF WATER DURING CONSTRUCTION.

2. TEMPORARY EARTHWORKS & EXCAVATION SUPPORT.

3. TEMPORARY SUPPORT & STABILITY OF ALL EXISTING ELEMENTS DURING DEMOLITION & REMEDIAL WORKS.

4. VERIFICATION OF LOCATIONS OF ALL BELOW GROUND SERVICES & OBSTRUCTIONS PRIOR TO UNDERTAKING OF ANY WORKS.

5. REMOVAL OF ALL OBSTRUCTIONS PRIOR TO PILING WORKS.

6. SURVEYING OF ALL NEW TO EXISTING INTERFACES TO VERIFY HISTORIC RECORDS WHICH HAVE FORMED THE BASIS OF DESIGN.

7. TESTING & VERIFICATION OF ANY EXISTING ELEMENTS AS REQUIRED BY THE STRUCTURAL ENGINEER.

8. END PLATED CONNECTIONS TO ALL BEAMS

STAGE 2 W.I.P. NOTES:

- STRUCTURAL PHILOSOPHY ONLY.
- STRUCTURAL ELEMENTS SUBJECT TO DESIGN DEVELOPMENT.
- PERIMETER DETAIL SUBJECT TO CONFIRMATION OF CLADDING PERFORMANCE CRITERIA

WAREHOUSE STRUCTURAL PHILOSOPHY:

- EXISITING PRIMARY AND SECONDARY BEAMS RESTRAINING COLUMNS TO BE RETAINED
- ALL NEW STEEL TO BE GRADE S355
- CONNECTIONS TO EXISITING STEEL TBC SUBJECT DESIGN DEVELOPMENT FURTHER TO SURVEYS TO CONFIRM EXISITING STEEL COMPOSITION
- ALLOW FOR TIE RODS ADJACENT TO LARGE OPENINGS AT 2m CENTRES

LEGEND

- INDICATES NEW STEEL BEAM
- INDICATES SPAN OF LIGHTWEIGHT METSEC FLOOR. ALLOW FOR 302.M.20 C JOIST @ 400 C/C.
- INDICATES EXISTING COLUMN TO SUPPORT NEW METSEC STRUCTURE
- INDICATES SPAN OF 160THK SMD CONCRETE COMPOSITE FLOOR
- DENOTES MOMENT CONNECTION
- INDICATES SPAN OF LIGHTWEIGHT TIMBER ROOF JOISTS

THIS DRAWING IS BASED ON INFORMATION RECEIVED 12.08.22

STRUCTURAL STEEL COLUMN SCHEDULE		
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B07	UB 305x165	S355
B08	SHS 200X200	S355
B09	RHS 200x100	S355
B10	UB 610x229	S355

Rev:	Description:	Date:	By:	Chkd:
P02	COLUMNS REMOVED FROM MEZZ STRUCTURE AND CANTILEVERS ADDED	18.11.22	KC	DB
P01	ISSUED FOR STAGE 2	31.08.22	KC	DB

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Status: STAGE 2 ISSUE

Project: GREAT NORTHERN WAREHOUSE

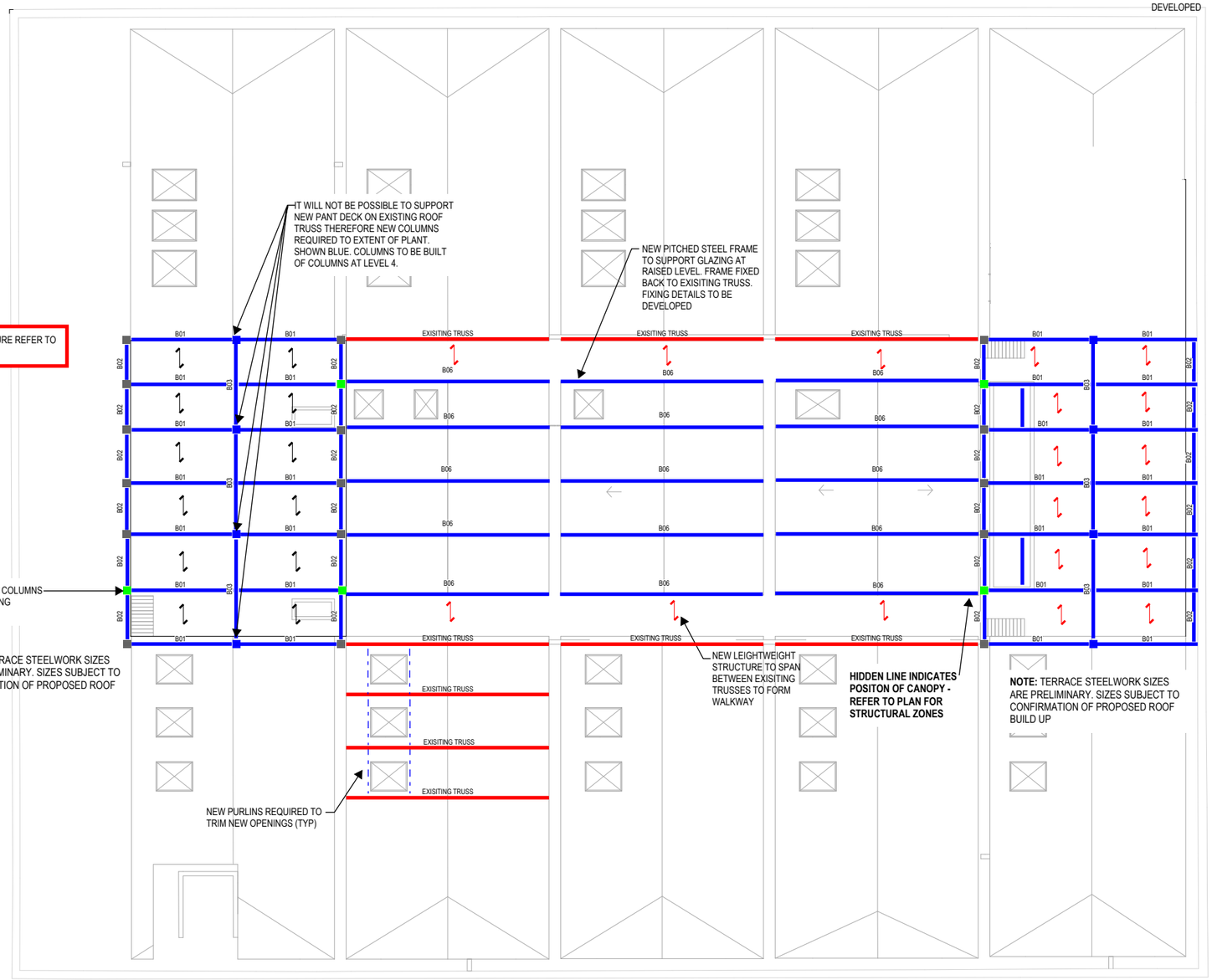
Drg Title: WAREHOUSE FIRST FLOOR MEZZANINE STRUCTURAL INTERVENTION GA

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	31/08/22	KC	DB	DB

Scale: As indicated

Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
064582 -	CUR -	Z2 -	M1 -	DR -	S -	20103 -	P02

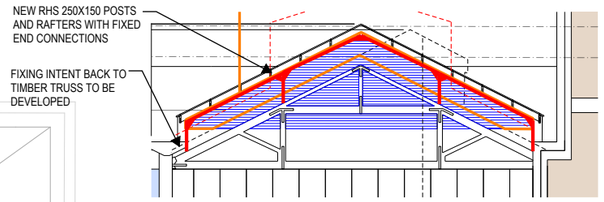
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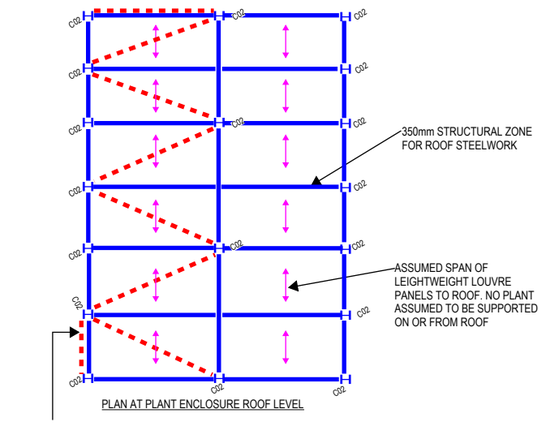
NOTE: EXISITING PURLINS ASSUMED TO BE RETAINED TO SUPPORT NEW ROOF FINISHES. WEIGHT OF NEW FINISHES IS CURRENTLY UNKNOWN. IF FINISHES ARE HEAVIER THAN EXISITING FINISHES PURLINS WILL NEED TO BE ASSESSED TO SUPPORT INCREASED LOAD. PURLINS MAY REQUIRE STRENGTHENING/REPLACEMENT. SUITABLE CONTINGENCY ALLOWANCE TO BE MADE

PROPOSED ROOF

SCALE: 1 : 175



SECTION SHOWING NEW PITCHED STEEL FRAME TO SUPPORT GLAZING



PLAN AT PLANT ENCLOSURE ROOF LEVEL

HIDDEN LINE DENOTES VERTICAL AND HORIZONTAL BRACING.

STRUCTURAL STEEL COLUMN SCHEDULE		
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- ALLOW FOR TIE RODS ADJACENT TO LARGE OPENINGS AT 2m CENTRES

LEGEND

- INDICATES EXISTING PRIMARY STRUCTURE
- INDICATES EXISTING SECONDARY STEEL BEAMS
- INDICATES EXISTING SECONDARY STEEL BEAMS TO BE REMOVED
- INDICATES NEW STEEL BEAMS
- INDICATES NEW STEEL BEAMS TRIMMING EXISTING STRUCTURE
- INDICATES VERTICAL BRACING
- INDICATES NEW VOID IN EXISTING FLOOR
- INDICATES NEW VOID FOR RISER. BRICK ARCH TO BE LOCALLY REMOVED WITH EXISITING STEELWORK RETAINED
- INDICATES SPAN OF 160mm THK SMD CONCRETE COMPOSITE FLOOR
- INDICATES SPAN OF LEIGHTWEIGHT TIMBER FLOOR AND JOISTS OR METSEC JOISTS TO TERRACE AREA AND WALWAYS

THIS DRAWING IS BASED ON INFORMATION RECEIVED 12.08.22

Rev:	Description:	Date:	By:	Chkd:
P02	PLANT ENCLOSURE STRUCTURE ADDED.	18.11.22	KC	DB
P01	ISSUED FOR STAGE 2	31.08.22	KC	DB

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Project: GREAT NORTHERN WAREHOUSE

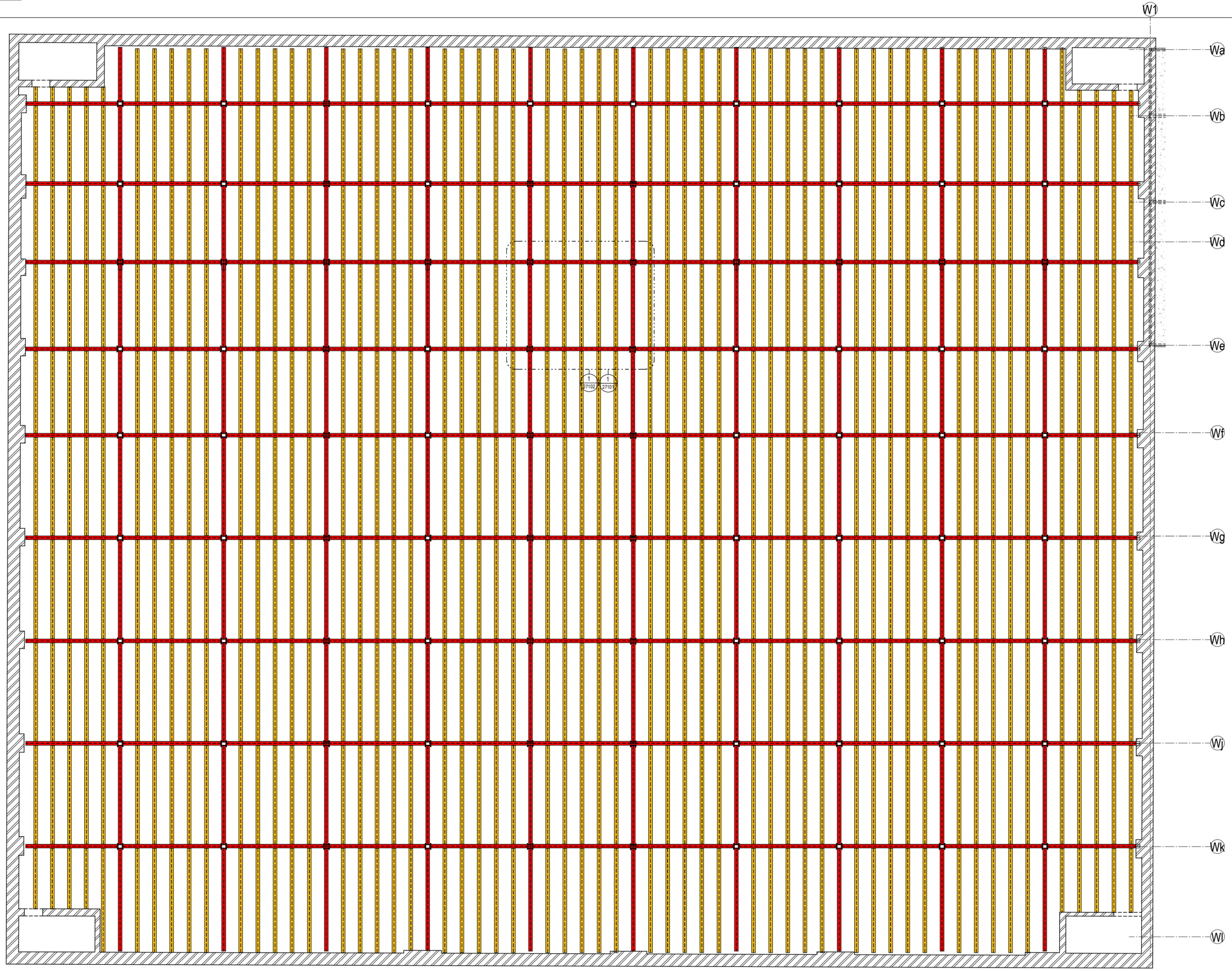
Drg Title: WAREHOUSE ROOF FLOOR STRUCTURAL INTERVENTION GA

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	31/08/22	KC	DB	DB

Scale: As indicated

Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
064582 -	CUR -	Z2 -	RF -	DR -	S -	20107 -	P02

Model Name:XXXXXX-CUR-ZZ-XX-M3-S-00001



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DENOTES BEAMS TO BE RETAINED

DENOTES POTENTIAL BEAMS TO BE REMOVED, BUT WITH STRUCTURAL MODIFICATIONS

NOT FOR CONSTRUCTION

WAREHOUSE TYPICAL BEAM LAYOUT

SCALE: 1 : 125

Rev:	Description:	Date:	By:	Chkd:
P1	STAGE 2 ISSUE	31/08/22	AC	DB

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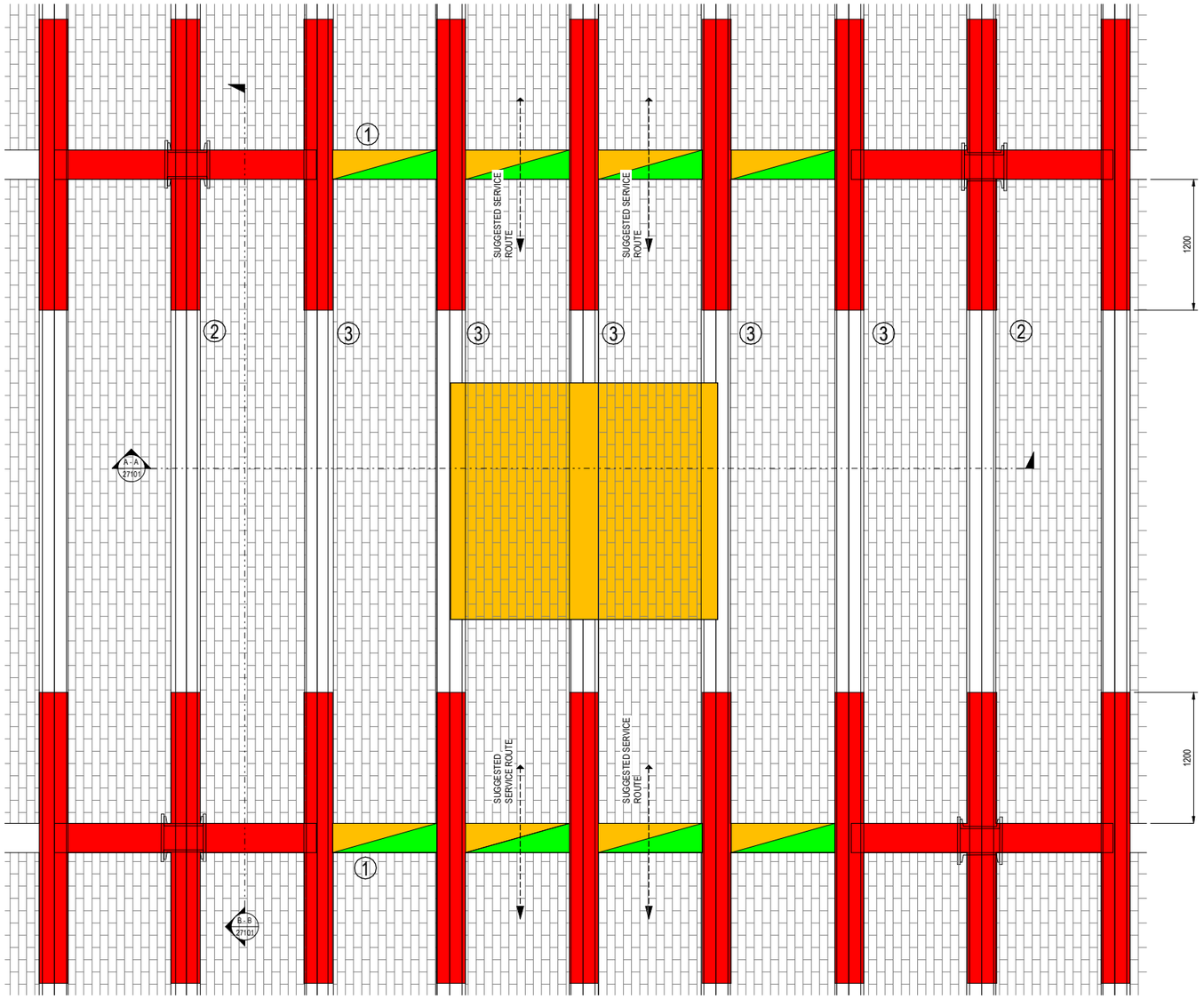
Project: GREAT NORTHERN WAREHOUSE

Drg Title: STRUCTURAL PRINCIPLES MODIFICATION ASSESSMENT OF EXISTING STRUCTURAL FLOOR PLATE

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	AUG 22	AC	DB	VC

Scale: As indicated

Project No:	Originator:	Zone:	Level:	Type:	Discipline:	Category / Number:	Rev:
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AVOID STRUCTURAL INTRUSIVE WORKS (IF POSSIBLE)

WORKS WOULD NEED DETAILED ASSESSMENT/STRENGTHENING WORKS

MINIMAL STRUCTURAL IMPACT

(1) PRIMARY BEAM ON GRID

(2) SECONDARY BEAM ON GRID

(3) SECONDARY BEAM OFF GRID

WHERE MULTIPLE BAYS ARE TO BE REMOVED BEAMS TYPE 1 & 2 ARE TO BE RETAINED

ALL PRIMARY BEAMS TO BE RETAINED AT ALL LEVELS, PLUS SECONDARY BEAMS WHERE THEY FRAME DIRECTLY INTO EXISTING COLUMNS.

NOTE :-

THE INTEGRITY OF THE WAREHOUSE AS A WHOLE IS DEPENDANT UPON A HIGH DEGREE OF DIAPHRAGM ACTION AT ALL FLOORS LEVELS.

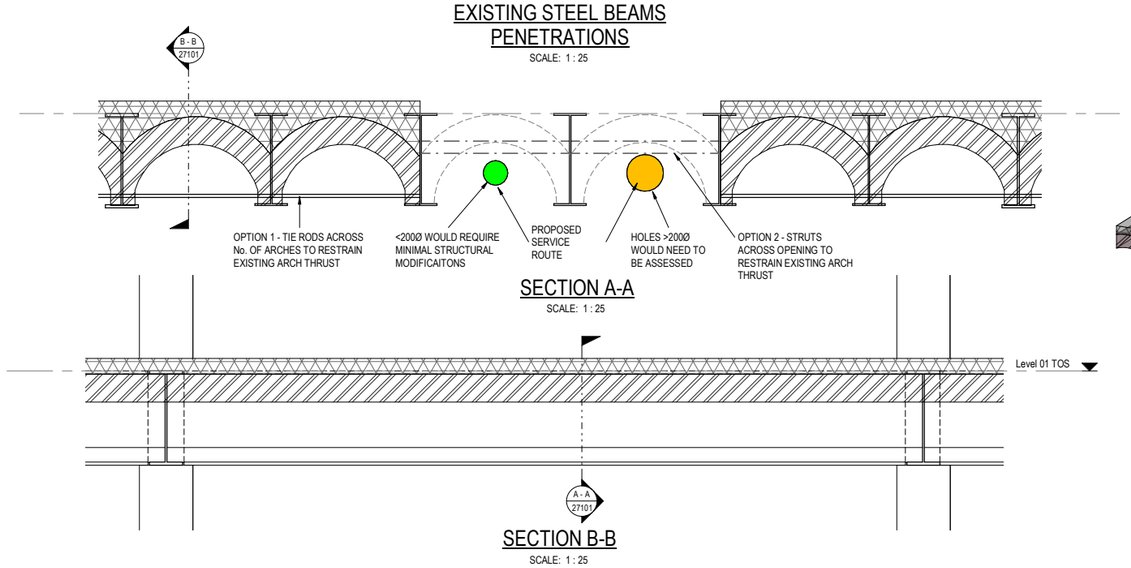
- ALL PRIMARIES TO REMAIN INTACT.

- SECONDARIES TO BE RETAINED WHEREVER POSSIBLE AND INTEGRATED INTO RISER SPACES

NOT FOR CONSTRUCTION

WAREHOUSE TYPICAL ENLARGED EXISTING STEEL BEAMS PENETRATIONS

SCALE: 1 : 25

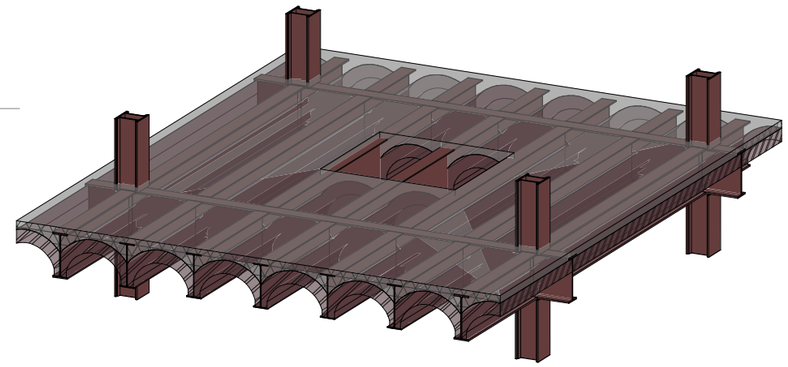


SECTION A-A

SCALE: 1 : 25

SECTION B-B

SCALE: 1 : 25



3D VIEW

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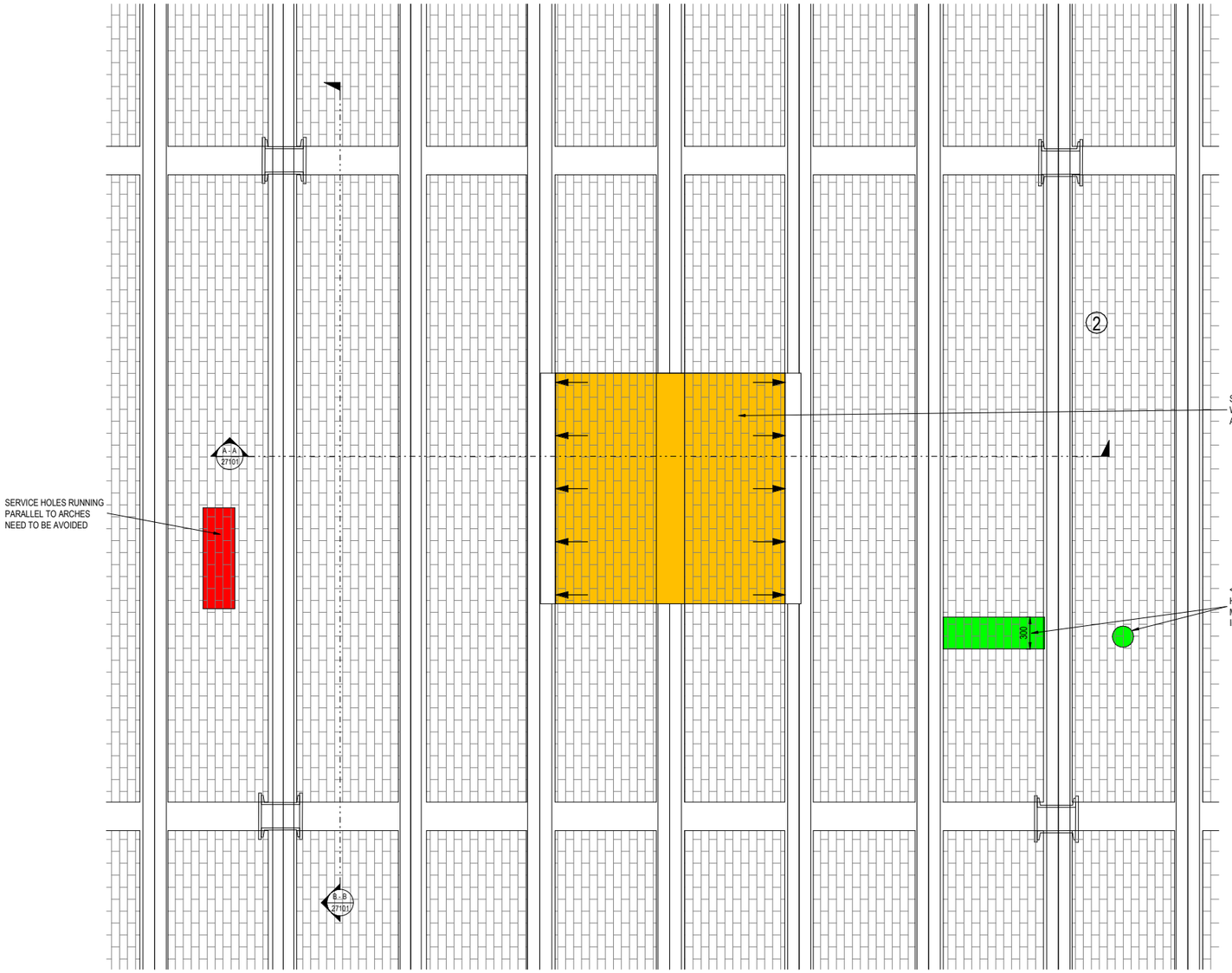
Status: STAGE 2

Project: GREAT NORTHERN WAREHOUSE

Drg Title: STRUCTURAL PRINCIPLES SERVICE ROUTE ASSESSMENT ON EXISTING STRUCTURAL FLOOR BEAMS

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	AUG 22	AC	DB	VC
Scale: As indicated				

Project No:	Originator:	Zone:	Level:	Type:	Discipline:	Category / Number:	Rev:
064582 -	CUR -	Z2 -	XX -	DR -	S -	27101 -	P1



TYPICAL ENLARGED PLAN BRICK ARCH PENETRATIONS

SCALE: 1 : 25

GENERAL NOTES:

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AVOID STRUCTURAL INTRUSIVE WORKS (IF POSSIBLE)

WORKS WOULD NEED DETAILED ASSESSMENT/STRENGTHENING WORKS

MINIMAL STRUCTURAL IMPACT

NOTE :-

THE INTEGRITY OF THE WAREHOUSE AS A WHOLE IS DEPENDANT UPON A HIGH DEGREE OF DIAPHRAGM ACTION AT ALL FLOORS LEVELS.

- ALL PRIMARIES TO REMAIN INTACT.

- SECONDARIES TO BE RETAINED WHEREVER POSSIBLE AND INTEGRATED INTO RISER SPACES

NOT FOR CONSTRUCTION

Rev:	Description:	Date:	By:	Chkd:
P1	STAGE 2 ISSUE	31/08/22	AC	DB

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Status: STAGE 2

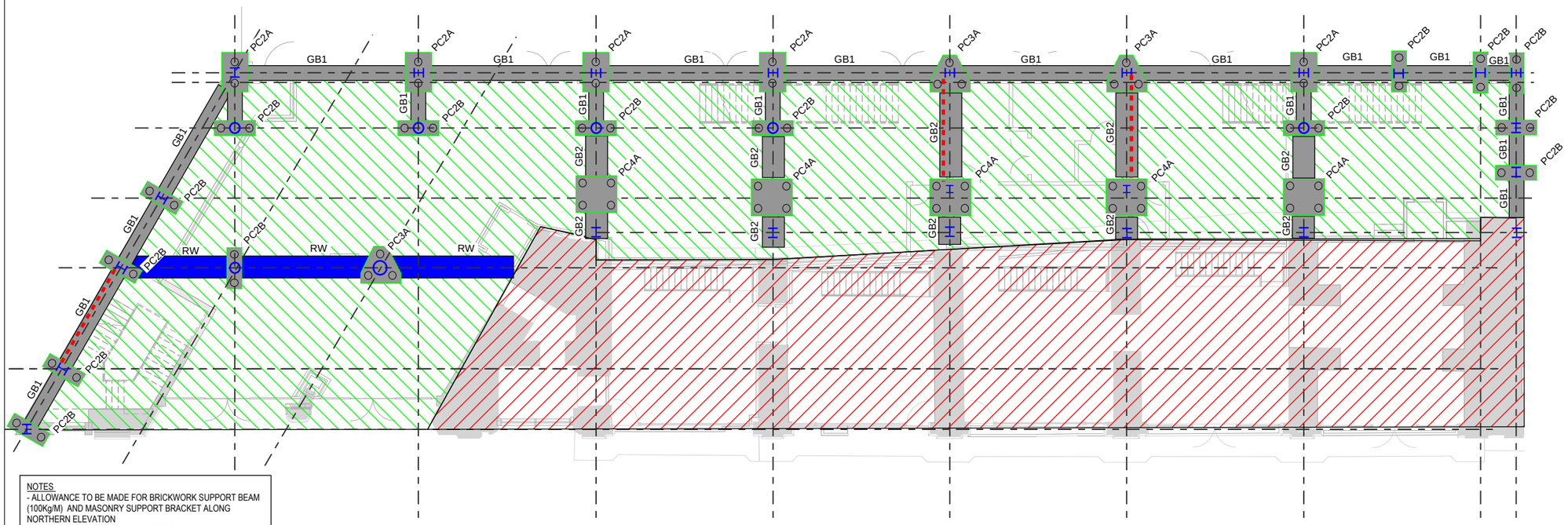
Project: GREAT NORTHERN WAREHOUSE

Drg Title: STRUCTURAL PRINCIPLES
SERVICE ROUTE ASSESSMENT ON EXISTING BRICK ARCH PENETRATIONS

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	AUG 22	AC	DB	VC

Scale: 1 : 25

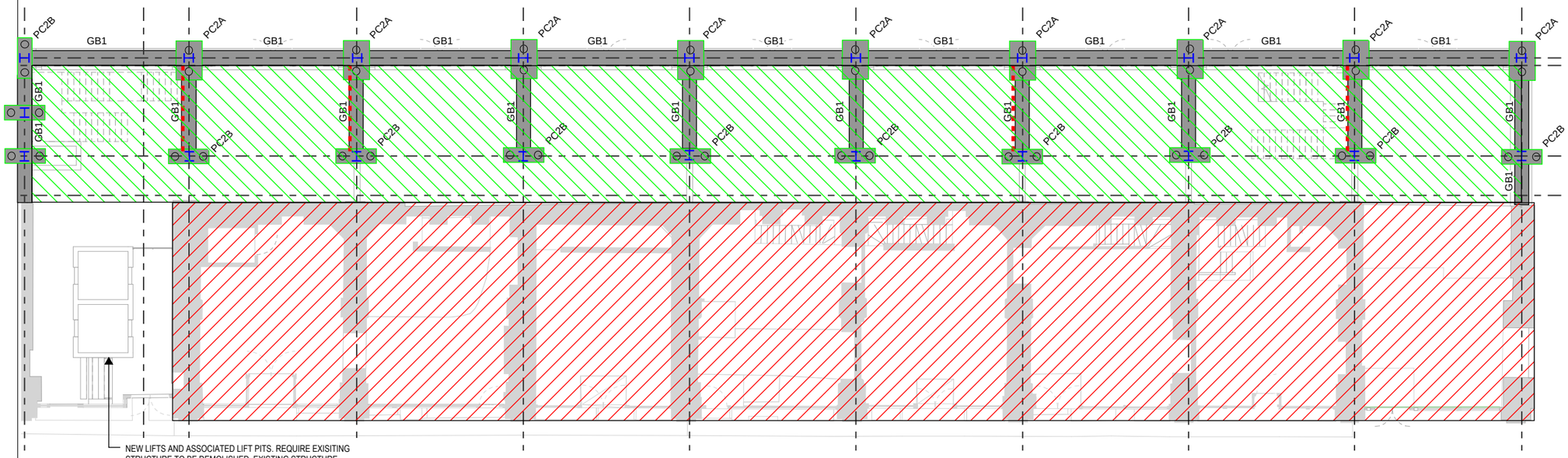
Project No:	Originator:	Zone:	Level:	Type:	Discipline:	Category / Number:	Rev:
064582 -	CUR -	Z2 -	XX -	DR -	S -	27102 -	P1



NOTES
- ALLOWANCE TO BE MADE FOR BRICKWORK SUPPORT BEAM (100Kg/M) AND MASONRY SUPPORT BRACKET ALONG NORTHERN ELEVATION
- ALLOWANCE TO BE MADE FOR RETAINING WALL ALONG NORTHERN ELEVATION TO ACCOUNT FOR LEVEL DIFFERENCE

PROPOSED GROUND FLOOR 1

SCALE: 1 : 100



NEW LIFTS AND ASSOCIATED LIFT PITS. REQUIRE EXISITING STRUCTURE TO BE DEMOLISHED. EXISTING STRUCTURE DETAILS TO BE DETERMINED VIA SURVEY.
NEW FOUNDATION SCHEME TO BE DEVELOPED, ALLOWANCE TO BE MADE FOR MINI PILES TO SUPPORT PILE CAP

RC WALLS REQUIRED TO FORM LIFT WALL. NEW RC STAIRS TO BE SUPPORTED FROM LIFT WALLS AND EXISITING MASONRY STRUCTURE

NEW GROUND FLOOR RC SLAB REQUIRED

PROPOSED GROUND FLOOR 2

SCALE: 1 : 100

FOUNDATION DESIGN BASED ON 350DIA. CFA PILES.

ASSUMED CAPACITY-
AXIAL = 800kN
SHEAR = 50kN

PILING CONTRACTOR TO BE ENGAGED TO CONFIRM CAPACITIES.

PILE CAP SCHEDULE		
REF.	DIMENSIONS	REBAR ALLOWANCE
PC2A	1700x1050x1000DP	200Kg/m^3
PC2B	1700x650x1000DP	200Kg/m^3
PC3A	1560x630x1000DP	200Kg/m^3

GROUND BEAM SCHEDULE		
REF.	DIMENSIONS	REBAR ALLOWANCE
GB1	600x600DP	200Kg/m^3

RETAINING WALL SCHEDULE			
REF.	BASE THK	STEM THK	REBAR ALLOWANCE
RW	300	200	200Kg/m^3

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3. TEMPORARY SUPPORT & STABILITY OF ALL EXISTING ELEMENTS DURING DEMOLITION & REMEDIAL WORKS.
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- STRUCTURAL ELEMENTS SUBJECT TO DESIGN DEVELOPMENT.
- PERIMETER DETAIL SUBJECT TO CONFIRMATION OF CLADDING PERFORMANCE CRITERIA

TERRACE STRUCTURAL PHILOSOPHY:

- FOUNDATIONS TO BE PILED
- ALL STEEL TO BE GRADE S355
- COLUMN SIZES SUBJECT TO GRID RESOULTION

FOUNDATION NOTES:

- FOUNDATION DESIGN IS PRELIMINARY.
- DESIGN IS SUBJECT TO DEVELOPMENT, GRID RESOLUTION, CONFIRMATION OF CONSTRUCTION BUILD UPS AND LOAD TAKE-DOWN
- REFERENCE SHOULD BE MADE TO CURTINS PHASE 2 SITE INVESTIGATIONS REPORT FOR DETAILS OF BELOW GROUND INFORMATION.
- CONSIDERATION SHOULD BE MADE FOR SPECIALIST REGARDING BELOW GROUND PROTECTION AGAINST RADON WITHIN BASEMENTS.

LEGEND

- INDICATES LOCATION OF VERTICAL BRACING
- DENOTES EXISTING RETAINED STRUCTURE
- INDICATES PROPOSED 175 THK GROUND BEARING REINFORCED CONCRETE SLAB GRADE RC32/40 WITH 2 LAYERS A252 MESH 1 TOP, 1 BTM.

THIS DRAWING IS BASED ON INFORMATION RECEIVED 12.08.22

Rev:	Description:	Date:	By:	Chkd:
P02	CANTILEVER GROUND BEAM ADDED	18.11.22	KC	DB
P01	ISSUED FOR STAGE 2	31.08.22	KC	DB

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Status:
STAGE 2 ISSUE

Project:
GREAT NORTHERN WAREHOUSE

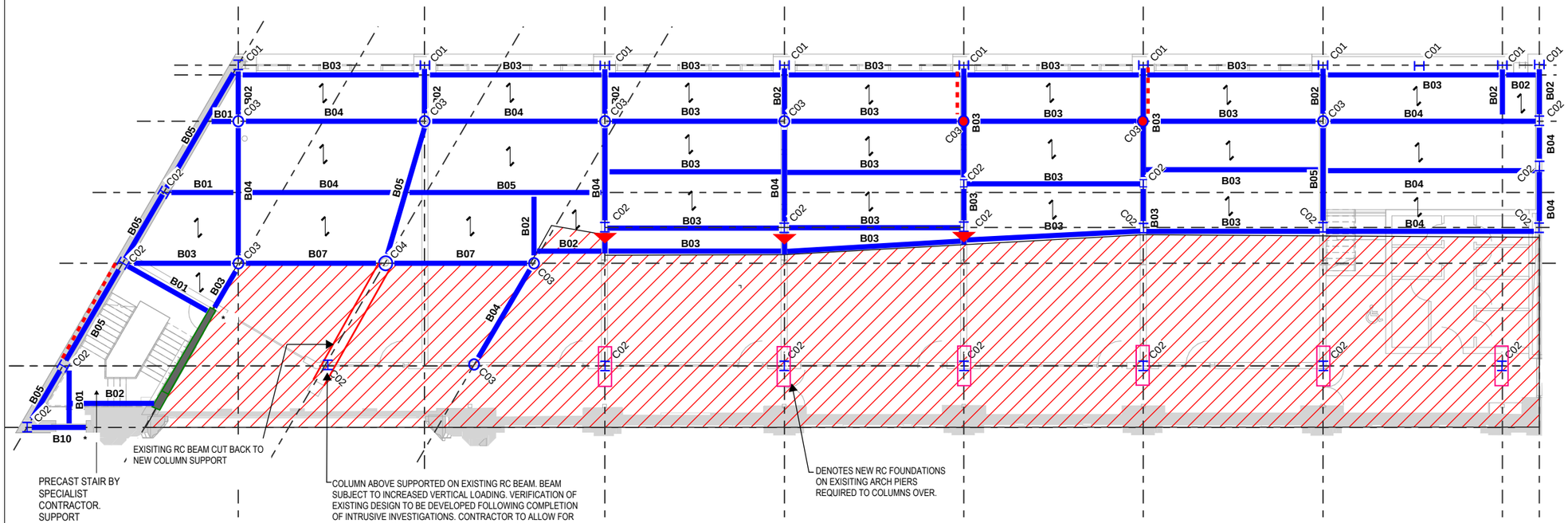
Drg Title:
TERRACE A GROUND FLOOR STRUCTURAL INTERVENTION GA

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	31/08/22	KC	DB	DB
Scale: As indicated				

Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
064582 -	CUR -	Z3A -	00 -	DR -	S -	20100 -	P02

Model Name:XXXXXX-CUR-ZZ-XX-M3-S-00001

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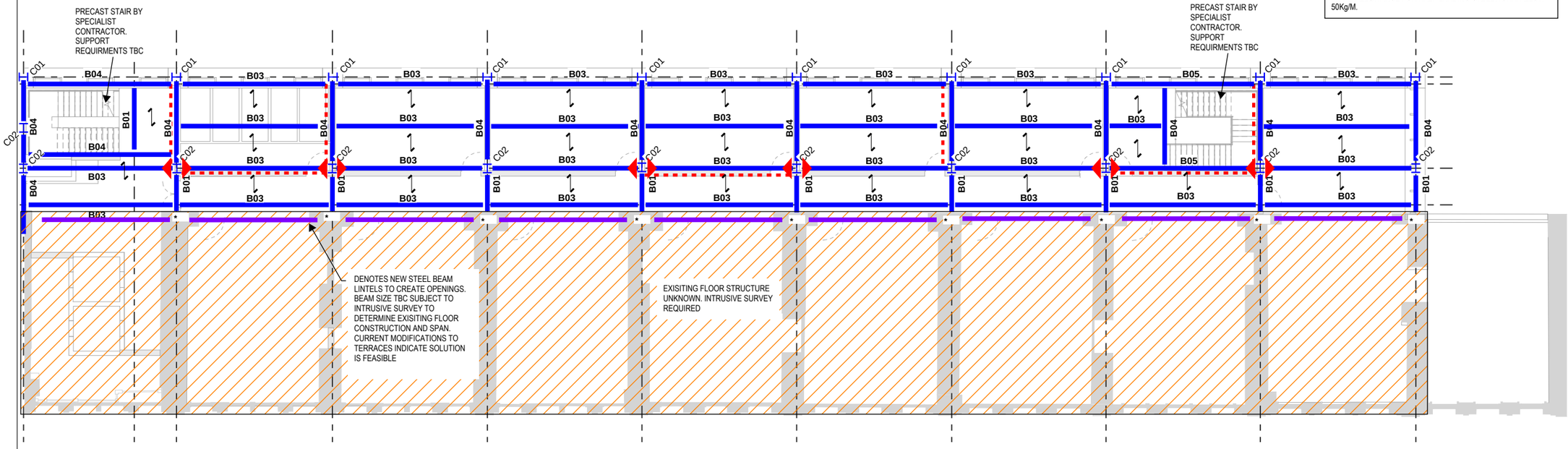


PROPOSED FIRST FLOOR 1

SCALE: 1 : 100

NOTES
-MAKE ALLOWANCE FOR CLADDING SUPPORT BEAM TO FULL EAST ELEVATION. ALLOW 125 Kg/M.

-MAKE ALLOWANCE FOR HALF LANDING STEELWORK. ALLOW 50Kg/M.



PROPOSED FIRST FLOOR 2

SCALE: 1 : 100

STRUCTURAL STEEL COLUMN SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
C01	UC 305x305	S355
C02	UC 203x203	S355
C03	CHS219x10.0	S355
C04	CHS323.9x10.0	S355

STRUCTURAL STEEL BEAM SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
B01	UB 203x133	S355
B02	UB 254x146	S355
B03	UB 305x165	S355
B04	UB 356x171	S355
B05	UB 406x178	S355
B06	UC 203x203	S355
B07	RHS 300x200	S355
B08	RHS 400x200	S355
B09	RHS 500x300	S355
B10	SHS 200x200	S355
B11	RHS 200x150	S355
B12	UB 457x191	S355

GENERAL NOTES:

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3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
4. FOR GENERAL NOTES REFER TO DRAWING.

CONTRACTOR TO MAKE ALLOWANCES FOR:

1. PRECLUSION OF WATER DURING CONSTRUCTION.
2. TEMPORARY EARTHWORKS & EXCAVATION SUPPORT.
3. TEMPORARY SUPPORT & STABILITY OF ALL EXISTING ELEMENTS DURING DEMOLITION & REMEDIAL WORKS.
4. VERIFICATION OF LOCATIONS OF ALL BELOW GROUND SERVICES & OBSTRUCTIONS PRIOR TO UNDERTAKING OF ANY WORKS.
5. REMOVAL OF ALL OBSTRUCTIONS PRIOR TO PILING WORKS.
6. SURVEYING OF ALL NEW TO EXISTING INTERFACES TO VERIFY HISTORIC RECORDS WHICH HAVE FORMED THE BASIS OF DESIGN.
7. TESTING & VERIFICATION OF ANY EXISTING ELEMENTS AS REQUIRED BY THE STRUCTURAL ENGINEER.
8. END PLATED CONNECTIONS TO ALL BEAMS

STAGE 2 W.I.P. NOTES:

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- STRUCTURAL ELEMENTS SUBJECT TO DESIGN DEVELOPMENT.
- PERIMETER DETAIL SUBJECT TO CONFIRMATION OF CLADDING PERFORMANCE CRITERIA

TERRACE STRUCTURAL PHILOSOPHY:

- FOUNDATIONS TO BE PILED
- ALL STEEL TO BE GRADE S355
- COLUMN SIZES SUBJECT TO GRID RESOULTION

FOUNDATION NOTES:

- FOUNDATION DESIGN IS PRELIMINARY.
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- CONSIDERATION SHOULD BE MADE FOR SPECIALIST REGARDING BELOW GROUND PROTECTION AGAINST RADON WITHIN BASEMENTS.

LEGEND

- INDICATES VERTICAL BRACING
- INDICATES SPAN OF 130mm THK SMD CONCRETE COMPOSITE FLOOR
- DENOTES MOMENT CONNECTION
- DENOTES EXISTING 1st FLOOR RC SLAB. DEPTH CURRENTLY UNKNOWN. SURVEY REQUIRED TO CONFIRM DEPTH AND SET OUT.

* DENOTES SUPPORTS VIA CONNECTION INTO EXISTING MASONRY PIER. DETAIL TO BE DEVELOPED. EXACT DETAIL TBC FOLLOWING COMPLETION OF DEMO & ON SITE MEASURE.

ALLOWANCE TO BE MADE FOR 19mm DIA x 100mm LONG SHEAR STUDS AT EACH TROUGH LOCATION & @ 300c/c WHERE PARALLEL TO ALL BEAMS.
ALLOW FOR B12 TRANSVERSE BAR AT EACH STUD LOCATIONS.

ALLOWANCE TO BE MADE FOR PENETRATIONS TO BEAM WEBS FOR SERVICE DISTRIBUTION. DETAILS TO BE DEVELOPED AND COORDINATED WITH M&E DESIGNER

Rev:	Description:	Date:	By:	Chkd:
P02	UPDATED TO SUIT ROOF TERRACE PROPOSALS	18.11.22	KC	DB
P01	ISSUED FOR STAGE 2	25.08.22	KC	DB

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Status:
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Project:
GREAT NORTHERN WAREHOUSE

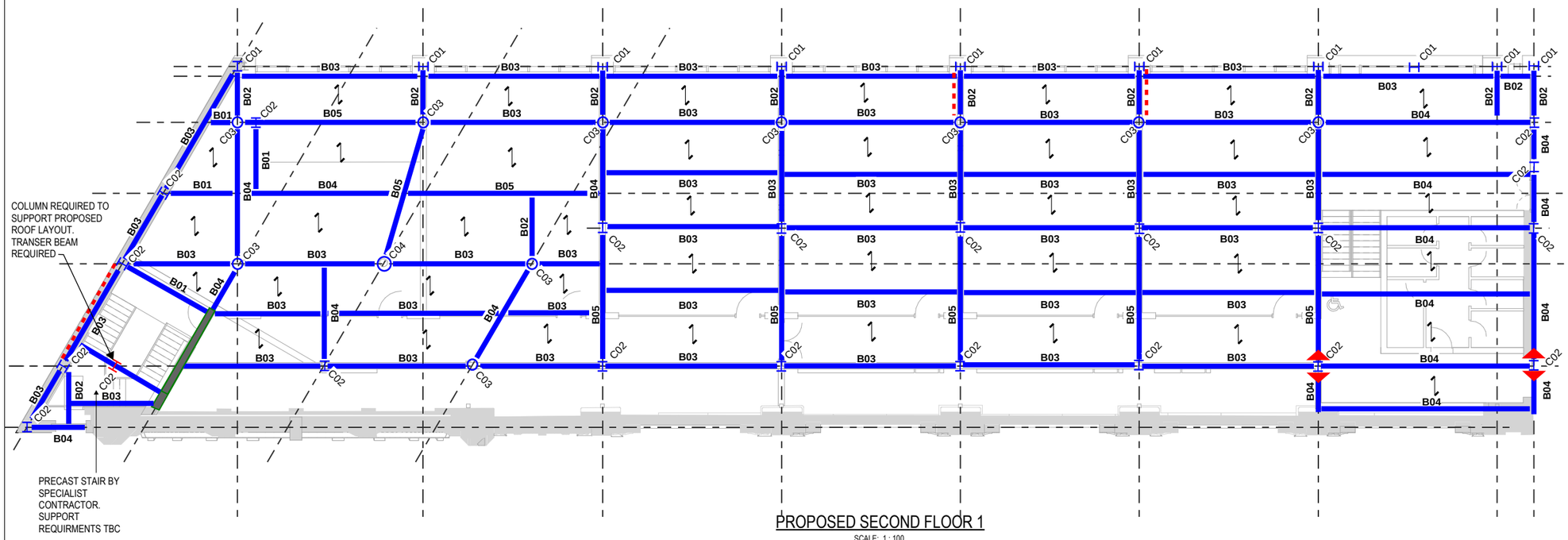
Drg Title:
TERRACE A FIRST FLOOR STRUCTURAL INTERVENTION GA

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	31/08/22	KC	DB	DB
Scale: As indicated				

Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
064582 -	CUR -	Z3A -	01 -	DR -	S -	20101 -	P02

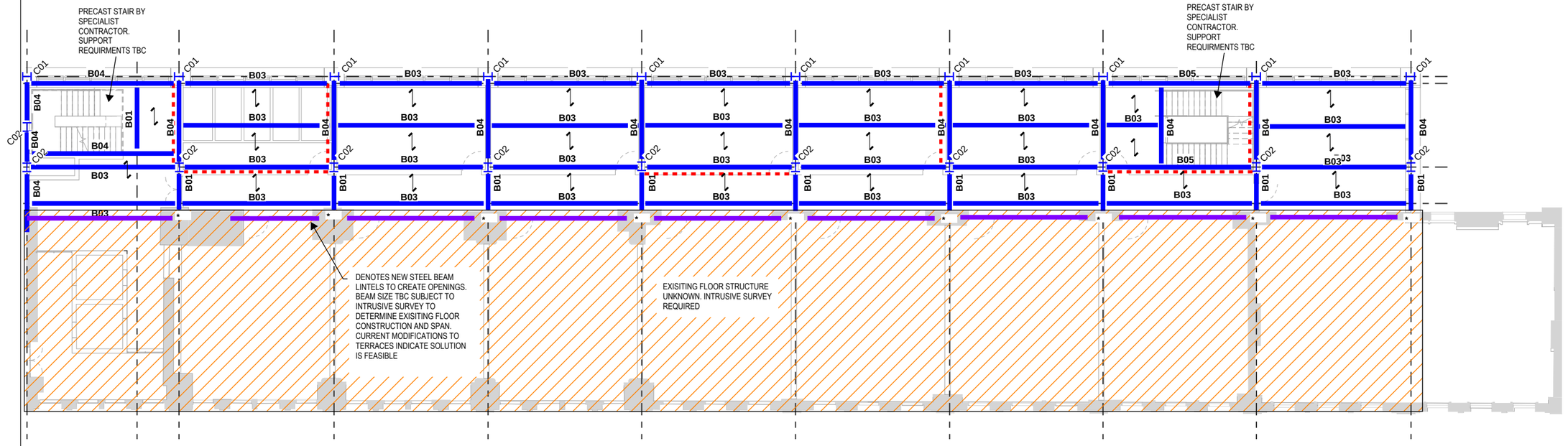
Model Name:XXXXXX-CUR-ZZ-XX-M3-S-00001

THIS DRAWING IS BASED ON INFORMATION RECEIVED 12.08.22



PROPOSED SECOND FLOOR 1

SCALE: 1 : 100



PROPOSED SECOND FLOOR 2

SCALE: 1 : 100

GENERAL NOTES:

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CONTRACTOR TO MAKE ALLOWANCES FOR:

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3. TEMPORARY SUPPORT & STABILITY OF ALL EXISTING ELEMENTS DURING DEMOLITION & REMEDIAL WORKS.
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8. END PLATED CONNECTIONS TO ALL BEAMS

STAGE 2 W.I.P. NOTES:

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- PERIMETER DETAIL SUBJECT TO CONFIRMATION OF CLADDING PERFORMANCE CRITERIA

TERRACE STRUCTURAL PHILOSOPHY:

- FOUNDATIONS TO BE PILED
- ALL STEEL TO BE GRADE S355
- COLUMN SIZES SUBJECT TO GRID RESOULTION

FOUNDATION NOTES:

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LEGEND

- INDICATES VERTICAL BRACING
- INDICATES SPAN OF 130mm THK SMD CONCRETE COMPOSITE FLOOR
- DENOTES MOMENT CONNECTION

* DENOTES SUPPORTS VIA CONNECTION INTO EXISTING MASONRY PIER. DETAIL TO BE DEVELOPED. EXACT DETAIL TBC FOLLOWING COMPLETION OF DEMO & ON SITE MEASURE.

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ALLOWANCE TO BE MADE FOR PENETRATIONS TO BEAM WEBS FOR SERVICE DISTRIBUTION. DETAILS TO BE DEVELOPED AND COORDINATED WITH M&E DESIGNER

Rev:	Description:	Date:	By:	Chkd:
P02	UPDATED TO SUIT ROOF TERRACE PROPOSALS	18.11.22	KC	DB
P01	ISSUED FOR STAGE 2	25.08.22	KC	DB

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Status: STAGE 2 ISSUE

Project: GREAT NORTHERN WAREHOUSE

Drg Title: TERRACE A SECOND FLOOR STRUCTURAL INTERVENTION GA

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	31/08/22	KC	DB	DB
Scale: As indicated				

Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
064582 -	CUR -	Z3A -	02 -	DR -	S -	20102 -	P02

Model Name:XXX-XXX-CUR-ZZ-XX-M3-S-00001

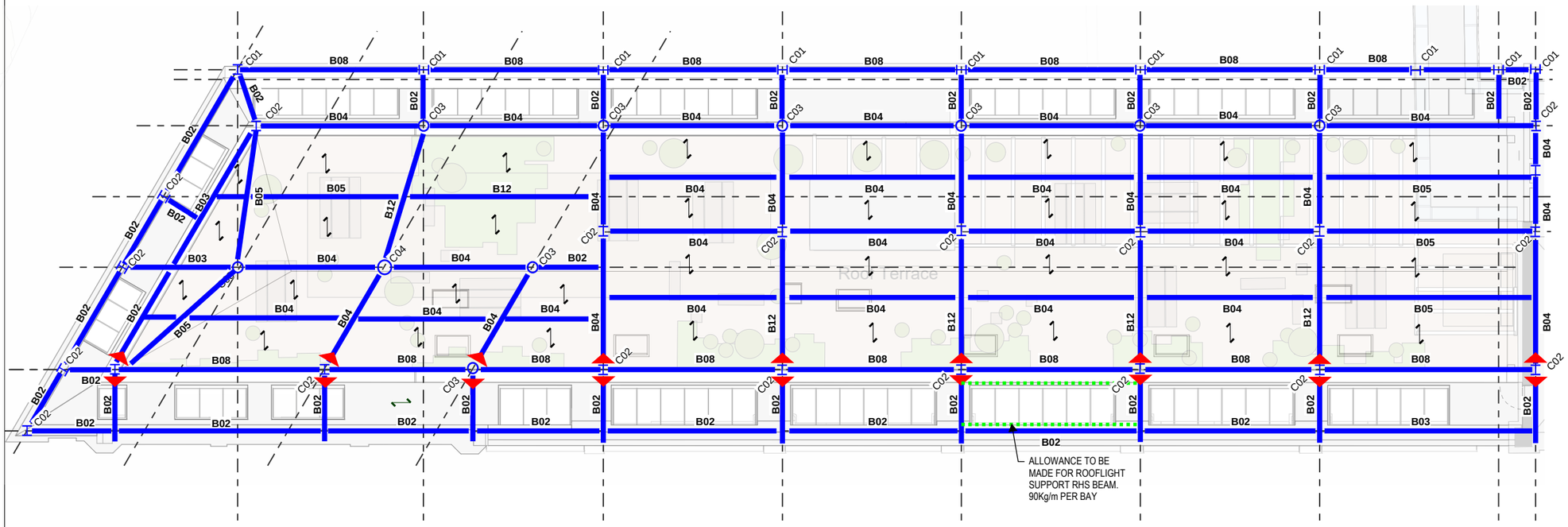
STRUCTURAL STEEL COLUMN SCHEDULE

REF.	TYPE	STRUCTURAL MATERIAL
C01	UC 305x305	S355
C02	UC 203x203	S355
C03	CHS219x10.0	S355
C04	CHS323.9x10.0	S355

STRUCTURAL STEEL BEAM SCHEDULE

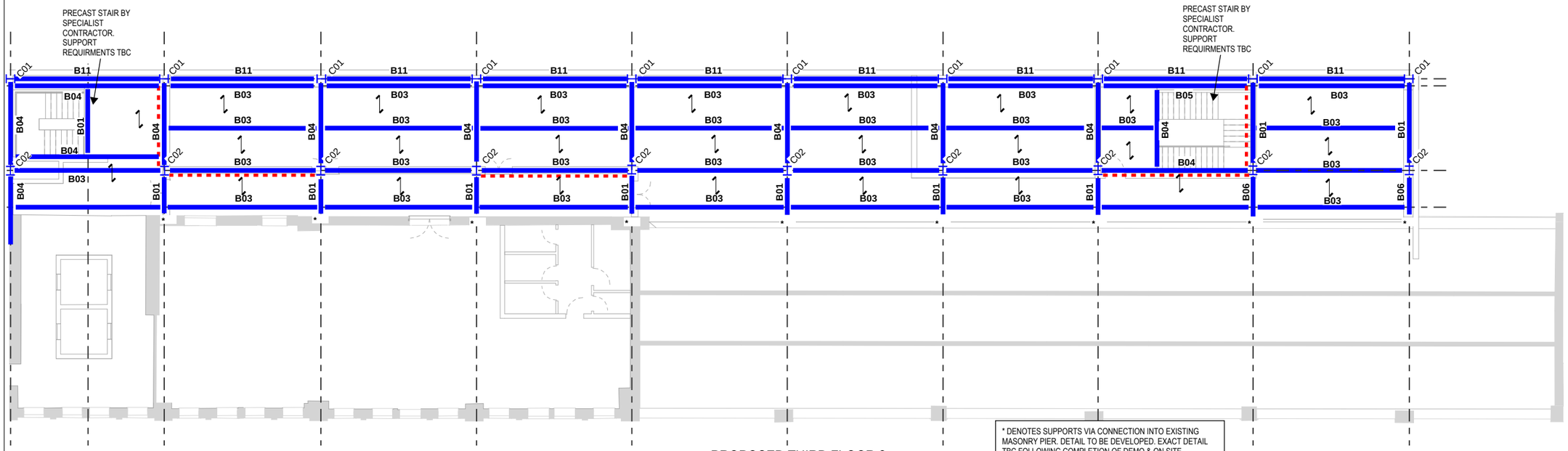
REF.	TYPE	STRUCTURAL MATERIAL
B01	UB 203x133	S355
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B05	UB 406x178	S355
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B07	RHS 300x200	S355
B08	RHS 400x200	S355
B09	RHS 500x300	S355
B10	SHS 200x200	S355
B11	RHS 200x150	S355
B12	UB 457x191	S355

THIS DRAWING IS BASED ON
INFORMATION RECEIVED 12.08.22



PROPOSED ROOF 1

SCALE: 1 : 100



PROPOSED THIRD FLOOR 2

SCALE: 1 : 100

* DENOTES SUPPORTS VIA CONNECTION INTO EXISTING MASONRY PIER. DETAIL TO BE DEVELOPED. EXACT DETAIL TBC FOLLOWING COMPLETION OF DEMO & ON SITE MEASURE.

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STRUCTURAL STEEL BEAM SCHEDULE

REF.	TYPE	STRUCTURAL MATERIAL
B01	UB 203x133	S355
B02	UB 254x146	S355
B03	UB 305x165	S355
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B07	RHS 300x200	S355
B08	RHS 400x200	S355
B09	RHS 500x300	S355
B10	SHS 200x200	S355
B11	RHS 200x150	S355
B12	UB 457x191	S355

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STAGE 2 W.I.P. NOTES:

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- COLUMN SIZES SUBJECT TO GRID RESOULTION

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LEGEND

- INDICATES VERTICAL BRACING
- INDICATES HORIZONTAL BRACING
- INDICATES SPAN OF 130mm THK SMD CONCRETE FLOOR
- INDICATES SPAN DIRECTION OF 202Z18 METSEC SLEEVED PURLINS @ 1200mm c/c. RAFTER STAYS AT ALTERNATE PURLINS & ANTI-SAG RODS TO MANUFACTURERS DETAILS.
- DENOTES MOMENT CONNECTION

THIS DRAWING IS BASED ON
INFORMATION RECEIVED 12.08.22

Rev:	Description:	Date:	By:	Chkd:
P02	UPDATED TO SUIT ROOF TERRACE PROPOSALS	18.11.22	KC	DB
P01	ISSUED FOR STAGE 2	25.08.22	KC	DB

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Status:
STAGE 2 ISSUE

Project:
GREAT NORTHERN WAREHOUSE

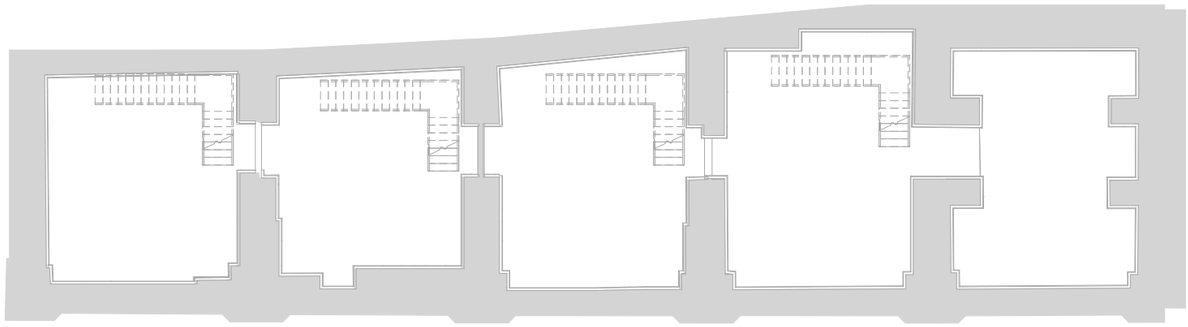
Drg Title:
TERRACE A THIRD FLOOR STRUCTURAL INTERVENTION GA

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	31/08/22	KC	DB	DB

Scale: As indicated

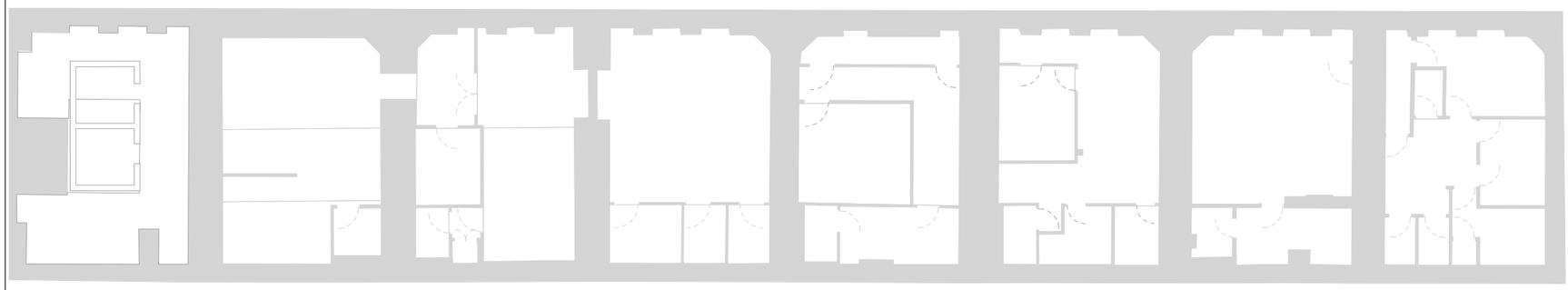
Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
064582	CUR	Z3A	03	DR	S	20103	P02

Model Name:XXX-XXX-CUR-ZZ-XX-M3-S-00001



PROPOSED BASEMENT 1

SCALE: 1 : 100



PROPOSED BASEMENT 2

SCALE: 1 : 100

GENERAL NOTES:

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CONTRACTOR TO MAKE ALLOWANCES FOR:

1. PRECLUSION OF WATER DURING CONSTRUCTION.

2. TEMPORARY EARTHWORKS & EXCAVATION SUPPORT.

3. TEMPORARY SUPPORT & STABILITY OF ALL EXISTING ELEMENTS DURING DEMOLITION & REMEDIAL WORKS.

4. VERIFICATION OF LOCATIONS OF ALL BELOW GROUND SERVICES & OBSTRUCTIONS PRIOR TO UNDERTAKING OF ANY WORKS.

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8. END PLATED CONNECTIONS TO ALL BEAMS

STAGE 2 W.I.P. NOTES:

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TERRACE STRUCTURAL PHILOSOPHY:

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P01	ISSUED FOR STAGE 2	31.08.22	KC	DB

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Status:

STAGE 2 ISSUE

Project:

GREAT NORTHERN WAREHOUSE

Drg Title:

TERRACE A BASEMENT STRUCTURAL INTERVENTION GA

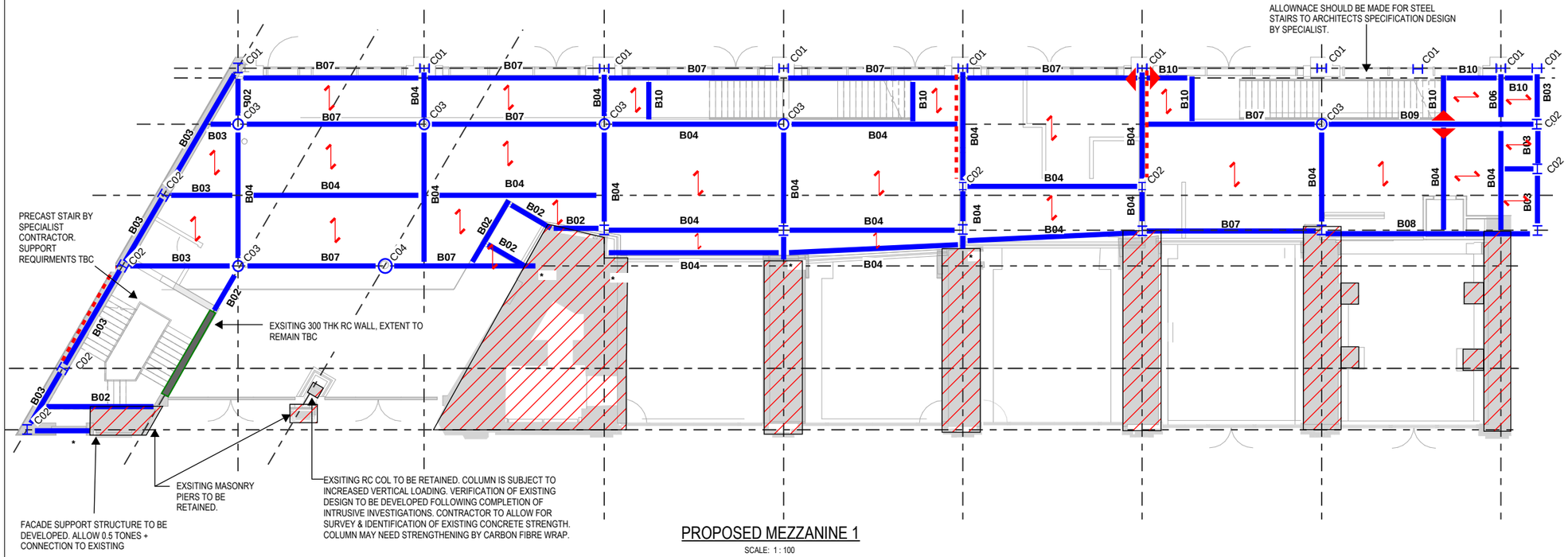
Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	31/08/22	KC	DB	DB

Scale: As indicated

Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
064582 -	CUR -	Z3A -	B1 -	DR -	S -	20080 -	P01

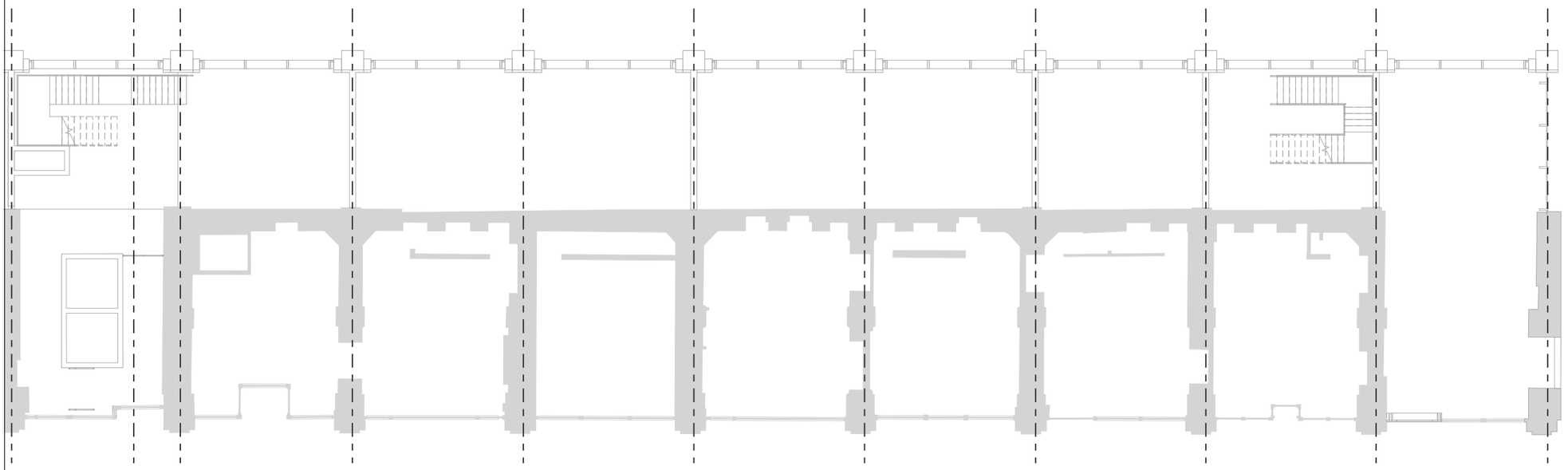
Model Name:XXXXXX-CUR-ZZ-XX-M3-S-00001

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PROPOSED MEZZANINE 1

SCALE: 1 : 100



PROPOSED MEZZANINE 2

SCALE: 1 : 100

STRUCTURAL STEEL COLUMN SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
C01	UC 305x305	S355
C02	UC 203x203	S355
C03	CHS219x10.0	S355
C04	CHS323.9x10.0	S355

STRUCTURAL STEEL BEAM SCHEDULE		
REF.	TYPE	STRUCTURAL MATERIAL
B01	UB 203x133	S355
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2. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
4. FOR GENERAL NOTES REFER TO DRAWING.

CONTRACTOR TO MAKE ALLOWANCES FOR:

1. PRECLUSION OF WATER DURING CONSTRUCTION.
2. TEMPORARY EARTHWORKS & EXCAVATION SUPPORT.
3. TEMPORARY SUPPORT & STABILITY OF ALL EXISTING ELEMENTS DURING DEMOLITION & REMEDIAL WORKS.
4. VERIFICATION OF LOCATIONS OF ALL BELOW GROUND SERVICES & OBSTRUCTIONS PRIOR TO UNDERTAKING OF ANY WORKS.
5. REMOVAL OF ALL OBSTRUCTIONS PRIOR TO PILING WORKS.
6. SURVEYING OF ALL NEW TO EXISTING INTERFACES TO VERIFY HISTORIC RECORDS WHICH HAVE FORMED THE BASIS OF DESIGN.
7. TESTING & VERIFICATION OF ANY EXISTING ELEMENTS AS REQUIRED BY THE STRUCTURAL ENGINEER.
8. END PLATED CONNECTIONS TO ALL BEAMS

STAGE 2 W.I.P. NOTES:

- STRUCTURAL PHILOSOPHY ONLY.
- STRUCTURAL ELEMENTS SUBJECT TO DESIGN DEVELOPMENT.
- PERIMETER DETAIL SUBJECT TO CONFIRMATION OF CLADDING PERFORMANCE CRITERIA

TERRACE STRUCTURAL PHILOSOPHY:

- FOUNDATIONS TO BE PILED
- ALL STEEL TO BE GRADE S355
- COLUMN SIZES SUBJECT TO GRID RESOULTION

FOUNDATION NOTES:

- FOUNDATION DESIGN IS PRELIMINARY.
- DESIGN IS SUBJECT TO DEVELOPMENT, GRID RESOLUTION, CONFIRMATION OF CONSTRUCTION BUILD UPS AND LOAD TAKE-DOWN
- REFERENCE SHOULD BE MADE TO CURTINS PHASE 2 SITE INVESTIGATIONS REPORT FOR DETAILS OF BELOW GROUND INFORMATION.
- CONSIDERATION SHOULD BE MADE FOR SPECIALIST REGARDING BELOW GROUND PROTECTION AGAINST RADON WITHIN BASEMENTS.

LEGEND

- INDICATES VERTICAL BRACING
- INDICATES SPAN OF 130mm THK SMD CONCRETE FLOOR
- INDICATES SPAN OF LIGHTWEIGHT METSEC FLOOR. ALLOW FOR 202.M.18 C JOIST @ 400 C/C.
- DENOTES MOMENT CONNECTION
- DENOTES EXISTING RETAINED STRUCTURE

* DENOTES SUPPORTS VIA CONNECTION INTO EXISTING MASONRY PIER. DETAIL TO BE DEVELOPED. EXACT DETAIL TBC FOLLOWING COMPLETION OF DEMO & ON SITE MEASURE.

ALLOWANCE TO BE MADE FOR 19mm DIA x 100mm LONG SHEAR STUDS AT EACH TROUGH LOCATION & @ 300c/c WHERE PARALLEL TO ALL BEAMS.
ALLOW FOR B12 TRANSVERSE BAR AT EACH STUD LOCATIONS.

ALLOWANCE TO BE MADE FOR PENETRATIONS TO BEAM WEBS FOR SERVICE DISTRIBUTION. DETAILS TO BE DEVELOPED AND COORDINATED WITH M&E DESIGNER

Rev:	Description:	Date:	By:	Chkd:
P02	UPDATED TO SUIT ROOF TERRACE PROPOSALS	18.11.22	KC	DB
P01	ISSUED FOR STAGE 2	25.08.22	KC	DB

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Status:

STAGE 2 ISSUE

Project:

GREAT NORTHERN WAREHOUSE

Drg Title:

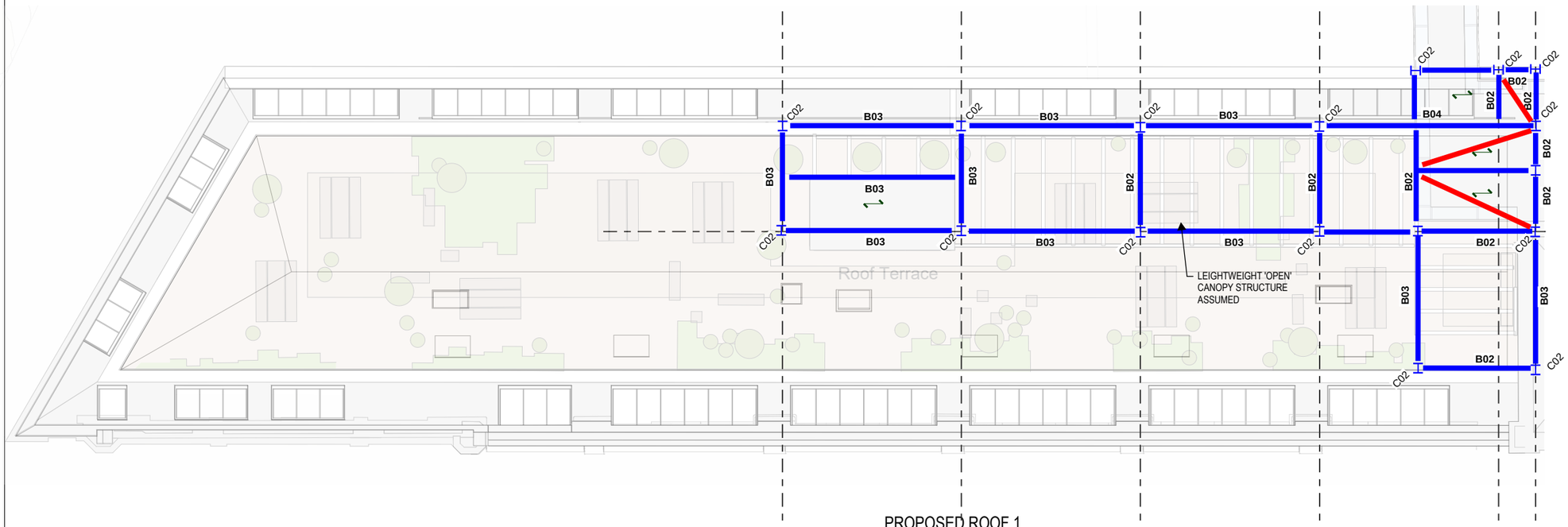
TERRACE A MEZZANINE STRUCTURAL INTERVENTION GA

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	31/08/22	KC	DB	DB
Scale: 1 : 100				

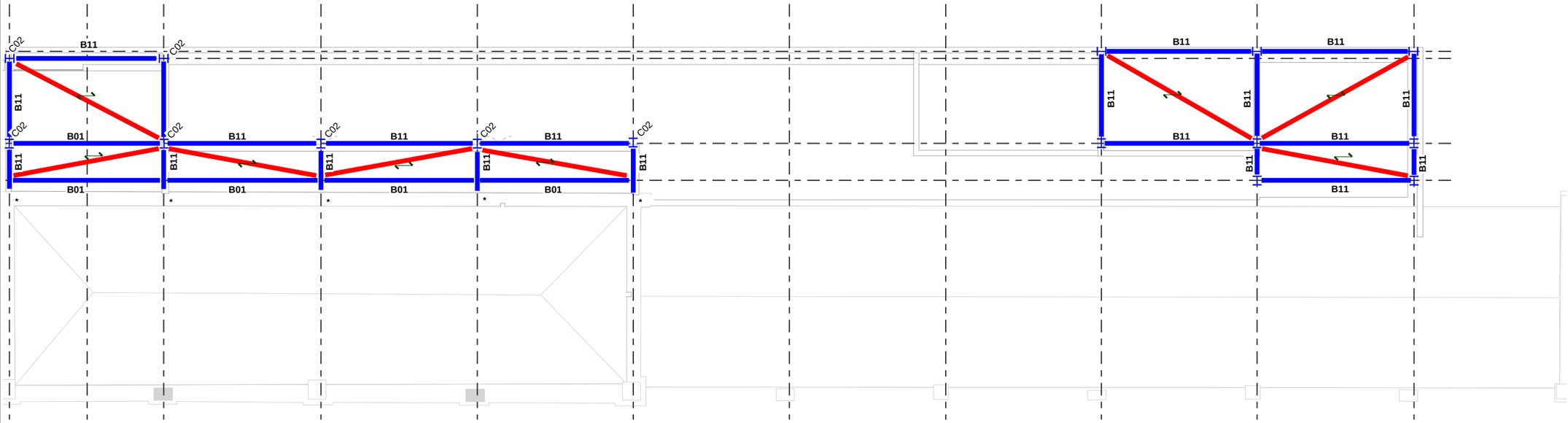
Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
064582	CUR	Z3A	M0	DR	S	20099	P02

Model Name:XXXXXX-CUR-ZZ-XX-M3-S-00001

THIS DRAWING IS BASED ON
INFORMATION RECEIVED 12.08.22



PROPOSED ROOF 1
SCALE: 1 : 100



PROPOSED ROOF 2
SCALE: 1 : 100

* DENOTES SUPPORTS VIA CONNECTION INTO EXISTING MASONRY PIER. DETAIL TO BE DEVELOPED. EXACT DETAIL TBC FOLLOWING COMPLETION OF DEMO & ON SITE MEASURE.

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STRUCTURAL STEEL COLUMN SCHEDULE

REF.	TYPE	STRUCTURAL MATERIAL
C01	UC 305x305	S355
C02	UC 203x203	S355
C03	CHS219x10.0	S355
C04	CHS323.9x10.0	S355

STRUCTURAL STEEL BEAM SCHEDULE

REF.	TYPE	STRUCTURAL MATERIAL
B01	UB 203x133	S355
B02	UB 254x146	S355
B03	UB 305x165	S355
B04	UB 356x171	S355
B05	UB 406x178	S355
B06	UC 203x203	S355
B07	RHS 300x200	S355
B08	RHS 400x200	S355
B09	RHS 500x300	S355
B10	SHS 200x200	S355
B11	RHS 200x150	S355
B12	UB 457x191	S355

GENERAL NOTES:

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4. VERIFICATION OF LOCATIONS OF ALL BELOW GROUND SERVICES & OBSTRUCTIONS PRIOR TO UNDERTAKING OF ANY WORKS.
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TERRACE STRUCTURAL PHILOSOPHY:

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- ALL STEEL TO BE GRADE S355
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FOUNDATION NOTES:

- FOUNDATION DESIGN IS PRELIMINARY.
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- REFERENCE SHOULD BE MADE TO CURTINS PHASE 2 SITE INVESTIGATIONS REPORT FOR DETAILS OF BELOW GROUND INFORMATION.
- CONSIDERATION SHOULD BE MADE FOR SPECIALIST REGARDING BELOW GROUND PROTECTION AGAINST RADON WITHIN BASEMENTS.

LEGEND

- INDICATES VERTICAL BRACING
- INDICATES HORIZONTAL BRACING
- INDICATES SPAN OF 130mm THK SMD CONCRETE FLOOR
- INDICATES SPAN DIRECTION OF 202Z18 METSEC SLEEVED PURLINS @ 1200mm c/c. RAFTER STAYS AT ALTERNATE PURLINS & ANTI-SAG RODS TO MANUFACTURERS DETAILS.
- DENOTES MOMENT CONNECTION

Rev:	Description:	Date:	By:	Chkd:
P02	UPDATED TO SUIT ROOF TERRACE PROPOSALS	18.11.22	KC	DB
P01	ISSUED FOR STAGE 2	25.08.22	KC	DB

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Status:
STAGE 2 ISSUE

Project:
GREAT NORTHERN WAREHOUSE

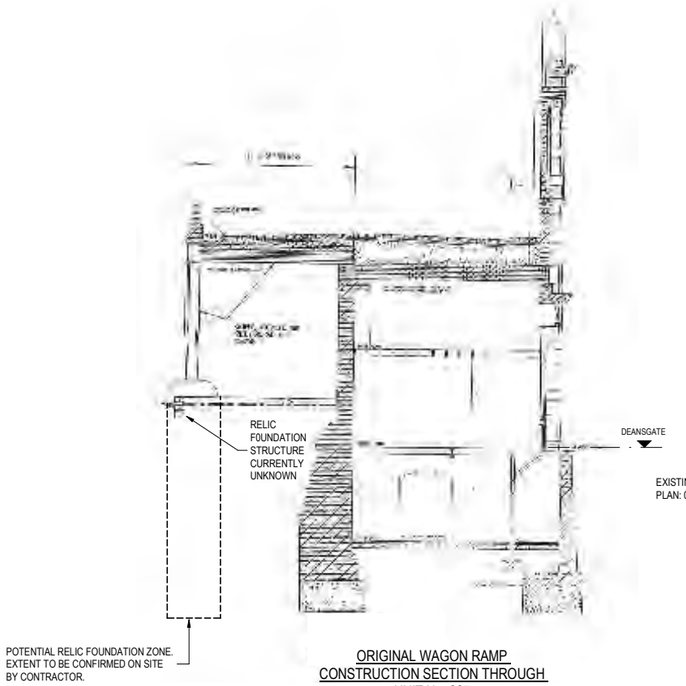
Drg Title:
TERRACE A ROOF STRUCTURAL INTERVENTION GA

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	31/08/22	KC	DB	DB

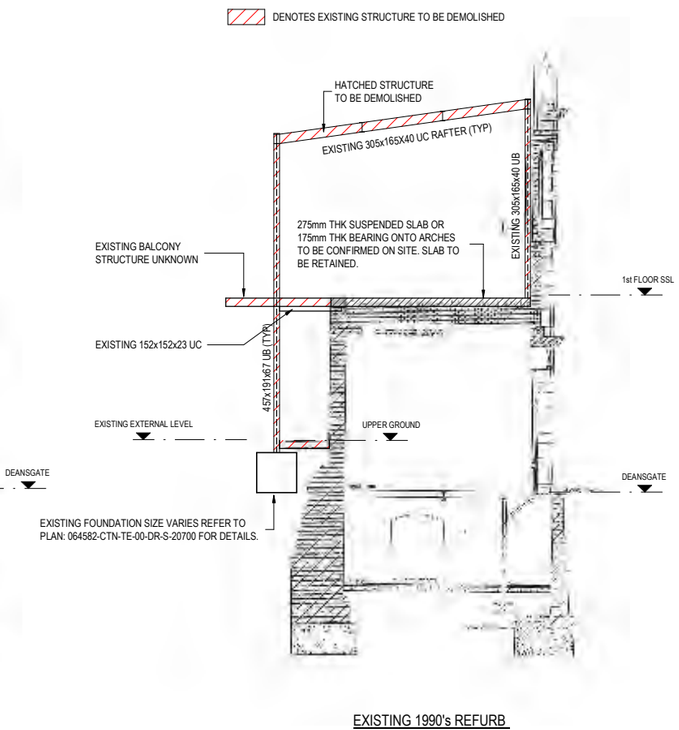
Scale: As indicated

Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
064582	CUR	Z3A	RF	DR	S	20105	P02

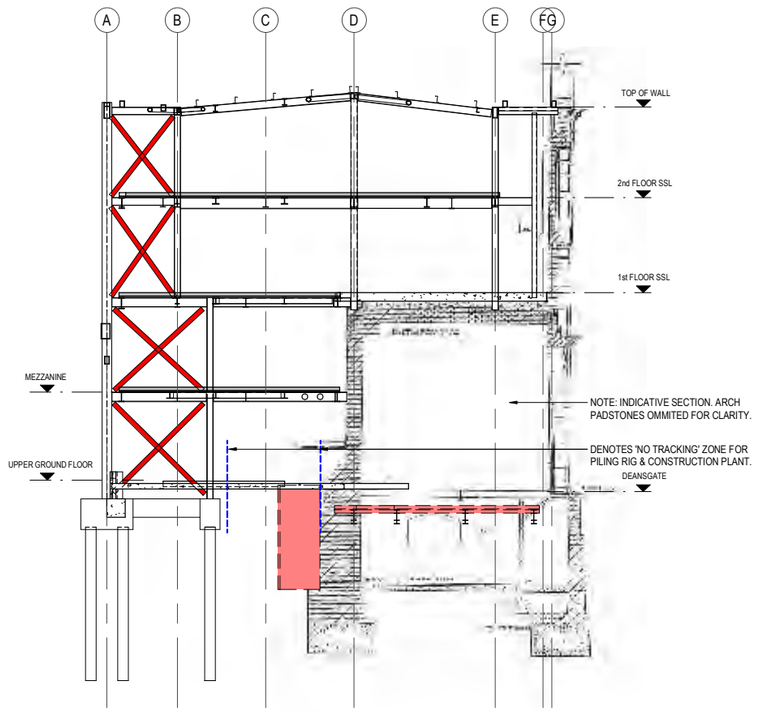
Model Name:XXX-XXX-CUR-ZZ-XX-M3-S-00001



ORIGINAL WAGON RAMP
CONSTRUCTION SECTION THROUGH
UNIT No. 227



EXISTING 1990's REFURB
CONSTRUCTION SECTION THROUGH
UNIT No. 227



PROPOSED CONSTRUCTION
SECTION ON GRIDLINE 5

RESIDUAL HAZARD REGISTER (RELATES TO CIVIL/STRUCTURAL MATTERS ONLY) MUST BE READ IN CONJUNCTION WITH CURTINS RESIDUAL REGISTER 064582-CTN-00-XX-HA-x-10001. HAZARDS THAT SHOULD BE OBVIOUS TO A COMPETENT CONTRACTOR HAVE NOT BEEN INDICATED ON THIS DRAWING, SHOULD ADDITIONAL HAZARDS BE IDENTIFIED, THE CONTRACTOR SHOULD NOTIFY ALL RELEVANT PROJECT TEAM MEMBERS.

HAZARD REF No.	ITEM (FEATURE, ELEMENT OR ACTIVITY)	RESIDUAL HAZARD
REF No.1.1	GROUND CONTAMINATION	POTENTIAL RISK TO HANDLING CONTAMINATED SUBSTANCES AND ACM's. REFERENCE SHOULD BE MADE TO CURTINS PHASE 2 SITE INVESTIGATION REPORT:- 608997-CUR-00-XX-RP-001-V02.
REF No.2.1	VIBRATION DURING CONSTRUCTION/PILING WORKS	RISK OF DAMAGE TO EXISTING STRUCTURES DUE TO VIBRATIONS FROM PILING OR THE GENERAL CONSTRUCTION WORKS METHODOLOGIES SHOULD CONSIDER GROUND VIBRATIONS AND THEIR EFFECTS ON ADJACENT STRUCTURES.
REF No.2.2	CONSTRUCTION - EXISTING BELOW GROUND OBSTRUCTION	THERE ARE A NUMBER OF CONSTRAINTS WHICH POSE A RISK TO THE EXCAVATIONS, PILING AND CONSTRUCTION WORKS INCLUDING (i.e. UXO, ARCHEOLOGICAL RISKS, EXISTING FOUNDATIONS AND SERVICES). REFERENCE SHOULD BE MADE TO THE UXO RISK ASSESSMENT REPORT BY '1st LINE OF DEFENSE' ALONG WITH CURTINS CONSTRAINTS DRAWING:- 064582-CUR-01-ZZ-DR-S-20700.
REF No.2.3	CONSTRUCTION - DEMOLITION AND NEW WORKS NEAR TO LIVE FOOTWAYS AND OCCUPIED BUILDING	ATTENTION IS DRAWN TO THE CLOSE PROXIMITY OF LIVE FOOTWAYS, ADJACENT LIVE PUBLIC SPACE AND OCCUPIED BUILDINGS. CONTRACTOR MUST ERECT APPROPRIATE BARRIERS AND HOARDINGS. CONTRACTOR TO AGREE WORKING HOURS AND METHOD STATEMENTS TO PROTECT THE PUBLIC AGAINST INTERACTION WITH THE WORKS.
REF No.2.4	CONSTRUCTION - UNMAPPED SERVICES	POTENTIAL FOR UNMAPPED SERVICES, OBSTRUCTIONS AND HISTORIC STRUCTURES NOT SHOWN ON THIS DRAWING. ALL DEMOLITION, EXCAVATION AND ENABLING WORKS MUST CONSIDER THIS CAREFULLY. ALL UNDERGROUND SERVICES MUST BE IDENTIFIED AND LOCATED BY THE MAIN CONTRACTOR PRIOR TO DEMOLITION.

HAZARD REF No.	ITEM (FEATURE, ELEMENT OR ACTIVITY)	RESIDUAL HAZARD
REF No.3.1	CONSTRUCTION - EXCAVATIONS AND FOUNDATIONS	EXCAVATIONS CLOSE TO EXISTING FOUNDATIONS AND STRUCTURAL ELEMENTS MUST CONSIDER THE RISK OF INSTABILITY. NO EXCAVATION IS TO UNDERMINE THE EXISTING FOUNDATIONS. THE MAIN CONTRACTOR TO SUBMIT A DETAILED AND ROBUST METHODOLOGY OUTLINING HOW TEMPORARY INSTABILITY OF STRUCTURAL COMPONENTS IS TO BE MANAGED.
REF No.5.1	DEMOLITION OF EXISTING NON-ORIGINAL STEEL FRAME	DURING THE DEMOLITION AND MODIFICATION WORKS TO THE EXISTING STRUCTURAL ELEMENTS THERE IS A RISK OF INSTABILITY. MAIN CONTRACTOR MUST SUBMIT THEIR PROPOSED DEMOLITION AND PROPPING SEQUENCING CAREFULLY CONSIDERING THIS ISSUE AND SUBMIT THEIR PROPOSALS FOR REVIEW BY THE SE PRIOR TO COMMENCEMENTS.
REF No.7.1	ERECTING STRUCTURE AND PLACING COMPONENTS	THE PRIMARY FRAME HAS BEEN DESIGNED WITH PERMANENT STABILITY IN MIND. TEMPORARY BRACING MAY BE REQUIRED TO PROVIDE STABILITY DURING CONSTRUCTION. THIS REQUIREMENT IS TO BE CAREFULLY CONSIDERED BY THE STEELWORK SUBCONTRACTOR IN LINE WITH THEIR PROPOSED CONSTRUCTION SEQUENCE.
REF No.7.2	CRANE SUB-BASE	ANY PROPOSED PLANT TRACKING LINES AND MOBILE CRANE LOCATION MUST BE REVIEWED BY THE CONTRACTORS TEMPORARY WORKS TEAM FOR INSTABILITYOF THE FOUNDING STRATA AND OR NEW/EXISTING STRUCTURE. CARE MUST BE TAKEN NOT TO SURCHARGE EXISTING STRUCTURES IN THE VICINITY AND A SUITABLE CORDON MUST BE MAINTAINED. THE METHODOLOGY MUST BE SUBMITTED FOR REVIEW BY SE.

GENERAL NOTES:

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3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
4. FOR GENERAL NOTES REFER TO DRAWING No. 064582-CUR-01-XX-DR-S-20001

NOTE: SECTIONS ARE INDICATIVE AND NOT TO SCALE. DO NOT SCALE FROM THIS DRAWING.

NOTE: EXISTING AND ORIGINAL FOUNDATION INFORMATION HAS BEEN TAKEN FROM ARCHIVE DRAWINGS. STRUCTURE TO BE CONFIRMED ON SITE.

NOTE
EXISTING STRUCTURE HAS BEEN INTERPRETED FROM ARUP ARCHIVE DRAWINGS FOR THE 1990's MODIFICATIONS/REFURB WORK. ALL SET OUT AND SIZE OF EXISTING STRUCTURE IS TO BE CONFIMED ON SITE

Rev:	Description:	Date:	By:	Chkd:
P01	STAGE 2 ISSUE	31/08/22	AC	DB

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Status: STAGE 2

Project: GREAT NORTHERN WAREHOUSE PHASE 1

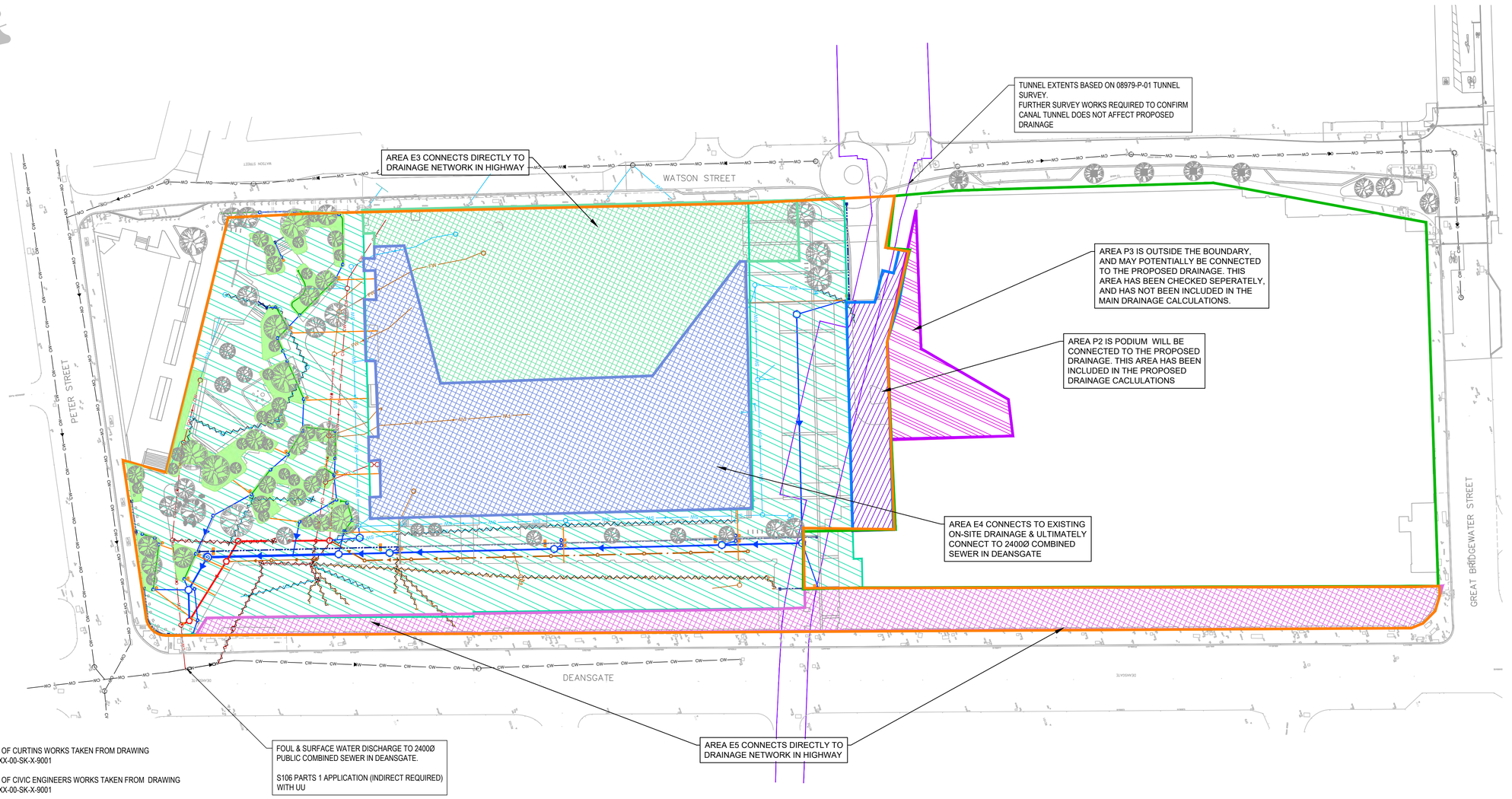
Drg Title: SITE CONSTRAINT SECTIONS

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	AUG 22	MH	DB	DB

Scale: As indicated

Project No:	Originator:	Zone:	Level:	Type:	Discipline:	Category / Number:	Rev:
064582	CUR	Z3A	XX	DR	S	21300	P01

Appendix C Proposed Drainage Drawings



GENERAL NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. DESIGN BASED ON TOPOGRAPHICAL SURVEY AND CCTV SURVEY INFORMATION AVAILABLE AT THE TIME OF DESIGN.
3. ALL EXISTING SEWERS, CONNECTIONS, PIPE SIZES AND INVERT LEVELS TO BE CONFIRMED BY CONTRACTOR PRIOR TO COMMENCEMENT OF WORKS TO ENSURE CONNECTIVITY. ANY VARIANCE FROM THE INFORMATION SHOWN SHOULD BE REPORTED TO THE ENGINEER FOR REVIEW.
4. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
5. ALL DIMENSIONS ARE IN METRES AND LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS OTHERWISE NOTED.
6. WHERE EXISTING DRAINAGE IS BEING USED, ALLOWANCES SHOULD BE MADE TO REMEDIATE THIS DRAINAGE IN LINE WITH AVAILABLE CCTV SURVEY INFORMATION. IF NO SURVEY IS AVAILABLE, IT IS ADVISED TO OBTAIN ONE PRIOR TO COMMENCEMENT OF WORKS.
7. ALL EXISTING SERVICES TO BE LOCATED PRIOR TO COMMENCEMENT OF ANY DRAINAGE WORKS, AND WHERE NECESSARY PROTECTION OR DIVERSIONS TO BE UNDERTAKEN TO AVOID CONFLICT WITH THE PROPOSED WORK.
8. ALL RAINWATER AND FOUL POP UPS LOCATIONS AND SIZES ARE TO BE CONFIRMED BY THE ARCHITECT AND M&E ENGINEER.
9. COVER LEVELS, GULLY POSITIONS, AND BUILDINGS LOCATION ARE APPROXIMATE AND SHALL BE CONFIRMED BY ARCHITECT/ LANDSCAPE ARCHITECT.
10. ALL PIPE DIAMETERS GIVEN ARE NOMINAL INTERNAL PIPE DIAMETERS. THESE ARE TO BE CONFIRMED ONCE A DETAILED CAPACITY CHECK HAS BEEN UNDERTAKEN AT A LATER DESIGN STAGE.
11. OUTFALL CONNECTION(S) SUBJECT TO AGREEMENT WITH THE APPROVING AUTHORITY.

KEY:

- BOUNDARY OF CURTINS WORKS TAKEN FROM DRAWING 772-02-CIV-XX-00-SK-X-9001
- BOUNDARY OF CIVIC ENGINEERS WORKS TAKEN FROM DRAWING 772-02-CIV-XX-00-SK-X-9001
- PROPOSED IMPERMEABLE AREA P1: 0.61 Ha
- PROPOSED IMPERMEABLE AREA P2: 0.05 Ha
  PODIUM AREA FALLS WITHIN CURTINS RESPONSIBILITY AND DRAINED BY THE PROPOSED SYSTEM.
- PROPOSED IMPERMEABLE AREA P3: 0.05 Ha
  THIS AREA FALLS WITHIN THE CIVIC ENGINEERS AREA OF RESPONSIBILITY, BUT IS POTENTIALLY MAY BE DRAINED BY THE PROPOSED SYSTEM. A CHECK OF THE CAPACITY OF THE SYTEM, INCLUDING THIS AREA, IS REQUIRED.
- SOFT LANDSCAPE
- EXISTING IMPERMEABLE AREA E3:
  THIS AREA CONSISTS OF EXISTING ROOF DRAINAGE THAT DRAINS DIRECTLY TO SEWERS IN WATSON STREET. CONNECTIONS ARE TO BE RETAINED, AND THEREFORE THIS AREA HAS BEEN EXCLUDED FROM DRAINAGE CALCULATIONS.
- EXISTING IMPERMEABLE AREA E4:
  THIS AREA CONSISTS OF EXISTING ROOF DRAINAGE THAT DRAINS VIA THE EXISTING DRAINAGE NETWORK ON THE SITE, AND OUTFALLS TO THE EXISTING PUBLIC SEWER IN DEANSGATE. CONNECTIONS ARE TO BE RETAINED, AND THEREFORE THIS AREA HAS BEEN EXCLUDED FROM DRAINAGE CALCULATIONS.
  THE EXISTING PRIVATE DRAINAGE WITHIN THE SITE WILL REQUIRE A DIVERSION.
- EXISTING IMPERMEABLE AREA E5:
  THIS AREA CONSISTS OF EXISTING ROOF DRAINAGE THAT DRAINS DIRECTLY TO SEWERS IN DEANSGATE. CONNECTIONS ARE TO BE RETAINED, AND THEREFORE THIS AREA HAS BEEN EXCLUDED FROM DRAINAGE CALCULATIONS.
- PROPOSED PRIVATE COMBINED DRAINAGE
- PROPOSED PRIVATE SURFACE WATER DRAINAGE
- PROPOSED PRIVATE FOUL DRAINAGE
- EXISTING PUBLIC COMBINED SEWER
- EXISTING PRIVATE COMBINED DRAINAGE
- EXISTING PRIVATE SURFACE WATER DRAINAGE
- EXISTING PRIVATE FOUL DRAINAGE

SURFACE WATER DRAINAGE DESIGN PHILOSOPHY

OUTFALL LOCATIONS
THE SURFACE WATER FOR THE PROPOSED BUILDING & EXTENSIONS TO THE 2400Ø PUBLIC COMBINED SEWER IN DEANSGATE, AS PER ADVICE RECEIVED FROM UNITED UTILITIES.

IT IS NOT CONSIDERED THAT INFILTRATION WILL BE SUITABLE FOR THIS SCHEME. HOWEVER, FURTHER TESTING MAY BE REQUIRED TO DEMONSTRATE THIS TO THE LLFA & UNITED UTILITIES.

LEVELS INDICATE THAT PUMPING WILL NOT BE REQUIRED.

PROPOSED FLOW RATES:
EXISTING FLOWS AS SHOWN IN TABLE 1.

THE MAXIMUM DISCHARGE OR THE 1-YEAR STORM IS 41 l/s, BASED ON A REDUCTION OF 50% FROM EXISTING FLOWS.

UNITED UTILITIES HAVE STATED THE MAXIMUM DISCHARGE RATE FROM THE SITE IS 47 l/s. THEREFORE, THIS DISCHARGE RATE HAS BEEN SET FOR THE 30 & 100-YEAR STORMS.

THIS IS BASED ON A 50% REDUCTION OF BROWNFIELD FLOWS FOR THE PROPOSED AREA (0.77HA), USING THE MODIFIED RATIONAL METHOD.

THE MAXIMUM DISCHARGE RATE IS TO BE AGREED WITH THE LLFA.

THE DRAINAGE HAS BEEN DESIGNED TO INCLUDE A 45% ALLOWANCE FOR CLIMATE CHANGE, IN ACCORDANCE WITH LLFA REQUIREMENTS

ATTENUATION REQUIREMENTS:
A QUICK STORAGE ESTIMATE INDICATES THAT THE REQUIRED ATTENUATION STORAGE IF APPROX. 300m³, FOR THE 1:100-YEAR STORM EVENT (INCLUDING 40% CLIMATE CHANGE).

THE ATTENUATION STORAGE IS TO BE PROVIDED BY:
- PERMEABLE SUB-BASE TO EXTERNAL PAVING
- FILTER DRAINS
- OVERSIZED PIPEWORK.

NOTE - FURTHER STORAGE ELEMENTS, SUCH AS CELLULAR TANKS, MAY BE REQUIRED IF THE PROPOSED STORAGE METHODS CAN NOT PROVIDE SUFFICIENT VOLUME.

SUSTAINABLE DRAINAGE:
SuDS TREATMENT IS PROVIDED BY THE RAIN GARDENS AND FILTER DRAINS, AND ALSO BY PERMEABLE SUB-BASE, IF USED.

FINAL SuDS PROPOSALS ARE SUBJECT TO FURTHER CO-ORDINATION AT DETAILED DESIGN STAGE.

A S106 (PART 1) APPLICATION WILL NEED TO BE SUBMITTED TO UNITED UTILITIES. A PART 2 APPLICATION WILL NOT BE REQUIRED.

TABLE 1: EXISTING AND PROPOSED DISCHARGE RATES

CATCHMENT	IMPERMEABLE AREA (Ha)	DISCHARGE FLOW RATES (l/s)		
		1-YR EVENT	30-YR EVENT	100-YR EVENT*
AREA E1	0.610	65	128	149
AREA E2	0.160	17	38	45
AREA E3	0.256	AS EXISTING - EXCLUDED FROM CALCULATIONS		
AREA E4	0.291	AS EXISTING - EXCLUDED FROM CALCULATIONS		
AREA E5	0.191	AS EXISTING - EXCLUDED FROM CALCULATIONS		
TOTAL IMPERMEABLE AREA (FOR DISCHARGE RATE CALCULATIONS)	**0.770**	**82**	**166**	**194**
		INCLUDES 50% REDUCTION IN ACCORDANCE WITH MCC REQUIREMENTS		
ALLOWABLE DISCHARGE		**41**	**83**	**97**
***PROPOSED INCLUDES FOR 45% CLIMATE CHANGE ALLOWANCE**				
ALLOWABLE DISCHARGE FOR 30 & 100-YEAR STORMS IS 47 l/s, AS PER UNITED UTILITIES REQUIREMENTS				

DRAWING IS BASED ON:

ARCHITECTS PLANS
- 10422-SHP-Z0-A-G100-PL-00-001 REV P08 SITE PLAN GROUND FLOOR
- 10422-SHP-Z0-A-G100-PL-01-001 REV P08 SITE PLAN FIRST FLOOR
- 10422-SHP-Z0-A-G100-PL-RF-001 REV P06 WAREHOUSE ROOF PLAN

LANDSCAPE ARCHITECT'S PLANS
- 2891-PLA-XX-00-DR-L-0001 REV P02 LANDSCAPE GA
- 2891-PLA-XX-XX-SK-L-0004 DRAFT LEVEL MARK UP

SERVICES
- 2891-PLA-XX-XX-SK-L-0002 REV P01 GN SQUARE WIP GA

SURVEY INFORMATION
- S13920-T-01 & 02 REV -- BY SEP MAR 2017
- CCTV SURVEY BY SEP DATED JUNE 2017
- 08979-P-01 TUNNEL SURVEY (WATERCOURSE) BY SEP DATED DEC 2013

SITE INVESTIGATION
- 064582-CUR-00-XX-RP-GE-001 REV P01 PHASE 1 PRELIMINARY RISK ASSESSMENT

TOPOGRAPHICAL SURVEY
- S13920-T-01 & T02 BY SEP RECEIVED APRIL 2017

UTILITY SURVEY
- S12020-U BY SEP DATED JAN 2016

CCTV SURVEY
- S14423-CCTV BY SEP DATED JAN 2016
- 1286 BY LAYER SURVEY DATED JUNE 2022

UNITED UTILITIES PUBLIC SEWER RECORDS
- EXTRACT DATED NOVEMBER 2018.

DESIGN RESPONSIBILITY PLANS (CIVIC ENGINEERS)
- 772-02-CIV-XX-00-SK-X-9001 REV P02
- 772-02-CIV-XX-00-SK-X-9002 REV P02
- 772-02-CIV-XX-00-SK-X-9001 REV P02

Rev:	Description:	Date:	By:	Chkd:
P01	FIRST ISSUE	28.10.22	ATL	MW

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Birmingham • Bristol • Cambridge • Cardiff • Douglas • Dublin • Edinburgh • Glasgow • Kendal • Leeds • Liverpool • London • Manchester • Nottingham

Status: SUITABLE FOR INFORMATION — S2

Project: GREAT NORTHERN WAREHOUSE, MANCHESTER

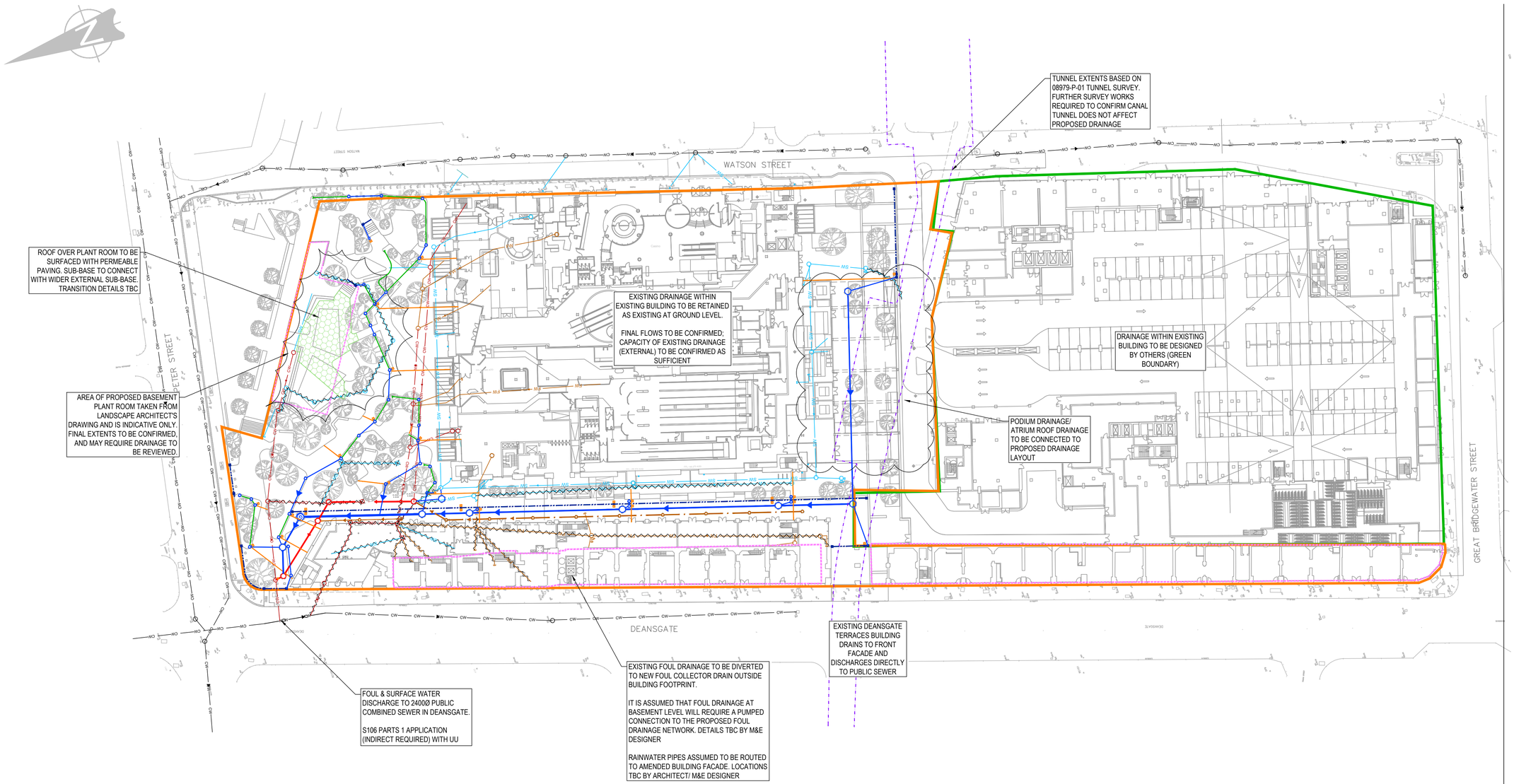
Drg Title: PROPOSED DRAINAGE CATCHMENTS

Drawn By	Designed By	Checked By
ATL	ATL	MW
	Date: 28/10/22	Scales @ A1: 1:500

Project No - Originator - Function - Spatial - Form - Discipline - Number: 064582 - CUR - XX - 00 - D - C - 92012

Revision: P01

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GENERAL NOTES:

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KEY

- RED LINE BOUNDARY, TAKEN 10422-SHP-Z0-A-G100-PL-00-00
- CURTINS DRAINAGE WORKS EXTENTS

EXISTING DRAINAGE

- EXISTING PUBLIC COMBINED SEWER
- EXISTING PRIVATE COMBINED DRAIN
- EXISTING PRIVATE FOUL DRAIN
- EXISTING PRIVATE SURFACE WATER DRAIN
- DRAINAGE TO BE ABANDONED & REMOVED

PROPOSED DRAINAGE

- PROPOSED COMBINED DRAINAGE
- PROPOSED FOUL DRAINAGE
- PROPOSED SURFACE WATER DRAINAGE
- PROPOSED PERFORATED SURFACE WATER DRAIN IN LANDSCAPED AREA
- PROPOSED LINEAR DRAINAGE - GATIC CASTSLOT TREADSAFE OR SIMILAR APPROVED.
- PERMEABLE SURFACING ON PLANT ROOM ROOF.
- DIFFUSER UNIT IN PERMEABLE SUB-BASE.
- CHECK DAM IN PERMEABLE SUB-BASE.
- EXTENT OF PLANT ROOM AREA (INDICATIVE ONLY - EXACT EXTENTS TBC)
- EXTENT OF UNDERGROUND CANAL ROUTE (INDICATIVE)

SURFACE WATER DRAINAGE DESIGN PHILOSOPHY

OUTFALL LOCATIONS
THE SURFACE WATER FOR THE PROPOSED BUILDING & EXTENSIONS TO THE 2400Ø PUBLIC COMBINED SEWER IN DEANSGATE, AS PER ADVICE RECEIVED FROM UNITED UTILITIES.

IT IS NOT CONSIDERED THAT INFILTRATION WILL BE SUITABLE FOR THIS SCHEME. HOWEVER, FURTHER TESTING MAY BE REQUIRED TO DEMONSTRATE THIS TO THE LLFA & UNITED UTILITIES.

LEVELS INDICATE THAT PUMPING WILL NOT BE REQUIRED.

PROPOSED FLOW RATES:
EXISTING FLOWS AS SHOWN IN TABLE 1.

THE MAXIMUM DISCHARGE OR THE 1-YEAR STORM IS 41 l/s, BASED ON A REDUCTION OF 50% FROM EXISTING FLOWS.

UNITED UTILITIES HAVE STATED THE MAXIMUM DISCHARGE RATE FROM THE SITE IS 47 l/s. THEREFORE, THIS DISCHARGE RATE HAS BEEN SET FOR THE 30 & 100-YEAR STORMS.

THIS IS BASED ON A 50% REDUCTION OF BROWNFIELD FLOWS FOR THE PROPOSED AREA (0.77hA), USING THE MODIFIED RATIONAL METHOD.

THE MAXIMUM DISCHARGE RATE IS TO BE AGREED WITH THE LLFA.

THE DRAINAGE HAS BEEN DESIGNED TO INCLUDE A 45% ALLOWANCE FOR CLIMATE CHANGE, IN ACCORDANCE WITH LLFA REQUIREMENTS

ATTENUATION REQUIREMENTS:

THE ATTENUATION STORAGE IS TO BE PROVIDED BY:
- PERMEABLE SUB-BASE TO EXTERNAL PAVING
- FILTER DRAINS
- OVERSIZED PIPEWORK.

NOTE - FURTHER STORAGE ELEMENTS, SUCH AS CELLULAR TANKS, MAY BE REQUIRED IF THE PROPOSED STORAGE METHODS CAN NOT PROVIDE SUFFICIENT VOLUME.

SUSTAINABLE DRAINAGE:
SuDS TREATMENT IS PROVIDED BY THE RAIN GARDENS AND FILTER DRAINS, AND ALSO BY PERMEABLE SUB-BASE, IF USED.

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FOUL WATER DRAINAGE DESIGN PHILOSOPHY

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FLOW RATES
TERRACE AREA
FW PEAK FLOW RATE: 13.7 l/s BASED ON 383.7 DISCHARGE UNITS, AS PER M&E DESIGNER INFORMATION.

WAREHOUSE BUILDING (ADDITIONAL DRAINAGE)
FW PEAK FLOW RATE: 6.5 l/s BASED ON 87 DISCHARGE UNITS, AS PER M&E DESIGNER INFORMATION.
FOUL DRAINAGE AT HIGHER LEVELS, AND IS TO BE CONNECTED TO EXISTING ABOVE GROUND DRAINAGE.
UNDERGROUND DRAINAGE NETWORK CAPACITY TO BE CHECKED FOR SUFFICIENCY

BASEMENTS
LEVELS INDICATE THAT THE EXISTING BASEMENT AREAS WILL REQUIRE PUMPING TO DISCHARGE FOUL DRAINAGE.
FURTHER SURVEY WORKS MAY BE REQUIRED IN ORDER TO CONFIRM IF THERE IS ANY EXISTING GRAVITY DRAINAGE FROM THIS AREA.

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TABLE 1: EXISTING AND PROPOSED DISCHARGE RATES

CATCHMENT	IMPERMEABLE AREA (Ha)	DISCHARGE FLOW RATES (l/s)		
		1-YR EVENT	30-YR EVENT	100-YR EVENT*
AREA E1	0.610	65	128	149
AREA E2	0.160	17	38	45
AREA E3	0.256	AS EXISTING - EXCLUDED FROM CALCULATIONS		
AREA E4	0.291	AS EXISTING - EXCLUDED FROM CALCULATIONS		
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TOTAL IMPERMEABLE AREA (FOR DISCHARGE RATE CALCULATIONS)	**0.770**	**82**	**166**	**194**
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- CCTV SURVEY BY SEP DATED JUNE 2017
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TOPOGRAPHICAL SURVEY
- S13920-T-01 & T02 BY SEP RECEIVED APRIL 2017

UTILITY SURVEY
- S12020-U BY SEP DATED JAN 2016

CCTV SURVEY
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Rev:	Description:	Date:	By:	Chkd:
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P01	STAGE 2 ISSUE	31.08.22	ATL	MW

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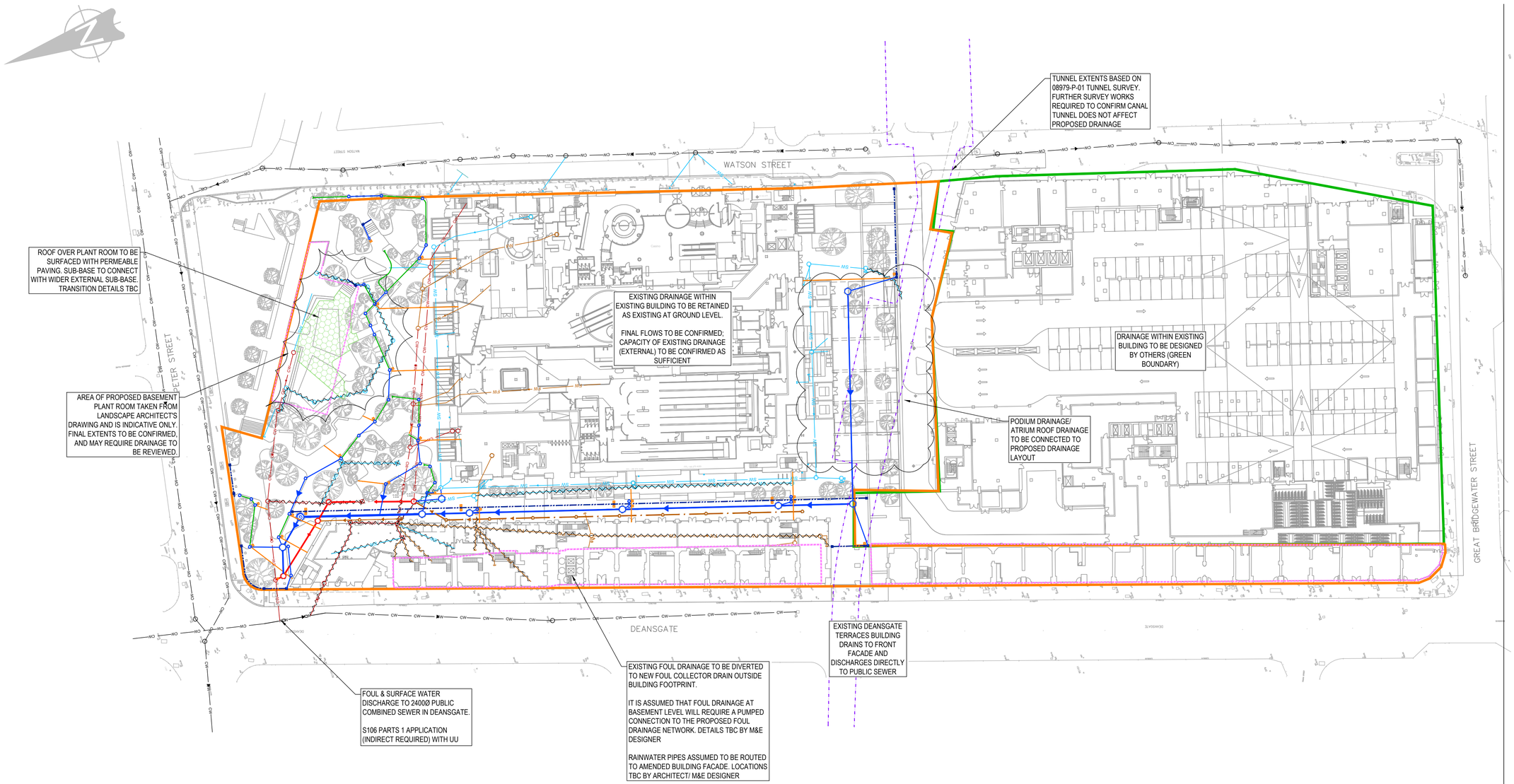
Project: GREAT NORTHERN WAREHOUSE

Drg Title: PROPOSED DRAINAGE STRATEGY OVERVIEW

Drawn By	Designed By	Checked By
ATL	ATL	CG
	Date: 31/08/22	Scales @ A1: 1:500

Project No - Originator - Function - Spatial - Form - Discipline - Number: 064582 - CUR - XX - XX - D - C - 92000
Revision: P02

\\mafs02\Projects\064001 - 065000\064582 Phase 1 & 2 Great Northern Warehouse\CAD\S 4 Production\4B Models & Drawings_Civil\C\CAD\



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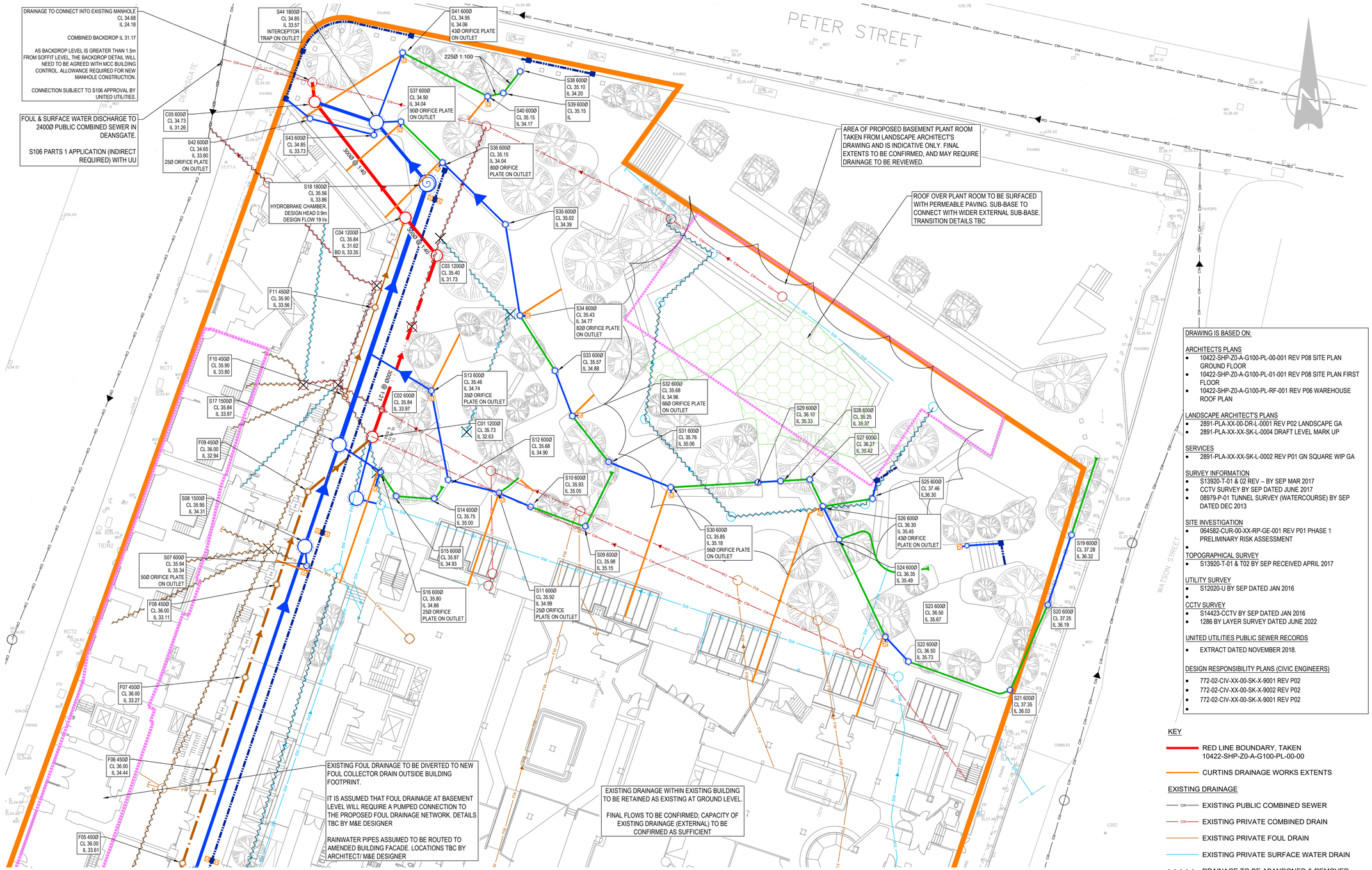
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\\mafs02\Projects\064001 - 065000\064582 Phase 1 & 2 Great Northern Warehouse\CAD\S 4 Production\4B Models & Drawings_Civil\C\CAD\



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- RED LINE BOUNDARY, TAKEN 10422-SHP-Z0-A-G100-PL-00-00
- CURTINS DRAINAGE WORKS EXTENTS

EXISTING DRAINAGE
- EXISTING PUBLIC COMBINED SEWER
- EXISTING PRIVATE COMBINED DRAIN
- EXISTING PRIVATE FOUL DRAIN
- EXISTING PRIVATE SURFACE WATER DRAIN
- DRAINAGE TO BE ABANDONED & REMOVED

PROPOSED DRAINAGE
- PROPOSED COMBINED DRAINAGE
- PROPOSED FOUL DRAINAGE
- PROPOSED SURFACE WATER DRAINAGE
- PROPOSED PERFORATED SURFACE WATER DRAIN IN LANDSCAPED AREA
- PROPOSED LINEAR DRAINAGE - GATIC CASTSLOT TREADSAFE OR SIMILAR APPROVED.
- PERMEABLE SURFACING ON PLANT ROOM ROOF.
- DIFFUSER UNIT IN PERMEABLE SUB-BASE.
- CHECK DAM IN PERMEABLE SUB-BASE.
- EXTENT OF PLANT ROOM AREA (INDICATIVE ONLY - EXACT EXTENTS TBC)
- EXTENT OF UNDERGROUND CANAL ROUTE (INDICATIVE)

SURFACE WATER DRAINAGE DESIGN PHILOSOPHY

OUTFALL LOCATIONS
THE SURFACE WATER FOR THE PROPOSED BUILDING & EXTENSIONS TO THE 2400Ø PUBLIC COMBINED SEWER IN DEANSGATE, AS PER ADVICE RECEIVED FROM UNITED UTILITIES.

IT IS NOT CONSIDERED THAT INFILTRATION WILL BE SUITABLE FOR THIS SCHEME. HOWEVER, FURTHER TESTING MAY BE REQUIRED TO DEMONSTRATE THIS TO THE LLFA & UNITED UTILITIES.

LEVELS INDICATE THAT PUMPING WILL NOT BE REQUIRED.

PROPOSED FLOW RATES:
EXISTING FLOWS AS SHOWN IN TABLE 1.

THE MAXIMUM DISCHARGE OR THE 1-YEAR STORM IS 41 l/s, BASED ON A REDUCTION OF 50% FROM EXISTING FLOWS.

UNITED UTILITIES HAVE STATED THE MAXIMUM DISCHARGE RATE FROM THE SITE IS 47 l/s. THEREFORE, THIS DISCHARGE RATE HAS BEEN SET FOR THE 30 & 100-YEAR STORMS.

THIS IS BASED ON A 50% REDUCTION OF BROWNFIELD FLOWS FOR THE PROPOSED AREA (0.77hA), USING THE MODIFIED RATIONAL METHOD.

THE MAXIMUM DISCHARGE RATE IS TO BE AGREED WITH THE LLFA.

THE DRAINAGE HAS BEEN DESIGNED TO INCLUDE A 45% ALLOWANCE FOR CLIMATE CHANGE, IN ACCORDANCE WITH LLFA REQUIREMENTS

ATTENUATION REQUIREMENTS:

THE ATTENUATION STORAGE IS TO BE PROVIDED BY:
- PERMEABLE SUB-BASE TO EXTERNAL PAVING
- FILTER DRAINS
- OVERSIZED PIPEWORK.

NOTE - FURTHER STORAGE ELEMENTS, SUCH AS CELLULAR TANKS, MAY BE REQUIRED IF THE PROPOSED STORAGE METHODS CAN NOT PROVIDE SUFFICIENT VOLUME.

SUSTAINABLE DRAINAGE:
SuDS TREATMENT IS PROVIDED BY THE RAIN GARDENS AND FILTER DRAINS, AND ALSO BY PERMEABLE SUB-BASE, IF USED.

FINAL SuDS PROPOSALS ARE SUBJECT TO FURTHER CO-ORDINATION AT DETAILED DESIGN STAGE.

A S106 (PART 1) APPLICATION WILL NEED TO BE SUBMITTED TO UNITED UTILITIES. A PART 2 APPLICATION WILL NOT BE REQUIRED.

FOUL WATER DRAINAGE DESIGN PHILOSOPHY

THE SURFACE WATER FOR THE PROPOSED BUILDING & EXTENSIONS TO THE 2400Ø PUBLIC COMBINED SEWER IN DEANSGATE, AS PER ADVICE RECEIVED FROM UNITED UTILITIES.

FLOW RATES
TERRACE AREA
FW PEAK FLOW RATE: 13.7 l/s BASED ON 383.7 DISCHARGE UNITS, AS PER M&E DESIGNER INFORMATION.

WAREHOUSE BUILDING (ADDITIONAL DRAINAGE)
FW PEAK FLOW RATE: 6.5 l/s BASED ON 87 DISCHARGE UNITS, AS PER M&E DESIGNER INFORMATION.
FOUL DRAINAGE AT HIGHER LEVELS, AND IS TO BE CONNECTED TO EXISTING ABOVE GROUND DRAINAGE.
UNDERGROUND DRAINAGE NETWORK CAPACITY TO BE CHECKED FOR SUFFICIENCY

BASEMENTS
LEVELS INDICATE THAT THE EXISTING BASEMENT AREAS WILL REQUIRE PUMPING TO DISCHARGE FOUL DRAINAGE.
FURTHER SURVEY WORKS MAY BE REQUIRED IN ORDER TO CONFIRM IF THERE IS ANY EXISTING GRAVITY DRAINAGE FROM THIS AREA.

A S106 (PART 1) APPLICATION WILL NEED TO BE SUBMITTED TO UNITED UTILITIES. A PART 2 APPLICATION WILL NOT BE REQUIRED.

TABLE 1: EXISTING AND PROPOSED DISCHARGE RATES

CATCHMENT	IMPERMEABLE AREA (Ha)	DISCHARGE FLOW RATES (l/s)		
		1-YR EVENT	30-YR EVENT	100-YR EVENT*
AREA E1	0.610	65	128	149
AREA E2	0.160	17	38	45
AREA E3	0.256	AS EXISTING - EXCLUDED FROM CALCULATIONS		
AREA E4	0.291	AS EXISTING - EXCLUDED FROM CALCULATIONS		
AREA E5	0.191	AS EXISTING - EXCLUDED FROM CALCULATIONS		
TOTAL IMPERMEABLE AREA (FOR DISCHARGE RATE CALCULATIONS)	**0.770**	**82**	**166**	**194**
		INCLUDES 50% REDUCTION IN ACCORDANCE WITH MCC REQUIREMENTS		
ALLOWABLE DISCHARGE		**41**	**83**	**97**
*PROPOSED INCLUDES FOR 45% CLIMATE CHANGE ALLOWANCE				

Rev:	Description:	Date:	By:	Chkd:
P01	DRAFT PLANNING ISSUE	28.10.22	ATL	MW

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Birmingham • Bristol • Cambridge • Cardiff • Douglas • Dublin • Edinburgh • Glasgow • Kendal • Leeds • Liverpool • London • Manchester • Nottingham

Status: SUITABLE FOR INFORMATION — S2

Project: GREAT NORTHERN WAREHOUSE

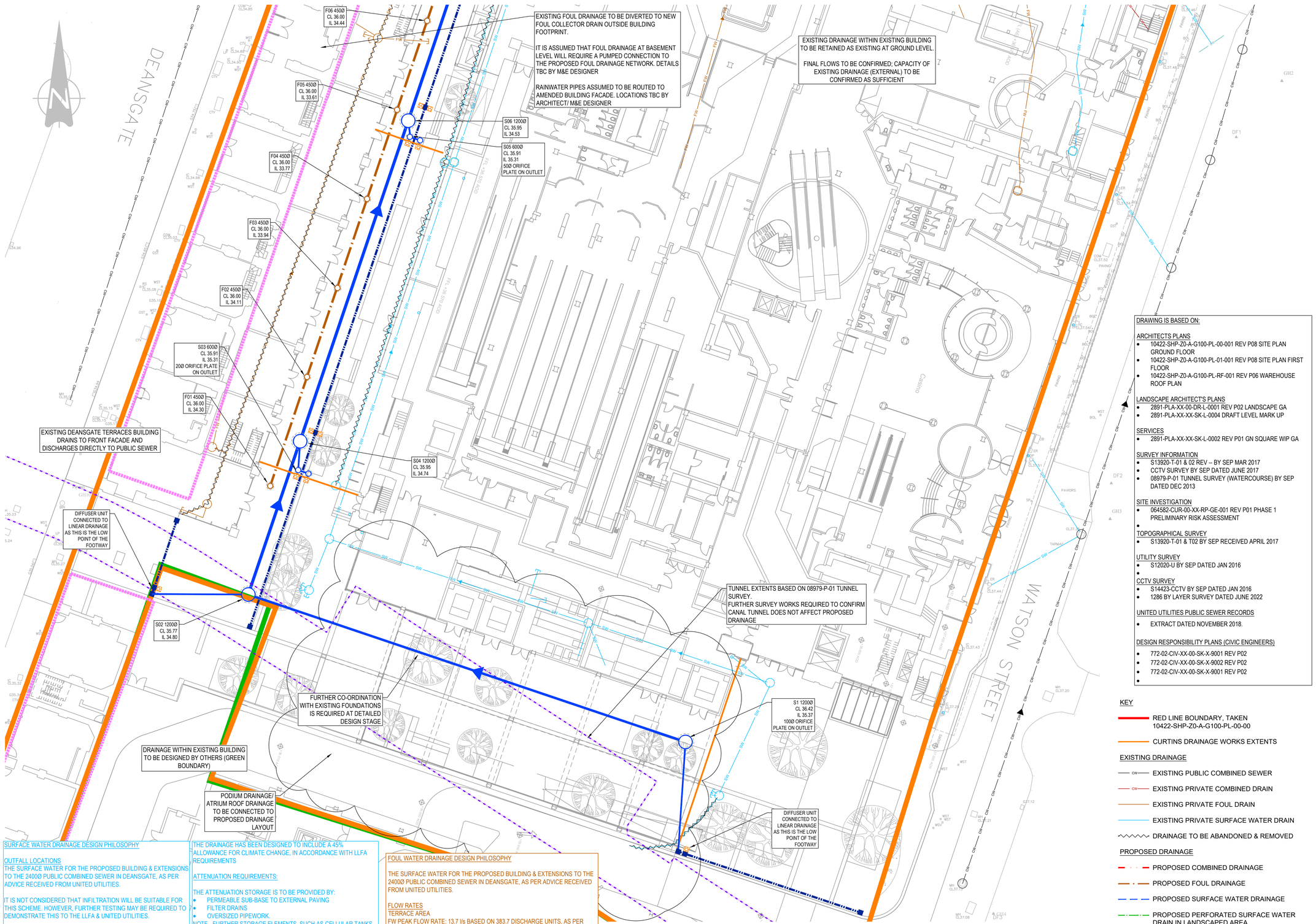
Drg Title: PROPOSED DRAINAGE STRATEGY SHEET 1

Drawn By	Designed By	Checked By
ATL	ATL	MW
	Date: 28/10/22	Scales @ A1: 1:200

Project No - Originator - Function - Spatial - Form - Discipline - Number: 064582 - CUR - XX - XX - D - C - 92001

Revision: P01

\\mafs02\Projects\064001 - 065000\064582 Phase 1 & 2 Great Northern Warehouse\2MS 4 Production\B Models & Drawings_Civil-C\ADI\



GENERAL NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. DESIGN BASED ON TOPOGRAPHICAL SURVEY AND CCTV SURVEY INFORMATION AVAILABLE AT THE TIME OF DESIGN.
3. ALL EXISTING SEWERS, CONNECTIONS, PIPE SIZES AND INVERT LEVELS TO BE CONFIRMED BY CONTRACTOR PRIOR TO COMMENCEMENT OF WORKS TO ENSURE CONNECTIVITY. ANY VARIANCE FROM THE INFORMATION SHOWN SHOULD BE REPORTED TO THE ENGINEER FOR REVIEW.
4. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
5. ALL DIMENSIONS ARE IN METRES AND LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS OTHERWISE NOTED.
6. WHERE EXISTING DRAINAGE IS BEING USED, ALLOWANCES SHOULD BE MADE TO REMEDIATE THIS DRAINAGE IN LINE WITH AVAILABLE CCTV SURVEY INFORMATION. IF NO SURVEY IS AVAILABLE, IT IS ADVISED TO OBTAIN ONE PRIOR TO COMMENCEMENT OF WORKS.
7. ALL EXISTING SERVICES TO BE LOCATED PRIOR TO COMMENCEMENT OF ANY DRAINAGE WORKS, AND WHERE NECESSARY PROTECTION OR DIVERSIONS TO BE UNDERTAKEN TO AVOID CONFLICT WITH THE PROPOSED WORK.
8. ALL RAINWATER AND FOUL POP UPS LOCATIONS AND SIZES ARE TO BE CONFIRMED BY THE ARCHITECT AND M&E ENGINEER.
9. COVER LEVELS, GULLY POSITIONS, AND BUILDINGS LOCATION ARE APPROXIMATE AND SHALL BE CONFIRMED BY ARCHITECT/ LANDSCAPE ARCHITECT.
10. ALL PIPE DIAMETERS GIVEN ARE NOMINAL INTERNAL PIPE DIAMETERS. THESE ARE TO BE CONFIRMED ONCE A DETAILED CAPACITY CHECK HAS BEEN UNDERTAKEN AT A LATER DESIGN STAGE.
11. OUTFALL CONNECTION(S) SUBJECT TO AGREEMENT WITH THE APPROVING AUTHORITY.

DRAWING IS BASED ON:

ARCHITECTS PLANS
- 10422-SHP-Z0-A-G100-PL-00-001 REV P08 SITE PLAN GROUND FLOOR
- 10422-SHP-Z0-A-G100-PL-01-001 REV P08 SITE PLAN FIRST FLOOR
- 10422-SHP-Z0-A-G100-PL-RF-001 REV P06 WAREHOUSE ROOF PLAN

LANDSCAPE ARCHITECT'S PLANS
- 2891-PLA-XX-00-DR-L-0001 REV P02 LANDSCAPE GA
- 2891-PLA-XX-XX-SK-L-0004 DRAFT LEVEL MARK UP

SERVICES
- 2891-PLA-XX-XX-SK-L-0002 REV P01 GN SQUARE WIP GA

SURVEY INFORMATION
- S13920-T-01 & 02 REV -- BY SEP MAR 2017
- CCTV SURVEY BY SEP DATED JUNE 2017
- 08979-P-01 TUNNEL SURVEY (WATERCOURSE) BY SEP DATED DEC 2013

SITE INVESTIGATION
- 064582-CUR-00-XX-RP-GE-001 REV P01 PHASE 1 PRELIMINARY RISK ASSESSMENT

TOPOGRAPHICAL SURVEY
- S13920-T-01 & T02 BY SEP RECEIVED APRIL 2017

UTILITY SURVEY
- S12020-U BY SEP DATED JAN 2016

CCTV SURVEY
- S14423-CCTV BY SEP DATED JAN 2016
- 1286 BY LAYER SURVEY DATED JUNE 2022

UNITED UTILITIES PUBLIC SEWER RECORDS
- EXTRACT DATED NOVEMBER 2018.

DESIGN RESPONSIBILITY PLANS (CIVIC ENGINEERS)
- 772-02-CIV-XX-00-SK-X-9001 REV P02
- 772-02-CIV-XX-00-SK-X-9002 REV P02
- 772-02-CIV-XX-00-SK-X-9001 REV P02

KEY
- RED LINE BOUNDARY, TAKEN 10422-SHP-Z0-A-G100-PL-00-00
- CURTINS DRAINAGE WORKS EXTENTS

EXISTING DRAINAGE
- EXISTING PUBLIC COMBINED SEWER
- EXISTING PRIVATE COMBINED DRAIN
- EXISTING PRIVATE FOUL DRAIN
- EXISTING PRIVATE SURFACE WATER DRAIN
- DRAINAGE TO BE ABANDONED & REMOVED

PROPOSED DRAINAGE
- PROPOSED COMBINED DRAINAGE
- PROPOSED FOUL DRAINAGE
- PROPOSED SURFACE WATER DRAINAGE
- PROPOSED PERFORATED SURFACE WATER DRAIN IN LANDSCAPED AREA
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- PERMEABLE SURFACING ON PLANT ROOM ROOF.
- DIFFUSER UNIT IN PERMEABLE SUB-BASE.
- CHECK DAM IN PERMEABLE SUB-BASE.
- EXTENT OF PLANT ROOM AREA (INDICATIVE ONLY - EXACT EXTENTS TBC)
- EXTENT OF UNDERGROUND CANAL ROUTE (INDICATIVE)

SURFACE WATER DRAINAGE DESIGN PHILOSOPHY

OUTFALL LOCATIONS
THE SURFACE WATER FOR THE PROPOSED BUILDING & EXTENSIONS TO THE 2400Ø PUBLIC COMBINED SEWER IN DEANSGATE, AS PER ADVICE RECEIVED FROM UNITED UTILITIES.

IT IS NOT CONSIDERED THAT INFILTRATION WILL BE SUITABLE FOR THIS SCHEME. HOWEVER, FURTHER TESTING MAY BE REQUIRED TO DEMONSTRATE THIS TO THE LLFA & UNITED UTILITIES.

LEVELS INDICATE THAT PUMPING WILL NOT BE REQUIRED.

PROPOSED FLOW RATES:
EXISTING FLOWS AS SHOWN IN TABLE 1.

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THIS IS BASED ON A 50% REDUCTION OF BROWNFIELD FLOWS FOR THE PROPOSED AREA (0.77hA), USING THE MODIFIED RATIONAL METHOD.

THE MAXIMUM DISCHARGE RATE IS TO BE AGREED WITH THE LLFA.

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ATTENUATION REQUIREMENTS:

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- FILTER DRAINS
- OVERSIZED PIPEWORK.

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FOUL WATER DRAINAGE DESIGN PHILOSOPHY

THE SURFACE WATER FOR THE PROPOSED BUILDING & EXTENSIONS TO THE 2400Ø PUBLIC COMBINED SEWER IN DEANSGATE, AS PER ADVICE RECEIVED FROM UNITED UTILITIES.

FLOW RATES
TERRACE AREA
FW PEAK FLOW RATE: 13.7 l/s BASED ON 383.7 DISCHARGE UNITS, AS PER M&E DESIGNER INFORMATION.

WAREHOUSE BUILDING (ADDITIONAL DRAINAGE)
FW PEAK FLOW RATE: 6.5 l/s BASED ON 87 DISCHARGE UNITS, AS PER M&E DESIGNER INFORMATION.
FOUL DRAINAGE AT HIGHER LEVELS, AND IS TO BE CONNECTED TO EXISTING ABOVE GROUND DRAINAGE.
UNDERGROUND DRAINAGE NETWORK CAPACITY TO BE CHECKED FOR SUFFICIENCY

BASEMENTS
LEVELS INDICATE THAT THE EXISTING BASEMENT AREAS WILL REQUIRE PUMPING TO DISCHARGE FOUL DRAINAGE.
FURTHER SURVEY WORKS MAY BE REQUIRED IN ORDER TO CONFIRM IF THERE IS ANY EXISTING GRAVITY DRAINAGE FROM THIS AREA.

A S106 (PART 1) APPLICATION WILL NEED TO BE SUBMITTED TO UNITED UTILITIES. A PART 2 APPLICATION WILL NOT BE REQUIRED.

TABLE 1: EXISTING AND PROPOSED DISCHARGE RATES

CATCHMENT	IMPERMEABLE AREA (Ha)	DISCHARGE FLOW RATES (l/s)		
		1-YR EVENT	30-YR EVENT	100-YR EVENT*
AREA E1	0.610	65	128	149
AREA E2	0.160	17	38	45
AREA E3	0.256	AS EXISTING - EXCLUDED FROM CALCULATIONS		
AREA E4	0.291	AS EXISTING - EXCLUDED FROM CALCULATIONS		
AREA E5	0.191	AS EXISTING - EXCLUDED FROM CALCULATIONS		
TOTAL IMPERMEABLE AREA (FOR DISCHARGE RATE CALCULATIONS)	**0.770**	**82**	**166**	**194**
		INCLUDES 50% REDUCTION IN ACCORDANCE WITH MCC REQUIREMENTS		
ALLOWABLE DISCHARGE		**41**	**83**	**97**

*PROPOSED INCLUDES FOR 45% CLIMATE CHANGE ALLOWANCE

Rev:	Description:	Date:	By:	Chkd:
P01	DRAFT PLANNING ISSUE	28.10.22	ATL	MW

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Status: SUITABLE FOR INFORMATION — S2

Project: GREAT NORTHERN WAREHOUSE

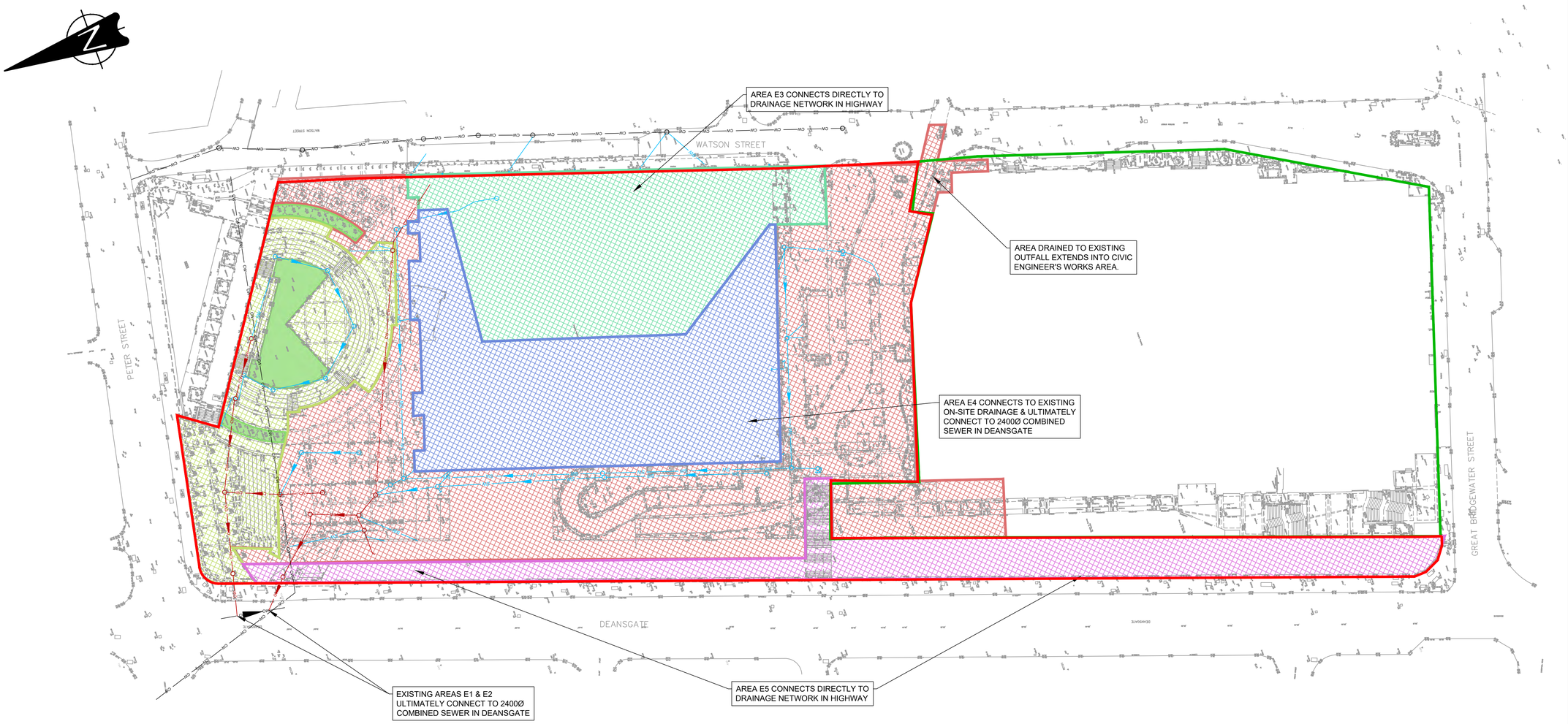
Drg Title: PROPOSED DRAINAGE STRATEGY SHEET 2

Drawn By	Designed By	Checked By
ATL	ATL	MW
	Date: 28/10/22	Scales @ A1: 1:200

Project No - Originator - Function - Spatial - Form - Discipline - Number: 064582 - CUR - XX - XX - D - C - 92002

Revision: P01

\\mafs02\Projects\064001 - 065000\064582 Phase 1 & 2 Great Northern Warehouse\ORS 4 Production\4B Models & Drawings_Civil\C\CAD\



GENERAL NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
4. FOR GENERAL NOTES REFER TO DRAWING.

KEY:

- BOUNDARY OF CURTINS WORKS TAKEN FROM DRAWING 772-02-CIV-XX-00-SK-X-9001
- BOUNDARY OF CIVIC ENGINEERS WORKS TAKEN FROM DRAWING 772-02-CIV-XX-00-SK-X-9001
- EXISTING IMPERMEABLE AREA E1:
- EXISTING IMPERMEABLE AREA E2:
- EXISTING IMPERMEABLE AREA E3:
  THIS AREA CONSISTS OF EXISTING ROOF DRAINAGE THAT DRAINS DIRECTLY TO SEWERS IN WATSON STREET. CONNECTIONS ARE TO BE RETAINED, AND THEREFORE THIS AREA HAS BEEN EXCLUDED FROM DRAINAGE CALCULATIONS.
- EXISTING IMPERMEABLE AREA E4:
  THIS AREA CONSISTS OF EXISTING ROOF DRAINAGE THAT DRAINS VIA THE EXISTING DRAINAGE NETWORK ON THE SITE, AND OUTFALLS TO THE EXISTING PUBLIC SEWER IN DEANSGATE. CONNECTIONS ARE TO BE RETAINED, AND THEREFORE THIS AREA HAS BEEN EXCLUDED FROM DRAINAGE CALCULATIONS.
  THE EXISTING PRIVATE DRAINAGE WITHIN THE SITE WILL REQUIRE A DIVERSION.
- EXISTING IMPERMEABLE AREA E5:
  THIS AREA CONSISTS OF EXISTING ROOF DRAINAGE THAT DRAINS DIRECTLY TO SEWERS IN DEANSGATE. CONNECTIONS ARE TO BE RETAINED, AND THEREFORE THIS AREA HAS BEEN EXCLUDED FROM DRAINAGE CALCULATIONS.
- EXISTING PERMEABLE AREA: 0.04 Ha
  THIS AREA DOES NOT DRAIN TO THE EXISTING DRAINAGE NETWORK, AND HAS THEREFORE BEEN EXCLUDED FROM CALCULATIONS.
- CW — EXISTING PUBLIC COMBINED SEWER
- CW — EXISTING PRIVATE COMBINED DRAINAGE
- SW — EXISTING PRIVATE SURFACE WATER DRAINAGE
- FW — EXISTING PRIVATE FOUL DRAINAGE

TABLE 1: EXISTING AND PROPOSED DISCHARGE RATES

CATCHMENT	IMPERMEABLE AREA (Ha)	DISCHARGE FLOW RATES (l/s)		
		1-YR EVENT	30-YR EVENT	100-YR EVENT*
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TOTAL IMPERMEABLE AREA (FOR DISCHARGE RATE CALCULATIONS)	**0.770**	**82**	**166**	**194**
		INCLUDES 50% REDUCTION IN ACCORDANCE WITH MCC REQUIREMENTS		
ALLOWABLE DISCHARGE		**41**	**83**	**97**
*PROPOSED INCLUDES FOR 45% CLIMATE CHANGE ALLOWANCE				

DRAWING BASED ON:

TOPOGRAPHICAL SURVEY
- S13920-T-01 & T02 BY SEP RECEIVED APRIL 2017

UTILITY SURVEY
- S12020-U BY SEP DATED JAN 2016
-

CCTV SURVEY
- S14423-CCTV BY SEP DATED JAN 2016
- 1286 BY LAYER SURVEY DATED JUNE 2022

UNITED UTILITIES PUBLIC SEWER RECORDS
- EXTRACT DATED NOVEMBER 2018.

DESIGN RESPONSIBILITY PLANS (CIVIC ENGINEERS)
- 772-02-CIV-XX-00-SK-X-9001 REV P02
- 772-02-CIV-XX-00-SK-X-9002 REV P02
- 772-02-CIV-XX-00-SK-X-9001 REV P02

Rev:	Description:	Date:	By:	Chkd:
P01	FIRST ISSUE	28/10/22	ATL	MW

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Status: PRELIMINARY

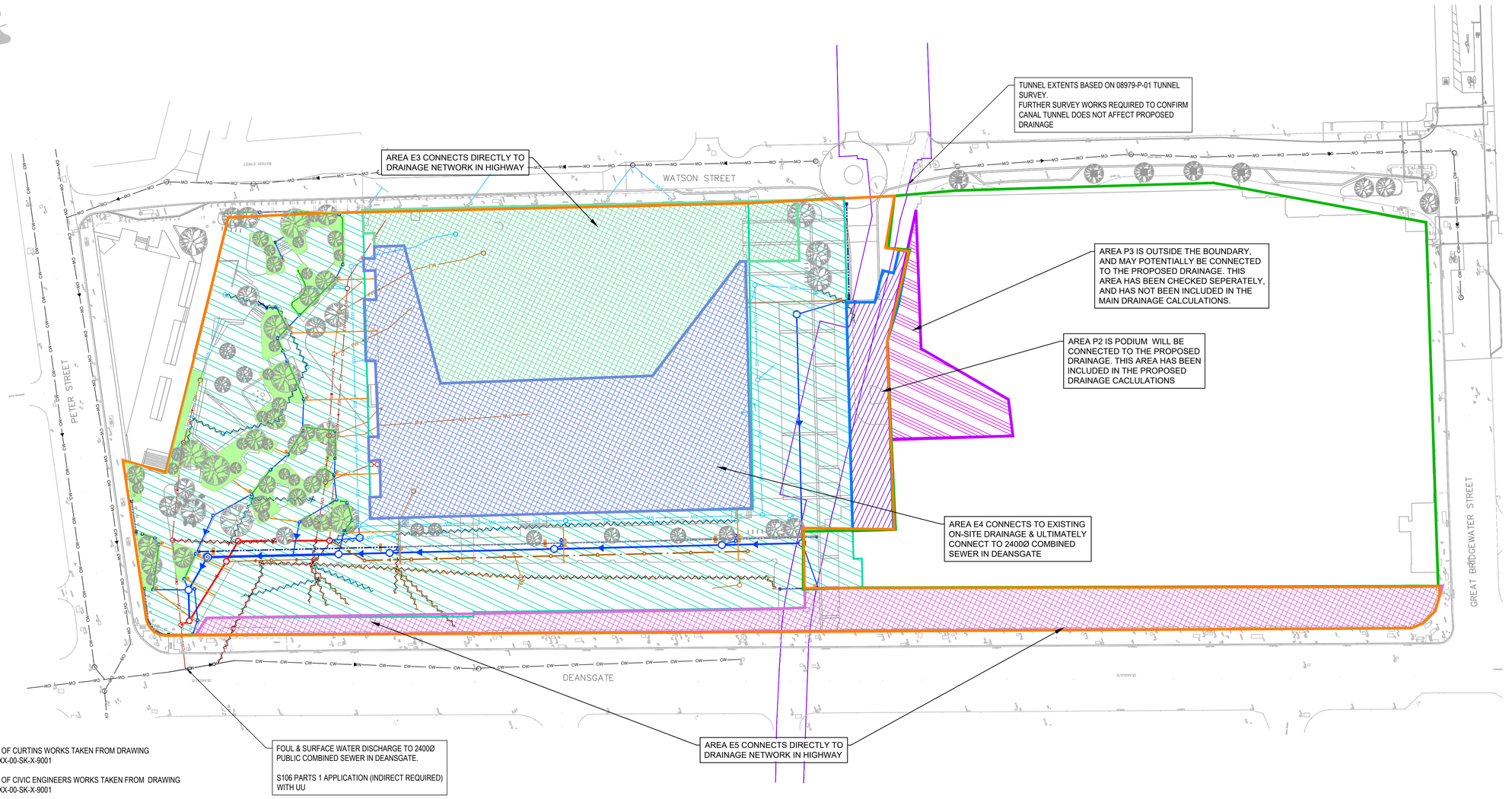
Project: GREAT NORTHERN WAREHOUSE, MANCHESTER

Drg Title: EXISTING DRAINAGE CATCHMENTS

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	28.10.22	ATL	ATL	MW
Scale: 1:500				

Project No:	Originator:	Zone:	Level:	Type:	Discipline:	Category / Number:	Rev:
064582	CUR	XX	00	D	C	92011	-P01

\\mafile1\Projects\064501 - 065000\064582 Phase 1 & 2 Great Northern Warehouse\DMS 4 Production\4B Models & Drawings\L Civil-C\CAD\



GENERAL NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. DESIGN BASED ON TOPOGRAPHICAL SURVEY AND CCTV SURVEY INFORMATION AVAILABLE AT THE TIME OF DESIGN.
3. ALL EXISTING SEWERS, CONNECTIONS, PIPE SIZES AND INVERT LEVELS TO BE CONFIRMED BY CONTRACTOR PRIOR TO COMMENCEMENT OF WORKS TO ENSURE CONNECTIVITY. ANY VARIANCE FROM THE INFORMATION SHOWN SHOULD BE REPORTED TO THE ENGINEER FOR REVIEW.
4. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
5. ALL DIMENSIONS ARE IN METRES AND LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS OTHERWISE NOTED.
6. WHERE EXISTING DRAINAGE IS BEING USED, ALLOWANCES SHOULD BE MADE TO REMEDIATE THIS DRAINAGE IN LINE WITH AVAILABLE CCTV SURVEY INFORMATION. IF NO SURVEY IS AVAILABLE, IT IS ADVISED TO OBTAIN ONE PRIOR TO COMMENCEMENT OF WORKS.
7. ALL EXISTING SERVICES TO BE LOCATED PRIOR TO COMMENCEMENT OF ANY DRAINAGE WORKS, AND WHERE NECESSARY PROTECTION OR DIVERSIONS TO BE UNDERTAKEN TO AVOID CONFLICT WITH THE PROPOSED WORK.
8. ALL RAINWATER AND FOUL POP UPS LOCATIONS AND SIZES ARE TO BE CONFIRMED BY THE ARCHITECT AND M&E ENGINEER.
9. COVER LEVELS, GULLY POSITIONS, AND BUILDINGS LOCATION ARE APPROXIMATE AND SHALL BE CONFIRMED BY ARCHITECT/ LANDSCAPE ARCHITECT.
10. ALL PIPE DIAMETERS GIVEN ARE NOMINAL INTERNAL PIPE DIAMETERS. THESE ARE TO BE CONFIRMED ONCE A DETAILED CAPACITY CHECK HAS BEEN UNDERTAKEN AT A LATER DESIGN STAGE.
11. OUTFALL CONNECTION(S) SUBJECT TO AGREEMENT WITH THE APPROVING AUTHORITY.

KEY:

- BOUNDARY OF CURTINS WORKS TAKEN FROM DRAWING 772-02-CIV-XX-00-SK-X-9001
- BOUNDARY OF CIVIC ENGINEERS WORKS TAKEN FROM DRAWING 772-02-CIV-XX-00-SK-X-9001
- PROPOSED IMPERMEABLE AREA P1: 0.61 Ha
- PROPOSED IMPERMEABLE AREA P2: 0.05 Ha
  PODIUM AREA FALLS WITHIN CURTINS RESPONSIBILITY AND DRAINED BY THE PROPOSED SYSTEM.
- PROPOSED IMPERMEABLE AREA P3: 0.05 Ha
  THIS AREA FALLS WITHIN THE CIVIC ENGINEERS AREA OF RESPONSIBILITY, BUT IS POTENTIALLY MAY BE DRAINED BY THE PROPOSED SYSTEM. A CHECK OF THE CAPACITY OF THE SYTEM, INCLUDING THIS AREA, IS REQUIRED.
- SOFT LANDSCAPE
- EXISTING IMPERMEABLE AREA E3:
  THIS AREA CONSISTS OF EXISTING ROOF DRAINAGE THAT DRAINS DIRECTLY TO SEWERS IN WATSON STREET. CONNECTIONS ARE TO BE RETAINED, AND THEREFORE THIS AREA HAS BEEN EXCLUDED FROM DRAINAGE CALCULATIONS.
- EXISTING IMPERMEABLE AREA E4:
  THIS AREA CONSISTS OF EXISTING ROOF DRAINAGE THAT DRAINS VIA THE EXISTING DRAINAGE NETWORK ON THE SITE, AND OUTFALLS TO THE EXISTING PUBLIC SEWER IN DEANSGATE. CONNECTIONS ARE TO BE RETAINED, AND THEREFORE THIS AREA HAS BEEN EXCLUDED FROM DRAINAGE CALCULATIONS.
  THE EXISTING PRIVATE DRAINAGE WITHIN THE SITE WILL REQUIRE A DIVERSION.
- EXISTING IMPERMEABLE AREA E5:
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- PROPOSED PRIVATE COMBINED DRAINAGE
- PROPOSED PRIVATE SURFACE WATER DRAINAGE
- PROPOSED PRIVATE FOUL DRAINAGE
- EXISTING PUBLIC COMBINED SEWER
- EXISTING PRIVATE COMBINED DRAINAGE
- EXISTING PRIVATE SURFACE WATER DRAINAGE
- EXISTING PRIVATE FOUL DRAINAGE

SURFACE WATER DRAINAGE DESIGN PHILOSOPHY

OUTFALL LOCATIONS
THE SURFACE WATER FOR THE PROPOSED BUILDING & EXTENSIONS TO THE 2400Ø PUBLIC COMBINED SEWER IN DEANSGATE, AS PER ADVICE RECEIVED FROM UNITED UTILITIES.

IT IS NOT CONSIDERED THAT INFILTRATION WILL BE SUITABLE FOR THIS SCHEME. HOWEVER, FURTHER TESTING MAY BE REQUIRED TO DEMONSTRATE THIS TO THE LLFA & UNITED UTILITIES.

LEVELS INDICATE THAT PUMPING WILL NOT BE REQUIRED.

PROPOSED FLOW RATES:
EXISTING FLOWS AS SHOWN IN TABLE 1.

THE MAXIMUM DISCHARGE OR THE 1-YEAR STORM IS 41 l/s, BASED ON A REDUCTION OF 50% FROM EXISTING FLOWS.

UNITED UTILITIES HAVE STATED THE MAXIMUM DISCHARGE RATE FROM THE SITE IS 47 l/s. THEREFORE, THIS DISCHARGE RATE HAS BEEN SET FOR THE 30 & 100-YEAR STORMS.

THIS IS BASED ON A 50% REDUCTION OF BROWNFIELD FLOWS FOR THE PROPOSED AREA (0.77HA), USING THE MODIFIED RATIONAL METHOD.

THE MAXIMUM DISCHARGE RATE IS TO BE AGREED WITH THE LLFA.

THE DRAINAGE HAS BEEN DESIGNED TO INCLUDE A 45% ALLOWANCE FOR CLIMATE CHANGE, IN ACCORDANCE WITH LLFA REQUIREMENTS

ATTENUATION REQUIREMENTS:
A QUICK STORAGE ESTIMATE INDICATES THAT THE REQUIRED ATTENUATION STORAGE IF APPROX. 300m³, FOR THE 1:100-YEAR STORM EVENT (INCLUDING 40% CLIMATE CHANGE).

THE ATTENUATION STORAGE IS TO BE PROVIDED BY:
- PERMEABLE SUB-BASE TO EXTERNAL PAVING
- FILTER DRAINS
- OVERSIZED PIPEWORK.

NOTE - FURTHER STORAGE ELEMENTS, SUCH AS CELLULAR TANKS, MAY BE REQUIRED IF THE PROPOSED STORAGE METHODS CAN NOT PROVIDE SUFFICIENT VOLUME.

SUSTAINABLE DRAINAGE:
SuDS TREATMENT IS PROVIDED BY THE RAIN GARDENS AND FILTER DRAINS, AND ALSO BY PERMEABLE SUB-BASE, IF USED.

FINAL SuDS PROPOSALS ARE SUBJECT TO FURTHER CO-ORDINATION AT DETAILED DESIGN STAGE.

A S106 (PART 1) APPLICATION WILL NEED TO BE SUBMITTED TO UNITED UTILITIES. A PART 2 APPLICATION WILL NOT BE REQUIRED.

TABLE 1: EXISTING AND PROPOSED DISCHARGE RATES

CATCHMENT	IMPERMEABLE AREA (Ha)	DISCHARGE FLOW RATES (l/s)		
		1-YR EVENT	30-YR EVENT	100-YR EVENT*
AREA E1	0.610	65	128	149
AREA E2	0.160	17	38	45
AREA E3	0.256	AS EXISTING - EXCLUDED FROM CALCULATIONS		
AREA E4	0.291	AS EXISTING - EXCLUDED FROM CALCULATIONS		
AREA E5	0.191	AS EXISTING - EXCLUDED FROM CALCULATIONS		
TOTAL IMPERMEABLE AREA (FOR DISCHARGE RATE CALCULATIONS)	**0.770**	**82**	**166**	**194**
		INCLUDES 50% REDUCTION IN ACCORDANCE WITH MCC REQUIREMENTS		
ALLOWABLE DISCHARGE		**41**	**83**	**97**
***PROPOSED INCLUDES FOR 45% CLIMATE CHANGE ALLOWANCE**				
ALLOWABLE DISCHARGE FOR 30 & 100-YEAR STORMS IS 47 l/s, AS PER UNITED UTILITIES REQUIREMENTS				

DRAWING IS BASED ON:

ARCHITECTS PLANS
- 10422-SHP-Z0-A-G100-PL-00-001 REV P08 SITE PLAN GROUND FLOOR
- 10422-SHP-Z0-A-G100-PL-01-001 REV P08 SITE PLAN FIRST FLOOR
- 10422-SHP-Z0-A-G100-PL-RF-001 REV P06 WAREHOUSE ROOF PLAN

LANDSCAPE ARCHITECT'S PLANS
- 2891-PLA-XX-00-DR-L-0001 REV P02 LANDSCAPE GA
- 2891-PLA-XX-XX-SK-L-0004 DRAFT LEVEL MARK UP

SERVICES
- 2891-PLA-XX-XX-SK-L-0002 REV P01 GN SQUARE WIP GA

SURVEY INFORMATION
- S13920-T-01 & 02 REV -- BY SEP MAR 2017
- CCTV SURVEY BY SEP DATED JUNE 2017
- 08979-P-01 TUNNEL SURVEY (WATERCOURSE) BY SEP DATED DEC 2013

SITE INVESTIGATION
- 064582-CUR-00-XX-RP-GE-001 REV P01 PHASE 1 PRELIMINARY RISK ASSESSMENT

TOPOGRAPHICAL SURVEY
- S13920-T-01 & T02 BY SEP RECEIVED APRIL 2017

UTILITY SURVEY
- S12020-U BY SEP DATED JAN 2016

CCTV SURVEY
- S14423-CCTV BY SEP DATED JAN 2016
- 1286 BY LAYER SURVEY DATED JUNE 2022

UNITED UTILITIES PUBLIC SEWER RECORDS
- EXTRACT DATED NOVEMBER 2018.

DESIGN RESPONSIBILITY PLANS (CIVIC ENGINEERS)
- 772-02-CIV-XX-00-SK-X-9001 REV P02
- 772-02-CIV-XX-00-SK-X-9002 REV P02
- 772-02-CIV-XX-00-SK-X-9001 REV P02

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Project: GREAT NORTHERN WAREHOUSE, MANCHESTER

Drg Title: PROPOSED DRAINAGE CATCHMENTS

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