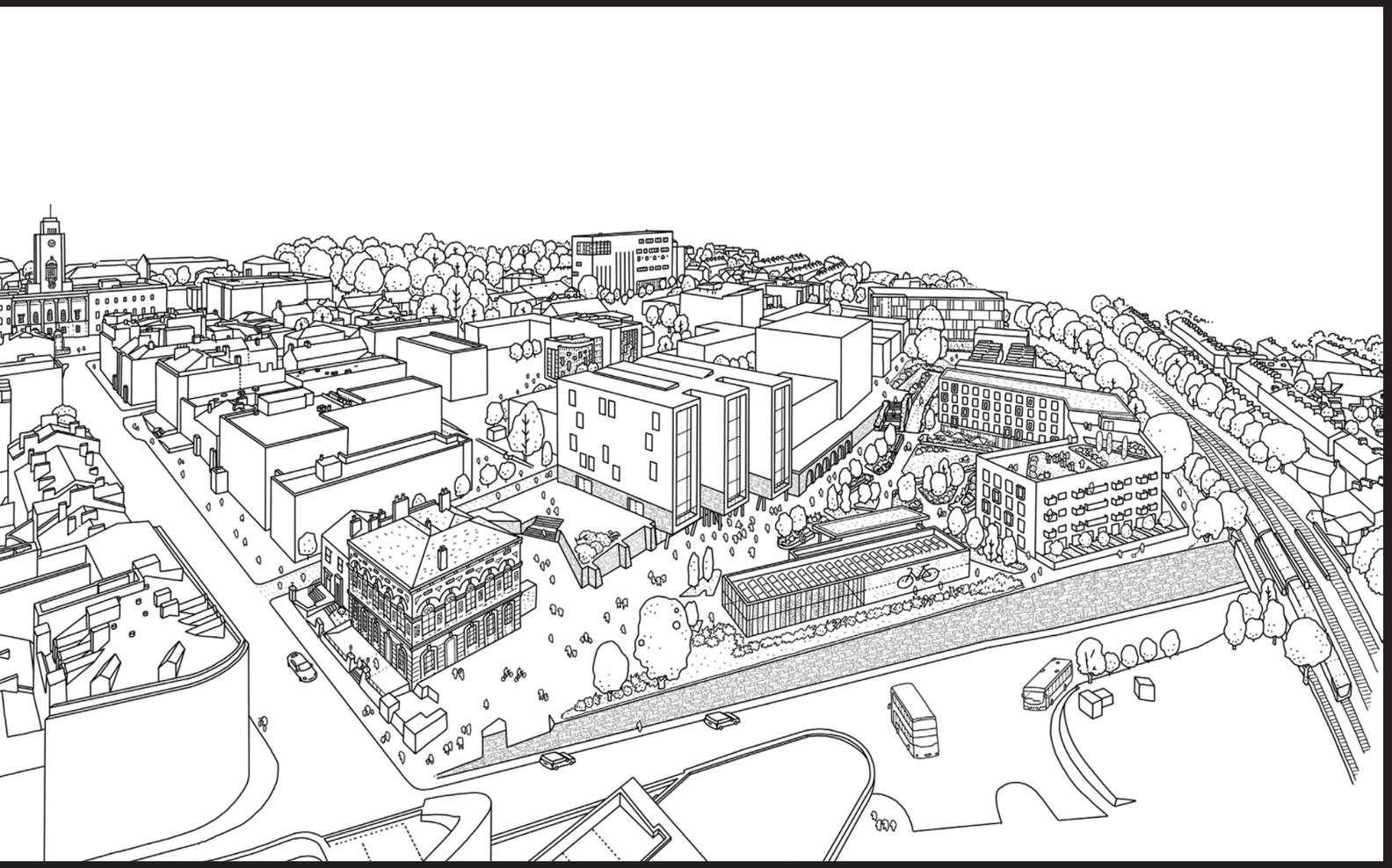

# THE SEAM

## Barnsley Digital Campus
## Phase 1

## Multi-Storey Car Park
## Stage 2 report

January 2022

BDP.

| Revision | Description | Date | Author | Checked |
|---|---|---|---|---|
| P01 | First Issue | 31/01/22 | ST | SMM |
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BARNSLEY
Metropolitan Borough Council

ARCADIS

BDP.

# THE SEAM

## Barnsley Digital Campus
## Phase 1

## Multi-Storey Car Park
## Stage 2 report
January 2022

BDP.


Disabled
badge
holders
only

# Contents

## Contents

# 1.0 Introduction

## 1.1 Project Overview

In May 2020 Barnsley Metropolitan Borough Council (BMBC) appointed a consultant team to prepare a new Development Blueprint for the site known as 'The Seam, Barnsley's Digital Campus'. The multi-disciplinary team was led by BDP in conjunction with Fore Consulting, Hydrock, BE Group and Warrington Martin. The site is a 4.5 ha parcel of land located within Barnsley town centre, immediately adjacent to the Transport Interchange.

The Digital Campus is home to DMC01, recently refurbished DMC02 and Barnsley College's new Scitech Digital Innovation hub. These buildings bring together digital and tech focused people, businesses, research and skills, enabling collaboration and innovation through a growing digital eco-system that operates on a regional, National and International level.

The Seam is a values driven concept, that brings together the 'soft' infrastructure of programmes, projects and support with the 'hard' infrastructure of an exciting urban village environment that provides a testbed for new ideas and technologies. All activity and development will be aligned to the Campus values:

- Building pathways – a place of possibilities
- Trailblazing
- For Barnsley, not only for business
- A dynamic digital ecosystem
- Putting people first

The Development Blueprint aims to transform the physical environment of this growing Digital Campus with opportunities to create a highly sustainable live-work neighbourhood in the heart of the town, connected by smart infrastructure, high quality public realm and a testbed for technology led innovation in retail, Internet of Things, low / zero carbon and active travel.

The Blueprint provides a flexible plot-based plan for the site ensuring wider strategic objectives of BMBC and its stakeholders are met, and development is brought forward in line with key infrastructure and phasing requirements.

The Development Blueprint outlines the development principles including:

- The range and mix of land uses considered appropriate
- Design constraints (such as heights, massing, and preservation of key views),
- Alignment with the site-wide strategies for sustainability, smart technology, transport, utilities, and drainage
- The delivery of enhanced public realm, including a central greenspace and pedestrian and cycle connections through the campus.
- Intended phasing of the development

In October 2021 a multi-disciplinary team comprising of BDP and Arcadis with development consultants Aspinall Verdi were appointed to prepare concept designs for Phase 1, comprising of:

- Multi-Storey Car Park to RIBA Stage 2
- Active Travel Hub to RIBA Stage 2
- Public Realm to RIBA Stage 3
- Feasibility studies for development plots 1 and 2
- Road and services infrastructure to support the above

This Stage 2 report contains work carried out during RIBA Stages 1 and 2, and includes concept design proposals for the Multi-Storey Car Park.

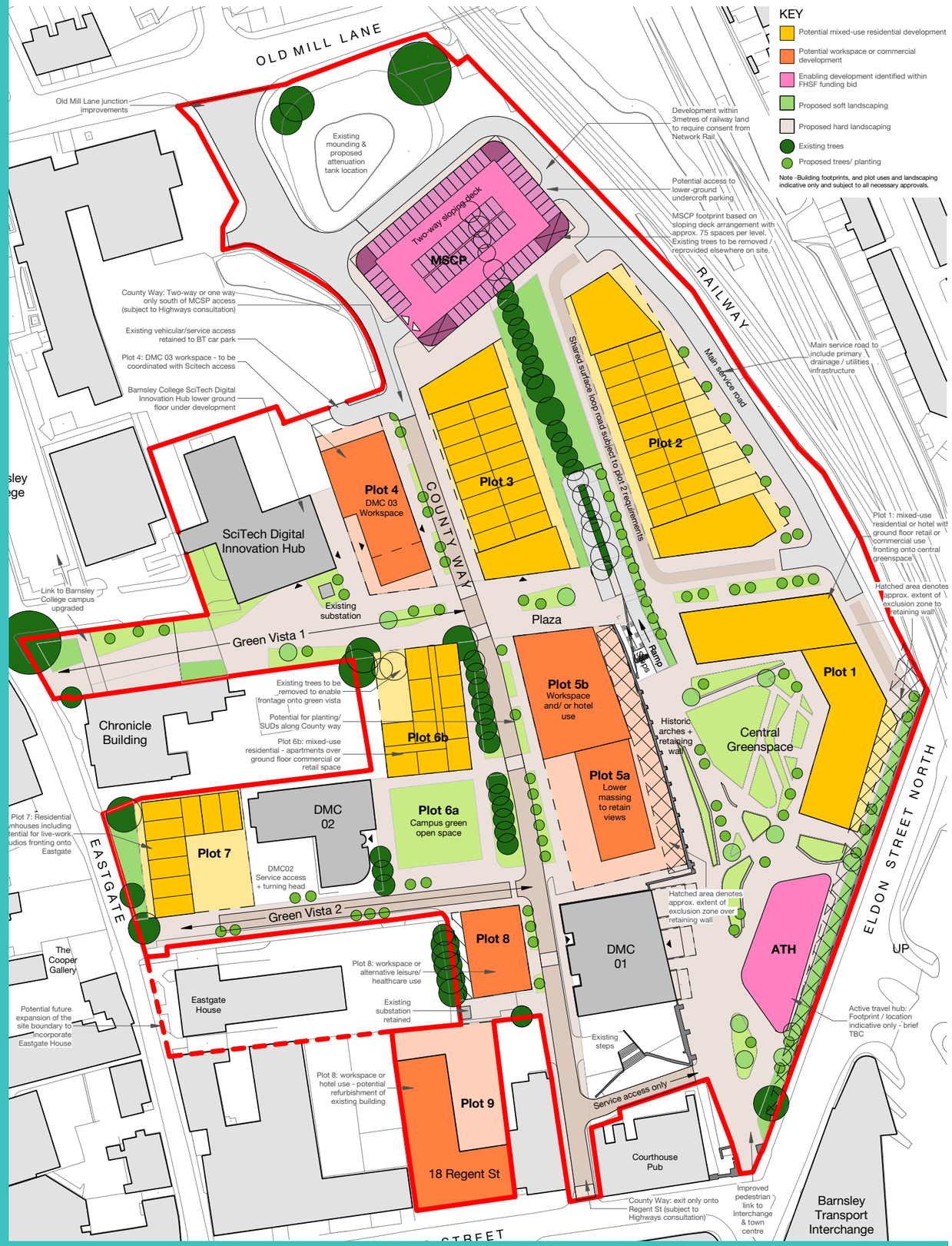



Figure 1.1: The Seam Development Blueprint - Illustrative Layout


Figure 1.2: Illustrative view looking North along the Seam public realm, and Diagram of The Seam Core Values

Figure 1.3: Aerial visualisation of The Seam Development Blueprint master plan

# 2.0 Site Context

## 2.1 Site Description

The Seam site is bounded by Regent Street to the south, Eastgate to the west, Old Mill Lane to the north and a combination of the railway line and Eldon Street North to the east. The site was formerly referred to as the 'Courthouse' site - divided into upper and lower Courthouse (above and below the existing central retaining wall). Due to an extensive level change of circa 7m from east to west, the site has been developed as a series of platforms and slopes. The majority of the site is covered by surface level car parking with several commercial buildings present to the south and west of the site. The phase 1 site is 2.5ha.

Located at the heart of the town centre, immediately adjacent to the Transport Interchange, the site is bounded by Regent Street to the south, Eastgate to the west, Old Mill Lane to the north and a combination of the railway line and Eldon Street North to the east. The site forms an important physical link between the town centre and the Barnsley College campus, offering opportunities to connect students and education facilities with the wider town.

The site was formerly referred to as the 'Courthouse campus' and is divided into two main plateaus – commonly referred to as Upper and Lower Courthouse (above and below the existing central retaining wall, a remnant of the Victorian railway infrastructure). The retaining wall tapers out towards the northern end of the site where the level change is formed by a steep bank with dense trees and shrubs. There is a significant level change across the site from east to west, and this offers long views across the Dearne Valley towards the east.

The site is currently home to the two flagship Digital Media Centre developments: DMC 01 and DMC 02 (formerly the Core). The Barnsley College Scitech Digital Innovation Hub also lies within the site boundary, demonstrating the collaborative nature of the Digital Campus environment.

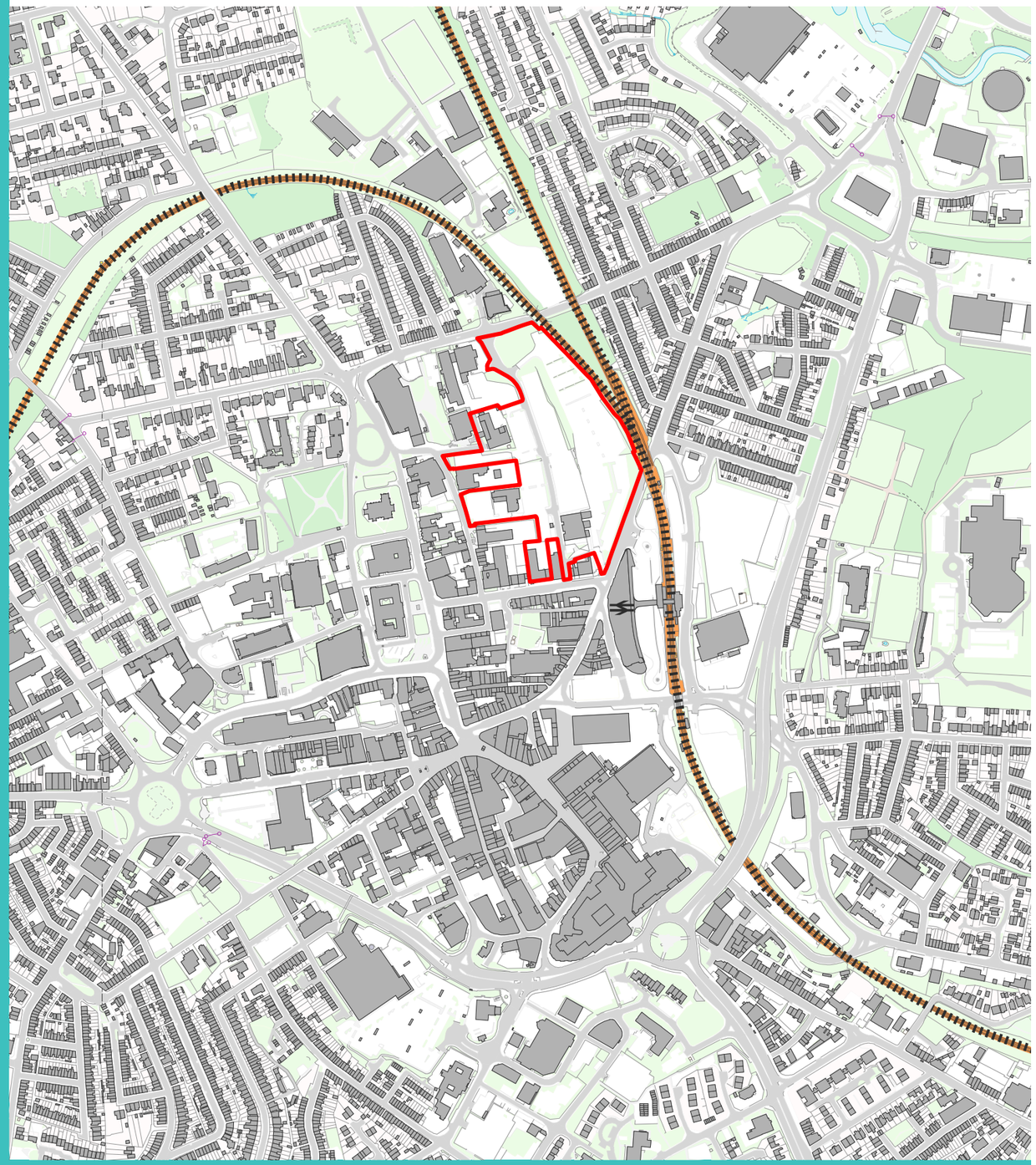


Figure 2.1: Barnsley plan showing The Seam site boundary

## 2.2 Phase 1 Site

The Phase 1 site is predominantly used as surface car parking operated by BMBC, with the primary access off Old Mill Lane and County Way. Towards the northern end there are a number of mature trees sited in between the car parking bays. Immediately adjacent to the eastern edge of the Lower Courthouse runs the Network Rail Wakefield-Sheffield railway line, beyond which lies expansive views over the Dearne Valley. A second masonry retaining wall forms the boundary to the south eastern edge of the site, fronting onto Eldon Street North.

The MSCP plot is located to the northern end of the site accessed off Old Mill Lane and County Way. In the Development Blueprint this was identified as the preferred location for the MSCP as it limits vehicle movements through the rest of the development. The plot straddles the upper and lower levels of the site. This area of land is also with the zone identified as a tall buildings opportunity in the 2009 Barnsley Building Heights Study.

Figure 2.2: Photograph of existing site looking North from the corner of Regent St and Eldon St

Figure 2.2: The Seam Phase 1 site boundary

# 3.0 Brief Development

## 3.1 Project Brief

A series of workshops have been held with BMBC stakeholders between November 2021 and January 2022 to establish the brief. During this time BDP reviewed various car park configurations and tested different circulation patterns.

As the MSCP plot straddles the upper and lower levels of the site, using the undercroft parking area with independent access from the lower level was considered. Different access and egress options were explored and internal traffic flows reviewed. It was concluded that the 'sloped deck' arrangement was the preferred option as it achieved the most efficient use of the plot, while also addressing site specific constraints. In line with the sustainability strategy, it is proposed that the MSCP will support the shift towards electric vehicles by providing dedicated spaces and charging points.

Opportunities for monitoring by providing 'Smart parking' and incorporating rooftop PV and battery storage have been explored as part of the Stage 2 design.

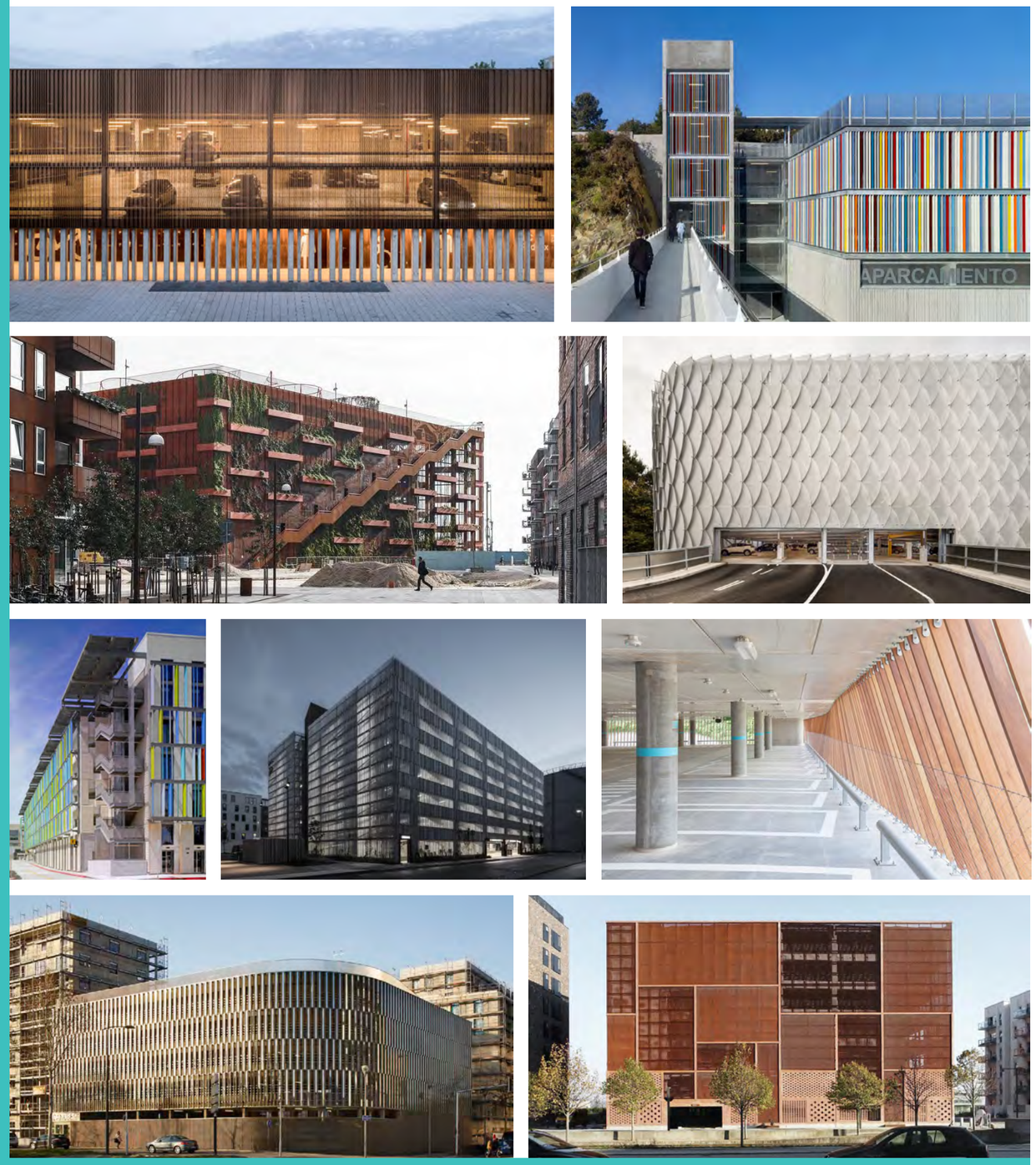



Figure 3.1: Multi-storey car park precedent images

## 3.2 Brief Requirements

A summary of briefed requirements is noted below.

**Building:**

- Connectivity to transport interchange – cycle / pedestrian route.
- Zero-low carbon building structure.
- Digital infrastructure and connectivity for 'Smart parking'.
- Well-lit and safe, MSCP only accessed by those parking (ticket only).
- Separate vehicles and pedestrians.
- Owned and operated by BMBC, and operational 24/7.
- Toilets, office, service areas, cleaning equipment storage provision tbc.
- Welfare facilities for 12 people + secure cash room for parking staff.
- Park Mark Plus accreditation.
- Sprinkler provision.
- Battery storage for PV panels – to be considered holistically across the site?

**Car parking:**

- Target = 400 standard 2.5 x 5m car park spaces (including disabled provision and family bays).
- Disabled provision = 16 (based on 400 spaces) as per BPA recommendation.
- 10% of parking bays to be equipped with electric vehicle charging.
- Infrastructure to support future increase in EV provision to 20%.
- EV charging = 70% slow (8 hr charge), 20 % fast charge, 10% rapid charge.
- Secure entry and exit to the parking (roller shutter and ticket only access).
- Access control = Metric / Amano (as per Glass Works MSCP).
- Smart parking – monitoring real time use of the car park + linked to wider town centre parking management.

Within the workshops, the stakeholders referred to the recently completed Glass Works MSCP in the centre of the town, and the need to learn lessons from some issues that had been experienced. These were summarised as follows:

- Anti-suicide measures / mesh.
- Internal stairwell –barriers to prevent dropping things down the stairwell.
- CCTV – including lifts.
- Lifts – 24 hour response.
- Avoid kerbs in the MSCP.
- Stairwells plastered and painted to improve security feel.
- Ticket machines – DDA compliant.
- Ceiling heights – check specification of GW as floor to ceiling height is good (doesn't feel hemmed in).
- Signage – with a ramped level include levels at the exits.

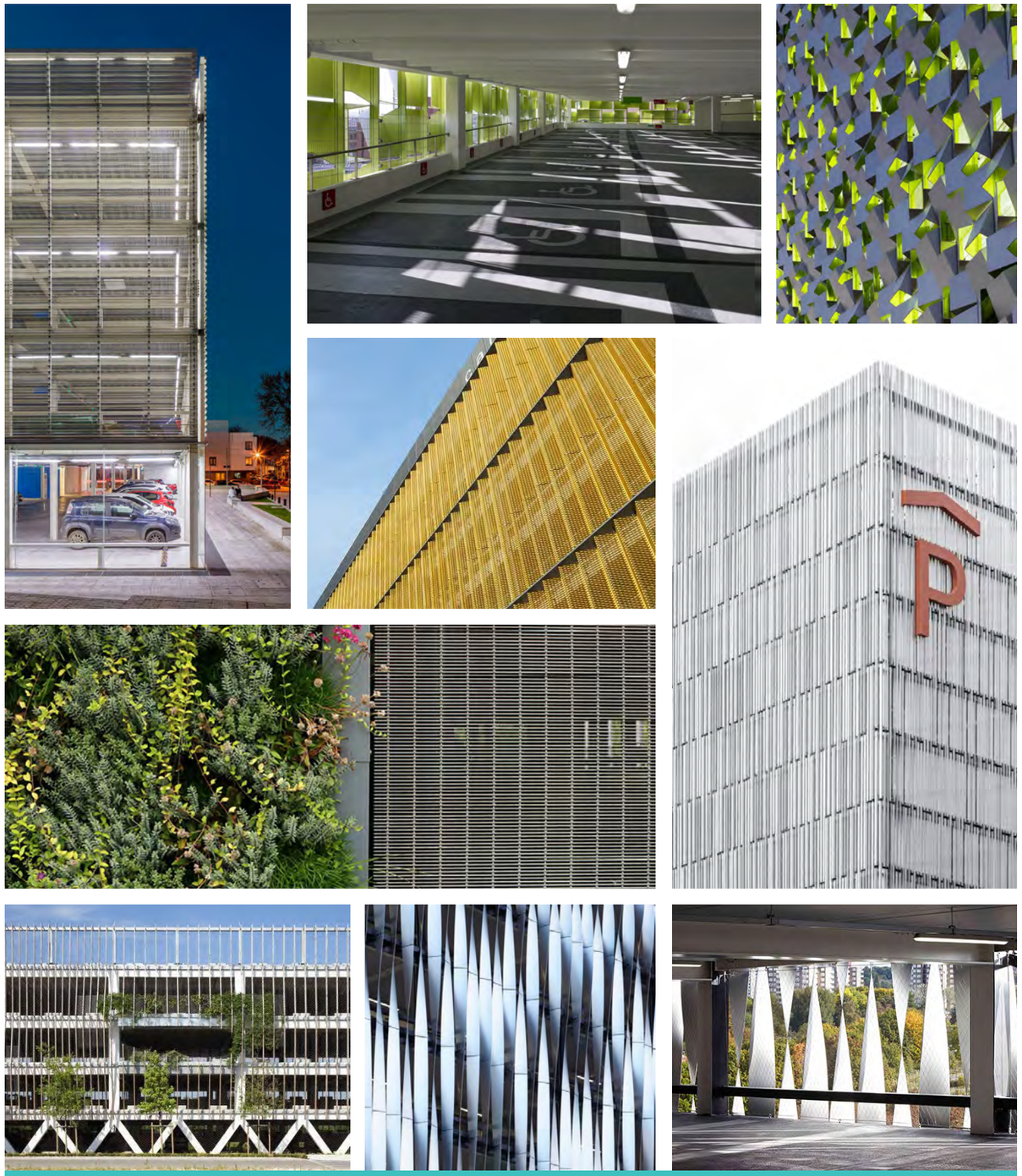


Figure 3.2: Facade precedent images

# 4.0 Architectural Proposals

## 4.1 Design Principles

The proposed car park has undertaken numerous design iterations to best take advantage of the site's location, topography, and surrounding road layouts, while also taking into consideration the emerging future developments and their close proximity.

The guiding principles have been to maximise the internal vehicle parking provision, around the most efficient circulation pattern suitable for the site, while keeping the building's volume to a minimum.

This exercise results in a seven storey building, measuring 22m in height on its East side facing the railway, where the ground level is at its lowest, and 18.15m in height on its West side, facing onto County Way.

The proposed building will accommodate a total of 409 vehicle spaces, split as following:

- 363no Standard Car Bays
- 20no Accessible Car Bays
- 14no Family Car Bays
- 12no Motorcycle Bays

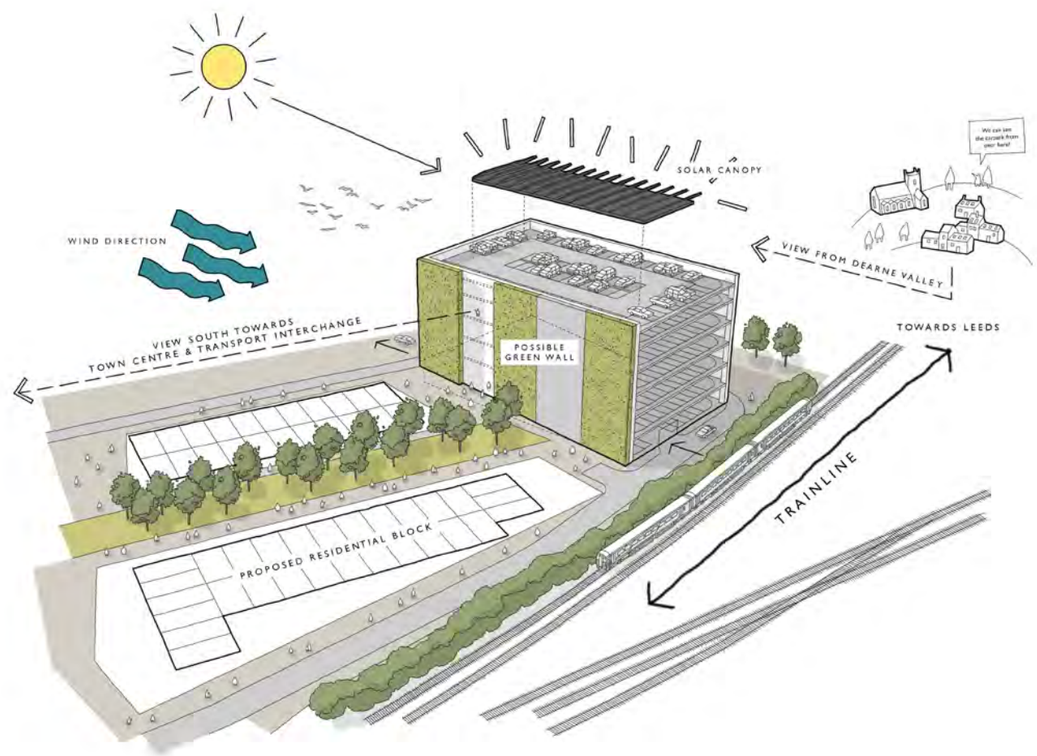



Figure 4.1: Concept design sketch - relationship with the context.

## 4.2 Scale and Massing

The Blueprint stage design shows a volume of 6 storeys occupying the site, having the Ground Floor defined by the levels on County Way on the site's West edge, with one storey extending below this in order to meet the ground level on the East edge, circa 5.7m lower.

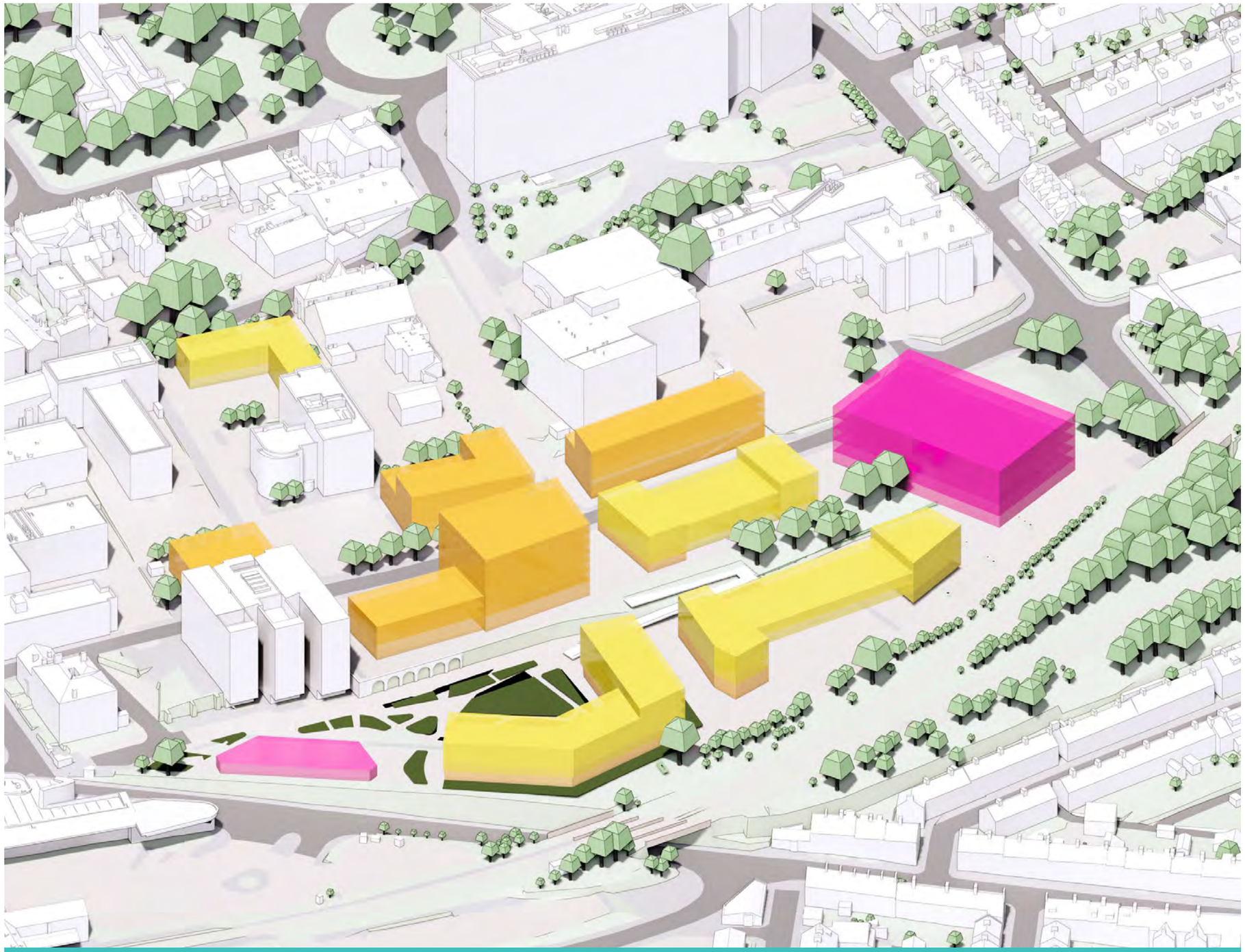


Figure 4.2: Aerial view of massing model, Blueprint stage.

## 4.2 Scale and Massing

The proposed building fills roughly the same volume, but by taking better advantage of the site's topography and optimising the interior circulation, it accommodates 6 typical parking decks, with 5 full circuit decks from levels B1-L03, in addition to two half circuit decks, at the lower ground (B2) parking area around the entrance, and at the top level deck (L04).

Figure 4.3: Aerial view of massing model, proposed design.

## 4.3 Building Layout

Internally, the building is arranged as a ramped floor type, meaning that the ramps that permit vertical vehicular circulation also can accommodate the parking bays, thus combining the two uses.

Several arrangements have been explored earlier in the design process, each with their own advantages and drawbacks, yet the ramped floor arrangement has emerged as the most efficient type suitable for the site.

By separating the access and exit, and using this deck arrangement, the proposal reduces the risks of internal traffic flows crossing over, improving the circulation and the user experience.

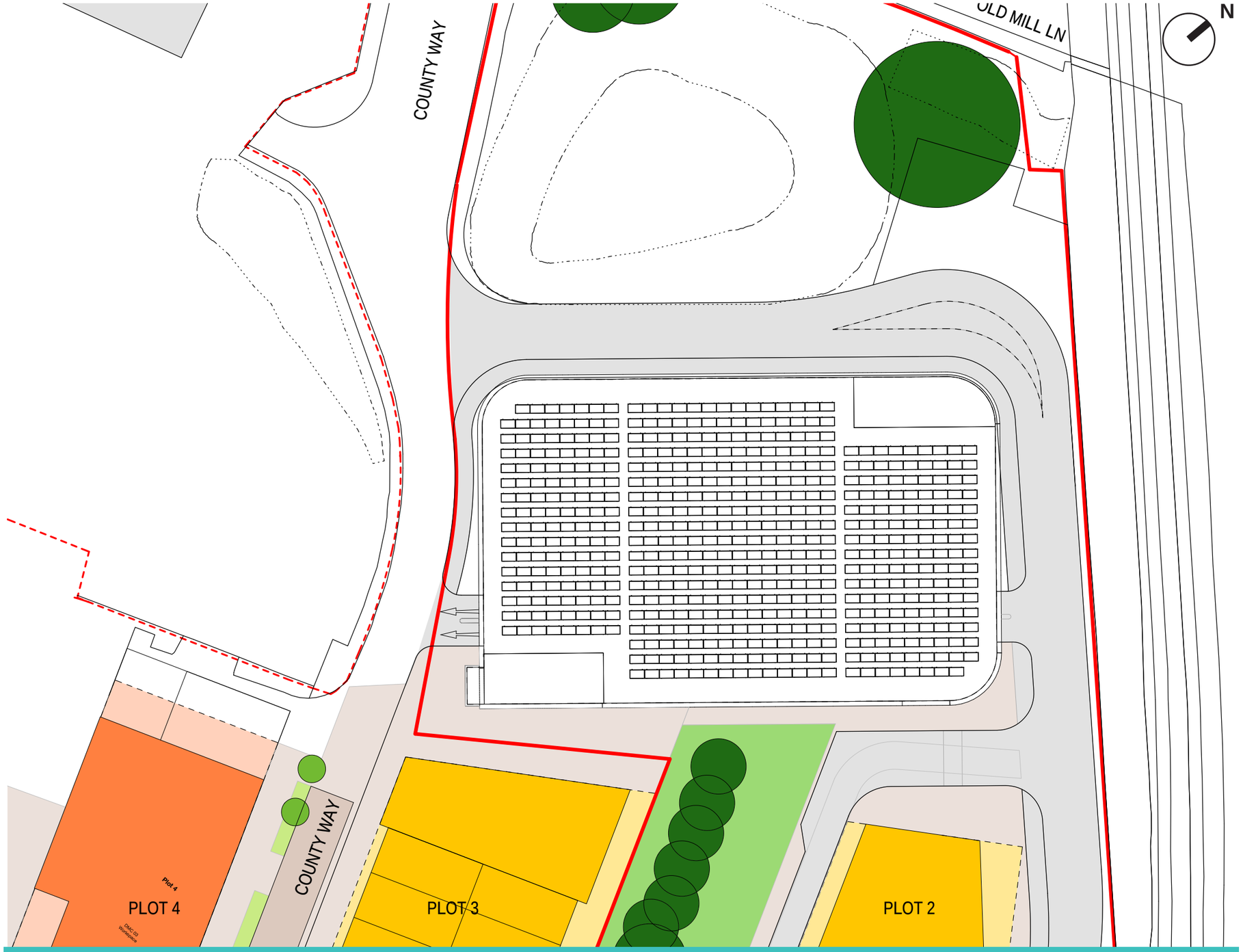



Figure 4.4: Site Plan

## 4.3 Building Layout

Internally, the building is arranged as a Sloping Deck Level type, meaning that the ramps that permit vertical vehicular circulation can also accommodate the parking bays, thus combining the two uses.

Several arrangements have been explored earlier in the design process, each with their own advantages and drawbacks, yet the SDL arrangement has emerged as the most efficient type suitable for the site.

By separating the access and exit, and using this deck arrangement, the proposal reduces the risks of internal traffic flows crossing over, improving the circulation and the user experience.

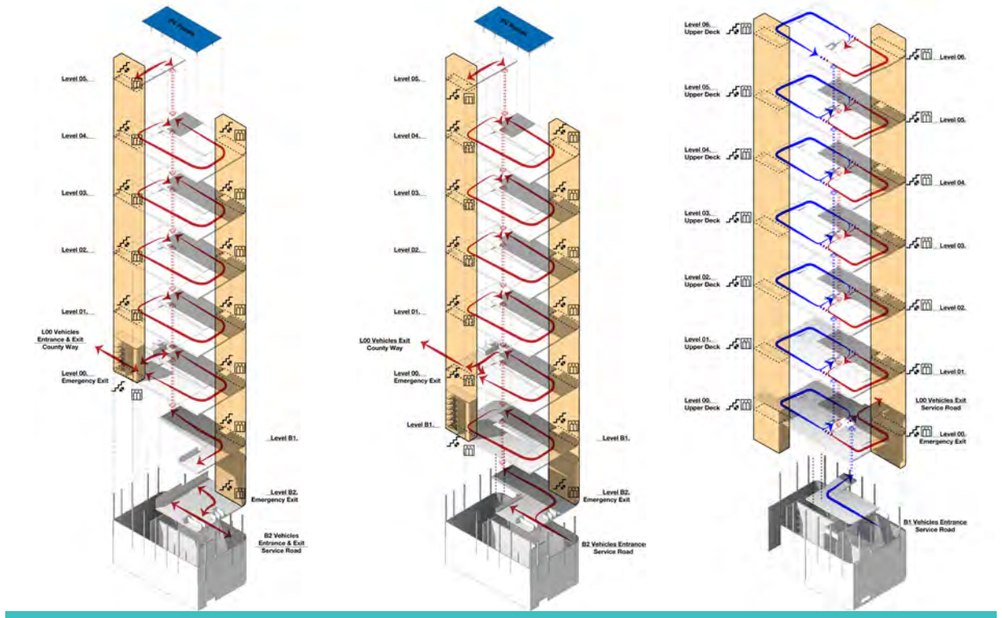


Figure 4.5: Previous design options - exploded axonometric views of internal circulation.

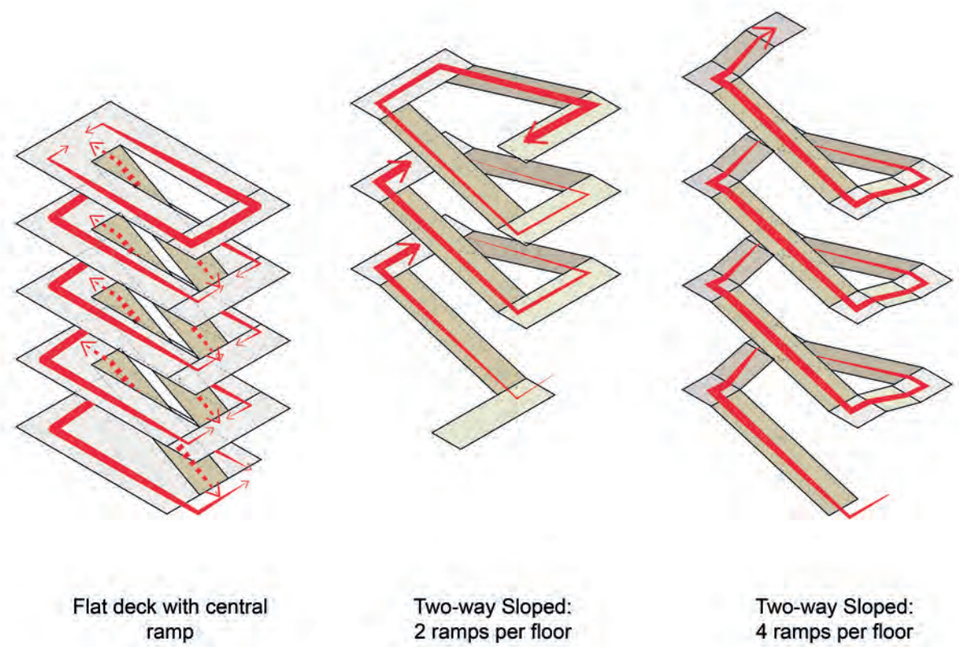



Figure 4.6: Types of car park circulation arrangements

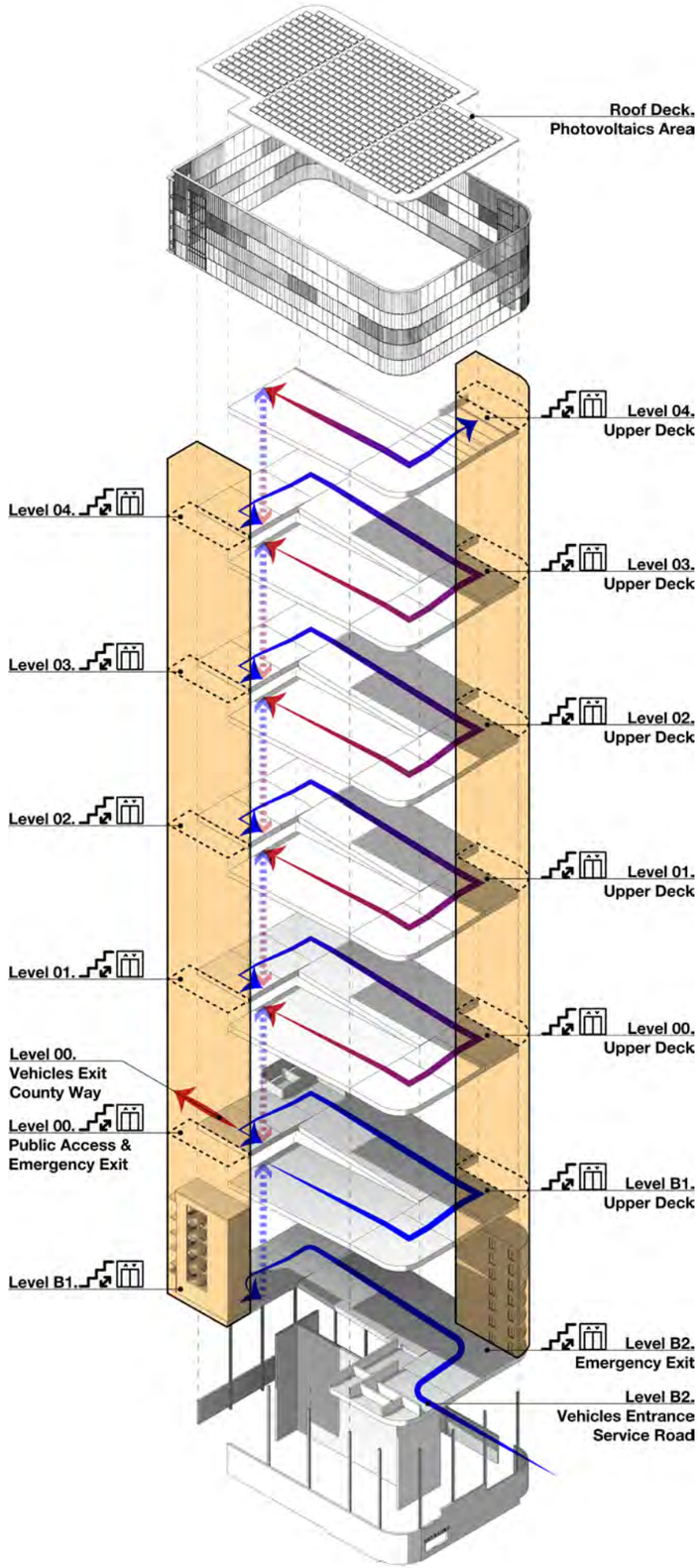



Figure 4.7: Proposed design - exploded axonometric view of internal circulation.

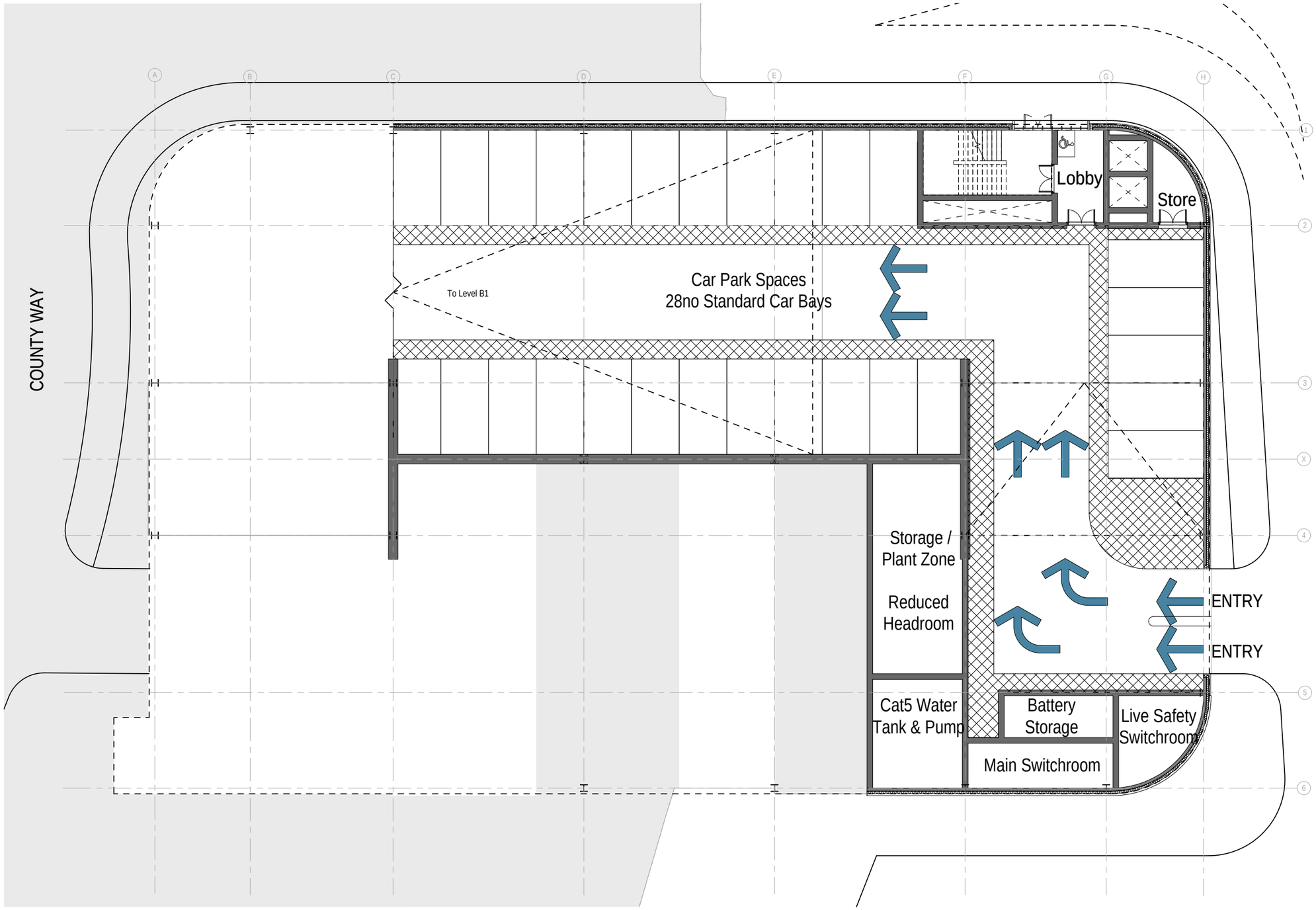



Figure 4.8: Level B2 Floor Plan

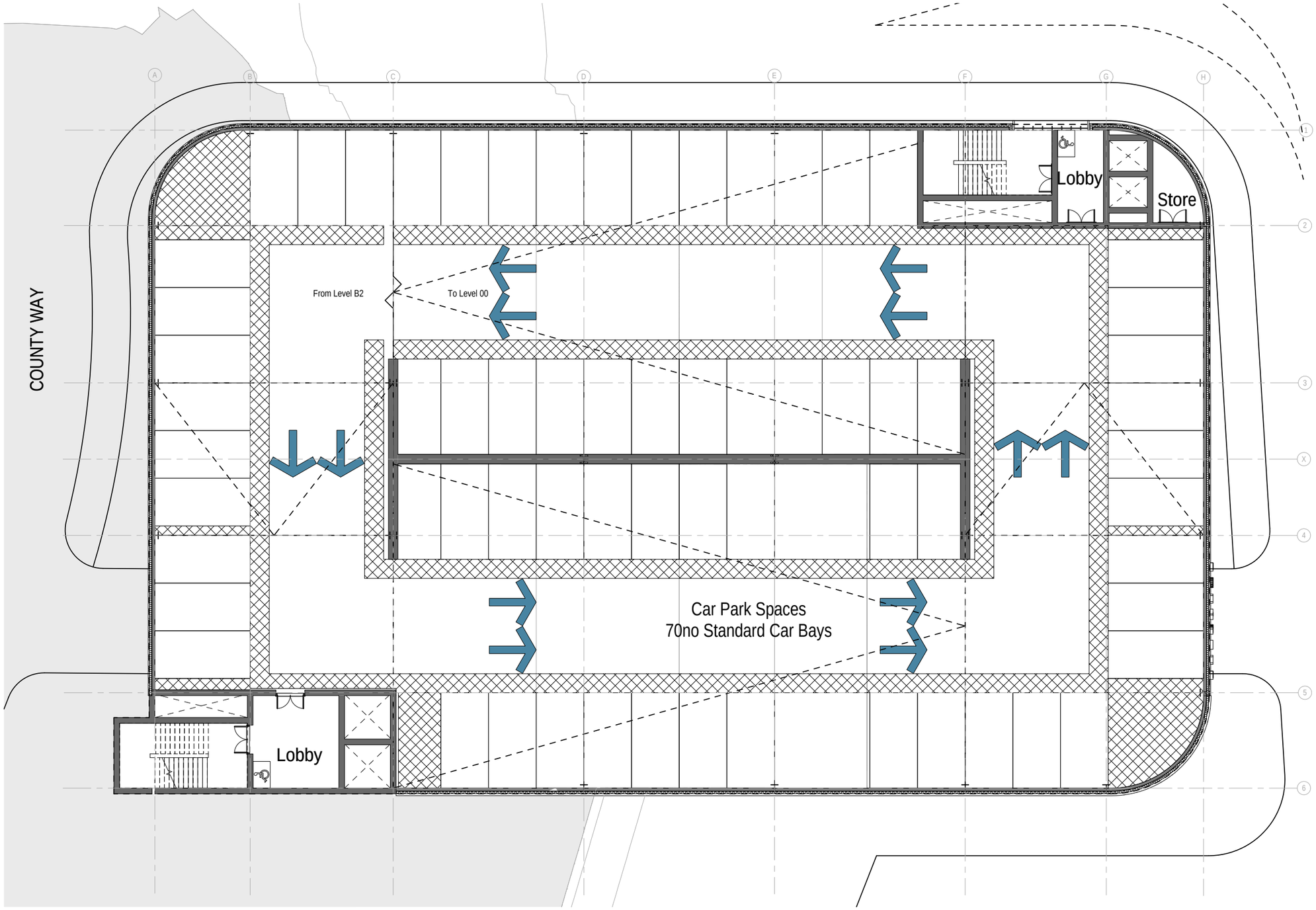



Figure 4.9: Level B1 Floor Plan

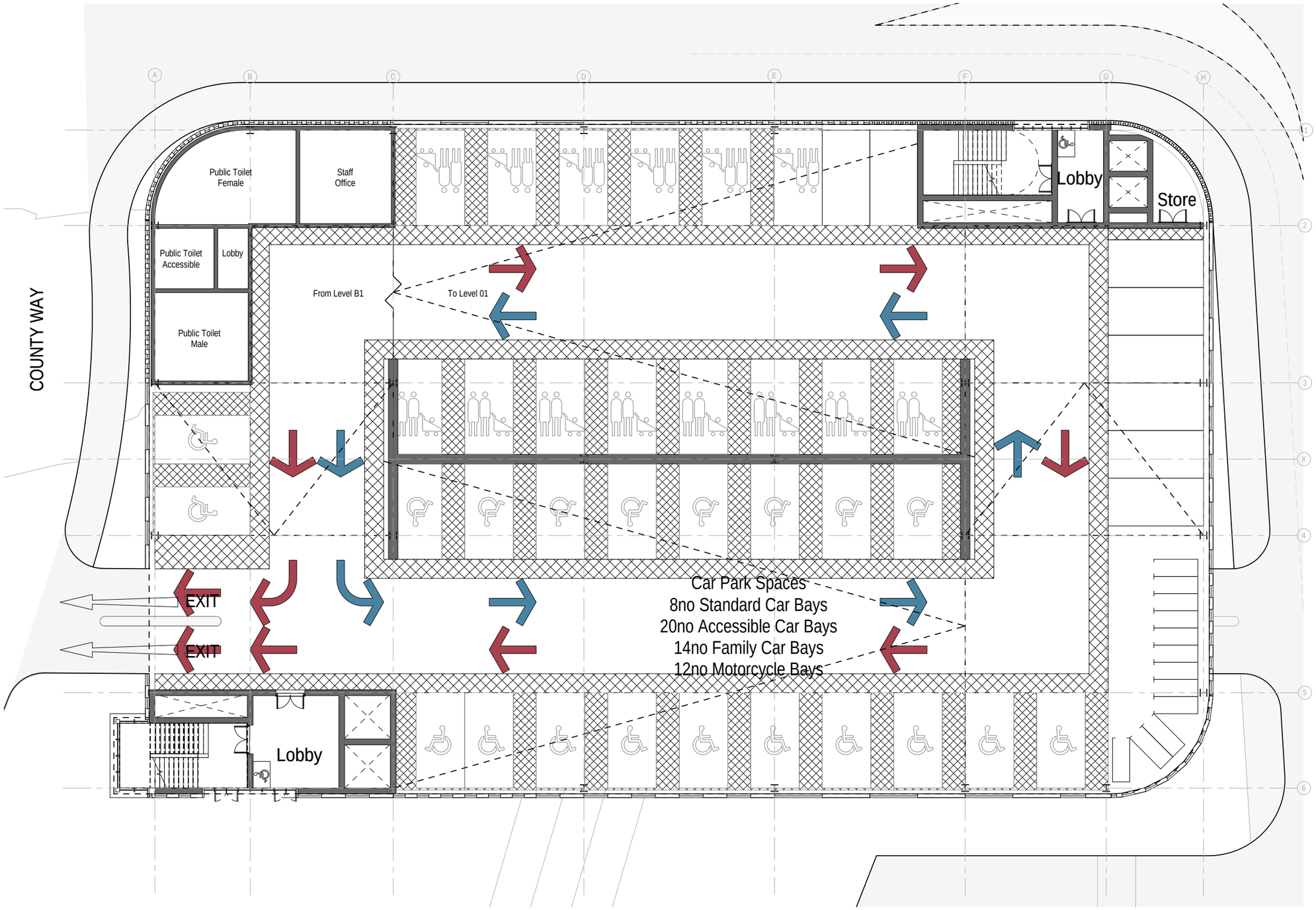



Figure 4.10: Level 00 Ground Floor Plan

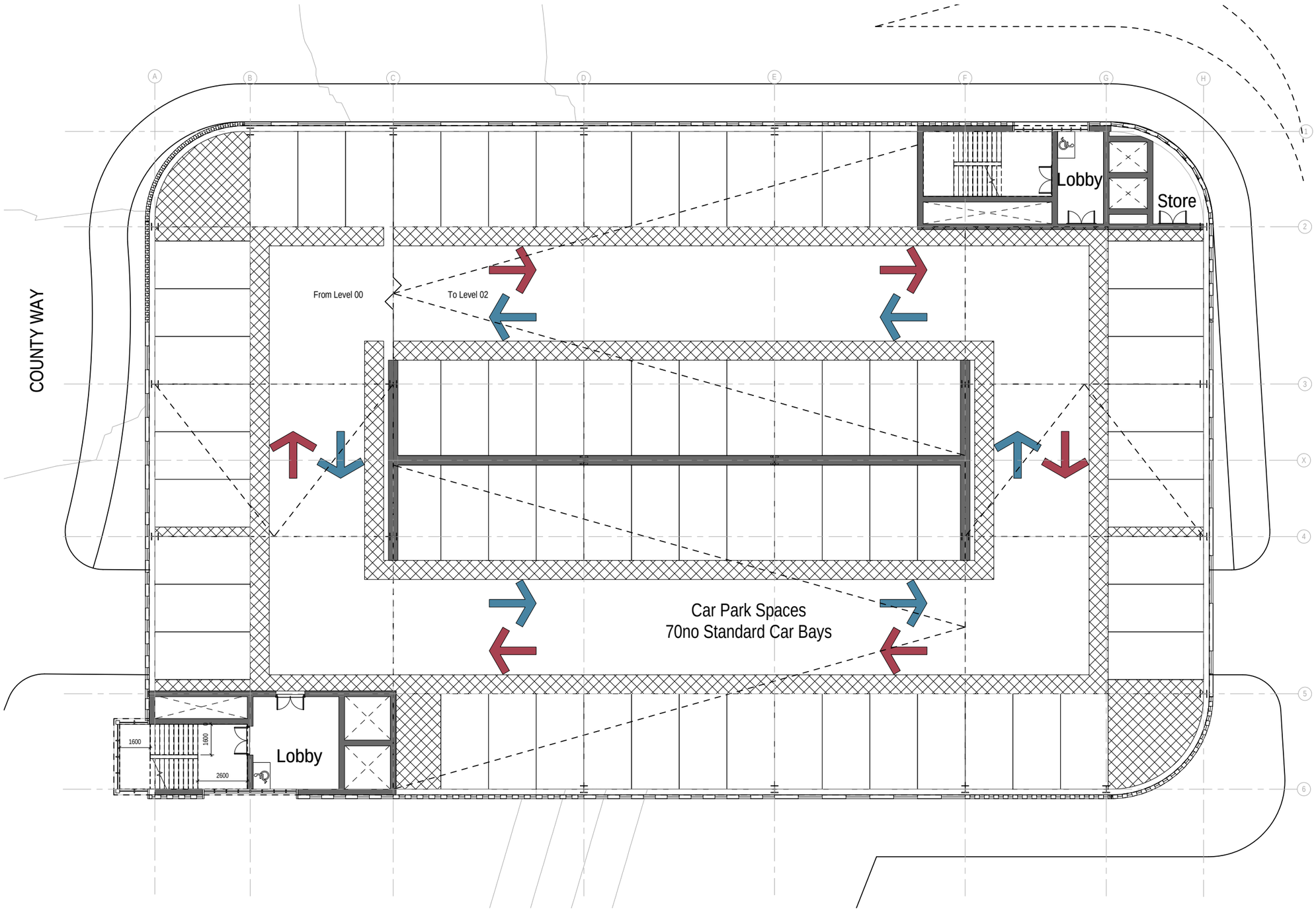



Figure 4.11: Level 01 Floor Plan

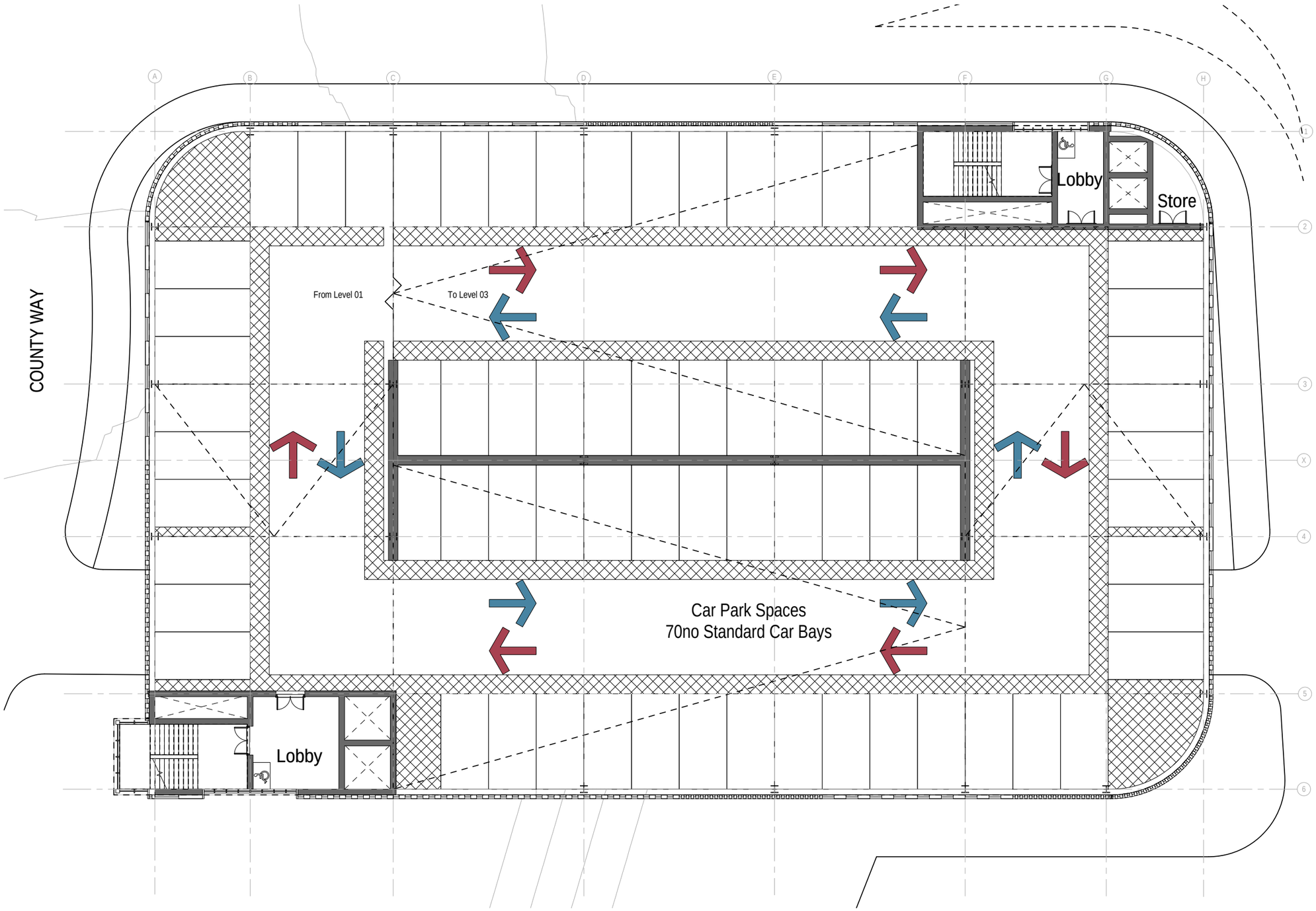



Figure 4.12: Level 02 Floor Plan

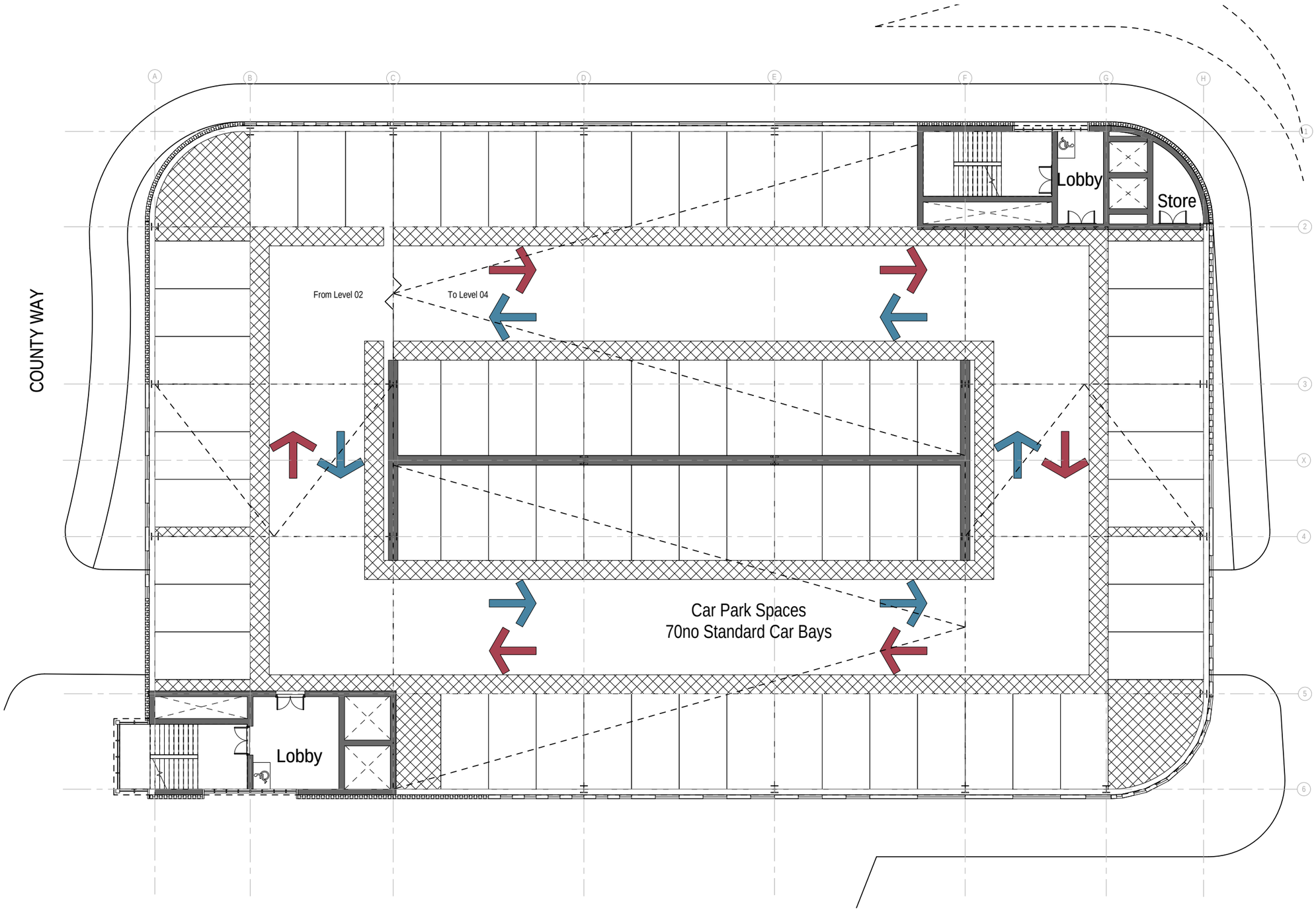



Figure 4.13: Level 03 Floor Plan

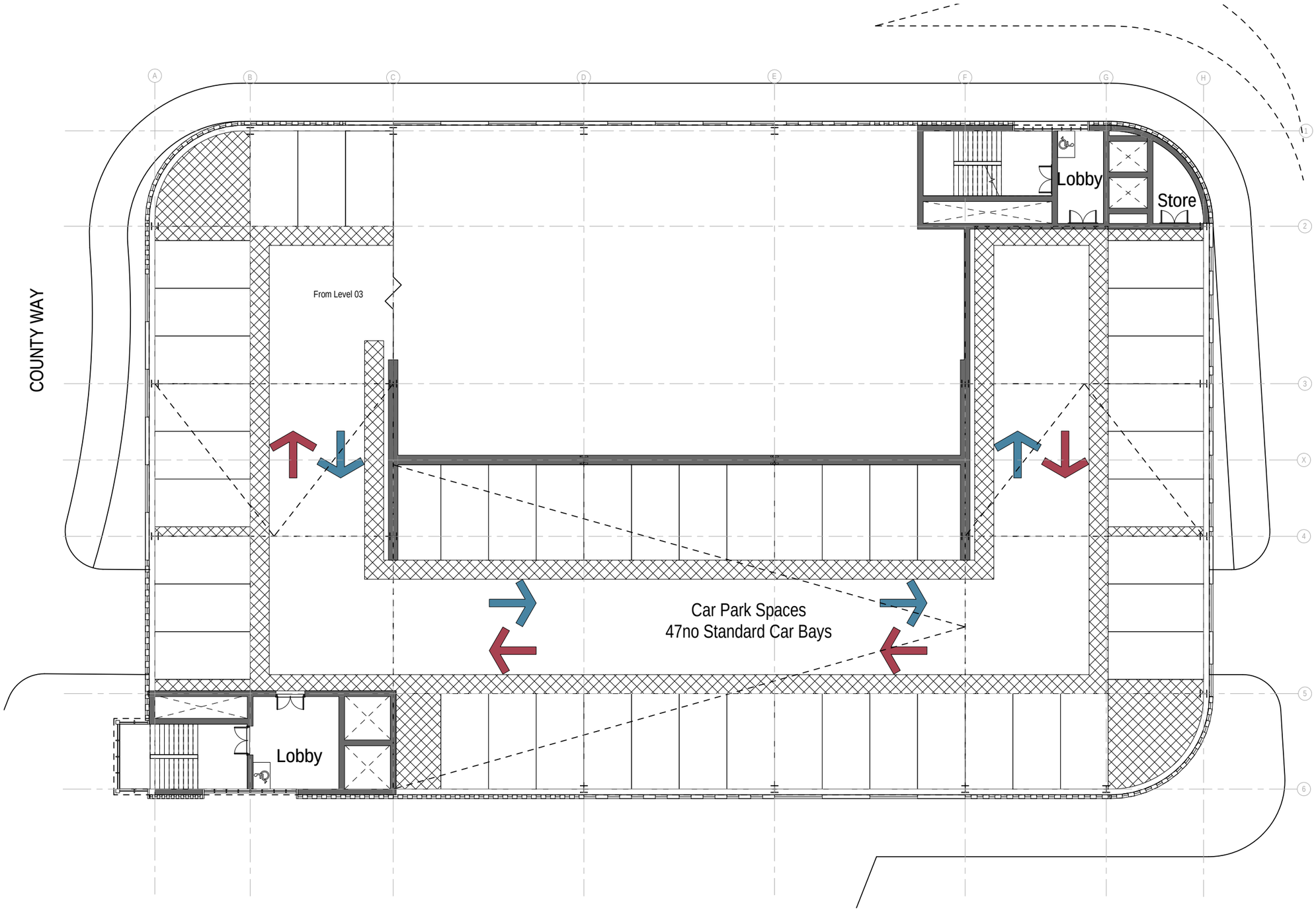



Figure 4.14: Level 04 Floor Plan

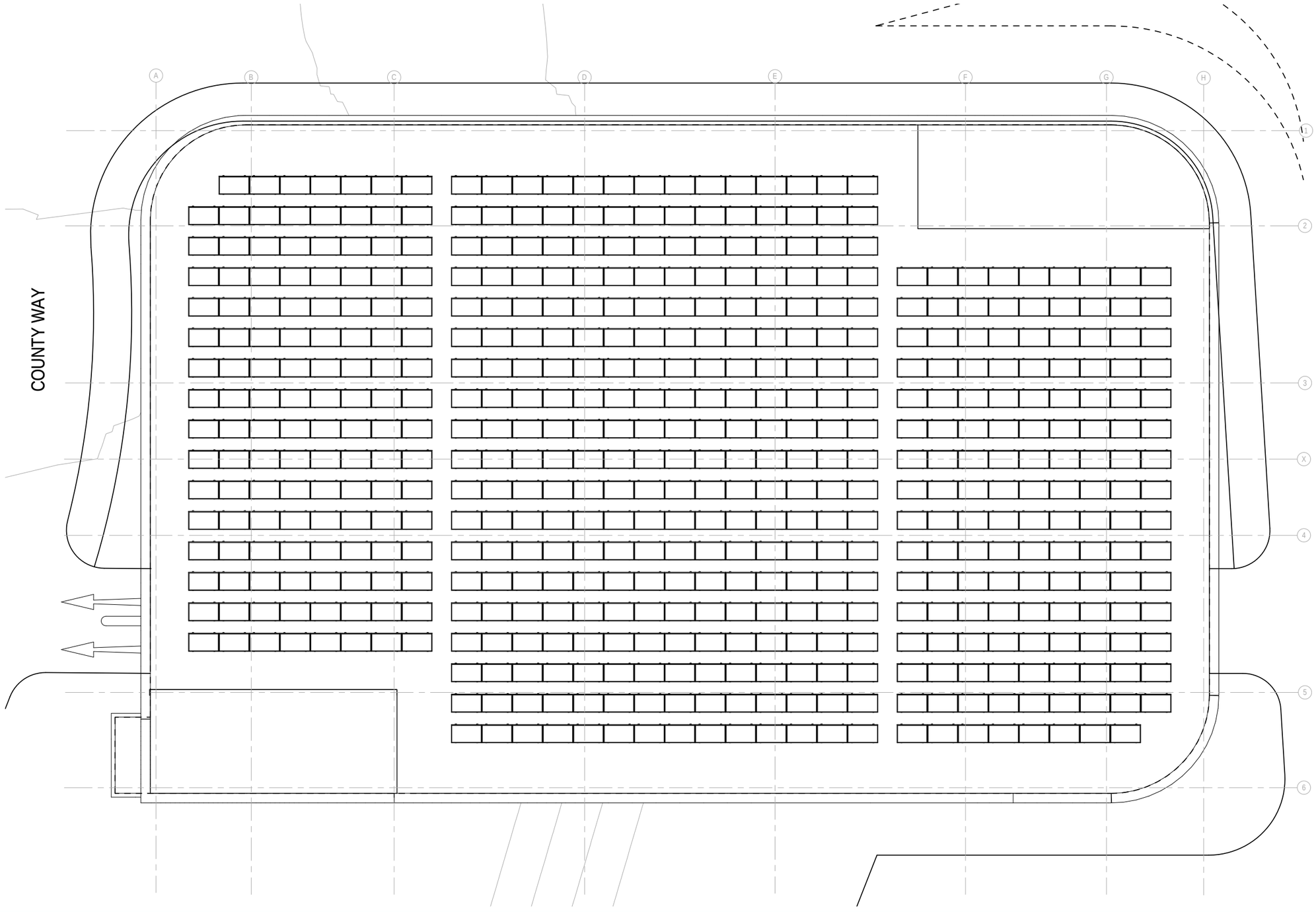
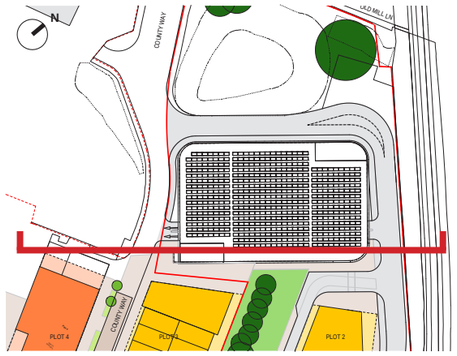



Figure 4.15: Roof Level Floor Plan

## 4.4 Building Sections

The site topography rises steeply towards the West side, but not uniformly across the length of the site. To accommodate the building and make the best use of the levels on the service road and on County Way, excavation will be required over part of the site.

The red dashed line shows the existing fall lines of the ground surface across the four building sections.



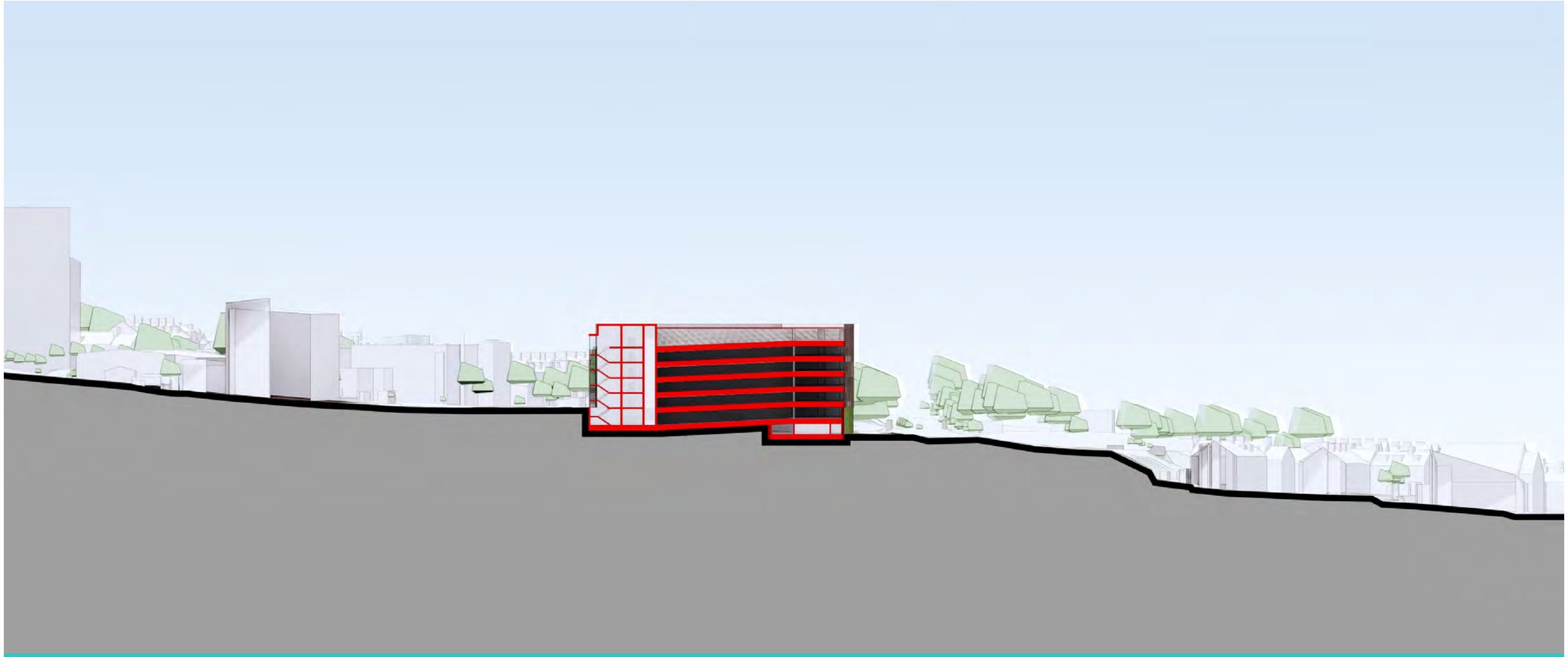
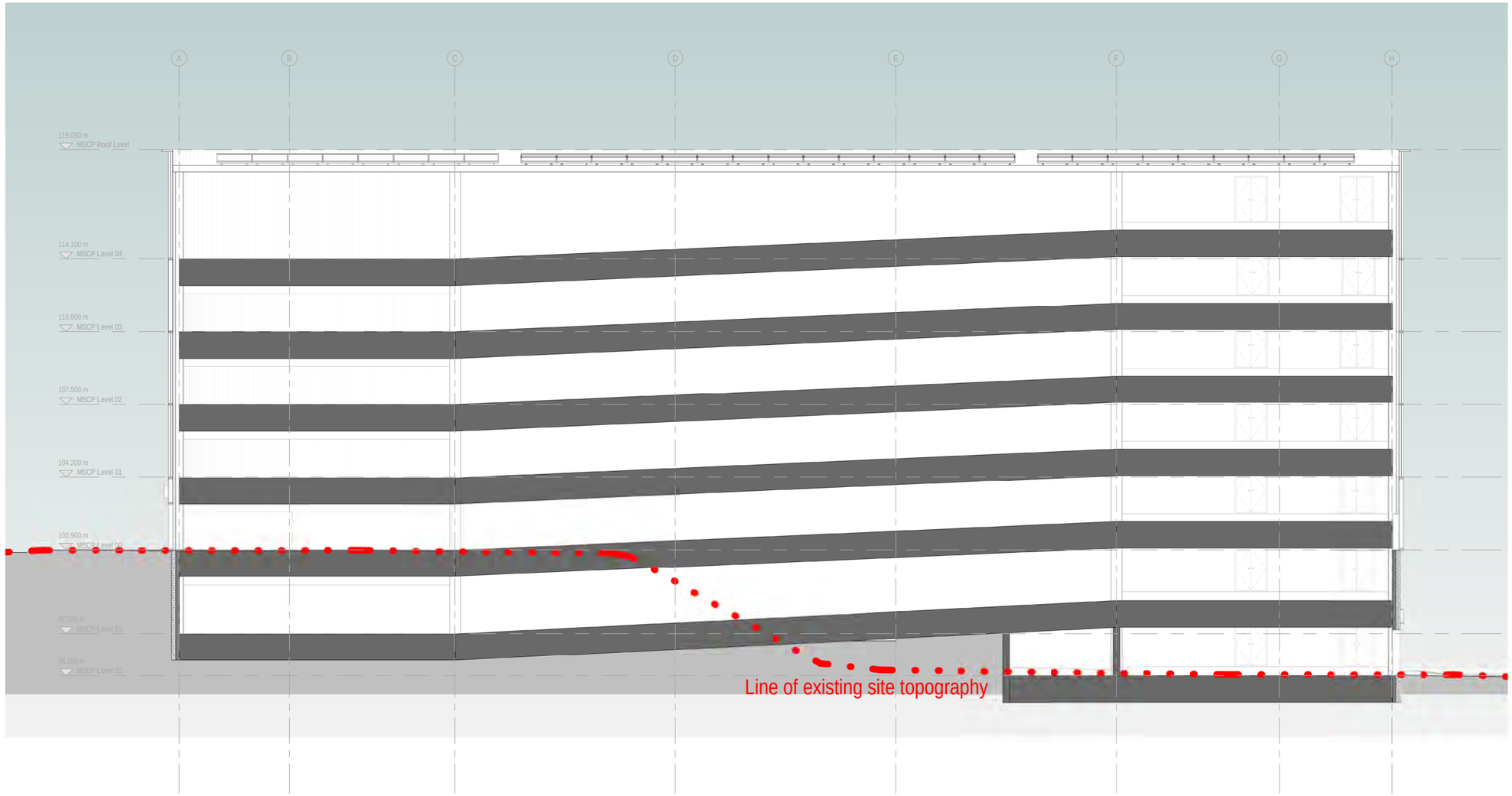



Figure 4.16: Site section




Option 2B Section A

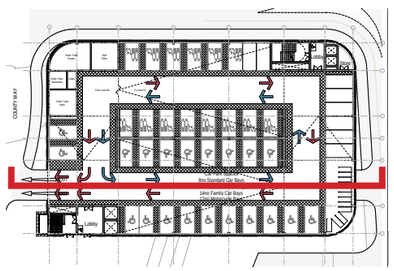
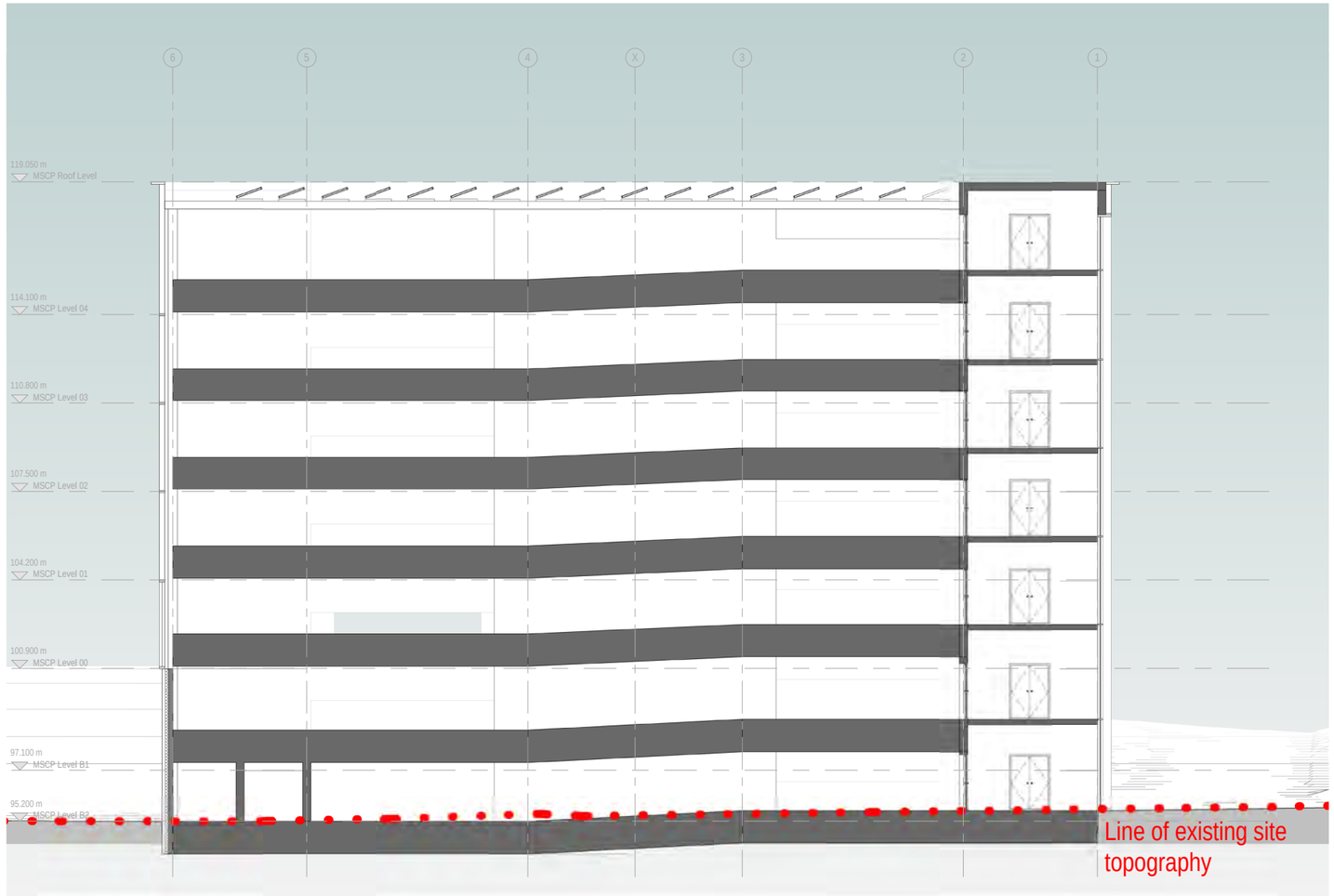


Figure 4.17: Section A




Option 2B Section B

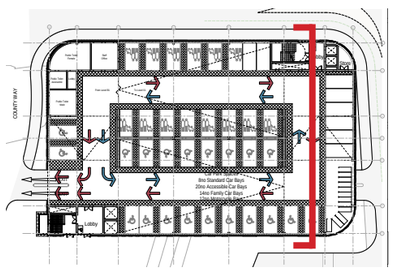
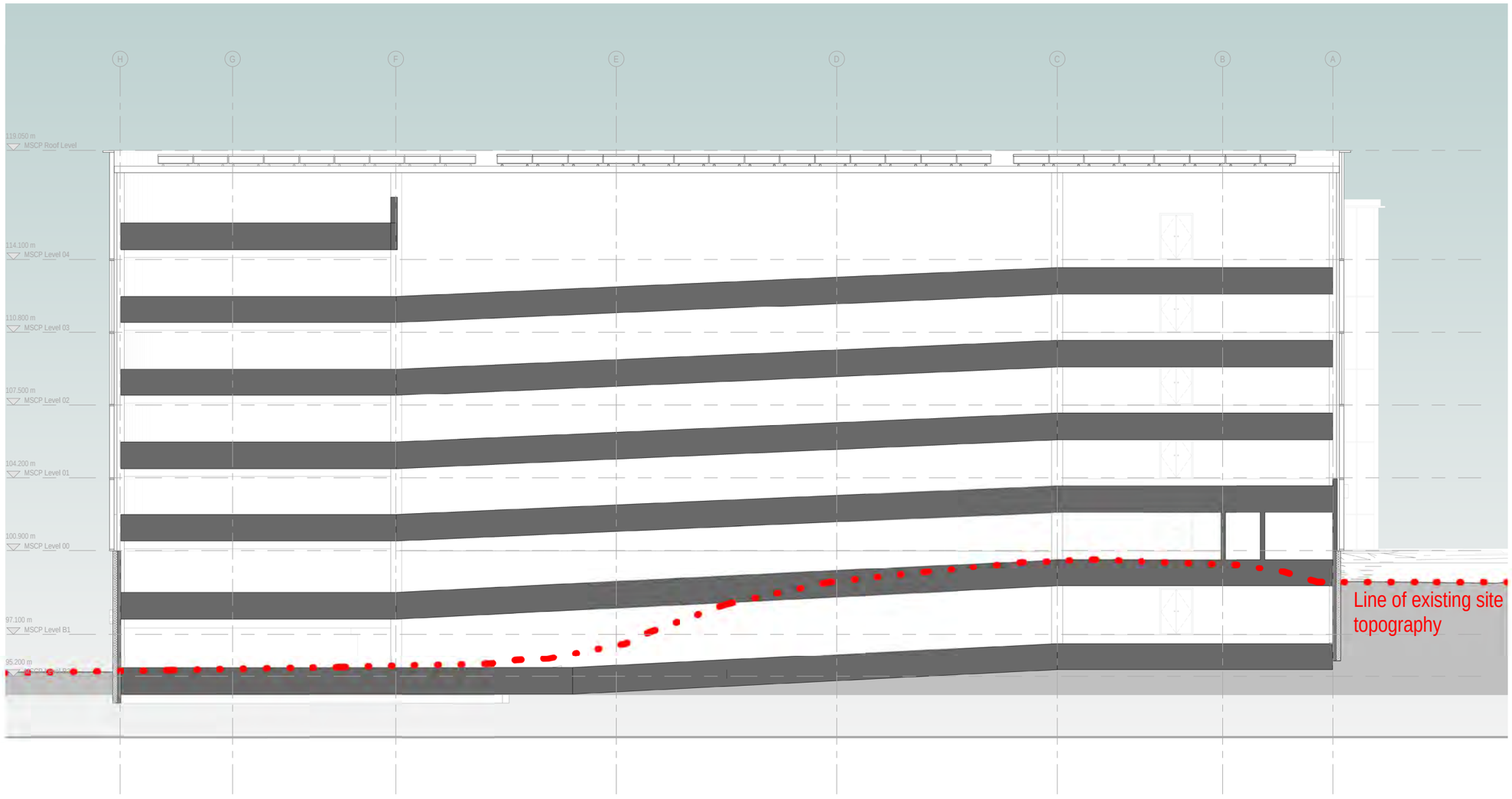


Figure 4.18: Section B




Option 2B Section C

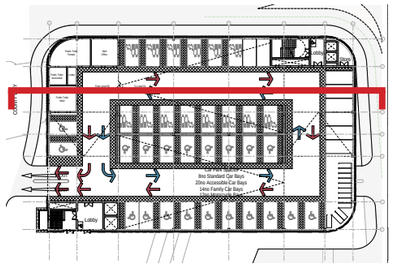
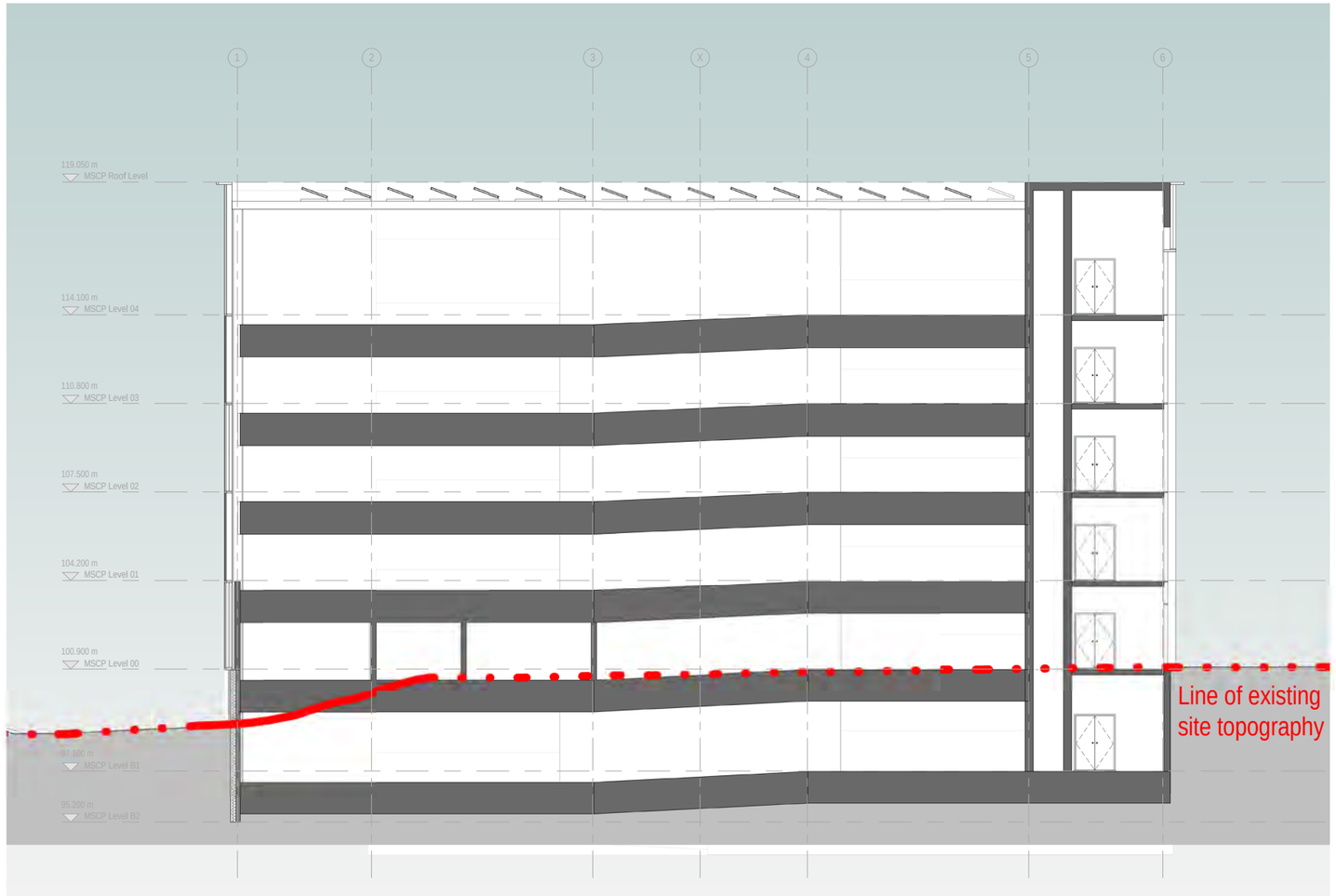


Figure 4.19: Section C




Option 2B Section D

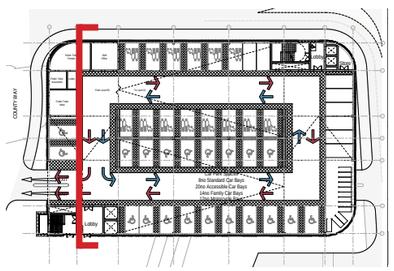


Figure 4.19: Section D

## 4.5 Building Appearance

The challenges posed by the topography, with the building partly submerged below the ground level, as well as by the emerging designs in the car park's vicinity, combined with the particular technical requirements for this type of building, start to create a framework for the envelope's appearance and function.

The upper levels of the car park are to be fully naturally ventilated and, therefore, the envelope is intended to provide a sufficient level of permeability to allow cross flows of air. In the lower levels, natural ventilation will be mechanically assisted.

These functional considerations thus inform two different façade treatments. The vehicular circulation along the West, North, and East sides also leads to a different, sturdier material choice than the South side, which faces onto the pedestrian circulation and future residential developments, requiring a softer treatment.

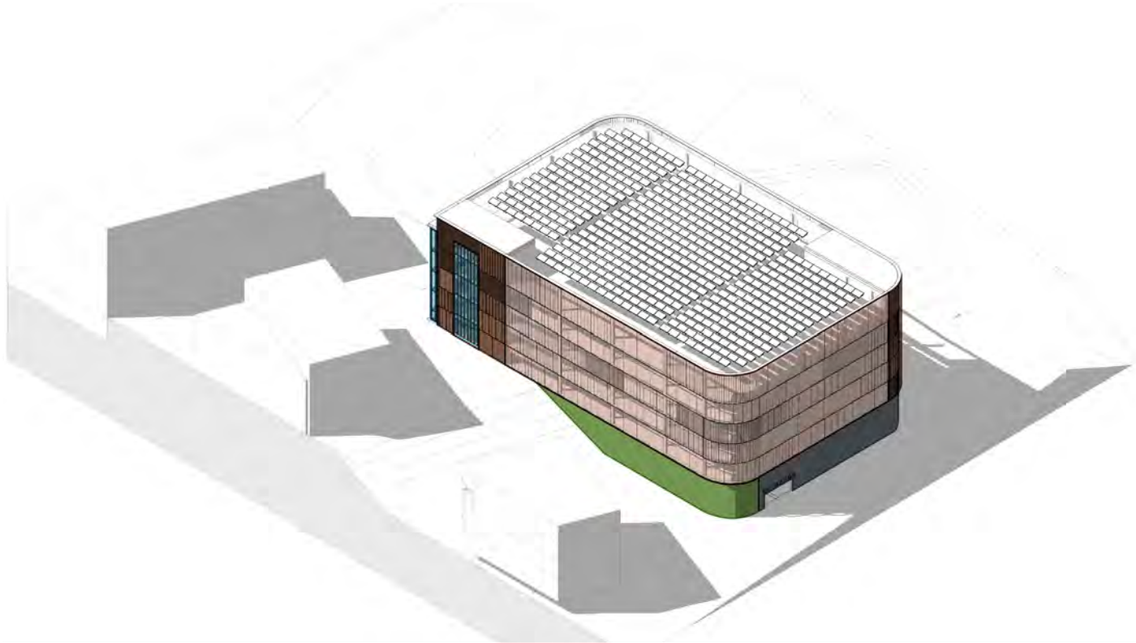


Figure 4.20: Facade Study Zones - Aerial SE View

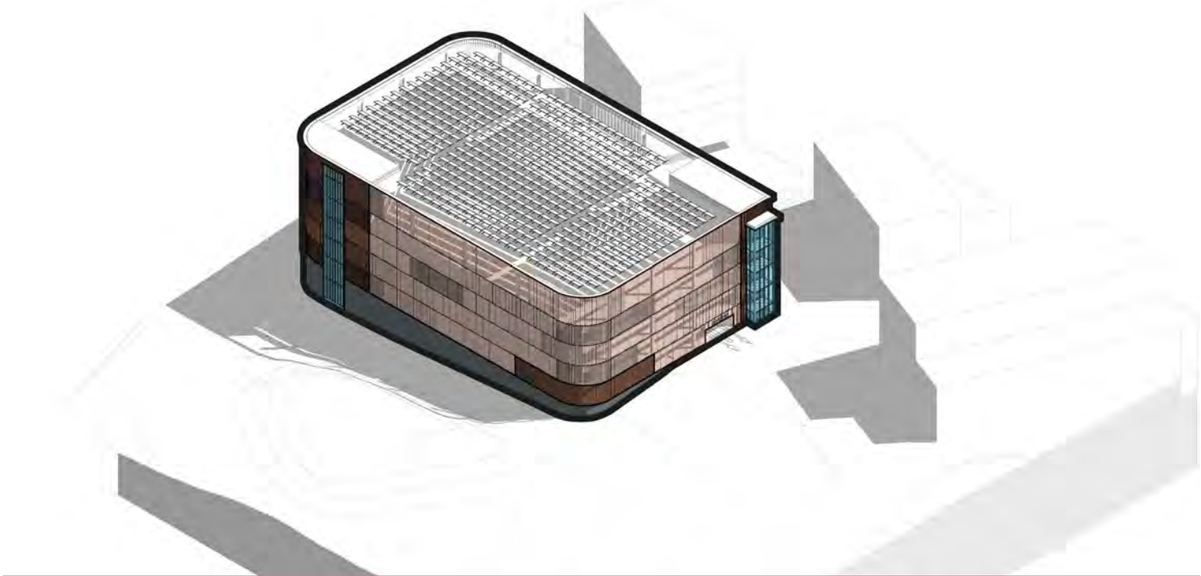



Figure 4.21: Facade Study Zones - Aerial NW View

## 4.5 Building Appearance

The proposed design splits the upper and lower levels: an articulated metal cladding, either perforated over the parking zones or solid over the cores, will envelop the upper zone; while a masonry construction is proposed for the lower zone. A green wall covers the South side, as if emerging from the landscape, and wrapping around the corner next to the entrance.

The vertical circulation is clearly defined, with the main public core projecting from the building volume, while the expansive glazed areas will provide views across the wider surrounding area.

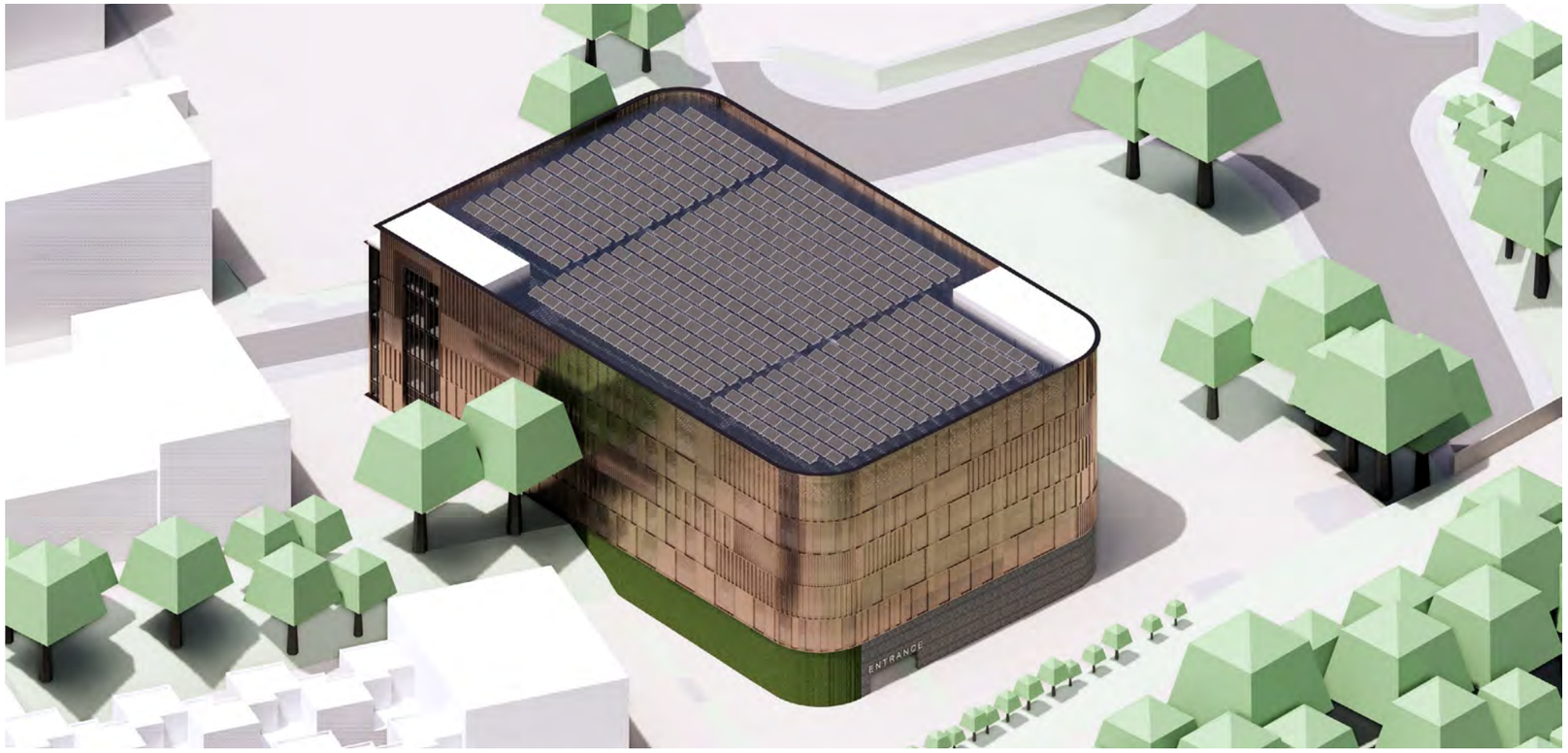



Figure 4.22: Aerial SE View

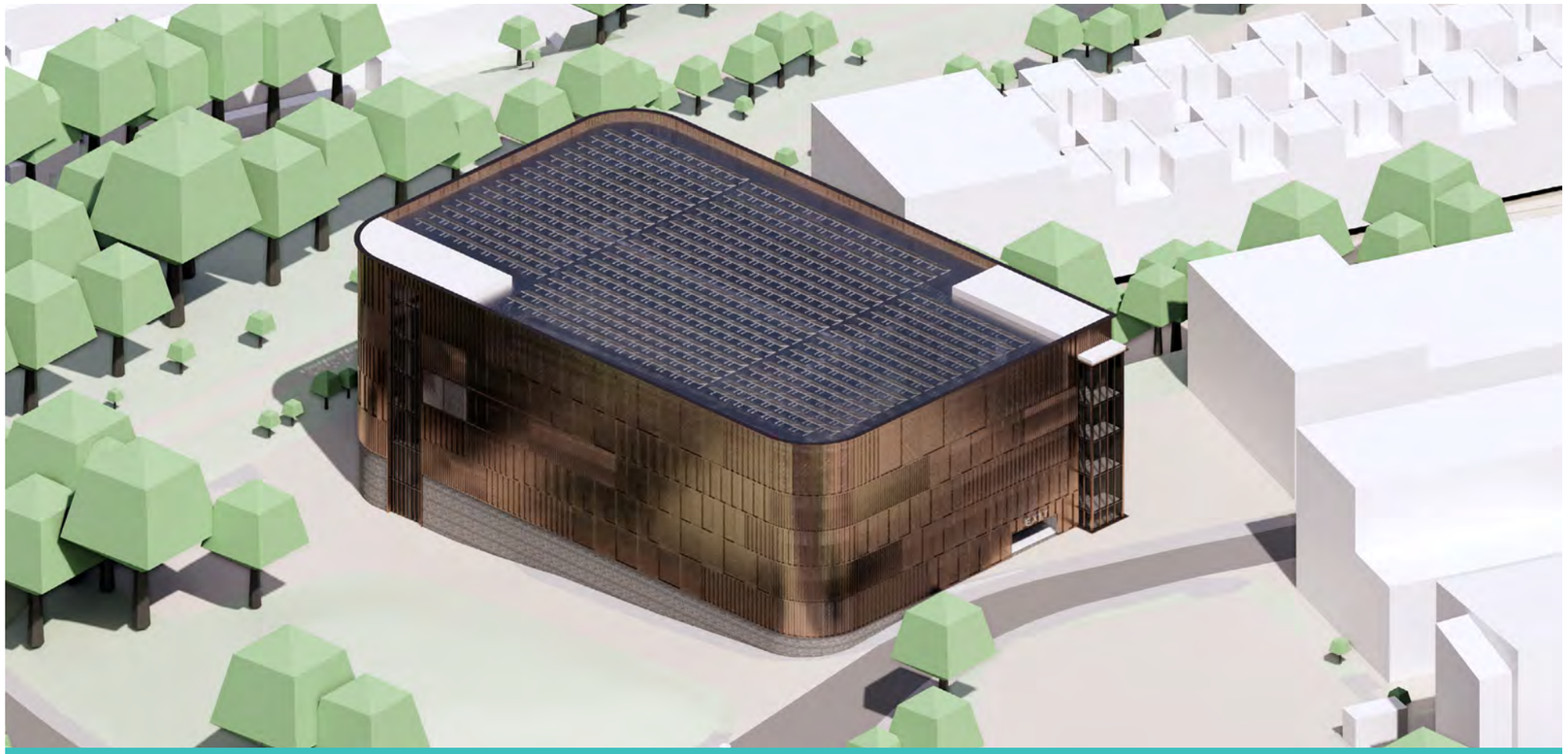
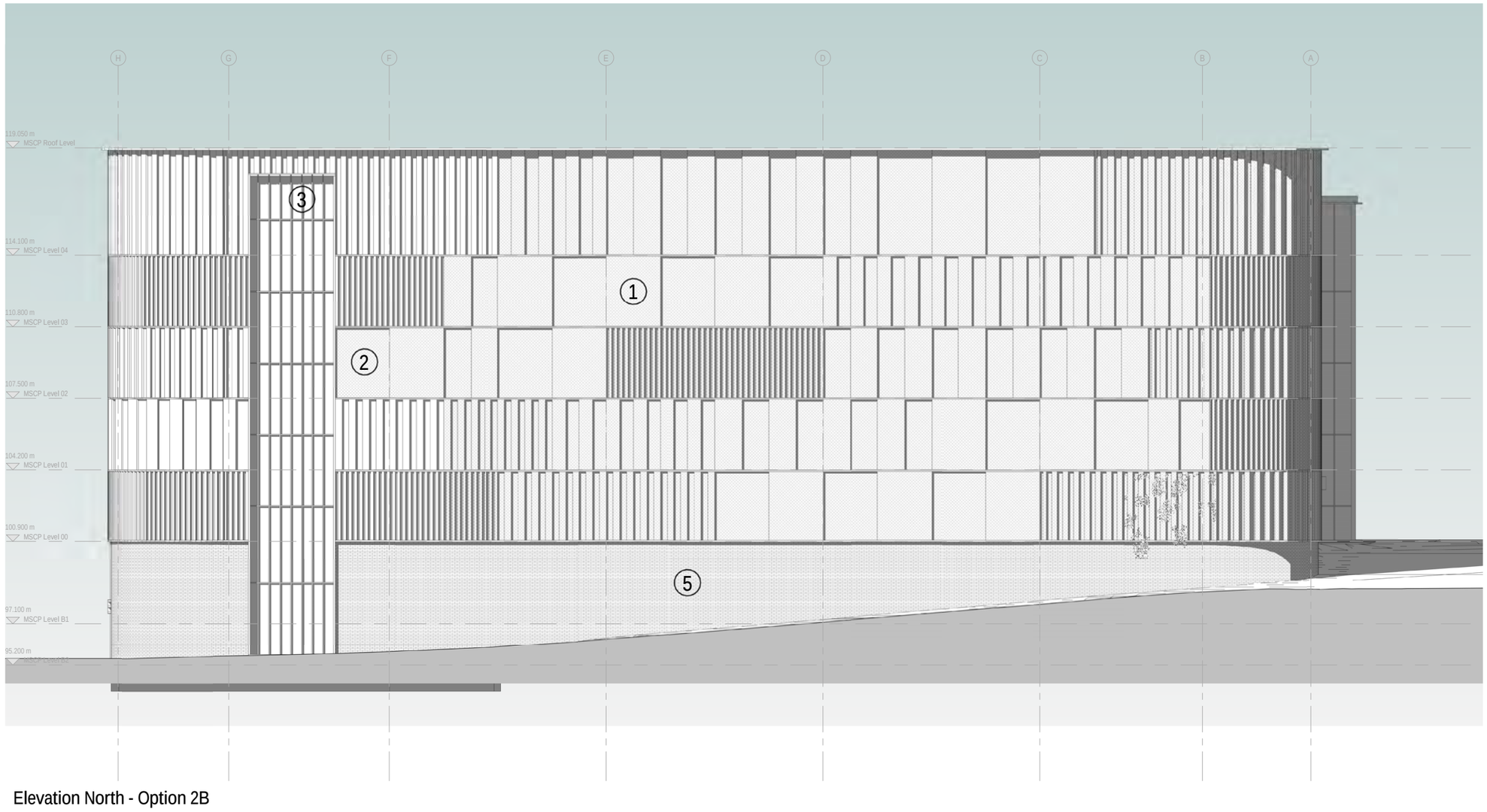


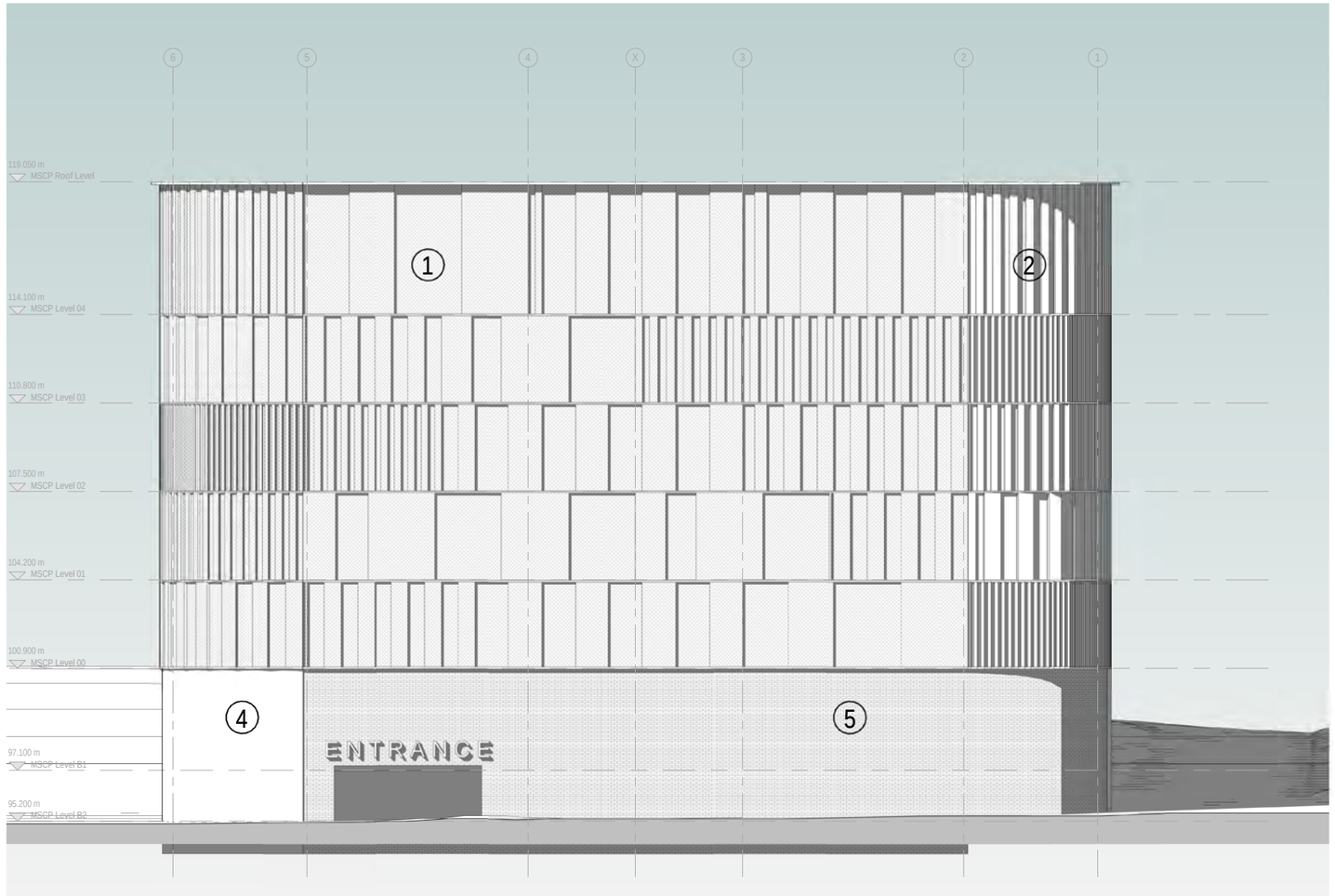
Figure 4.23: Aerial NW View




Materials Key

1. Articulated Perforated Metal Cladding.
2. Articulated Solid Metal Cladding.
3. Glass Curtain Wall.
4. Green Wall.
5. Masonry.

**Figure 4.24: North Elevation**

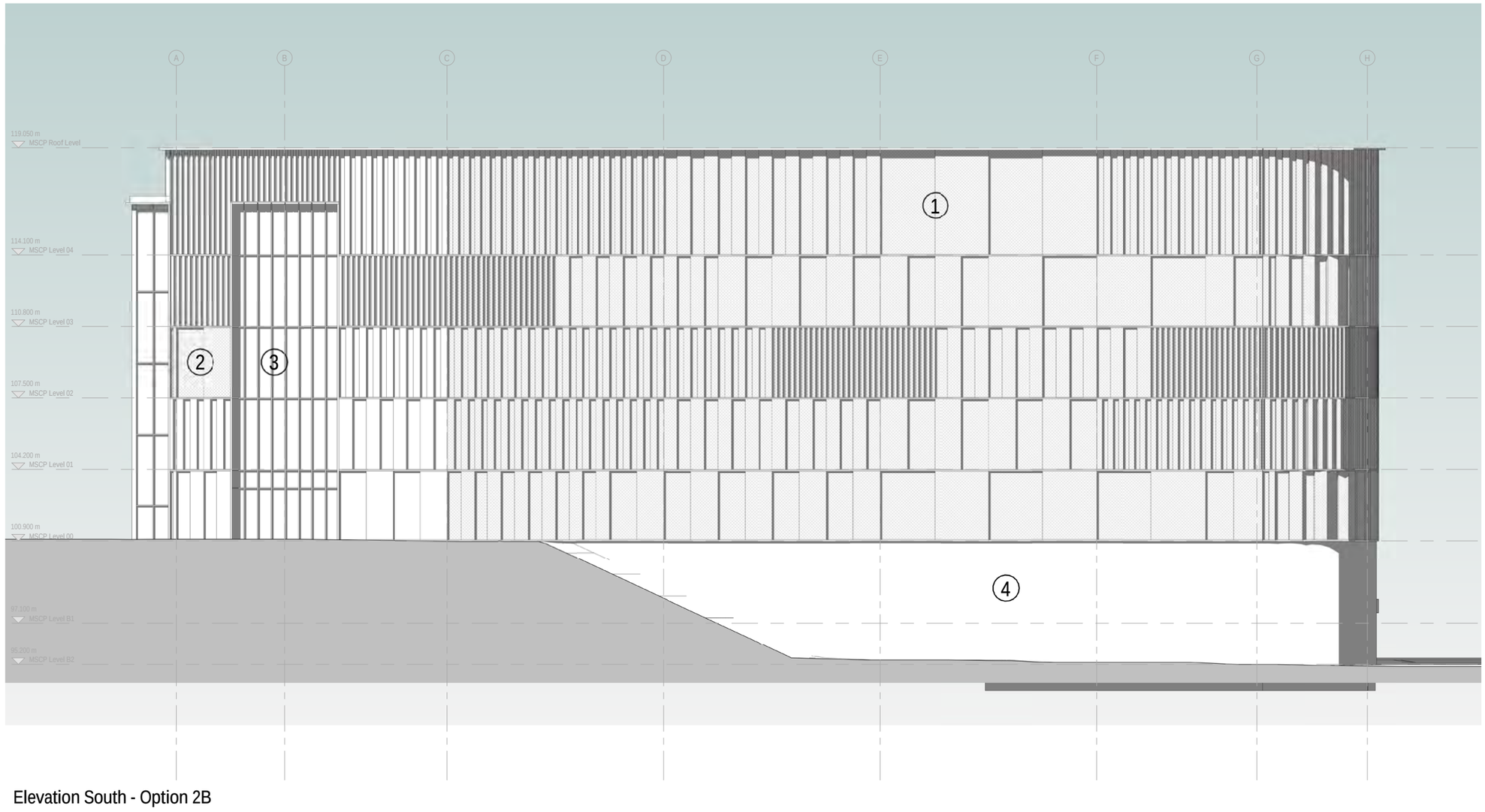



Elevation East - Option 2B

Materials Key

1. Articulated Perforated Metal Cladding.
2. Articulated Solid Metal Cladding.
3. Glass Curtain Wall.
4. Green Wall.
5. Masonry.

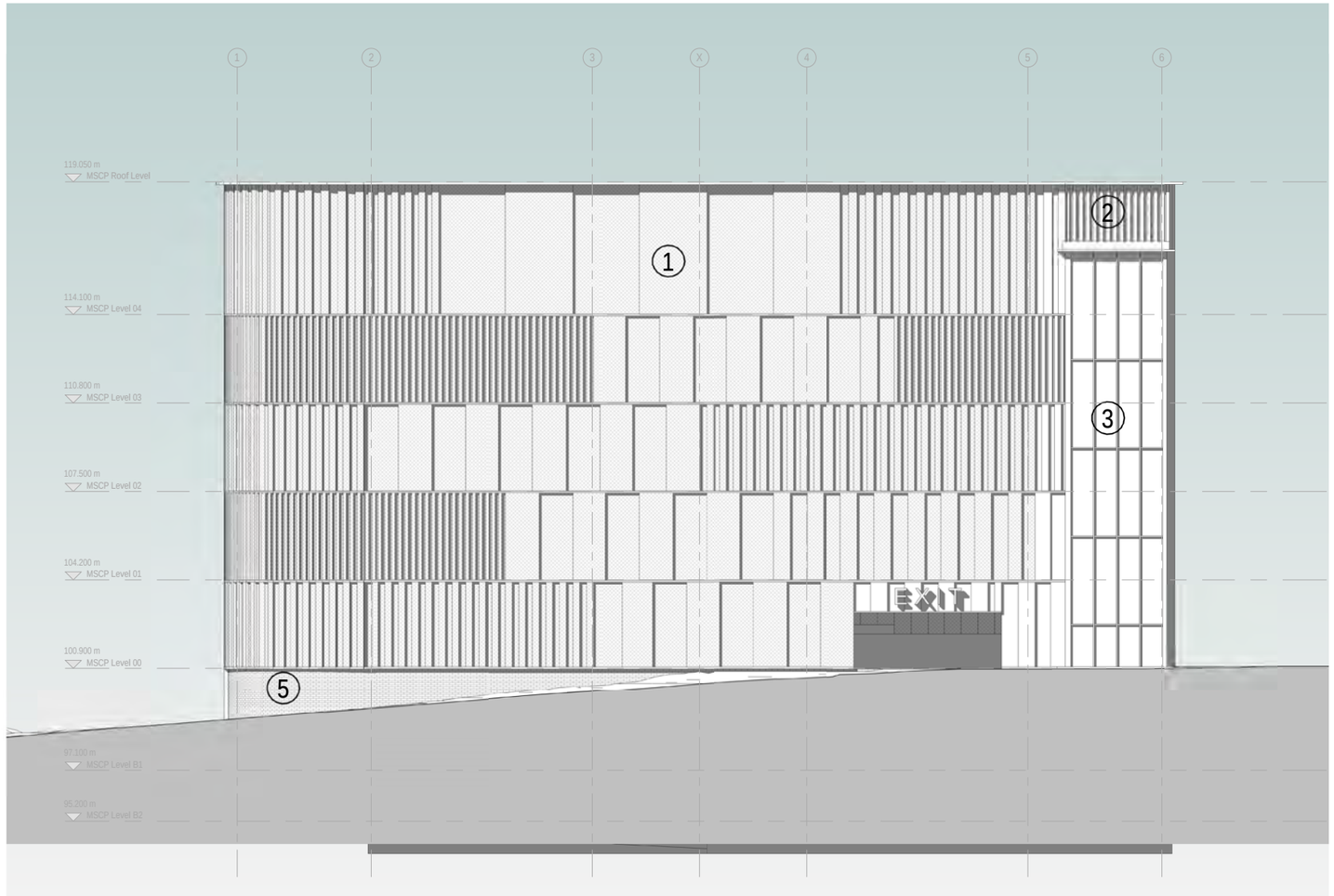
**Figure 4.25: East Elevation**




Materials Key

1. Articulated Perforated Metal Cladding.
2. Articulated Solid Metal Cladding.
3. Glass Curtain Wall.
4. Green Wall.
5. Masonry.

**Figure 4.26: South Elevation**

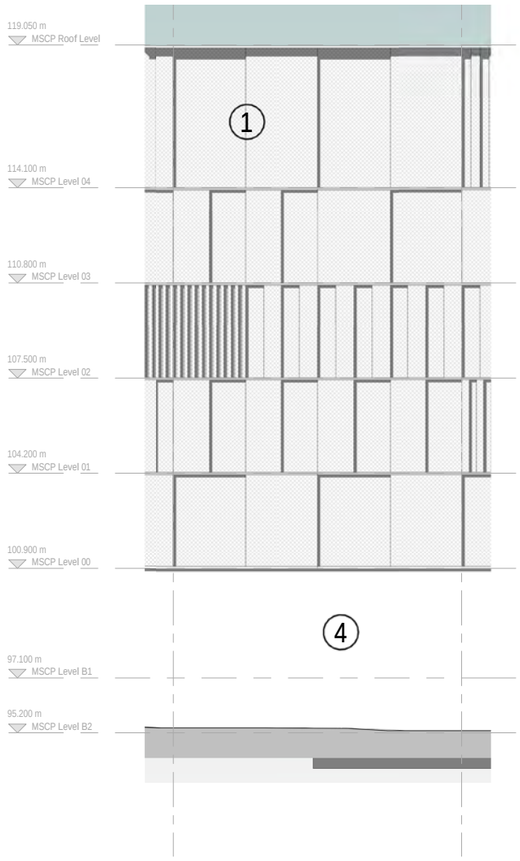



Elevation West - Option 2B

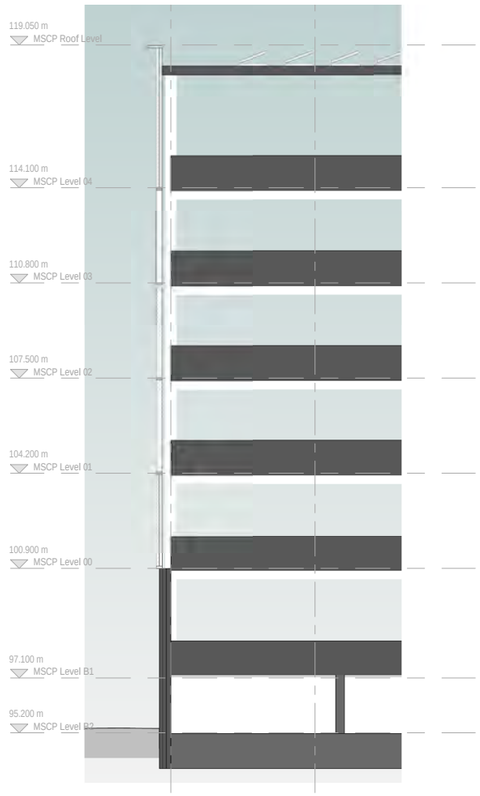
Materials Key

1. Articulated Perforated Metal Cladding.
2. Articulated Solid Metal Cladding.
3. Glass Curtain Wall.
4. Green Wall.
5. Masonry.

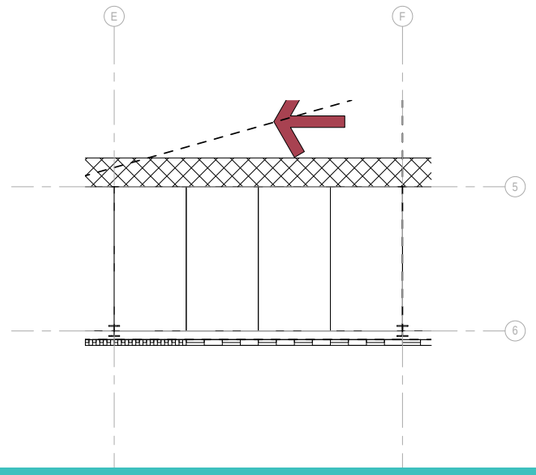
**Figure 4.27: West Elevation**

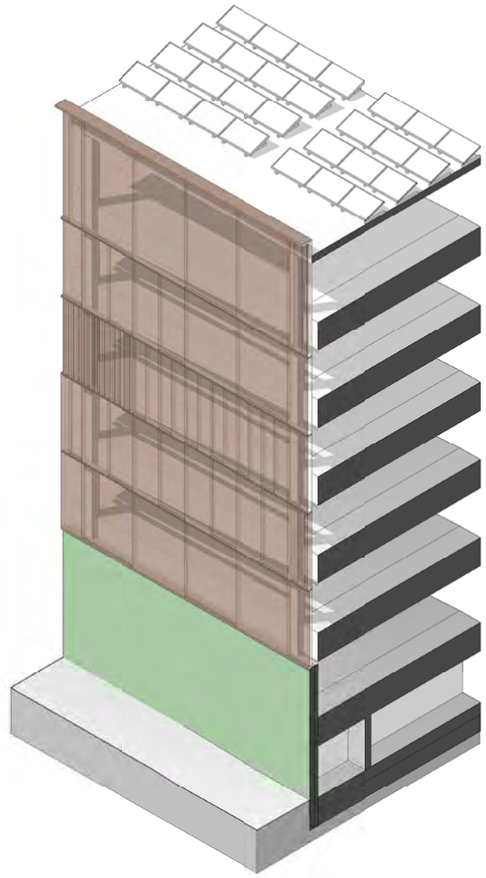



MSCP Bay Study A Elevation




MSCP Bay Study A Section

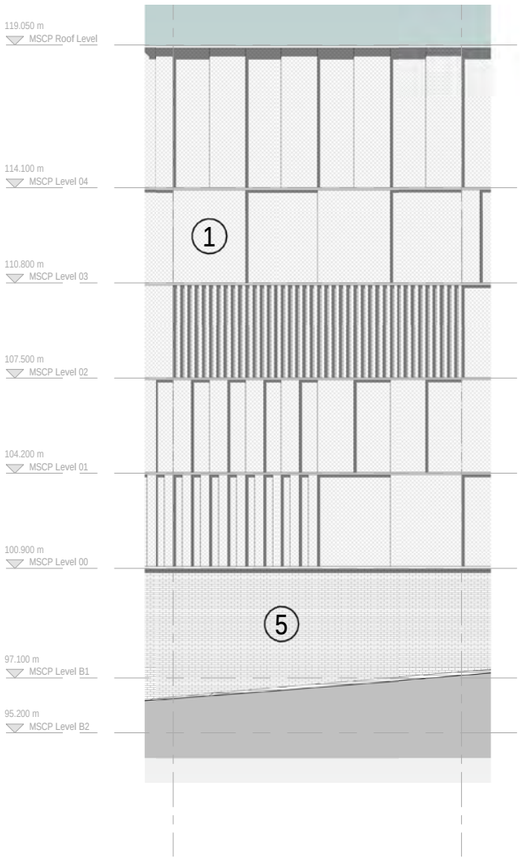


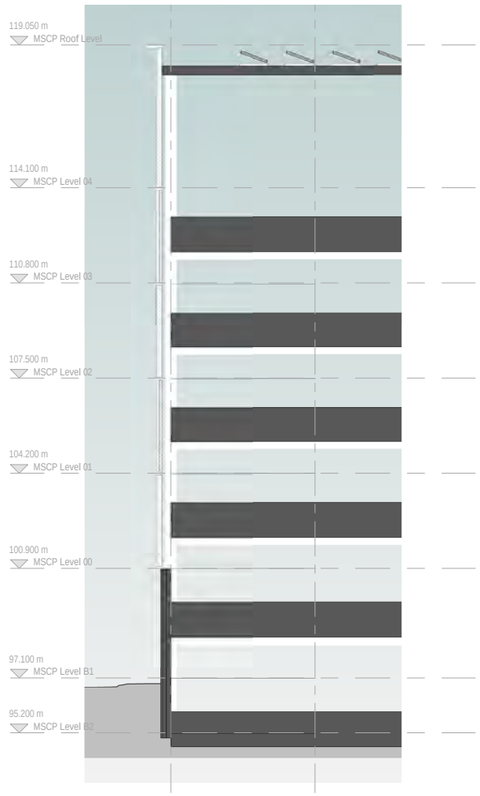
Materials Key

1. Articulated Perforated Metal Cladding.
2. Articulated Solid Metal Cladding.
3. Glass Curtain Wall.
4. Green Wall.
5. Masonry.

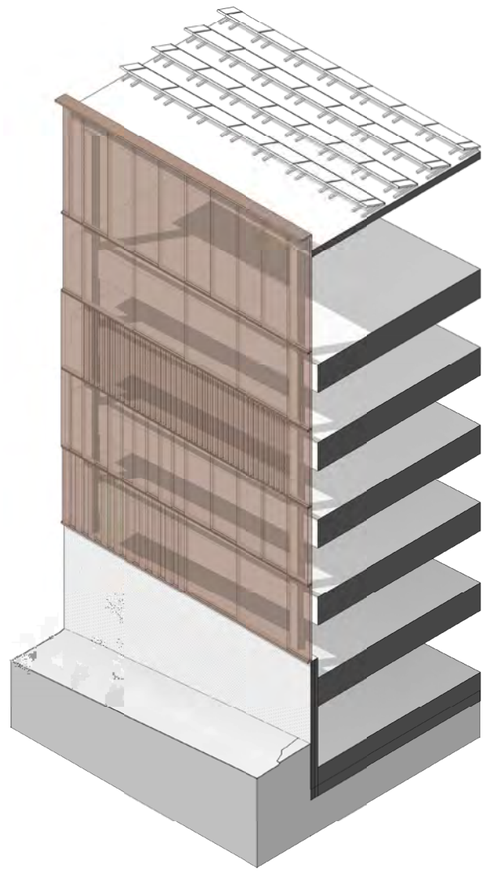
**Figure 4.28: Bay Study A**




MSCP Bay Study B Elevation



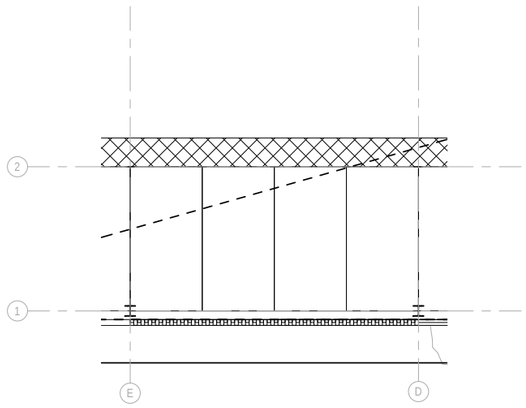

MSCP Bay Study B Section



MSCP Bay Study B Axo View

Materials Key

1. Articulated Perforated Metal Cladding.
2. Articulated Solid Metal Cladding.
3. Glass Curtain Wall.
4. Green Wall.
5. Masonry.




MSCP Bay Study B Typical Plan

**Figure 4.29: Bay Study B**

## 4.6 Key Views

A series of key views have been extracted from the model, showing the proposed car park within its wider context.

This exemplifies the mass of the building in relation to the emerging proposal around The Seam, as well as in relation to the existing local urban fabric.

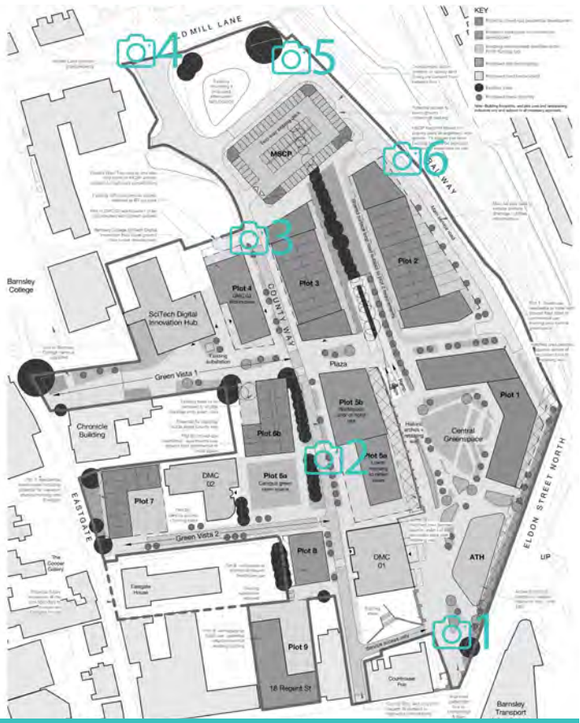



Figure 4.30: Key Views Site Plan.

Figure 4.31: View 1 - From Active Travel Hub and DMC01.

Figure 4.32: View 2 - Along County Way.


Figure 4.33 : View 3 - Main public core and vehicle exit onto County Way.

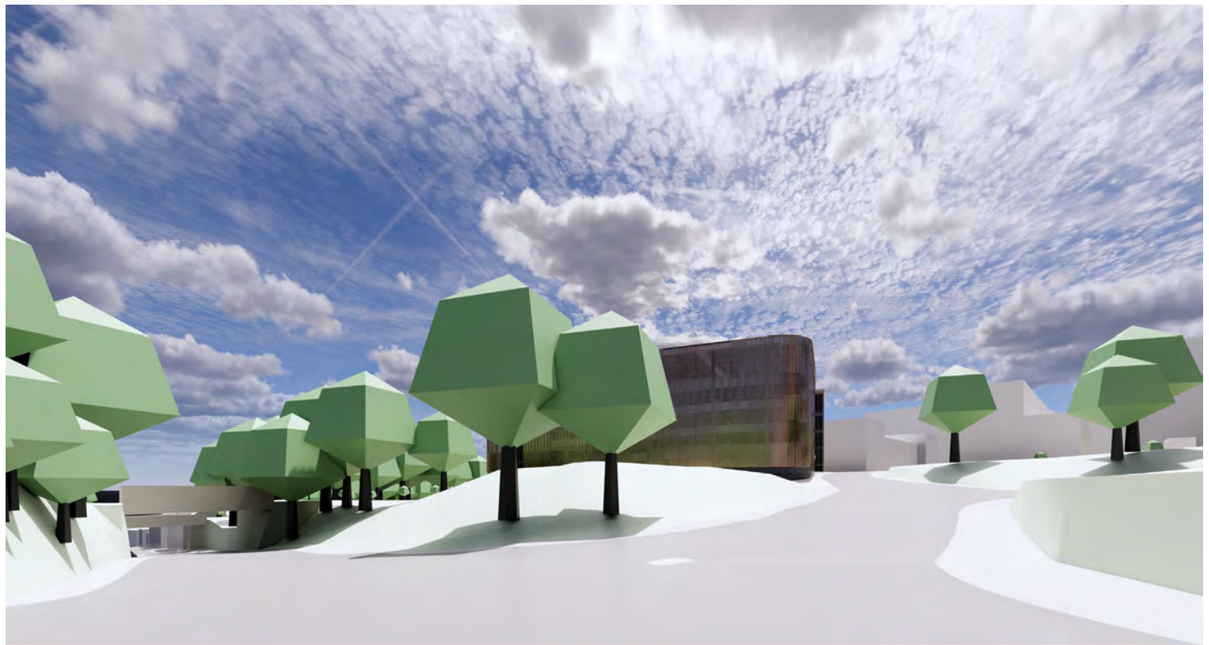


Figure 4.34: View 4 - From Old Mill Lane.

Figure 4.35: View 5 - Secondary escape core along the service road.

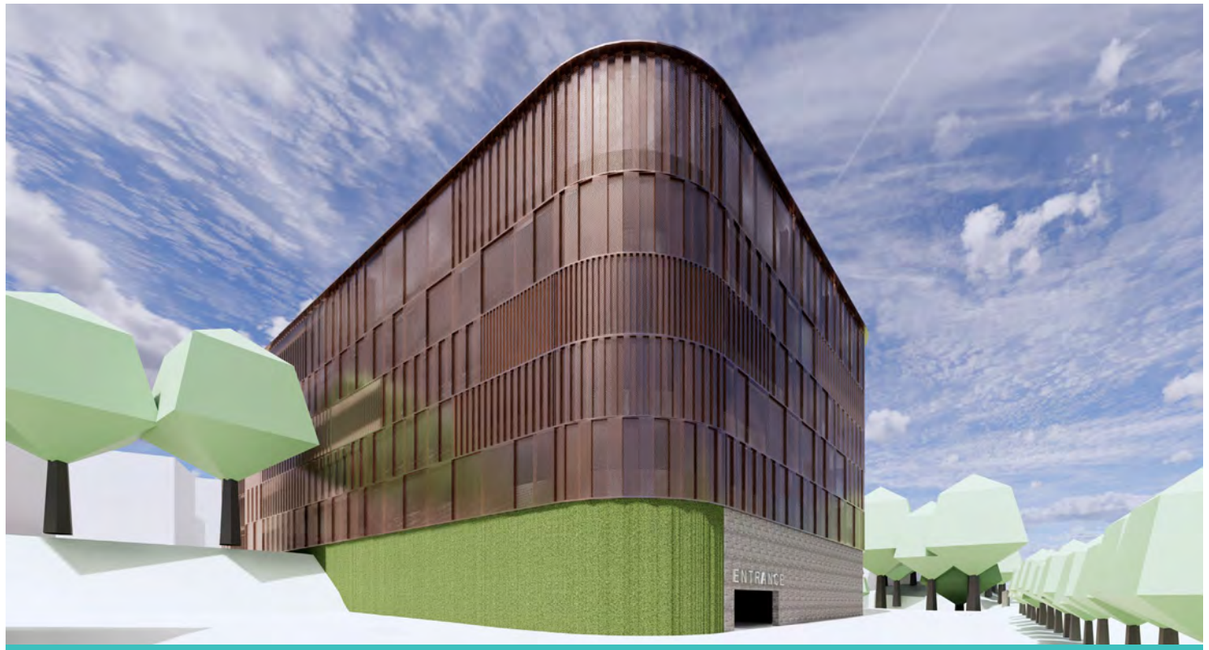



Figure 4.36: View 6 - Vehicle entrance and green wall, from the service road and railway.

## 4.7 Precedent Study

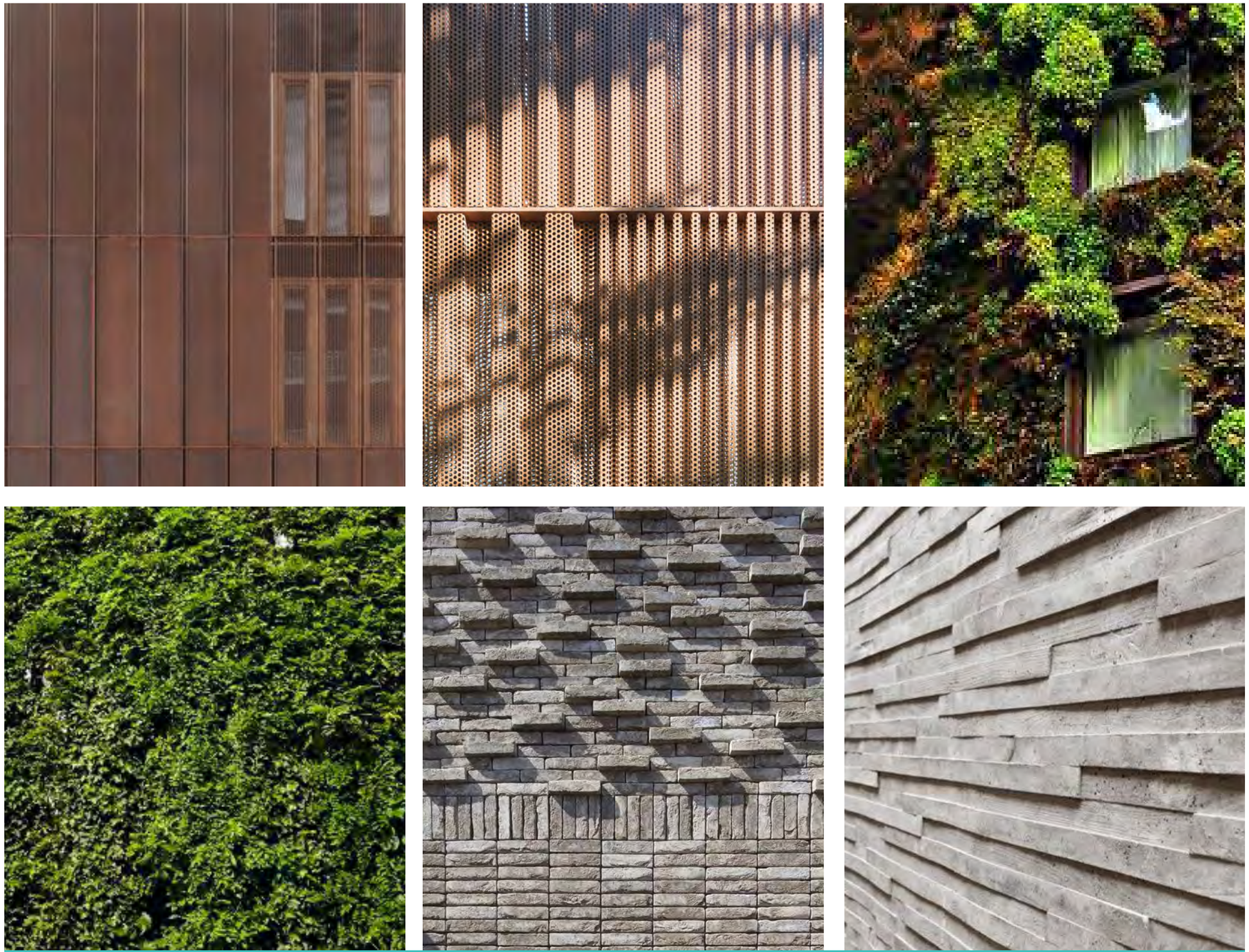


Figure 4.37: Material Palette

## 4.7 Precedent Study

Figure 4.38: Glasshouse MSCP - Alderley Park, UK - BDP

Figure 4.39: Inselhalle Parkhaus - Lindau, DE - Auer Weber

# 5.0 Structures

## 5.1 Introduction

BDP C&S Engineers have been appointed, on behalf of Barnsley Metropolitan Borough Council (BMBC), to provide structural engineering design advice in relation to the proposed Multi-Storey Car Park (MSCP) for the Seam Digital Campus project in the centre of Barnsley. BDP C&S have worked closely with the wider design team, comprising disciplines from both Arcadis and BDP, to develop the design up to RIBA Stage 2.

BDP C&S remit for this Stage extends to the structural engineering design and drainage design (refer to Section 6) with the geotechnical and civil design elements being undertaken by others.

This report sections summarises the Stage 2 structural design optioneering process undertaken to develop the most appropriate structural solution in the context of the site constraints, Architectural intent and Client project drivers.

In addition, this section outlines the technical basis of design upon which subsequent design phases are to be based.


Figure 5.1: CGI of proposed MSCP

### 5.1.1 Key Project Drivers

The development of the structural design has progressed in the context of some key project drivers including:-

- **Cost** – Ultimately, the MSCP must fit within the funding budget in order to be viable. As such, cost and adopting the best value solutions has been a key influence on the development of the design.
- **Sustainability** – BMBC have a clear aspiration to make this development as sustainable as possible in the context of the budget. As such, sustainability and the assessment of aspects that maximise the projects sustainable credentials at an early stage is considered a primary project driver
- **Space Planning** – The MSCP has a clearly defined footprint, based on site constraints and plot size, and a key design influence is the make sure the space is working efficiently to optimise the use of this space
- **Durability and ongoing Maintenance** – the nature of an MSCP is such that the structural frame is exposed in a relatively aggressive environment (potentially wet; de-icing salts etc). As such, durability and the minimisation of long term maintenance needs to be considered from the outset


Figure 5.2: Key Design Criteria

In addition the above, the following aspects have been considered to date and should be addressed as any ongoing design progressed:-


Figure 5.3: Futher Design Considerations

## 5.1.2 Site Constraints

### 5.1.2.1 Topography

A topographical survey has been undertaken and shows that there is a significant level change across the site of circa 3.8m. This level change occurs in two directions and is primarily due to a steep slope within the centre of the site area. The placement of the building is critical to tie into existing levels as far as possible and this has been a key consideration due to the development of the solution.

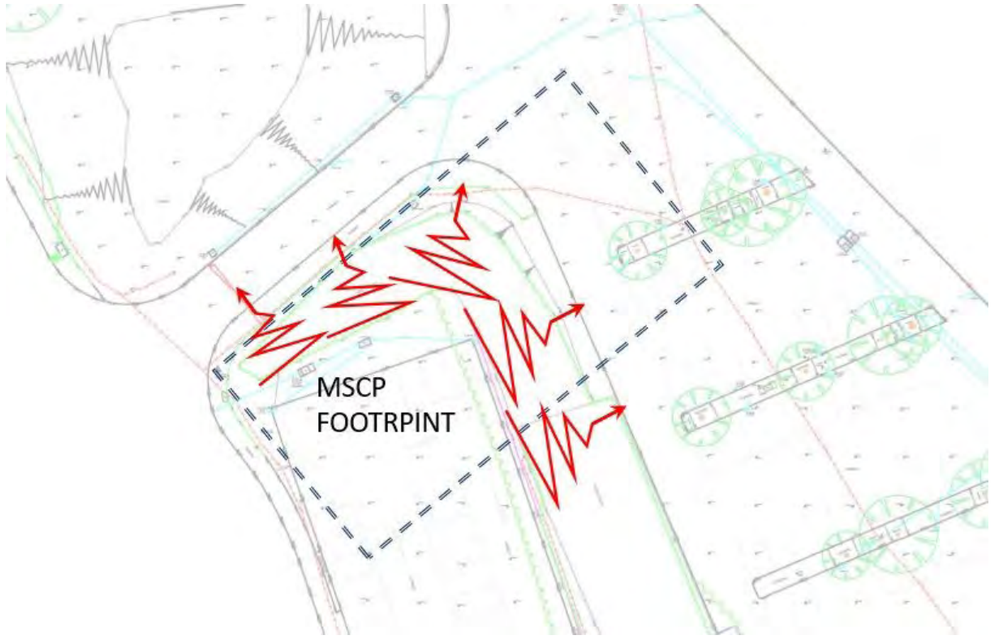



Figure 5.4: Key Design Criteria

### 5.1.2.2 Network Rail

The site is adjacent to critical Network Rail infrastructure. As such, it is recommended that the construction will have to consider any impact (vibration, noise etc) and any mitigation agreed. It is understood that a meeting is to occur between the council and Network Rail where requirements will be established


Figure 5.5: Vicinity of MSCP to Network Rail Assets

### 5.1.2.3 Site History

Whist as full Phase I Site investigation is still awaited, historical maps indicate that the site has had three primary uses namely:-

- railways,
- college/office buildings
- carpark (as current)

As a previously developed brownfield site, there is risk of made ground, contamination and site obstructions. To manage this risk a full Site Investigation is proposed as outlined in section 7.

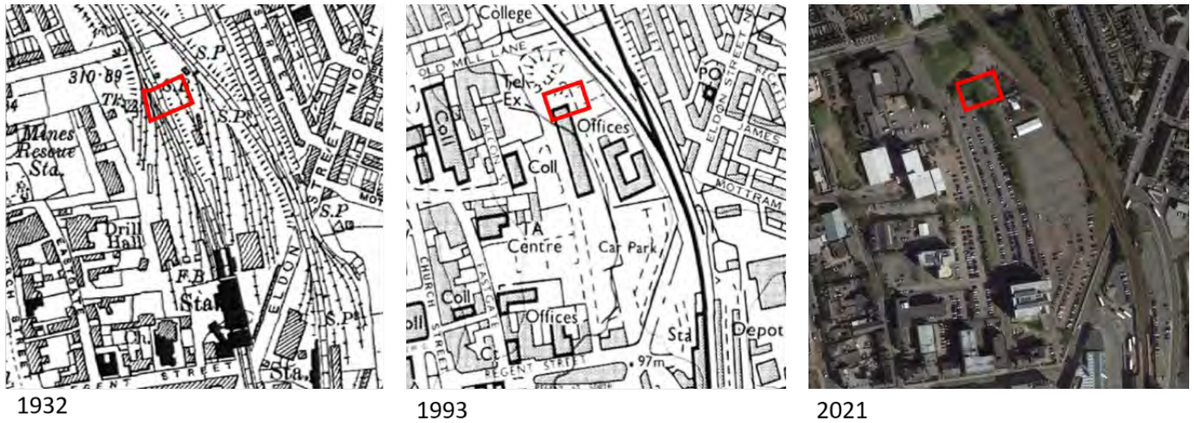



Figure 5.6: Site History

### 5.1.2.4 Coal Mining

Due to the presence of coal seams under part of Phase 1, consideration should be given to the potential that coal mining has occurred on or near to site. Following a detailed risk assessment, it is understood that the coal seams are located outside of the MSCP footprint and away from the primary areas of concern. However this will need to be address by subsequent site investigations and interpretation.

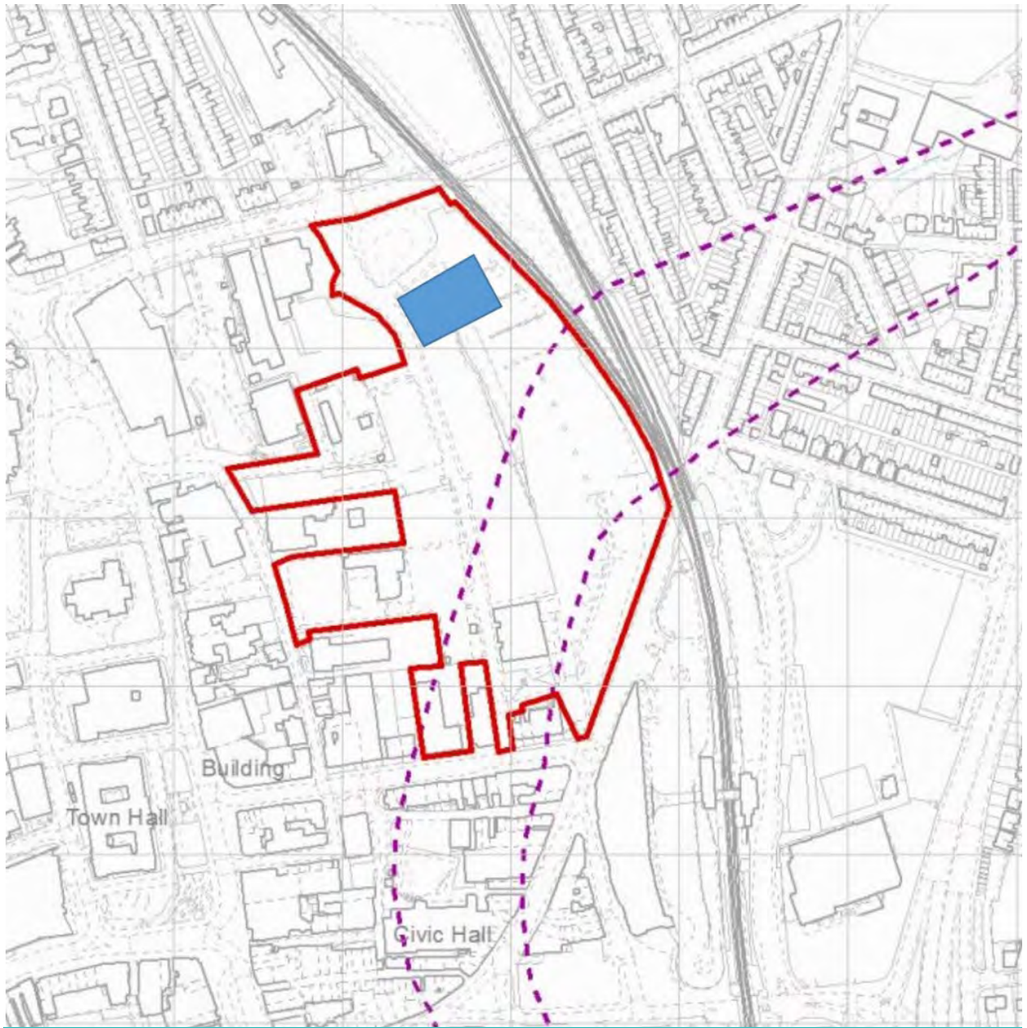



Figure 5.7: Coal outcrop in relation to MSCP

### 5.1.2.5 Ground Conditions

A full site investigation in needed to fully understand the ground conditions. This will include informing the foundations solutions for the building and external works as well as considering local contamination and potential ground gasses. BDP C&S have inputted into the scope for the comprehensive Site investigation. Reference should be made to section 7 for further information.

### 5.1.2.6 Existing services

There are a number of existing services currently indicated as crossing the MSCP site footprint. These will need to be abandoned (if feasible) and grubbed up; or diverted to facilitate the construction of the MSCP. Reference should be made to the Utilities section for further details.

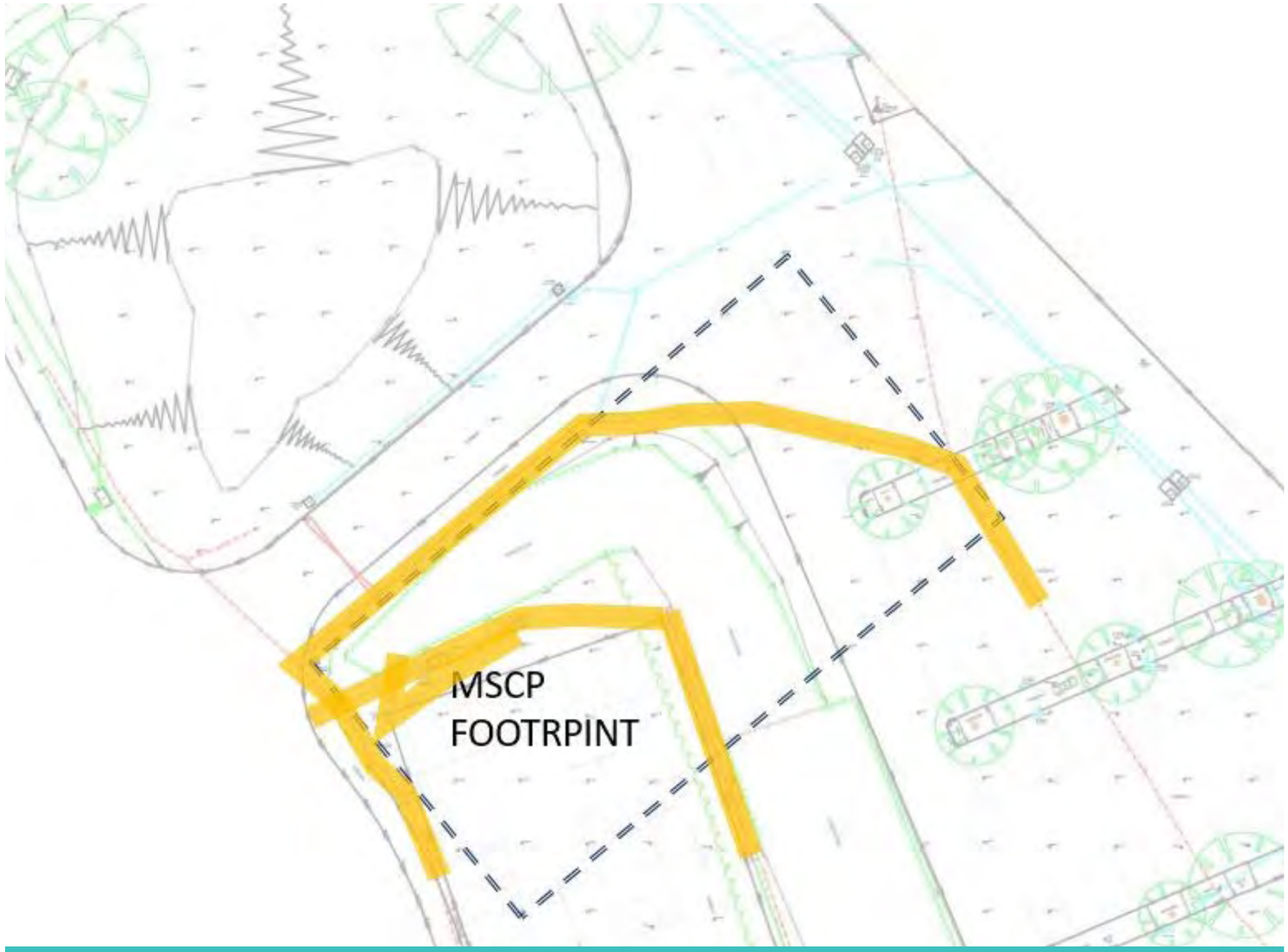



Figure 5.8: Existing Services in MSCP footprint

## 5.2 Structural Options Process

The following section outlines the structural optioneering process undertaken during Stage 2.

The process consisted of two parts. Initially, the structural variables were determined:-- Car park Circulation Arrangements- Grid Arrangements- Grid Spacing- Frame Type- Slab Type

Once assessed options were appraised on a number of factors, some identified as key drivers at the stage inception and are outlined below:

### 5.2.1 Car Park Circulation Arrangements

The following layouts were considered by the architects:

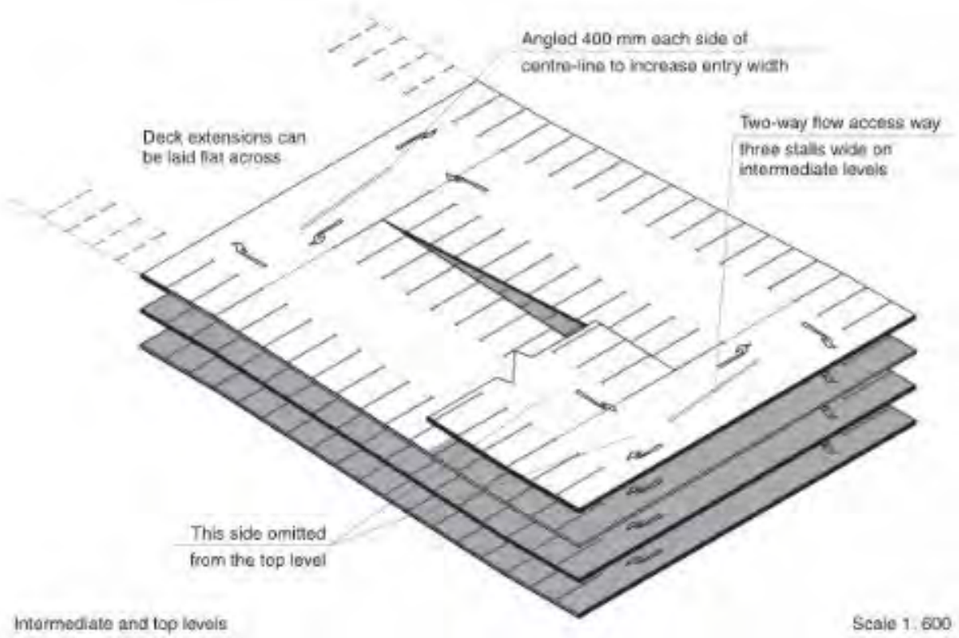



Figure 5.9: Sloping Deck (SD) Circulation Layout

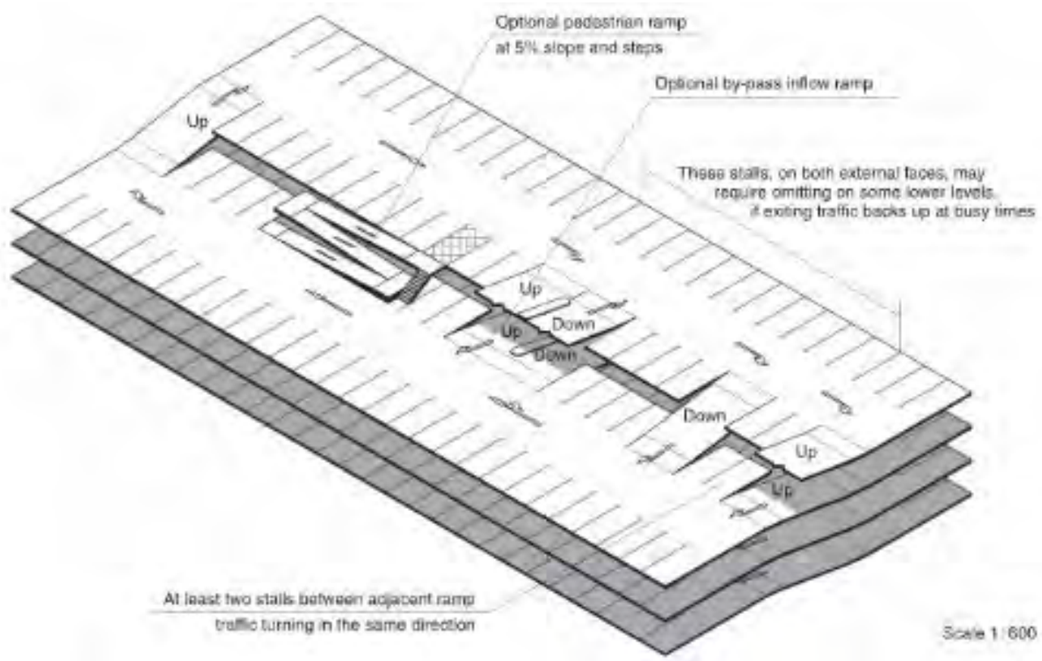



Figure 5.10: Split Level Deck (SLD) Circulation Layout

Whilst the structural arrangement for both is similar in form, as a result of the single and double traffic flow arrangements for either option this impacts the aisle and therefore bin width.

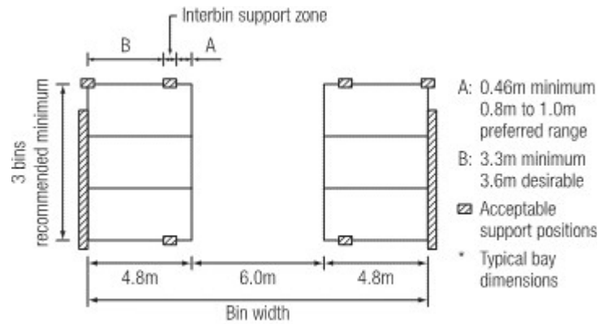



Figure 5.11: Typical bin arrangement with structural support locations

On this scheme it has been determined that the parking bays are 5.0m long and 2.5m wide and at 90deg to the direction of flow in the aisles. The following extract from the ICE Car Park Designer's Manual outlines recommended aisle widths for different car park circulation arrangements:

| | |
|---|---|
| 90° with two-way flow | 7.00 m |
| 90° with one-way flow | 6.00 m |
| 80° | 5.25 m |
| 75° | 5.00 m |
| 60° | 4.20 m |
| 45° | 3.60 m |
| 90° with one-way flow | |
| 2.5-m-wide stalls | 5.70 m |
| 2.6-m-wide stalls | 5.40 m |

Figure 5.12: Extract from ICE Car Park Designer's Manual 2nd Edition (Section 3.4.4)

It can be seen from the above that the typical aisle widths for one- and two-way flow (i.e. the SLD and SD arrangements respectively) results in aisle widths of 6.0m and 7.0m respectively (i.e. total bin widths of 16m and 17m respectively). A further reduction of aisle width is possible for one-way flow, however this was not considered as part of the architectural layout. The determination of the bin widths is a key constraint for the structural solution as large spans and therefore column free environments are desirable for the end users.

A further limitation for the SLD arrangement is the slope of the ramps between the split levels, which places a limit on the overall structural build-ups viable for that option, since a minimum headroom is required and the length of the ramp between levels is fixed and a maximum slope of 17% is permitted.

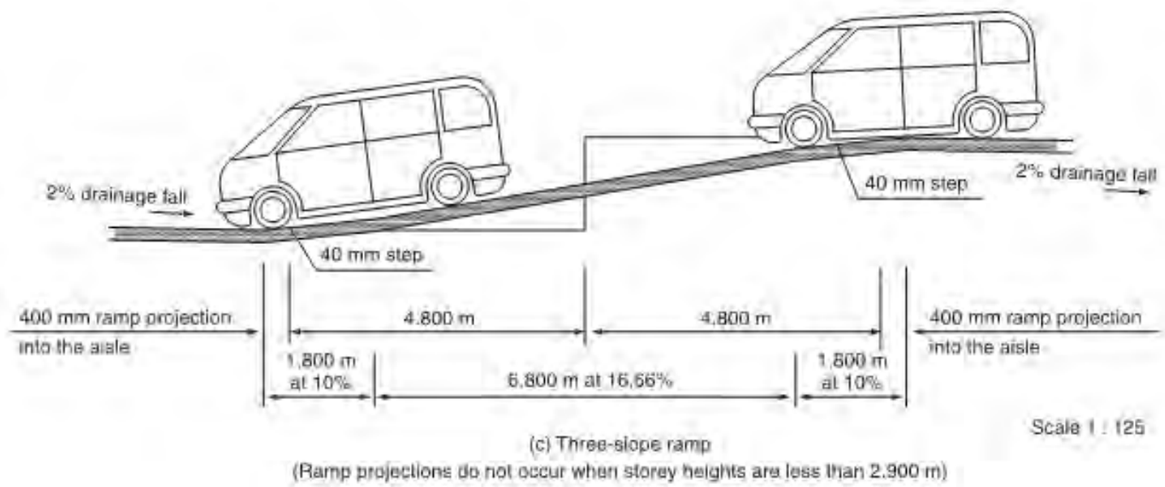



**Figure 5.13: Extract from ICE Car Park Designer's Manual depicting an option for the ramp geometry between split levels (based on bay lengths of 4.8m)**

**Grid Arrangements**
As part of the optioneering process a number of frame arrangements were assessed in order to understand the impact on structural sizes (and hence headroom) and sustainability. The different frame arrangements outlined below:

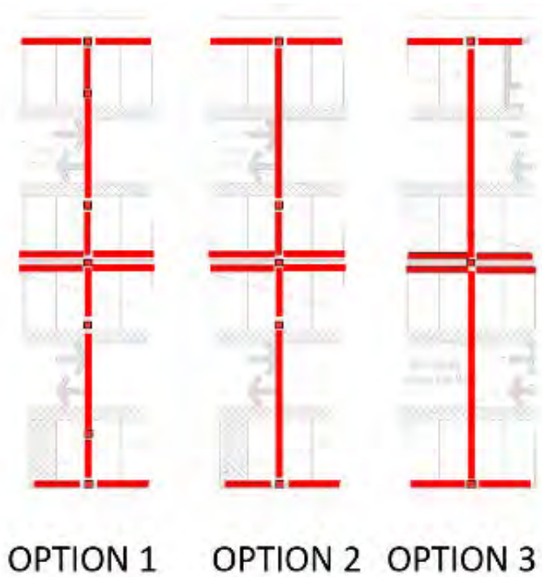



**Figure 5.14: Summary of frame arrangements assessed**

Option 1 – columns provided within each parking bay either side of aisle (spans = 4m / 9m / 4m)

Option 2 – column provided in one parking bay only (spans = 4m / 13m)

Option 3 – no columns provided in parking bays (span = 17m)

Further to the frame arrangements above, two different frame spacings, 5.0m and 7.5m, were assessed to understand the impact on structural sizes and sustainability.

**Frame Type**
Two different frame types were assessed as part of the optioneering exercise to determine the impact on sustainability for various options, summarised below:

Steel frame

**Figure 5.15: Typical Steel Framed Car Park Structure**

Precast concrete frame

**Figure 5.16: Typical Precast Concrete Frame Structure**

### 5.2.5 Slab Type

Three different slab types were considered as part of the optioneering exercise, outlined below:

**Precast double tees**

Advantages – long spans achievable (to maximise steel frame spacings), can be set down into depth of steel beams.

Disadvantages – heavy units require increased craneage

Figure 5.17: Precast concrete double tee units

**Precast hollowcore slabs**

Advantages – cost, common construction method

Disadvantages – increased thickness, difficult installation details

Figure 5.18: Precast hollowcore units

**Composite slab (steel deck & in-situ concrete)**

Advantages – cost, common construction method, lightweight

Disadvantages – span limitations, more steel required, visually undesirable, less durable (soffit degradation)

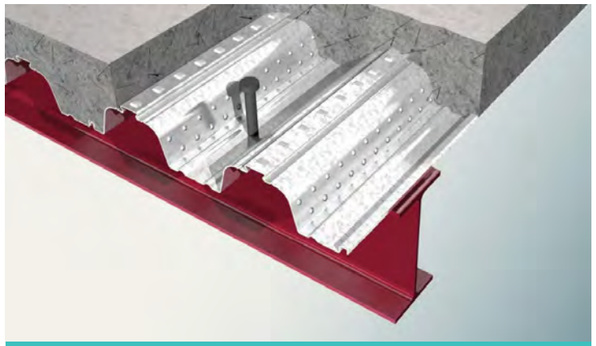


Figure 5.19: Composite slab with steel beam

#### 5.2.5.6 Options Appraisal Criteria

**Beam Depth / Headroom / Overall Height**
As per the ICE Car Park Designer's Manual, Section 3.9 states a minimum headroom of 2.1m should be provided.

As outlined in the circulation arrangements section of this report, the dimensions of the car park bays along with the circulation arrangement impact the storey height of the car park building.

For the SD layout option the half-storey height is limited by the ramp length between split-levels and was determined to be 1.55m i.e. storey height of 3.1m. Therefore the maximum structural floor zone for this option is 1.0m.

As is the case for the SLD option, there is a maximum gradient permitted for use on the sloped deck arrangement at 5%, and using this figure along with the plan geometry of the SD option a maximum storey height of 3.75m is achievable. Therefore the maximum structural floor zone for this option is 1.65m.

**Sustainability**
For each option of structural frame type, frame arrangement and slab type the typical structural sizes were determined and volumes determined for a typical bay.

Using the latest Inventory of Carbon & Energy database for embodied carbon figures, various construction material embodied carbon rates for the 'cradle to gate' stages (A1 – A3) were used to determine the overall embodied carbon for each option to enable benchmarking to be undertaken between options.

For foundations, an assumed axial capacity of a piled foundation was determined, with an assumed diameter and length, which enabled a high-level assessment of the number of piles required for a given bay and hence enable an embodied carbon value to be determined.

**Optioneering Process**
Various combinations of frame types, column spacings, frame spacings and slab types were assessed and a simple structural model for each type was developed using the design inputs identified in the basis of design section of this report.

The structural sizes, including number of piles required, were then used to determine material volumes for a typical bay and enabled an embodied carbon value per metre squared to be calculated.

The various structural arrangements considered are shown below:

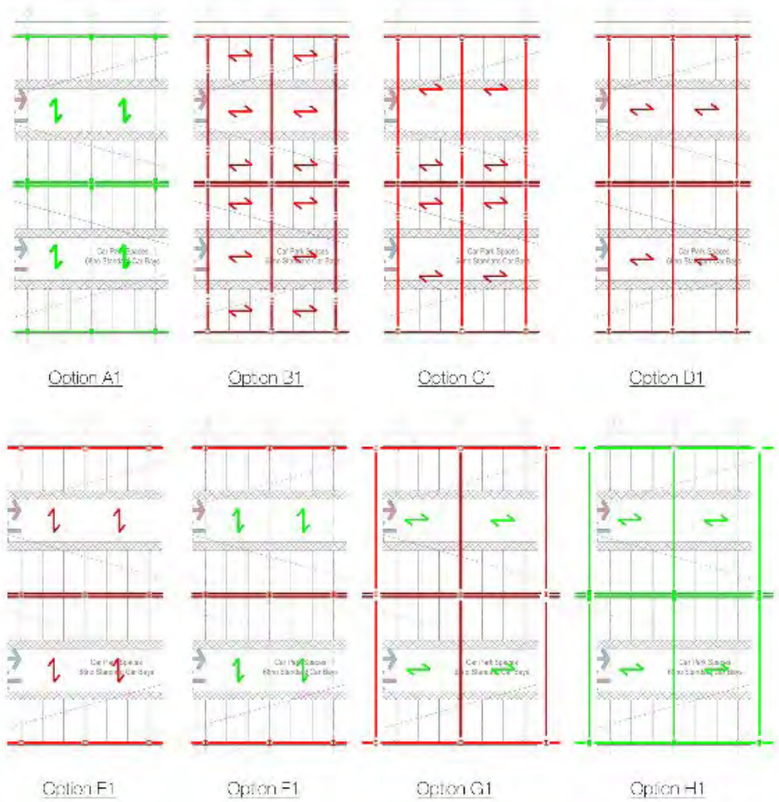



Figure 5.20: Summary of the various structural options considered in the optioneering exercise

Summary of the structural options considered

| Ref | Slab | Frame | Frame Centres (m) | Max beam span (m) | Plank Span (m) |
|---|---|---|---|---|---|
| Option A1 | Precast Double tee | Precast Frame | 7.5 / 5.0 | 7.5 | 17.0 / 16.0 |
| Option B1 | Hollowcore | Steel Frame | 7.5 / 5.0 | 9.4 | 7.5 / 5.0 |
| Option C1 | Hollowcore | Steel Frame | 7.5 / 5.0 | 13 | 7.5 / 5.0 |
| Option D1 | Hollowcore | Steel Frame | 7.5 / 5.0 | 17.0 / 16.0 | 7.5 / 5.0 |
| Option E! | Hollowcore | Steel Frame | 7.5 / 5.0 | 7.5 / 5.0 | 17.0 / 16.0 |
| Option F1 | Precast Double tee | Steel Frame | 7.5 / 5.0 | 7.5 / 5.0 | 17.0 / 16.0 |
| Option G1 | Precast Double tee | Steel Frame | 10 | 17.0 / 16.0 | 10 |
| Option H1 | Precast Double tee | Precast Frame | 10 | 17.0 / 16.0 | 10 |
| Option I1 | Composite Slab | Steel Frame | 7.5 / 5.0 | 17.0 / 16.0 | 3.75 |

### 5.2.7 Summary / Output

As outlined earlier in this report, the two car park circulation types allow for different structural span arrangements (resulting from the one- & two- way traffic flow requirements), and the SLD arrangement places requirements on the storey height as a result of the limitation from the ramps.

Therefore, two groups of options have been considered, one for each circulation type. Both summaries are presented below:

Summary of solutions for Sloped Deck (SD) arrangement

| Sloped Deck | | | | | |
|---|---|---|---|---|---|
| Ref | Frame eCO2/m2 | Substructure eCO2/m2 | Total | Floor depth (mm) | <im F2F (mm) |
| Option A1 | 147.5 | 5.5 | 153.1 | 950 | 3050 |
| Option B1 | 123.5 | 3.9 | 127.4 | 758 | 2858 |
| Option C1 | 129.6 | 3.9 | 133.5 | 758 | 2868 |
| Option D1 | 138.7 | 3.9 | 142.6 | 1066 | 3166 |
| Option E! | 179.9 | 6.1 | 185.9 | 525 | 2625 |
| Option F1 | 154.8 | 5.0 | 159.7 | 950 | 3050 |
| Option G1 | 125.2 | 4.1 | 129.4 | 1173 | 3273 |

For the SD arrangement, following consultation with the client, Options B1 and C1 were discounted on the basis of internal columns within the car park which are determined to be undesirable for end-users. From the remaining viable options, it can be seen that Option E1 offers the shallowest floor build-up (therefore offering maximised headroom), however this comes at a cost to the embodied carbon value, as well as more onerous foundation requirements and is therefore discounted.

From the remaining options, the most sustainable option is G1, however the disadvantage of this option is the increased floor depth compared to the other options. However, this is still compatible with the SD arrangement with the consequence being an increased building height, as a result of the steeper gradient needed to achieve the minimum headroom.

Summary of solutions for the Split Level Deck *SLD) arrangement

| Split Level Deck | | | | | |
|---|---|---|---|---|---|
| Ref | Frame eCO2/m2 | Substructure eCO2/m2 | Total | Floor depth (mm) | <im F2F (mm) |
| Option A1 (SLD) | 140.7 | 5.4 | 146.1 | 850 | 2950 |
| Option D1 (SLD) | 147.1 | 3.6 | 150.7 | 861 | 2961 |
| Option E1 (SLD) | 169.0 | 5.5 | 174.6 | 475 | 2575 |
| Option F1 (SLD) | 151.6 | 4.8 | 156.4 | 850 | 2950 |
| Option G1 (SLD) | 126.3 | 4.1 | 130.4 | 1077 | 1177 |
| Option G1 (SLD) Fabsec | 122.9 | 4.1 | 127.0 | 895 | 2995 |
| Option H1 (SLD) | 167.7 | 6.3 | 174.0 | 825 | 2925 |
| Option I1 (SLD)140.7 | 155.0 | 2.4 | 157.4 | 827 | 2927 |

For the SLD arrangement, it can be seen that Option G1 is not compatible with the minimum storey height (3.1m, limited by the ramps between split-levels) and is therefore discounted.

From the remaining viable options, it can be seen that the two lowest embodied carbon options are A1 and D1, with both options achieving similar floor depths. However, for Option A it can be seen that the requirements for foundations is likely to be more expensive (and has higher embodied carbon). In addition, comparing the slab types (precast double tee to precast hollowcore respectively) Option D1 is less onerous for constructability.

### 5.2.8 Stability Core Options

There are two viable options for the stability system:

**Vertical bracing (steel frame building only)**

Advantages – cost, speed of construction

Disadvantages – less stiff than concrete core, difficult details at interfaces, requires fire protection

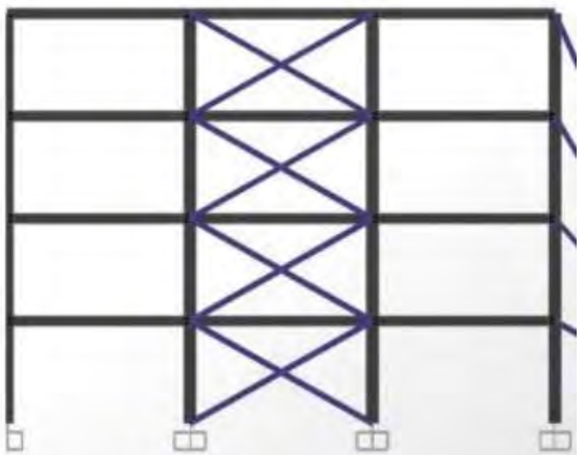


Figure 5.21: Diagram indicating vertical bracing

**Reinforced concrete core (precast or in-situ, compatible with steel or precast concrete frame)**

Advantages – More stiff than steel bracing, inherent fire protection, no additional finishes required

Disadvantages – difficult connection details with steel frame, slower construction


Figure 5.22: Precast concrete shear core

### 5.2.9 Key Design Considerations

**Floor Vibration**

In accordance with guidance in SCI P354 the minimum natural frequency used for the optioneering exercise is 3.0 Hz.

**Fire Engineering**

A 1 hour fire resistance is currently assumed in the design and is subject to ongoing input from the Fire Engineer.

For a steel framed structure this resistance would be provided by an applied intumescent paint to exposed steelwork surfaces.

A precast concrete framed structure possesses inherent fire resistance due to the cover of concrete to the steel reinforcement, thus by choosing appropriate cover for the reinforcement adequate fire resistance can be achieved, as long as minimum structural thicknesses are adhered to.

**Car park barriers**

Barriers are required around the perimeter and on any ramps to the car park structure in order to provide robustness to the structure and safety to cars manoeuvring in the building.

There are two options of car park barriers available:

**Floor mounted system**

Figure 5.23: Floor mounted car park barrier system

**Structural Sections between columns**

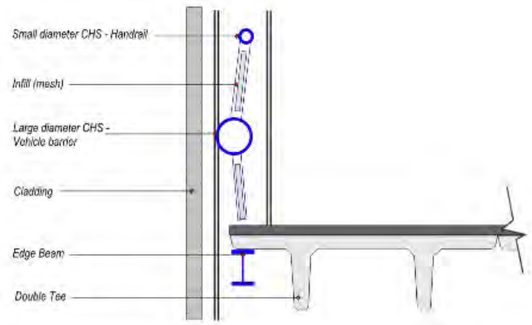



Figure 5.24: Car park barrier comprised of structural sections between columns

**Cladding**

A perforated cladding system is proposed for the car park building. A sample image is provided below for reference.


Figure 5.25: Image of the proposed cladding on the MSCP building

It is assumed that cladding provided on the structure will be in a panellised form, supported directly by the edge beams of the structure and is compatible with either a steel or precast concrete framed building.

**Roof Canopy & PVs**

In order to achieve the aspirations of a low to zero carbon building in the brief, PV panels are proposed on the uppermost deck of the car park, supported on a secondary steel frame which also acts as a canopy to users of the car park. A typical example of a combined canopy & PV support frame in a car park setting is shown below.

It should be noted that coordination of the secondary frame for the canopy with the primary frame would be necessary, and additional primary frame elements may be required in order to provide adequate support to the canopy.

Figure 5.26: Example of PVs munted to canopy support frame in a car park

**Embodied carbon mitigation**

One of the key ways to reduce embodied carbon is to minimise retaining wall construction and significant earth movement. The nature of the site is such that the building has to dig into the existing levels in order to achieve the project requirements. However, the extent of this has been consciously reduced where possible. In addition, we are suggesting a temporary works solution which should mitigate the overall embodied carbon.

### 5.2.10 Recommended Structural Solution

On the basis of being the most sustainable solution whilst achieving the requirements of the brief, minimising internal columns and likely being one of the quicker options to construct, the preferred structural solution is Option G1.

Refer to appendices for layout details.

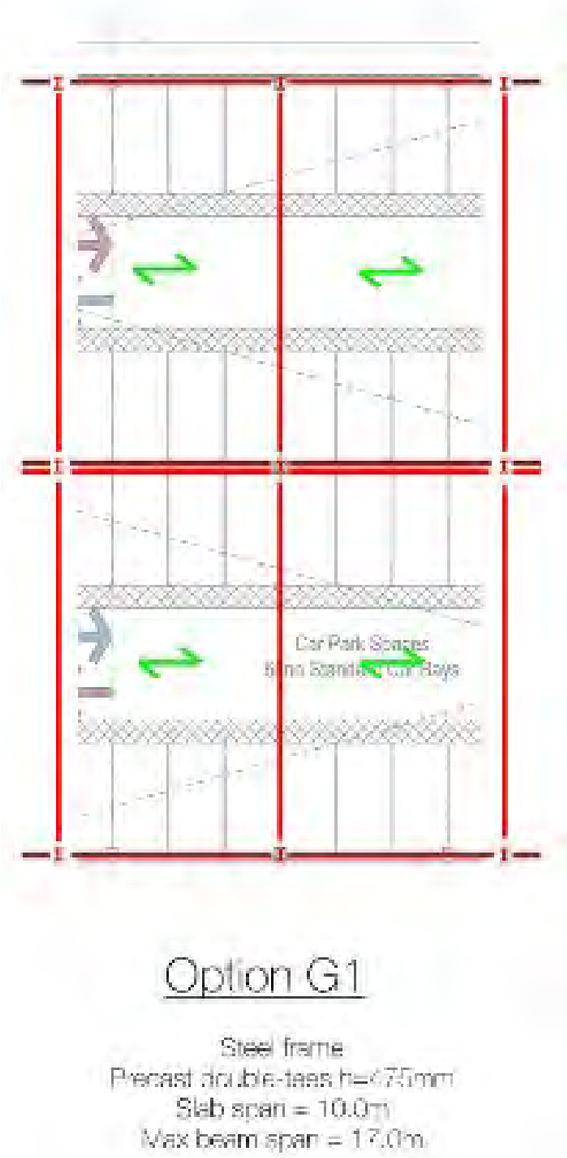



Figure 5.27: Diagram of typical bays for Option G1

## 5.3 Substructure

### 5.3.1 Anticipated foundation solution

At this stage of the design no factual ground investigation information is available, therefore using engineering judgement it has been determined the most likely suitable foundation solution for the MSCP building is piled foundations and ground beams, with a suspended ground floor slab.

Since no factual information is available to make an assessment of likely pile capacities, an indicative pilecap sketch has been produced using engineering judgement, shown below for reference.

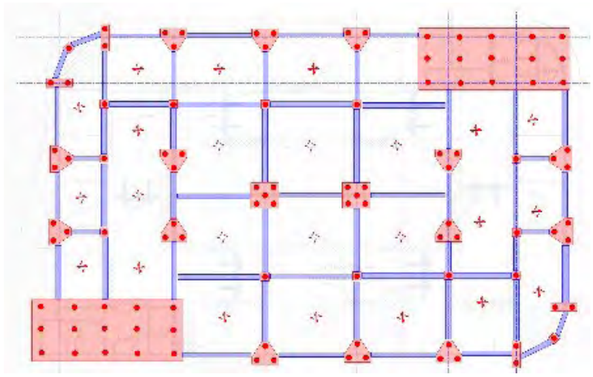


Figure 5.28: Indicative pilecap arrangement sketch

### 5.3.2 Retaining walls – suggested solution

As a result of the sloping topography of the site, it is necessary for retaining walls to be provided to provide the required space for the car park decks at the lower level. An indicative layout of the retaining walls is shown below for reference.

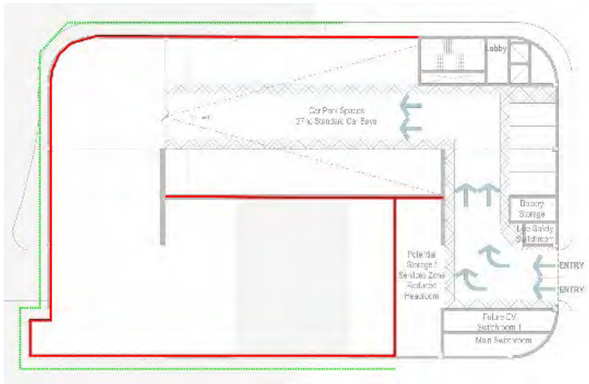


Figure 5.29: Indicative retaining wall extents

The anticipated retaining wall is expected to be a reinforced concrete cantilever wall, with a maximum retained height of approximately 3.25m.

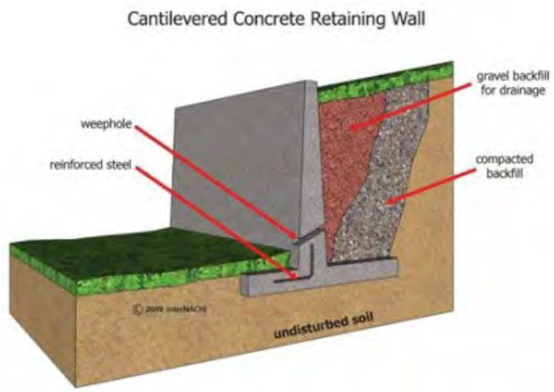



Figure 5.30: Image of a typical cantilever retaining wall

In order to construct the retaining wall, temporary sheet piling offset circa 1.5m outside of the proposed retaining wall would be required in order to provide adequate space to construct the wall.

It should be noted that a detailed cut & fill exercise is needed at the next stage of the design, with reference to the factual ground investigation report, in order to minimise the extent of cut as well as waste material which would require off-site disposal.

## 5.4 Next Steps

At the next stage of the design, the following items will be undertaken and will feed-in to development of the structural solutions.

**Site Investigation**

A full Phase 2 Geoenvironmental Investigation Report will be undertaken during the next design stage which will provide details on the nature of the ground, as well as levels of contamination (if any). Information on the nature of the ground will inform the foundation and retaining wall design, which will enable a more accurate assessment of the most appropriate foundation solution as well as more accurate cost information to be determined.

In addition, the Phase 2 GI Report will indicate the contamination and thus impact the cut & fill exercise that is necessary on this project to minimise the amount of retaining structures and minimise the amount of waste material.

**Cost reviews**

Option G1, along with option D1 for both SLD and SD arrangements have been provided to the QS for high level costing. For the purpose of this report the most favourable structural solution has been identified, however, following cost advice an alternative option may be determined more favourable.

During the next design stage the level of detail in the structural design proposals can be refined in order to provide a more accurate and representative cost for this aspect of the scheme.

**Detailed design**

At the next design stage a full analysis model will be created in order to more accurately determine structural sizes and assess lateral stability. More detailed structural sizes and stability requirements can then be provided for costing.

**Sustainability validation**

Further to the detailed design, more accurate structural element sizes for the structure, as well as a details of more accurate foundation solution, will enable validation of the sustainability work undertaken to date to ensure that embodied carbon is minimised on the scheme.

## 5.5 Basis of Design

### 5.5.1 Design Standards

The latest Eurocode revisions do not cover the composite
The latest Eurocode revisions do not cover the composite
design of steel frames with precast floors. Therefore, the Civil and Structural engineering design will be based on the British Standards and UK industry recognised guidelines as listed below.

The following lists summarises the design codes to be incorporated into the design

Structural Engineering:-

- BS6399:1997 Part 2: Loading for Buildings: Code of Practice for Wind Loads
- BS6399:1988 Part 3: Loading for Buildings: Code of Practice for Imposed Roof Loads
- BS8110:1997 Part 1: Structural Use of Concrete
- BS5950:2000 Part 1: Structural Use of Steelwork
- BS5950:2000 Part 3&4 Code of Practice for Composite Construction
- BS8002 :1994 Earth Retaining Structures
- BS8004 :1986 Code of Practice for Foundations
- BS8102 :1990 Protection of Structures against Water from the Ground
- BS5628 :2005 Structural Use of Masonry
- BS5268:2,6:1996 Structural Use of Timber
- BS5268:4,7:1990 Structural Use of Timber
- BS6472: 2008 Evaluation of Human Exposure to Vibration in Buildings
- BS5930:1997 Code of Practise for Site Investigations
- BS476 Series: Fire Tests on Building Materials and structures
- BS 8007:1997 Design of Concrete structure retaining aqueous liquids
- BS 7543:2003 Guide to durability of buildings and building elements
- BS EN 197-1:2001 Cement
- BS4449:2005 Steel for the reinforcement of concrete
- BS4483:2005 Steel fabric for the reinforcement of concrete
- BS6093:2006 Design for joints and jointing in building construction
- SCI 076 – Design Guide on the Vibration of Floors

Civil Engineering:-

- Building Regulations Approved documents Part H – Drainage and waste disposal
- BS EN 752 – Drain and sewer systems outside buildings
- BRE 365 – Soak away design
- Interim code of practice for sustainable drainage systems
- PPS25 – Development and flood risk
- Sewer for Adoption 6th Edition
- The SuDS Manual – Good practice guide to sustainable drainage
- BS 594987 – Asphalt for roads and other paved areas
- BS 7533 – Pavements constructed with clay, natural stone or concrete pavers
- Design Manual for Roads and Bridges Volume 6 – Road Geometry
- Design Manual for Roads and Bridges Volume 7 – Pavement Design and Maintenance
- Londonwide Asphalt Specification
- MCDHW – Specification for highway works
- BS5400 : Steel, Concrete and Composite bridges (loading data)

### 5.5.2 Design Loadings

All building design loads shall comply with the requirements of BS6399: pts 1 to 3, except where specific loading requirement information is provided.

Any areas subject to vehicle loading will be subject to the loading requirements of BS 5400.

#### 5.5.2.1 Imposed (Occupancy) Loading Requirements

All loads are in accordance with BS6399 pt 1, subject to the following minimum loadings and will be combined as necessary to give the most severe effect:

**Car Park/Retail**

| Area Usage | Minimum Distributed Load (kN/m2) | Minimum Point Load (kN) |
|---|---|---|
| Toilets | 4.0 | 3.2 |
| Stairs / corridors | 5.0 | 4.5 |
| Plant Rooms | 7.5 | 4.5 |
| Parking for Cars | 2.5 | 9.0 |
| Partitions (double height) | 2.0 | - |
| Flat Roof, maintenance access only | 1.5 | 1.8 |
| Flat or Pitched Roof, no access | 0.75 | - |

#### 5.5.2.2 Dead (permanent) Loads

Self weight loads of building elements and components are calculated in accordance with BS 648 'Schedule of Weights for Building materials' or the product supplier specified loads are used.

Dead Loads calculated have assumed the following material densities:

| | |
|---|---|
| Concrete (Normal weight) | 24 kN/m3 |
| Steel | 78.5 kN/m3 |
| Concrete Block Walls* | 20 kN/m3 |
| Timber (assume hardwood) | 7 kN/m3 |

*Assumes normal weight blocks

#### 5.5.2.3 Superimposed Dead Loads

In addition to the self weight loads, the structures will be subject to a superimposed dead loading, i.e. permanent loads applied after the structure has been built. Allowances for these are listed below (final loading values subject to adopted floor and wall finishes, service requirements etc):

**Car Park/Retail**

| Superimposed Load Type | Allowance (kN/m2) | Comments |
|---|---|---|
| Services & Ceilings | 0.25 | On plan |
| Louvred Panels | 1.5 | On Elevation |

The above list and loading allowances will be expanded once the cladding and finishes strategy is progressed.

#### 5.5.2.4 Balustrade Loading

Balustrade Loads shall be in accordance with BS 6399 pt 1. The balustrade, infill and supports shall be design in accordance with the following:

| Load Type | Horizontal Line Load (UDL kN/m) | UDL Applied to infill (kN/m2) | Point Load applied to part of infill (kN) |
|---|---|---|---|
| Fire escape staircases | 3.0 – landings | 1.5 | 1.5 |
| 2.0 - flights | - | - | 1.5 |
| Vehicular – pedestrian areas in car parks | 1.5 | 1.5 | 1.5 |

#### 5.7.2.5 Wind Loadings

Wind loads for both overall building stability and localised cladding design shall be calculated in accordance with BS 6399 pt 2. In accordance with BS 6399 pt 2 Foreword, the provided CP3 Basic Wind Speed is converted to a usable BS value by dividing by the Terrain and Building Factor (Sb). Therefore, the following wind loading criteria is adopted:

| | | |
|---|---|---|
| Basic wind speed (BS6399) | Vb = | 22.5 m/s |
| Altitude factor | Sa = | 1.10 |
| Direction factor | Sd = | 1.00 |
| Seasonal factor | Ss = | 1.00 |
| Probability factor (1 in 50 yr return) | | |
| | Sp = | 1.00 |
| Site wind speed | Vs = | 24.75 m/s |
| Building factor | Sb = | 1.96 |
| Effective Wind Speed | Ve = | 48.5 m/s |

#### 5.5.2.6 Notional Loads

Notional horizontal loads will be used where they exceed either wind or seismic loading and will be derived and applied in accordance with the parameters of BS8110 pt 1 and BS5950 pt 1 as applicable:

Steel Structures NHL =

0.5% of factored vertical Dead and Imposed loads

Concrete Structures NHL =

1.5% of total characteristic Dead load

#### 5.5.2.7 Construction Loads

Within the design, an allowance for construction loading will Within the design, an allowance for construction loading will be made. Temporary or permanent construction loads will be incorporated into the design as necessary, dependant on the final construction type.

An assessment of any locked in stresses generated from the construction methodology and temporary activities will be incorporated into the design as well as the associated permanent deflections.

#### 5.5.2.8 Load Combinations

Load combinations will be applied in accordance with the relevant design code so as to ensure the most adverse loading conditions for design. The following (minimum) loading conditions will apply:

1.4 Dead+1.6 Live

1.2 (Dead + Live + Wind*)

1.4 Dead +1.4 Wind*

0.9 Dead +1.4 Wind*

*Wind or Notional Horizontal Loading depending on the most onerous value

Additional seismic design loadings will be as section 3.2.6.

### 5.5.3 Thermal Effects

Temperature changes within the structural elements will result in both thermal movement and deformations. All temperature effects will be incorporated into the design including those related to seasonal climatic variations, day/night variations, internal/external variations and variation due to differing exposures to sunlight.

Absolute movements due to temperature changes will be incorporated into the design of building movement joints, acting in suitable combination with other effects including wind, seismic, shrinkage, expansion and creep.

There are two scenarios that will be required to be considered for thermal effects. During construction stage, structural steelwork will be exposed and should be designed for a temperature range between -15C to 60C to allow for frost, wind chill and direct solar gain. Internally, in the permanent state of the structure, temperature ranges will be advised by MEP.

### 5.5.4 Deflection, Vibration and Settlement Criteria

#### 5.5.4.1 Gravity Loading

The limiting design deflections of structural elements are all in accordance with the relevant British Standards. More specifically these are tabulated as follows:

| The limiting design deflections of structural elements are all in accordance with the relevant British Standards. More specifically these are tabulated as follows: | Dead Load Deflection | Imposed Load Deflection |
|---|---|---|
| Steel Floor Beams - Internal | Span/360 | Span/360 |
| Steel Roof Beams - Perimeter | Span/360 | Span/500 |
| Roof Beams – Steel | Span/200 | Span/360 |
| Stairs - Steel | Span/360 | Span/360 |
| Stairs - Concrete | Combined dead + imposed < Span/250 | |

Absolute dead deflections within projector rooms is to be 5mm

Relative differential live load deflections shall be limited to 10mm on perimeter beams and 25mm on internal beams and slabs

A 25mm deflection head detail is recommended to the head of all non load bearing internal partitions where they meet the soffit of a floor slab or a supporting beam.

#### 5.5.4.2 Building Sway

The following maximum horizontal building movements will apply:

Wind/NHL H/500 (total)

H/300 (inter storey drift)

#### 5.5.4.3 Floor Vibration

Floor vibration will be controlled generally by limiting the natural frequency for the proposed floor structure. This requirement ensures that the complete floor, and / or any structural component of the floor will have a natural frequency of vibration suitable to the usage.

Floors with higher values of natural frequencies are generally more rigid and have less noticeable vibrations, whilst floors with lower values of natural frequency have more noticeable and longer duration vibrations and can sometimes feel "bouncy". High frequency, more rigid floors utilise more material in their construction and are therefore more expensive.

3.0 Hz is the recommended value, as per Steel Construction Institute Design Guide P354, and reflects the normally tolerated level of vibration in a car park.

Guidance for recommended values of natural frequency for car parks is given by the IStructE in their paper 'Design recommendations for multi-storey and underground car parks.' The guidance states that most car park structures are found to be satisfactory when the design gives natural frequencies above 5Hz, though if the car park is not empty, additional damping is being provided and a natural frequency of 3Hz would be acceptable.

Individual Component / Floor Plate Natural Frequency (min)

Car Parks - 3.0 Hz

#### 5.5.4.4 Foundation Settlement Criteria

Any foundation element will be designed to ensure the following maximum settlements are achieved:

Maximum total long term settlement under main foundations = 20mm

### 5.5.5 Design Life and Durability

The durability of structural elements, both internal and external, will provide a minimum design life of 50 years with minimal maintenance.

This will be achieved by the following means:

Concrete foundations: Consistent quality concrete, appropriate cover to steel reinforcement and suitable protection to potential aggressive ground conditions. It is critical, particularly for external concrete, that the correct cover to reinforcement is achieved. The site inspection team will be instructed to pay particular attention to reinforcement cover.

Structural steelwork: Internally exposed steelwork – Intumescent paint to achieve a minimum of 1 hour fire rating with decorative top coat.

Internally concealed and protected steelwork – primer finish only and fire protected via boxing out with fireboard

Protected steelwork within cavities – high build primer

Externally exposed secondary steelwork in car park (no fire protection requirements – galvanised or painted finish

External exposed steelwork in car park (visible) – high build primer and decorative top coat, or galvanised finish and decorative top coat in areas which may be exposed to the more severe weather and climatic conditions

Paint finishes generally will be specified which provide a period to first maintenance of 20 years for accessible elements and 50 years for inaccessible elements.

### 5.5.6 Fire Protection

At this stage, it is assumed that the following methods of Fire Protection will be applicable (subject to the Fire Strategy) to achieve a minimum 1 hr fire rating:

Concrete Elements – inherent via adoption of appropriate cover

Exposed Steelwork elements – Intumescent Paint

Concealed Steelwork elements – Fire resistant board / intumenscant paint / cementitious spray.

### 5.5.7 Robustness

In addition to designing the building with due regard to economy and safety, and a structure capable of fulfilling its intended function over its intended life, the design will also take into account the additional consideration of disproportionate collapse. This is a national Building Regulations requirement within the UK.

The requirements are such that, the structure is required to be sufficiently robust and adequately tied together, such that if an element were to fail (e.g. a beam or column) due to some form of accidental loading (e.g. vehicle impact or gas explosion) that the resulting damage is neither disproportionate to the cause nor does it lead to progressive failure of significant elements of the structure.

In order to design a building to avoid disproportionate collapse, certain members may be required to be designed as 'key elements'. For a member to be considered as a key element an assessment must be made as to the portion of the building at risk of collapse if this member was notionally 'removed' from the building. If this portion of collapse is considered to be substantial then it should be designed as a key element for the accidental loading specified in BS 6399-1. Key elements will be identified within the final calculations but essentially will comprise of stanchions or structural elements supporting either 15% of the floor area or 70 sqm and two or more sequential levels.

Alternatively, if key element design is not appropriate, then the structure is required to be sufficiently tied – i.e. all beam to column, beam to beam and column to column connections to be capable of resisting a notional additional force.

The building structure is to be designed taking into account the relevant guidance contained within the relevant Eurocode.

### 5.5.8 Material Specification

The following minimum material specifications will be adopted in the design of the substructure and superstructure elements:

#### 5.5.8.1 Concrete

The following minimum concrete specification is assumed, subject to SI results and further design development:

| | | |
|---|---|---|
| Concrete Grade | - | 32/40 |
| Aggregate size | - | 20mm |
| Cover | - | 50mm |
| Foundations | - | 25mm Slabs |

**Below Slab Membrane**

Further to information gathered from early site investigations and the industrial history of the site, it is envisaged that the land may be contaminated and it therefore proposed that an allowance for 1200g gas proof membrane should made for below the slab for this stage of the design.

#### 5.5.8.2 Steel

The following typical steelwork specification is assumed:

| | | |
|---|---|---|
| Steel Grade | - | S355 |
| Bolts | - | 8.8 Grade |
| Welds | - | Min. 6mm |

**Protection**

Suitable protection, in accordance with the environmental condition and the position within the building, will be applied to structural steelwork (see 3.6 for protection summary)

### 5.5.9 Construction Health and Safety

During the conception and design of the structural elements, due consideration will be given to required construction techniques and process to ensure that all parts of the structures can be erected in a safe manner. Furthermore, the design will ensure that inherent risk, either during the construction or working life of the building, is minimised and design out. Reference should be made to the project Risk Register into which foreseen structural risks have been incorporated.

The maximisation of prefabrication and incorporation of standardisation and construction techniques will inherently minimise site risk. In instances where significant or unusual construction risks remain, these will be highlighted accordingly.

# 6.0 Drainage

## 6.1 Introduction

The area proposed for the development of the Multi-Storey Car park is currently utilised as an existing car park. A GPR Survey undertaken by 1st Horizon in January 2018 confirmed this area to be positively drained with surface water runoff assumed to discharge into the public surface water sewers on County Way and Old Mill Lane. No foul water connections are currently located in the vicinity of the proposed development.

The MSCP forms part of the development proposals for Phase 1 and therefore any drainage associated with the MSCP will connect into the main infrastructure design proposed for Phase 1.

The outline drainage strategy proposes for surface water runoff from the MSCP to be drained via rainwater pipes to a new below ground surface water drainage network, connecting into the proposed Phase 1 surface water drainage infrastructure downstream. In line with Environment Agency guidance a petrol interceptor will be installed upstream of the connection into the Phase 1 drainage network to remove any potential contaminants prior to discharge into the public surface water sewer on Old Mill Lane.

Attenuation from the MSCP will be primarily provided within the geo-cellular tank to be located in the north of the site, which will be designed to accommodate runoff up to the 1 in 100 year plus 40% climate change event.

Foul water flows from the proposed WCs are to be directed into a new foul water drainage network, designed to serve Phase 1. Flows are proposed to be discharged into the public combined sewer on Old Mill Lane, subject to approval from YW.

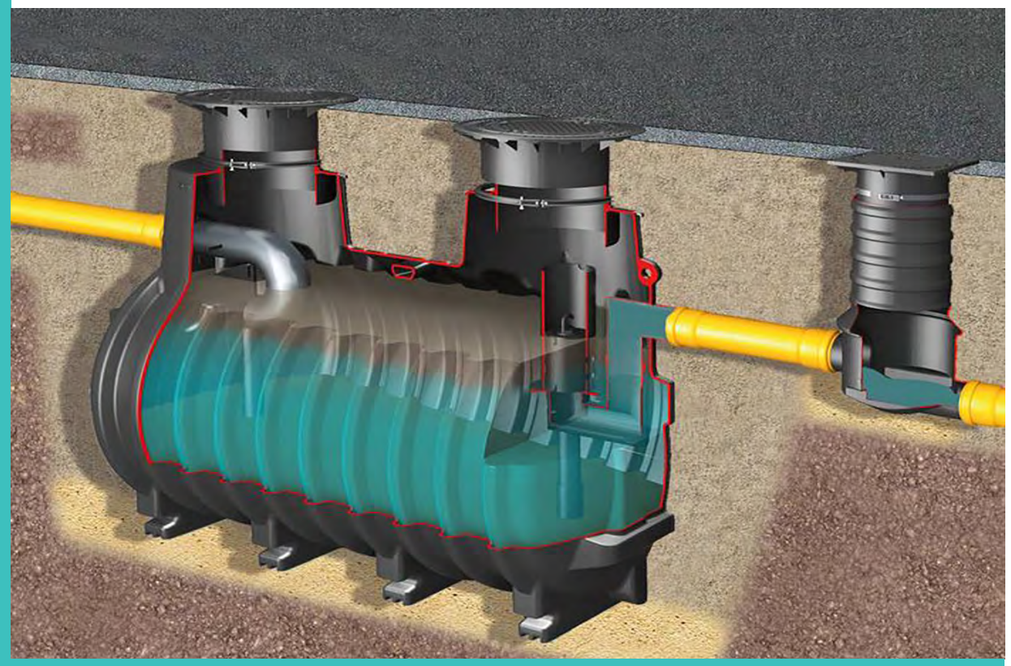


Figure 6.1: Avada Oil Seperator

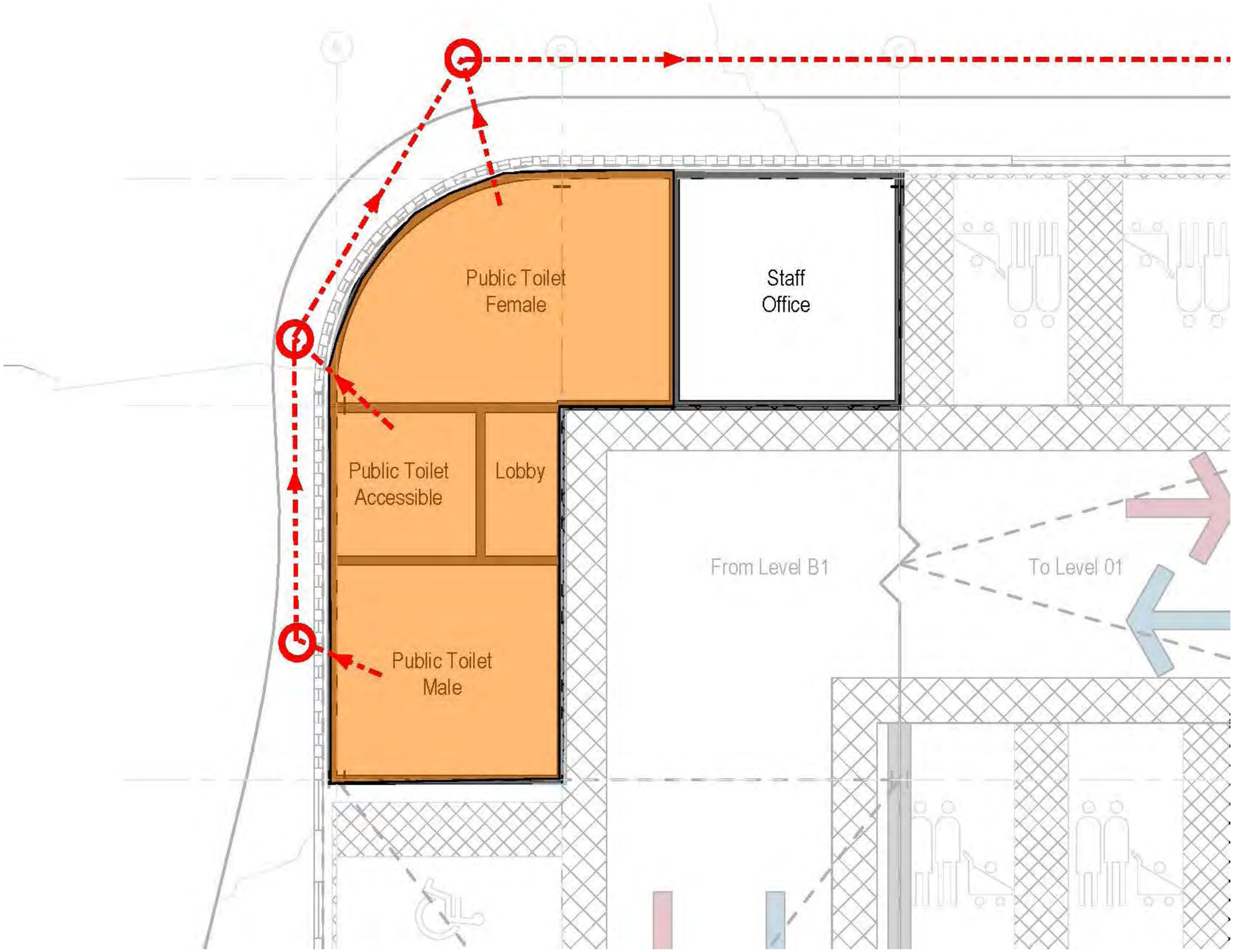



**Figure 6.2: Foul water drainage connections to accommodate Ground floor public toilets**

# 7.0 Geotechnical

## 7.1 Introduction

### 7.1.1 Stage 2 Brief

The team was tasked with assessing the existing information relating to ground conditions at the site, to identify potential geo-environmental and geotechnical development constraints and data gaps. The findings have informed the scoping of and detailed specification for supplementary site investigations and surveys to inform the future stages of design. The main deliverable of this work (at Stage 2 Design) is a fully costed/ tendered package of ground investigation (GI) and structural investigation and measured surveys of the existing retaining walls.

### 7.1.2 Scope of Work

The following scope of work has been completed:

- Review of third-party reports made available by the client;
- Review of readily available online resources including Google Earth, British Geological Survey (BGS) GeoIndex, and the Coal Authority's interactive web viewer;
- Identified data gaps and potential constraints to be investigated through supplementary surveys;
- Developed a scope and written specification of supplementary GI for the whole of the red line site area.

### 7.1.3 Documents Reviewed

Several phases of ground investigation have previously been undertaken at the site. These are detailed in the following reports which have been made available to for review:

- Ground Investigation Report, Courthouse Leisure Scheme, Barnsley, prepared for The Barnsley Miller Partnership. WSP Environmental, ref: 90913LE, November 1999.
- Report on a Site Investigation, Courthouse Leisure Scheme, Barnsley, prepared for The Barnsley Miller Partnership. WSP Environmental, ref: 21108LE, January 2001.
- Preliminary Land Contamination and Geotechnical Risk Assessment, Courthouse Redevelopment Barnsley, prepared for Barnsley Metropolitan Borough Council. Hamson Barron Smith, ref: 23-24-18-1-6011/DSR1, October 2017.
- Ground Investigation Report, Courthouse Redevelopment Barnsley, prepared for Barnsley Metropolitan Borough Council. Hamson Barron Smith, ref: 23-24-18-1-6011/GIR1, June 2018.
- Review of existing documentation at the Courthouse Campus site, Barnsley, prepared for BDP. Hydrock, ref: 15398-GNST-HYD-TDN-001, August 2020.

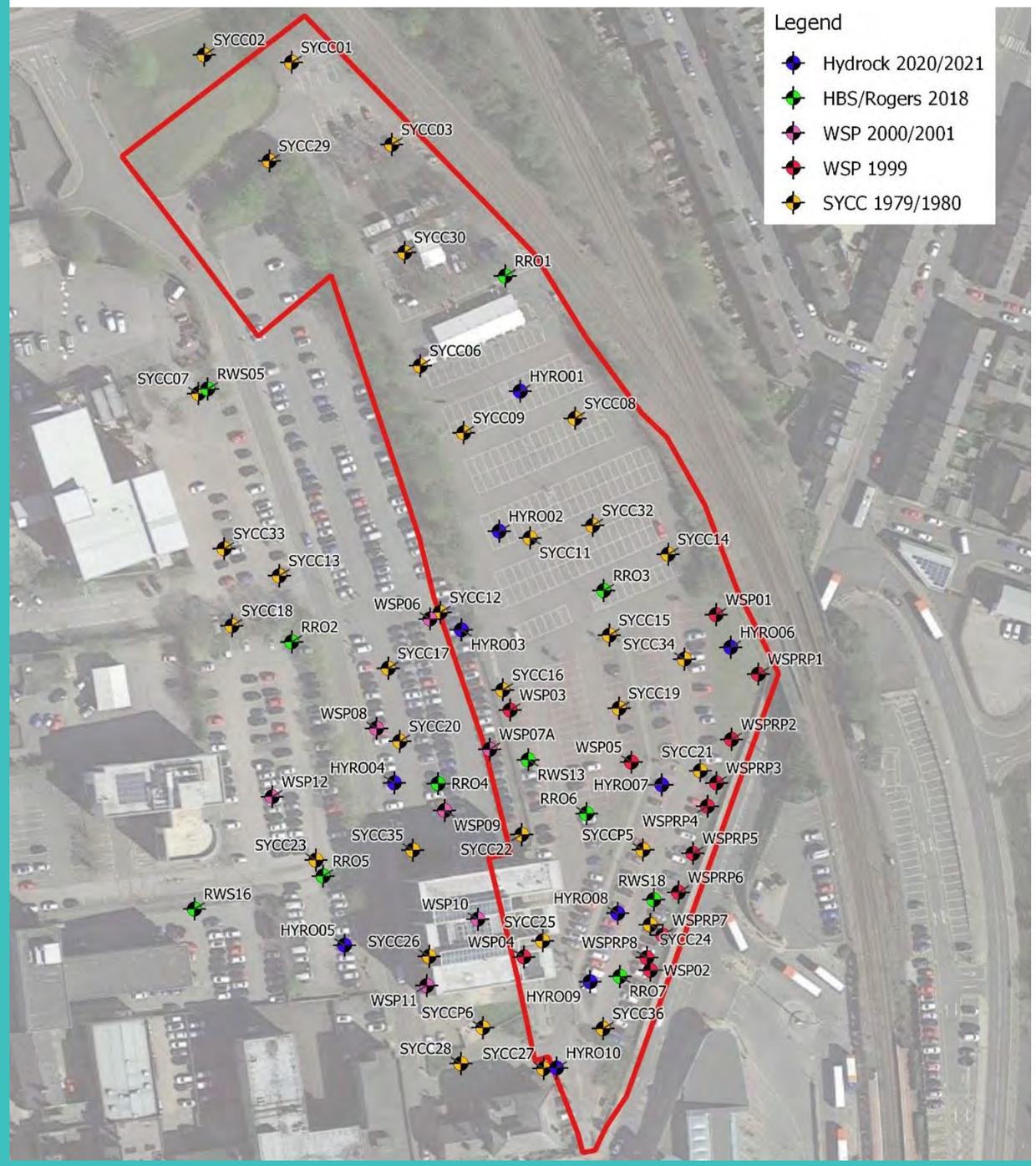



Figure 7.1: Previous site investigation exploratory hole locations

## 7.2 Previous Work

### 7.2.1 Investigation Techniques

In summary, previous investigations have comprised:

- The formation of cable percussion boreholes to depths up to ~10m bgl;
- Rotary boreholes to depths up to 30m bgl;
- Windowless sample boreholes to a maximum depths of 3.45m bgl;
- Dynamic probe holes adjacent to selected boreholes;
- Machine excavated trial pits to establish foundations of the retaining wall along the western site boundary;
- Limited geotechnical laboratory analysis on soils.
- Soil chemical laboratory testing (general suites of contaminants appropriate to the site present and past uses/brownfield nature);
- Ground gas monitoring.

### 7.2.2 General Ground Conditions

Recorded ground conditions comprised Made Ground of varying thickness between approximately 1 and 8m. The thinnest Made Ground is generally in the south of the site with the thickest deposits in the central and eastern areas of the site. A "wedge" of Made Ground backfill is also present behind the Eldon Street North retaining wall up to ~7m thick.

Made Ground was variably described as:

- Medium dense fine to coarse angular sandstone gravel.
- Loose to medium dense clayey sandy fine to medium gravel, interbedded locally with soft to firm gravelly clay
- Firm to stiff clay with mudstone and sandstone gravel.

The Pennine Middle Coal Measures lie directly beneath the Made Ground deposits. The upper layer of weathered rock comprises firm to stiff slightly gravelly, silty, clay between ~0.5 and 6.5m in thickness. Underlying solid strata generally comprised sandstone (Kent's Rock) bedrock to the north, and mudstone and siltstone across the central and southern site areas.

A band of dull black coal, 0.6m thick, was recorded in several boreholes along the southern end of the Eldon Street North Retaining wall at depths of between 3 and 5m bgl. Voids were recorded in four borehole locations on the site, at depths of between 12.60 and 22.40mbgl.

Resting groundwater was recorded in only two locations at around 2.5m, all other exploratory holes remained dry.

### 7.2.3 Coal Mining

Evidence of potential mine workings were recorded in three boreholes drilled behind the Eldon Street North retaining wall. A loss of flush within soft or broken ground was recorded at a depth of 12.2m bgl in the northernmost borehole along the retaining wall, and at around 19m bgl further south along the retaining wall.

Within all of the previous investigation data, Hydrock did not identify any particular boreholes where voids were encountered with insufficient competent material above the void to prevent potential void migration and collapse at the surface. However, coal seams present close to rockhead may impact on the design of piled foundations.

### 7.2.4 Contamination

No obvious visual/olfactory evidence of soil or groundwater contamination was noted in previous investigations. Based on the historical dataset of chemical test results, the overall environmental risk is considered generally low, however certain mitigation measures may need to be implemented during development to protect end-users including potentially barrier pipe for new potable water supplies and importation of clean topsoil for landscaping.

### 7.2.5 Ground Gas

Only limited ground gas monitoring has been undertaken however the monitoring recorded low concentrations of carbon dioxide (<1.7%v/v) and no elevated concentrations of methane or detectable flow rates. It has been concluded that the site is likely not significantly affected by ground gas, however further development specific monitoring would be required to satisfy guidelines and planning.

### 7.2.6 Retaining Walls

Very limited investigation into the existing retaining walls has been undertaken. Only two foundation pits were carried out along the base of the retaining wall to the west of the site (former railway arches). One uncovered a sandstone foundation bearing on clay strata at 1.15m bgl, however the second pit was not able to excavate to the base of the foundation.

Behind the Eldon Street North retaining wall Made Ground was found to approach a thickness of 7m to the north, reducing to 2m towards the southern end, comprising a "wedge" of mudstone fill material. Two of the rotary holes encountered mortared brickwork to around 7m bgl indicative of a buttressed type retaining wall design.

## 7.3 Data Gap Analysis

The key data gaps which have informed the scope of supplementary investigations are presented in the following table:

| | |
|---|---|
| Made Ground | Limited in-situ strength information available. Additional data required to support design of floor slabs, roads & pavement, and assessment of potential for ground improvement/earthworks if required (e.g. to support shallow foundations). |
| Shallow Founding Strata | The characteristics of any natural deposits (weathered strata) above rock head have not been well defined. These are important for the exploration of shallow foundation options and ground-bearing floor slabs. |
| Deep Founding Strata | The strength profile and rock quality/condition has not been suitably investigated beneath proposed building to date. Such data is required to support deep foundation/pile design in the future. |
| Coal Mining / Underground Workings | There is some evidence of voids/potential workings beneath the site however these are currently thought to be at depths which will not significantly affect or require stabilisation to permit development of the site. Notwithstanding this, weak coal seams may be present near the top of the bedrock and therefore further investigation and characterisation of this is required for foundation design. |
| Soakaway drainage | Soakaway testing is required to determine whether soakaway drainage of surface water will be feasible and if so the design infiltration rates. |
| Gas Monitoring | A complete programme of development-specific ground gas monitoring is required to support future planning applications. |
| Supplemental Chemical Testing | Supplemental chemical testing and analysis should be undertaken as part of future investigations to provide additional confidence in the condition of the site soils and the level of risk posed to the development and end-users. |
| Retaining Wall Structure and Stability | Very limited investigation into the structure and stability of the retaining walls has been undertaken to date. To allow geotechnical stability analyses to be undertaken in the future design, data is required on the construction of the wall (materials & geometry) and the foundation/supporting and backfill/retained soils. The Eldon Street North wall is also constructed with soil nails at its northern end - the length of which are currently unknown. |

## 7.4 GI Survey Scope & Specifications

A Site Investigation Specification (Arcadis document ref: 10052406-ARC-XX-XX-SP-GE-0001-01, full copy attached in Appendix G) has been produced. In summary the scope includes:

- 12no cable percussive boreholes to bedrock / refusal (anticipated depths given in Table 1). Boreholes are to be located to target the potential footprints of the proposed development plots, or to investigate retaining wall fill. All boreholes include in-situ Standard Penetration Tests (SPTs) at regular depth intervals.
- Rotary core follow-on within 10no of the above boreholes to prove 12m of competent solid strata. Rock cores are to be logged and core sub-samples for testing shall be chosen in consultation with the investigation supervisor.
- 10no dynamic windowless sample boreholes, to target depths of 5mbgl.
- Monitoring well installations in selected boreholes;
- 4no trial pits are to be formed by saw cutting and mechanical excavation to a depth of 2m bgl to allow BRE365 full soakaway tests to be undertaken. CBR testing is also required in these four locations, beneath the existing subbase to provide design CBR values.
- 2no mechanically excavated trial pits to be formed to a target depth of 3m bgl behind the Eldon Street North retaining wall.
- 2no hand-excavated pits to investigate the foundations at the base of the County Way car park retaining wall.
- 2no pits to be formed by vacuum excavation to investigate the foundations at the base of the Eldon Street North retaining wall.
- Comprehensive soil sampling schedule for geotechnical and environmental laboratory analysis.
- Comprehensive suites of geotechnical and geo-chemical laboratory testing and analysis.
- 6no rounds of ground gas and groundwater monitoring.

In addition, a GPR survey is to be undertaken along the area at the back of the Eldon Street North retaining wall with the objective of identifying any buttresses or buttress-like features which are part of the wall construction.
It is also proposed to investigate the length of the existing soil nails which extend back into the site from the face of the Eldon Street North wall. These must be investigated in a non-destructive way ruling out intrusive investigation and it is therefore proposed to use geophysical techniques to attempt to map the length and positions of the soil nails.

## 7.5 Retaining Wall Survey Works

A scope and specification for retaining wall surveys was also produced (BDP document ref SEAM-BDP-ZZ-SP-S-0001, full copy attached in Appendix G). In summary the scope includes:

- Measured survey of both retaining walls;
- Photographic record of the entire elevations of both retaining walls; and
- Drill tests & cores on both retaining walls to determine thicknesses and composition of the retaining wall structure.

## 7.6 Tender and Commission of Investigations & Surveys

The tender process has been completed as part of Stage 2 design. The selected contractor is set to be appointed during February 2022 with a 1- week programme (from instruction to issue of factual report) with follow-on period of 7 weeks to complete the ground gas monitoring programme.


Figure 7.2: Proposed retaining walls survey extents and core ("C") and drill ("D") locations.

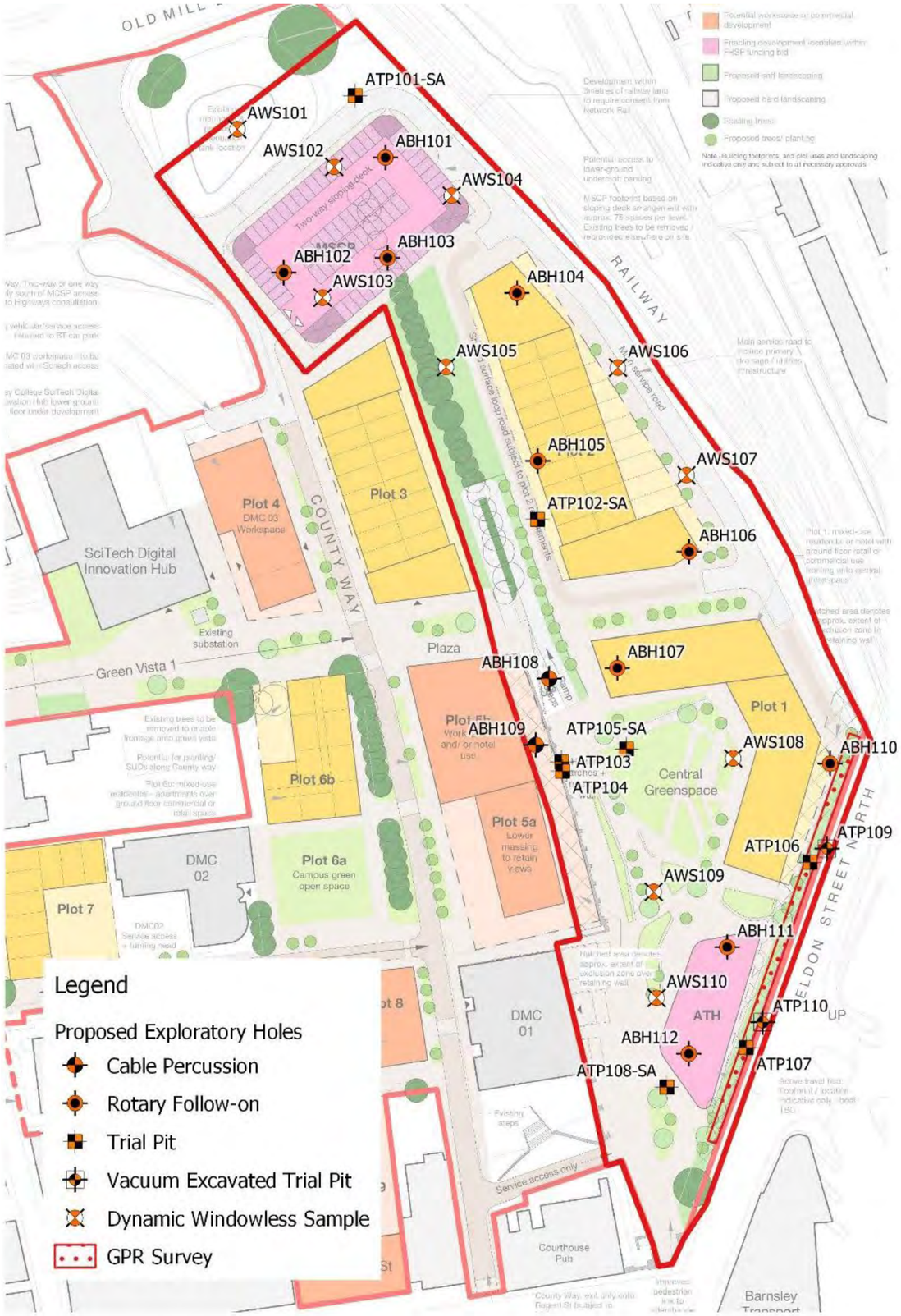



Figure 7.3: Proposed site investigation exploratory hole locations shown in relation to proposed development (conceptual design)

# 8.0 Building Services Engineering

## 8.1 The Building Services Engineering Strategy

### 8.1.1 Introduction

The energy strategy for the ATH uses the following energy hierarchy:

- Use Less Energy (Be Lean)
- Supply Energy Efficiently (Be Clean)
- Use Renewable Energy (Be Green)
- Monitor Energy Consumption (Be Seen)

Specifically the building services engineering design uses the following strategies

- use the most onerous envelope performance as is commercially available at construction.
- construct with the minimum air permeability, be mechanically ventilated, with appropriately sized and shaded windows.
- Mechanically ventilate generally, with openable windows as required.
- Efficient building engineering systems with heat recovery where possible to minimise resource consumption and pollution.
- To reduce wasted energy and water wherever feasibly possible.
- Use renewable energy sources wherever practical.

All engineering equipment will be installed in secure locations, with secure and easy access for operation, maintenance and replacement.

## 8.2 Mechanical Engineering Strategy

The mechanical engineering strategy is to provide safe and healthy environment for those working and using the MSCP as energy efficiently as practical.

All engineering equipment will be installed in secure locations, with secure and easy access for operation, maintenance and replacement.

### 8.2.1 Mechanical Design Criteria

The proposed Stage 2 Concept MEP design for the MSCP is based and follows the requirements, guidelines and recommendations in the following documents:

The following Design Standards are to be followed:

- Building Regulation Approved Document B – Fire Safety
- Building Regulation Approved Document F - Ventilation
- Building Regulation Approved Document L – Conservation of Fuel and Power
- Relevant CIBSE Technical Memoranda including:
- CIBSE Guide A: Environmental Design
- CIBSE Guide B: Heating, Ventilation Air Conditioning and Refrigeration
- Relevant BSRIA Guides
- British standards, including: BS 6700, BS 9251, BS9999, BS5041

The design will be in line with all the relevant British Standards and EN documents. Where existing, BSRIA guides and industry good practice recommendations are to be followed.

Expected Life Time of Equipment,

| | |
|---|---|
| • Heat Pumps | 20 years |
| • Air Handling Units | 20 years |
| • Heat Emitters | 30 years |
| • Pumps | 20 years |
| • Pipework | 35 years |
| • Ductwork | 25 years |
| • Detectors, Actuators Sensors | 20 years |

### 8.2.2 Ventilation Strategy

The ventilation strategy is to provide comfortable healthy internal environment for those working and using the MSCP. In line with the sustainability strategy where possible, natural ventilation has been proposed.

### 8.2.3 Internal conditions

For the MSCP spaces' design criteria please see below table:

| Building | Room | Ventilation Strategy | | | Internal Ambient Noise levels (NR) | Notes |
|---|---|---|---|---|---|---|
| | | Natural Ventilation | Mechanical Ventilation | Smoke Ventilation | | |
| MSCP | Above Ground Car Park Levels | Louvred elevations | N/A | Louvred elevations | 45 | Minimum open free area = 5% floor area |
| | Above Ground Car Park Levels | Louvred elevations | 6 ACH | 10 ACH | 45 | |
| | Stairs and Lobbies | Windows | N/A | AOV | 45 | |
| | Public Toilets | N/A | 10 ACH | Windows | 40 | |
| | Office | N/A | 20 l/s/p | Windows | 35 | |
| | Plantroom | 10 ACH | 10 ACH | Doors | 45 | |

**Table 8.1: Ventilation Systems Design Criteria**

### 8.2.4 Car Parking

The car parking floors will be naturally ventilated via the four open external elevations. A minimum free area of 1/20th of the floor area is required at each floor, of which at least 25 % should be on each of two opposing walls to promote cross flow ventilation.

The two lower levels of car parking will not have four open elevations. The natural ventilation on these two floors will supplemented by impulse fans directing the used air to outside. The fans will operate at two speeds:

- Normal - for day to day use.
- Fast - under Fire Fighters' control for smoke clearance.

### 8.2.5 Stairs and Lobbies

The car parking stairs and lobbies will be naturally ventilated via openable windows.

The lobbies will include for Automatic Opening Ventilation (AOV) panels on the external elevation. These will open should a fire be detected anywhere in the car park.

### 8.2.6 Toilets

The Public Toilets will be mechanically ventilated with ceiling mounted unit.

The twin extract fans will run continually at low speed during the operational hours of the building and will be boosted via presence detectors (PIR) whenever the any of the toilets are in use before setting back to lower speed i.e. trickle ventilation.

The make up air will be provided by the same ventilation unit. The returning exhaust air will pass through a heat exchanger, warming the incoming outside air whenever it is needed before suppling the toilets with warm filtered air.

The air exhaust and intake louvres will be on two different elevations and with the intake louvre away from any car park openings.

### 8,2,7 Office

The Office will be mechanically ventilated with ceiling mounted unit.

The extract fan will run continually at low speed during the operational hours of the building and will be boosted via presence detectors (PIR) whenever the office is in use before setting back to lower speed i.e. trickle ventilation.

The make up air will be provided by the same ventilation unit. The returning exhaust air will pass through a heat exchanger, warming the incoming outside air whenever it is needed before suppling the toilets with warm filtered air.

The air exhaust and intake louvres will be on two different elevations and with the intake louvre away from any car park openings.

### 8.2.8 Plantrooms

The Plantrooms will be mechanically ventilated with fans extracting the air out each plantroom and louvres allowing air from the adjacent areas to be drawn back in.

### 8.2.9 Metering

The power to the ventilation equipment will be metered, with the metering connected to a BMS (Building Management System) or an Energy Management System. All meters and calculated values will be totalled and trended.

### 8.2.10 Outline Specification

Impulse Fans:

- Two Way Fans as required.
- Motor outside  the air stream
- Variable speed drive units
- Turndown to 10% without a drop in efficiency.
- Motors will be provided with thermistor over temperature protection.
- Automatic system control for everyday ventilation and smoke clearance.
- Dual power supply for life safety.

Figure 8.1: Impulse Fan

Air Handling Units:

- Direct drive plug type with motor in the air stream
- Variable speed drive units
- Turndown to 10% without a drop in efficiency.
- Motors will be provided with thermistor over temperature protection.

Provided with flexible connections to ductwork and be installed on isolation bases to prevent vibration transfer to structure.

- Duct mounted sound attenuators will be provided on both the supply and extract and on the atmospheric and on the room side of the air handling units.

Figure 8.2: MVHR unit

Extract Fans:

- Duty/ Standby Fans as required.
- Direct drive plug type with motor in the air stream
- Variable speed drive units
- Turndown to 10% without a drop in efficiency.
- Motors will be provided with thermistor over temperature protection.
- Provided with flexible connections to ductwork and be installed on isolation bases to prevent vibration transfer to structure.
- Duct mounted sound attenuators will be provided on both the supply and extract and on the atmospheric and on the room side of the fans

Ductwork:

- Galvanized Sheet metal to HVCA DW/144, Class A.
- Thermal insulation on intake, supply, return air ductwork, and for 2m downstream of extract ductwork from final louvre connection.
- Thermal insulation to be metal mesh faced mineral wool mattresses and Mineral wool slabs insulation.
- Automated Fire Smoke Dampers (mode 6) mounted in the ductwork at all penetrations through fire compartment walls and floor slabs within the building.
- Cross Talk attenuators mounted in the ductwork between noise sensitive spaces and whenever the ductwork crosses an acoustically rated partition.
- VAV and CV and MCDs to be provided throughout the toilet office and plantroom ventilation systems for full automatic control of all areas served based on air quality, a space temperatures and occupancy.

## 8.3 Heating and Cooling

The heating and cooling strategy is minimised to be as energy efficient as possible, with only the necessary areas being heated or cooled.

Wherever heating and cooling is provided the design of the spaces will follow the sustainable strategy guidelines:

- The best U values possible for the walls, floor, ceiling, doors and windows.
- Windows will be include for solar control.
- The rooms will be of an air tight construction.
- Target <15kWhr/m2/yr of heating for the enclosed spaces.

**Internal conditions**

For the individual spaces design criteria please see below table:

| Building | Room | Winter Design Temperature (˚C) (min) | Cooling (Y/N) | Summer Design Temperature (˚C) (max) | Relative Humidity (% r.h.) | Small Power, W/m² | Lighting, W/m² | Notes |
|---|---|---|---|---|---|---|---|---|
| MSCP | Above Ground Car Park Levels | N/A | N | N/A | N/A | EV Charging | 5 | |
| | Above Ground Car Park Levels | N/A | N | N/A | N/A | EV Charging | 5 | |
| | Stairs and Lobbies | N/A | N | N/A | N/A | 5 | 5 | |
| | Toilets | 18 | N | N/A | UNCONTROLLED | 10 | 5 | |
| | Office | 18 | Y | 24˚C +/-1 | UNCONTROLLED | 15 | 7 | |
| | Plantroom | 16 | N | N/A | UNCONTROLLED | TBA | 5 | |

**Table 8.2: Heating and Cooling Systems Design Criteria**

### 8.3.1 Heated and Cooled Spaces

The Public Toilets and Office will be served by a small dedicated energy efficient Heat Pump which will provide the heating and cooling.

The Public toilets will be heated by ceiling mounted radiant panels. Whilst the office will include a ceiling mounted Fan Coil Unit which will heat and cool the room

Any plantrooms requiring heating will include electric heaters.

**Metering**

The power to the Heat Pump will be metered, with the metering connected to a BMS (Building Management System) or an Energy Management System. All meters and calculated values will be totalled and trended.

Outline Specification

Heat Pumps

- Turndown to 20% without a drop in efficiency.
- High efficiency
- Low GWP, R32 with GWP=675.
- Refrigerants Leak Detection
- Maximising free cooling.

Pumps, Pipework and Fittings

- Variable Speed, Duty/Standby Pumps
- Heavy Grade Steel pipelines.
- Thermally insulated pipework throughout
- External LTHW and CHW services pipework will be trace heated to stop freezing.
- PICV control

**Figure 8.3.1 : Hybrid VRF Unit**

### 8.3.2 Public Health Services

The public health engineering strategy is to provide safe and healthy water and drainage services for those working and using the MSCP as energy efficiently as practical.

All engineering equipment will be installed in secure locations, with secure and easy access for operation, maintenance and replacement.

**Design Criteria**

The proposed Stage 2 Concept MEP design for the MSCP is based and follows the requirements, guidelines and recommendations in the following documents:

- Building Regulation Approved Document B – Fire Safety
- Building Regulation Approved Document G - Sanitation, hot water safety and water
- Building Regulation Approved Document H – Drainage and Waste Disposal
- HSE Health and Safety: Legal Series L8 Legionnaires' disease.
- Water Regulations: 1999
- Relevant CIBSE Technical Memoranda
- CIBSE Technical Memoranda TM 13 Minimising the risk of Legionnaire's disease: 2013.
- Relevant BSRIA Guides
- British standards, including:
- BS EN 12056 – 2: Gravity Drainage Inside Buildings
- BS 6700, BS 9251, BS9999, BS5041

The design will be in line with all the relevant British Standards and EN documents. Where existing, BSRIA guides and industry good practice recommendations are to be followed.

Expected Life Time of Equipment,

- Pumps 20 years
- Pipework 35 years
- Detectors, Actuators Sensors 20 years

The following tables detail the criteria by which the Domestic Water System will be sized.

| Appliance | Draw off Per Fitting | | | Discharge Rate per fitting, Demand Unit |
|---|---|---|---|---|
| | Hot water (l/s) | Cold water (l/s) | Demand Unit | |
| WC Cistern | N/A | 0.13 | 2 | 1.8 |
| Wash Hand Basin | 0.15 | 0.15 | 2 | 0.3 |
| Cleaners Sink | 0.2 | 0.2 | 3 | 1.3 |
| Washdown Point | N/A | 0.2 | 2 | 0.3 |

**Table 3: Domestic Water and Above Ground Drainage Systems Design Criteria**

| System | Storage (l/person) | Storage (hr) | Recovery Time (hr) |
|---|---|---|---|
| Cat 5 Cold Water | N/A | 6 | 1.5 |

**Table 8.3: Domestic Water Tank Storage**

# 8.4 Above-Ground Drainage

## 8.4.1 Rainwater Drainage

Slotted drains will be located across on all of the MSCP floors and the surface water drainage collected. The system will be gravity fed and connect into a new below ground surface water drainage system designed by the civil engineers.

An oil separator within the below ground drainage system will be required before discharge to the utilities sewer.

An option to consider is that all electric vehicles will not require any surface water drainage to be oil separated before discharge. However this may be better as an option in the future as this will require strict management of the car park to ensure no cross contamination.

Collecting of Rainwater from the MSCP will be considered for any areas of open roof that are not part of the parking and therefore not at risk of being contaminated by the standing vehicles. This will include areas such as the PV canopy, and the stair and Lobbies roofs.

## 8.4.2 Waste Water Drainage

The Waste Water Foul from the sinks in the toilets and office within the MSCP will connect via gravity into the new below ground waste drainage system.

## 8.4.3 Foul Drainage

Foul drainage will run from the toilets and office within the MSCP. Foul drainage will be gravity fed and connect into the new below ground waste drainage system.

## 8.4.4 Outline Specification

Pipework and Fittings

- Small diameter branch discharge pipework and fittings:
    - o High Density Polyethylene (HDPE) above ground waste water branch discharge pipelines
    - o Copper pipelines where required, for example, the tea point
- Large diameter branch discharge pipework and fittings:
    - o High Density Polyethylene (HDPE) above ground drainage pipelines
- Discharge stack pipework and fittings:
    - o Cast iron above ground discharge and ventilation pipes

## 8.4.5 Hot and Cold Domestic Water Systems

**Domestic Cold Water Systems**

The new metered incoming mains water connection will serve the toilets and office, and the Cat 5 tank in the lower basement,

The Cat 5 supply (air separated from the incoming mains water connection) will pump cold water to:

- wash-down points at each floor of the MSCP
- the irrigation tank

An irrigation system will be irrigate the green walls at the lower levels. This system will be located with a dedicated plant room.

**Domestic Hot Water (DHW) Systems**

Domestic hot water will be provided by local electrical water heaters are proposed to be located under the Wash Hand Basins (WHB) in the Public Toilets and at the Office tea point.

## 8.4.6 Metering

Meters will be installed to measure water consumed for:

Public Toilets
Irrigation

All metering will be connected to a BMS (Building Management System) or an Energy Management System. All meters and calculated values will be totalled and trended.

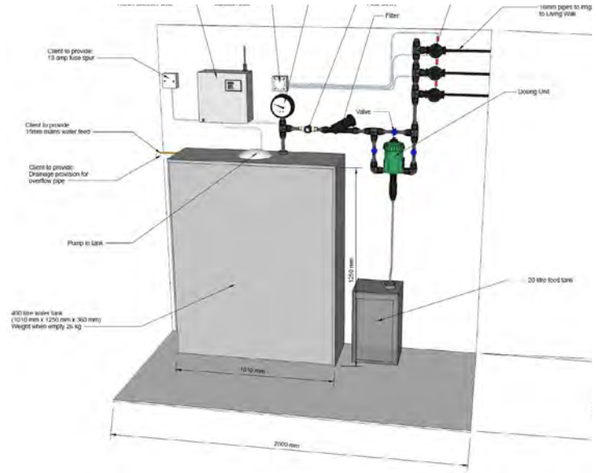


**Figure 8.3: Schematic Example of Irrigation Plant**

**Outline Specification**

**Domestic Water Pipework and Fittings**

Cat 5 Water Pumps - Duty/Duty/Standby

- Copper pipelines.
    - o Thermally insulated throughout.
    - o Fire stopped at all penetrations through fire compartment walls and floor slabs within the building.
    - o External domestic water services pipework will be trace heated to stop freezing.
    - o No dead legs of HWS pipework greater than 300mm.
- WRAS approved fittings.

## 8.5 Firefighting and Suppression Systems

The fire fighting and suppression strategy will include dry rises on each of the two escape stairs, manual sprinklers and/or hand-held fire extinguishers.

Each dry riser will include inlet valves at ground level and outlet valves at each stair lobby from the lower basement up to the top floor.

Likewise the manual sprinkler system will include an inlet valve at the ground level of each escape stair. The rising pipework in each stair will then branch off at each level to serve half of each floor. A manual outlet valve will allow the firefighter to activate the sprinklers serving that half of the floor. The manual sprinkler system will be served by the fire fighting appliance as needed by the fire fighters. The sprinklers will be at high level fixed to the underside of the floor slab.

Should the Council's insurers confirm they require a fully automatic sprinkler system this would require the following;

- a L1 detection system,
- a dedicated, unmetered mains water connection,
- a remote water tank
- a dedicated plant room for the pump sets,
- Distribution pipework at high level on all floors.
- backup generator

**Figure 8.4: Sub meter**

**Outline Specification**

Pipework and Fittings

- Heavy Grade Steel pipelines.
- Provide inlets at ground level for Dry Risers and Sprinklers in each of the two stair cores.
- Provide outlet valve at each level for both risers
- The vertical sprinkler pipework will branch off to each floor to provided half coverage of each floor.

## 8.6 Electrical Engineering Strategy

The Electrical engineering strategy is to provide safe environment for those working and using the MSCP as energy efficiently as practical.

All engineering equipment will be installed in secure locations, with secure and easy access for operation, maintenance and replacement.

The works will include all elements to complete the procurement, installation, witnessing & commissioning and operation of the complete working systems including Builder's Work in Connection, access systems (allowing for complete replacement of all plant). It also includes generating all as built system drawings separately using computer generated software e.g. AutoCAD and REVIT.

All items of LV switchgear and distribution equipment will be installed in secure locations, ensuring ease of access for maintenance and operation, in an area inaccessible to staff or visitors.

All low voltage cabling will be tagged, with tag numbers corresponding with the LV schematic and O&M documents.

### 8.6.1 Electrical design criteria and targets

The criteria for the electrical engineering systems is based on the Park Mark Plus guidance document, BS 7671 18th edition and any specific system's standard as described in each of the following sections.

The following table details the Electrical Design Criteria for the different types of systems

| System type | Reference | Applied Design Criteria |
|---|---|---|
| Lighting | BS EN 12464-1:2021 | Parking areas – open to public with a large number of users e.g shopping centers, arenas: $\bar{E}_m$ required[a] 150, $\bar{E}_m$ modified[b] 200, $U_o$ 0,40, $R_a$ 40, $R_{UGL}$ -, $\bar{E}_{m,z}$ 50, $\bar{E}_{m,wall}$ 50, $\bar{E}_{m,ceiling}$ 15, $U_o \geq 0,10$; Specific requirements: 1. Illuminances at floor level. 2. A high vertical illuminance increases<br><br>Astronomical Time switch control |
| Fire Alarm | BS 5839-1: 2017 | Category L1. Secondary supply to fire alarm panel provided by 6 hours integral battery |
| Electrical load | BSRIA Rule of Thumb | Small power and lighting 10w/m2 |
| Load diversity | N/A | 0.7 |
| Evacuation communication<br><br>System | BS 5839-9: 2021 | - Provision for evacuation lift emergency intercom/communication system between car and all evacuation floors (only operates when the fire alarm system has been activated).<br>- Provision for Fire-fighting lift communication system for the fire service, between the lift car and the fire service access level (adjacent ground level, within the lobby at discharge point), operates by fireman's override switch to the face plates. |
| Life Safety Systems Supplies | BS 8519:2020 | Secondary power supply from standby generator provided for B02 smoke extract, fire-fighting lifts and evacuation lifts.<br><br>(Sprinkler to be automatic). |
| Security | Park Mark Plus<br><br>Guidance | CCTV camera throughout, entrance barriers, ANPR |
| SMART services (requiring power) | Glassworks Car Park, Site wide Smart philosophy | IoT-based system that sends data about free and occupied parking spaces via web/mobile application, parking management system. |
| EV charging points | Requirements confirmed during Stage 2 presentation meeting (11-01-2022) | 10% current, 20% total future allowance with 70% slow, 20% fast and 10% rapid charging types.<br><br>Additional options for 60% and 100% future have also been provided in this report. |
| PV system | BS 7671 | Roof mounted with 1450 m2 area, 250kW peak circa |

**Design Life**

| | |
|---|---|
| HV Substation | 30 years |
| Transformers | 30 years |
| LV Switchgear and Distribution Boards | 20 years |
| Submain Distribution | 20 years |
| HV / LV Cables (Thermosetting) | 35 years |
| Busbar Trunking | 35 years |
| General LV Power | 25 years |
| Conduits & Cable Trunkings | 30 years |
| Light Fittings Internal | 20 years |
| Light Fittings External | 15 years |
| Emergency Lighting (Self Contained) | 25 years |
| Photovoltaic devices, including cells, panels, modules etc. | 25 years |
| Earthing & Bonding Cables and Components | 30 years |

**Electrical Standard and guidances**

- CIBSE Guide M: Maintenance Engineering and Management
- CIBSE TM39 Building Energy Metering
- BR Approved Document L2A Conservation of Fuel and Power in new buildings other than dwellings
- BS7671 18th edition Requirements for Electrical Installations. IET Wiring Regulations
- BS EN 50173-1:2011 - Information Technology - Generic Cabling Systems.
- BS EN50174 Information technology Cabling installation
- BS 6701 Telecommunications equipment and telecommunications cabling
- BS 7346 Components for smoke control systems
- BS 8300 Design of an accessible and inclusive built environment. Buildings - code of practice
- CIBSE Lighting Guides
- BS7430 Code of practice for protective earthing
- BS EN IEC 61936-1 Power installations exceeding 1 kV a.c. Common rules
- BS EN 50522:2010 Earthing of power installations exceeding 1 kV a.c.
- Electricity Distributors (UKPN) requirements
- G99 Document
- Construction product regulations (CPR)
- ANSI/TIA 568C
- BSUH-CL-ST1- PO-A20
- Low Voltage Directive 2006/95/EC
- EMC Directive 2004/108/EC
- EN 60950-1:2001/A11:2004
- EN 61000 – All sections - Electromagnetic compatibility
- BS EN81-72 Safety rules for the construction & installation of lifts – Firefighters lifts
- To BS EN 60839-11-1
- BS EN 50131

## 8.6.2 Power

**LV Distribution and small power**

Power to the car park will be provided by a LV switchboard (MS/B02/01) located in a new switchroom located at Level B02 inside the MSCP as shown in the electrical layouts. The switchboard will be directly fed from a new substations to supply the MSCP.

The main switchboard will directly feed:

- Local plantrooms DBs;
- EV charging points DBs,
- Split metered distribution boards located in the electrical riser to supply each floor.
    - These will supply general power, lighting, smart systems and security systems;
- The main fire alarm panel;
- The EVAC system panel;
- The external lighting DB;
- 4No. lifts;
- PV Inverter located on roof;

The supply cables will distribute through the risers in vertical trays, and horizontally by means of metallic perforated trays/ trunking fixed to the ceiling.

The Distribution Boards will be provided with 25% spare outgoing ways and designed to be suitable for future expansion.

The busbars will support dual-metered split-load distribution boards on each level, allowing the loads to be metered separately, for energy management purposes.

The proposed electrical design will be installed to the following parameters:

Voltage 400V/230V +/- 4%, 3 Phase 50Hz AC nominal.

The new supply will ensure compliance with all relevant Codes of Practice, Byelaws and Statutory requirements, including:

- BS 7671 of IEE Wiring Regulations 18th Edition
- Relevant Utility Services Provider Approval

All items of LV switchgear and distribution equipment will be installed in secure locations, ensuring ease of access for maintenance and operation, in an area normally inaccessible to staff or visitors.

**LV Generator**

A packaged LV generator, will be installed outside adjacent to the car park as secondary source of power supply for, smoke extract system, evacuation lifts and fire-fighting lifts.

The generator will have a minimum fuel storage capacity of 8hours and will operate whenever the primary power source to life safety equipment fails. It will provide fault indication at the BMS system and will be linked to the life safety switchboard ATS (Automatic Transfer Switch) via a fire resistant power failure signal cable.

The generator will feed the ATS, located at level B02 of the MSCP, by means of a buried 2 hours fire resistant FP600 cables as shown in the electrical layouts.

**LV Switchboards**

The main LV switchboard in the MSCP will be manufactured to Form 4 Type 4b with front access. The switchboard will be located in the switchroom at level B02 to include 25% spare ways.

The switchboard will contain protective devices, and a surge protection device.

Following a post installation power quality survey, a harmonic filter and a power factor corrector, to reach 0.95 p.f, will be provided should the power factor be lower than 0.9, and the harmonics be higher than 3%.

**Submain Cables**

The submain cables coming from the main LV switchboard MSB will run in the risers to feed each floor.

Multicore armoured XLPE/SWA/LSOH cables compliant with BS EN 60332-1-2 will be installed (equivalent to cable CPR class Eca).

Submains feeding fire safety equipment like smoke extract, evacuation lifts and fire-fighting lifts should be multicore FP600.

**Electrical Risers**

The car park will have 1no.electrical riser.

The riser will host three phase split metered distribution boards, fire, data and ELV perforated trays, and a solid metallic submains tray to avoid EMC issues with the data cables.

The vertical containment system design and installation will ensure physical separation between cables of different voltages and circuit category as stated in BS50174.

**Distribution Boards**

Split-metered lighting and power distribution boards will supply small power and lighting on each of the floors.

Distribution boards will include an integral switch-disconnector and will utilise outgoing miniature circuit breakers (MCB), residual current devices (RCD) and combined residual current and over-current circuit breakers (RCBO). These devices will be selected to suit the type of load being served and provided in line with the council's requirements.

The distribution boards will be supplied complete with lockable hinged front cover(s), mixed-capacity single and multi-pole circuit breakers as necessary, 'dedicated' earth bars and suitably sized terminations for the cable size as specified.

All metering, contactors and control components are to be incorporated with a separated section of the distribution boards in a purpose-built enclosure to match the distribution board in size and colour and be complete with a separate access door clearly labelled as to its purpose.

Distribution boards will be provided with a suitably bolted solid neutral (unswitched) supply connection complete with bolted test link facility.

Distribution boards will be sized and provided with 25% spare capacity.

**Small Power**

The small power distribution considers the final power circuits from the distribution boards to the power outlets, luminaires and fixed electrical equipment. The small power system will serve the following types of final circuits:

- Fixed mechanical equipment wired as dedicated radial circuit with MCB rating of the equipment;
- Power supply to fixed items served as dedicated radial circuits and fed via fused connection units;
- General-purpose socket outlet circuits such as cleaners' sockets will normally be wired as dedicated standard radial or ring main circuits and mounted on the wall. These will be protected by suitable earth leakage 'RCD' devices;
- High-level lighting circuits will be supplied as 10A radial circuits.
- Security access control, fire alarm and control systems will be wired as 16A or 20A radial circuits.

Small power and lighting cables will run in exposed soffit mounted metallic trunkings or ducts in the parking area.

**Metering**

The metering strategy will follow the Building Regulations part L.

All final distribution boards greater than 50kW will be metered and the distribution boards in the risers will be split metered lighting and power.

### 8.6.3 PV System

The car park will have a 250kWp PV system located at roof level. An initial assessment based on the available PV area and the car park energy consumption shows that the available PV area is insufficient to charge a battery capable of supplying the car park load whilst in the dark hours of the day.

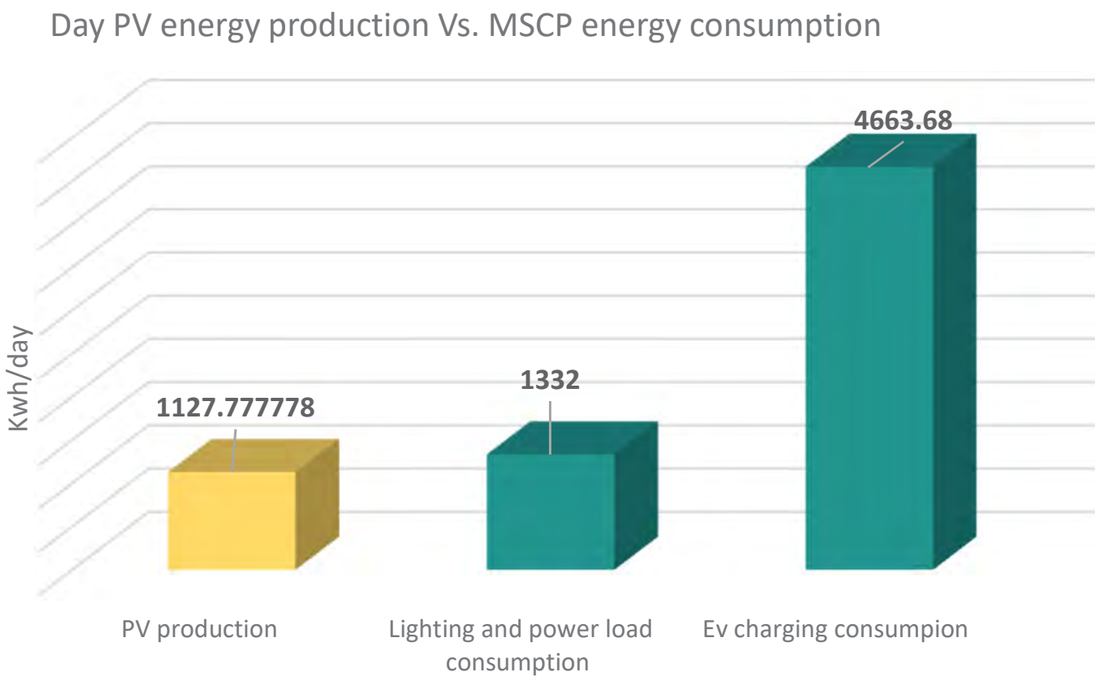



Figure 8.5: PV Energy Production Vs. Energy Consumption

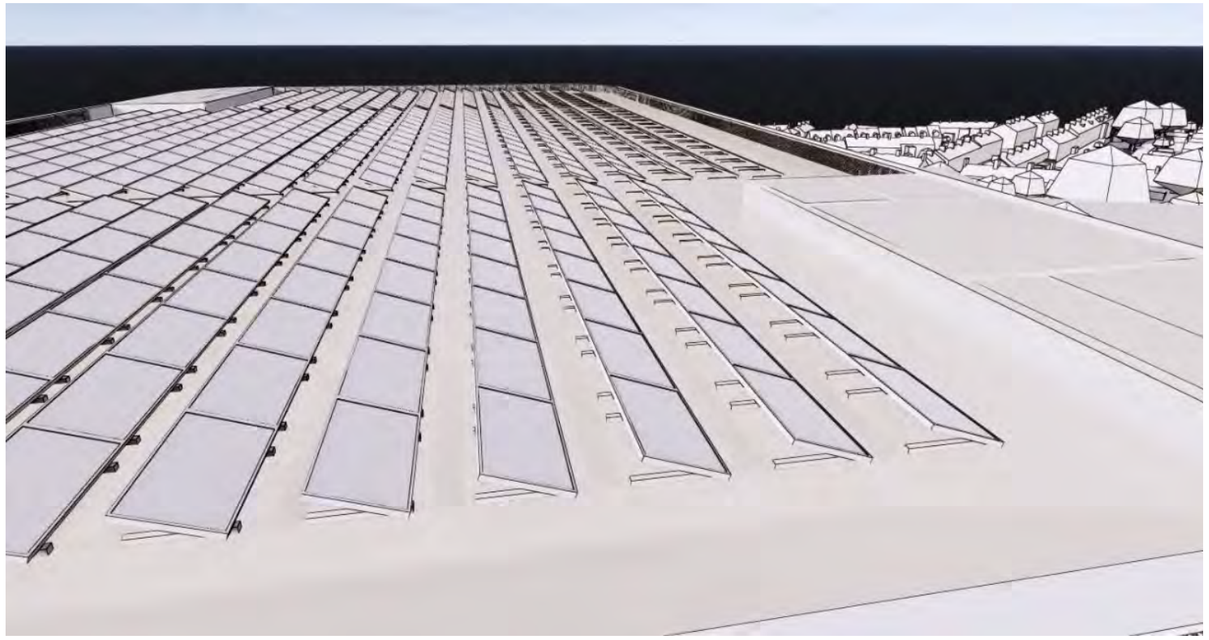


Figure 8.6

### 8.6.4 Earthing and Bonding

Earthing and bonding will consist of LV system circuit protective conductors, equipotential bonding, supplementary bonding and dedicated clean earth distribution to any IT rack.

The electrical earthing system in the car park building will be TN-S type, and will have separate CPCs and neutrals throughout the system coming back to the new substation.

Each switchboard will have its own earth terminal, which will be connected via armour and/or extra CPC to the main earth bar located in the new substation.

All exposed conductive parts will be connected by a protective conductor to the relative switchboard/distribution board earth reference bar. Each, sub-distribution board, motor control centre and final distribution board will have its own integral earth bar.

Submain cables will be sized to ensure a 5s disconnection time is achieved in case of short circuit or earth fault as per BS7671. Each final circuit wired in single core cable will include a separate full-sized circuit-protective conductor.

Main equipotential bonding will ensure that all extraneous conductive parts are bonded to the earth bar of the main earth terminal. This will generally consist of bonds to the main water pipes, main gas pipes, ductwork, pipework, exposed metallic parts of building structure, thermal insulation metallic cladding and metallic cable sheaths of all cables (except British Telecom).

Supplementary equipotential bondings will be made at each floor to interconnect all extraneous metallic parts to the closest earth terminal as a minimum.

### 8.6.5 Lightning protection system

A Lightning Protection System will be provided to comply with the guidance contained within BS EN 62305 utilising either the steel framework or metal re-bars within concrete columns as down conductors. The air termination network will utilise metallic roof materials where suitable otherwise copper tapes will be utilised.

The system will be concealed within the building fabric. A layered system of transient over-voltage protection will be provided comprising surge protection devices incorporated into main switchboards and distribution boards as noted elsewhere in this report.

**Charging Points**

The current charging points numbers provision has been set by the council as 10% of the total number of parking spaces (400), whilst the infrastructure will be instead sized to supply 20% of the parking spaces. In addition to this, 2no. future options have been analysed to inform the Council of the potential load involvement with percentage at 60% and 100% of the parking spaces.

The types and quantities of charging points are shown in the table below.

| EV charging provision | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Current | | Future options | | | | | |
| **Total Percentage** | 10% | | 20% | | 60% | | 100% | |
| **Total EV chargers( Existing plus Future)** | 40 | | 80 | | 240 | | 400 | |
| | **Percentage by EV charger type** | **EV chargers by type** | **Percentage by EV charger type** | **Additional EV chargers by type** | **Percentage by type on additional chargers** | **Additional EV chargers by type** | **Percentage by type on additional chargers** | **Additional EV chargers by type** |
| 7.4kW | 70% | 28 | 70% | 28 | 70% | 140 | 70% | 252 |
| 11kW | 0% | 0 | 0% | 0 | 0% | 0 | 0% | 0 |
| 22kW | 20% | 8 | 20% | 8 | 20% | 40 | 20% | 72 |
| 43kW | 5% | 2 | 10% | 4 | 5% | 10 | 10% | 36 |
| | **Total kW** | | **Total additional kW** | | **Total additional kW** | | **Total additional kW** | |
| | 389 | | 389 | | 1943 | | 3498 | |

**Table 8.4: EV charging station type and load per current and future option**

### 8.6.6 Lighting

The design objectives of the lighting scheme may be summarised as:

- • Illuminate both vertical and horizontal surfaces appropriate to the specific tasks taking place, supplying the visitors with a comfortable operational environment.
- • Provide a cost effective, sustainable and energy efficient system, in terms of initial capital costs and continuing operational use. Select lamp types for their efficacy, colour rendition and longevity to provide an efficient lighting solution with a predictable maintenance regime.
- • Utilise light sources appropriate for the character and function of each space while retaining a coherent, rationalised illumination system in terms of lit effect, and equipment installed.

Select light sources and luminaires for their performance, material construction, design, fabrication and ingress protection. Identify luminaires from standard product ranges and site equipment in accessible locations.

Design parameters

The following mandatory, legislative and regulatory requirements, British Standards, Codes of Practice and Best Practice professional guidance publications will form the parameters of the lighting installation:

- BS EN 12464-1:2011 Light and lighting - Lighting of work places. Indoor work places
- SLL Lighting Handbook, 2018
- The Health and Safety (Display Screen Equipment) Regulations 2002
- BS 8300-2:2018 Design of an accessible and inclusive built environment, Part 2: Buildings, Code of practice
- BS EN 13201-2 - 2015 Road Lighting - Part 2 - Performance Requirements.
- ILP Guidance Notes for the Reduction of Obtrusive Light GN01:201

### 8.6.7 Lamps and Luminaires

Luminaires will be specified for their photometric performance, with suitable distribution, efficiency and appropriate glare control, for effective illumination of a particular task or space. Materials, construction, build quality and cost effectiveness will also determine luminaire selection.

Specified luminaires will comply with the current relevant European or British Standards, principally BS EN 60 598.

The luminaires should have the following characteristics:

- High-quality direct/indirect lighting design for optimum lighting
- IP65;
- IK08;
- Translucent white reflector
- Version for extreme ambient temperatures
- Impact-proof polycarbonate diffuser made of a single-piece injection moulding, with internal prismatic structure
- Primary optic optimised for LED technology
- LED service life: 50 000 h before luminous flux is reduced to 90 % of the initial value
- High luminaire efficiency of 135 lm/W with colour temperature 4000 K and colour rendering Ra > 80
- High luminaire efficiency of 142 lm/W with colour temperature 6500 K and colour rendering Ra > 70 Dimming level for DC mode preset to 15 %
- Chromaticity tolerance between multiple luminaires of up to 3 MacAdam ellipses
- DV model with integral loop-in/ loop-out wiring: 5 x 2.5 mm² + 2 x 1.5 mm²
- DALI-controllable converters

High frequency electronic control gear will be used to eliminate stroboscopic effects, improve lamp life and maximise energy efficiency.

Figure 8.6

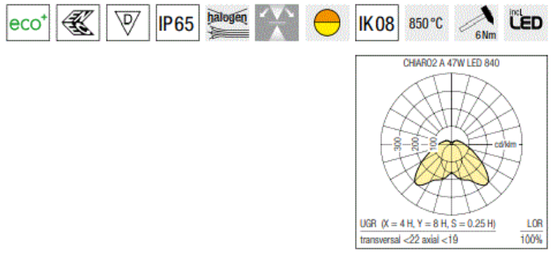



Figure 8.7

## 8.7 CDM

Any CDM issues relating to the lighting design scheme have been identified per area within the area-by-area descriptions.

As a general strategy throughout the building, LED technology has been embraced to minimise maintenance and access at height along with a task-oriented lighting scheme to ensure light is provided where needed.

**WEEE Directive - Waste Electrical and Electronic equipment**

All lamps, luminaires and relevant lighting equipment must be procured from manufacturers/suppliers registered with the WEEE directive PCS (Producer Compliance Scheme). All these manufacturers/ suppliers must prove that they are registered by providing their PCS registration number.

**Controls**

A lighting control system will be provided to enable the illumination levels to be controlled to meet the needs of the occupants and functions of each space. This will result in energy savings, and therefore reduced running costs for the life of the installation.

**Lighting Control Strategy**

The lighting control system will use a DALI interface to control the luminaires.

**Daylight linking**

The system must enable the dimming and switching of all luminaires in areas where daylight ingress is sufficient to reduce their output for all or part of the day. This will typically include luminaires near external glazing and building perimeter, but must also include any luminaire inside or outside the building which may be dimmed or switched off due to daylight ingress. Where daylight linking is active, the illuminance provided in the space by the combination of electric and natural light must not fall below the required illuminance criteria.

In addition, the system must enable constant light sensing across the areas: to ensure illuminance levels are maintained to within ±10% of intended value throughout the maintenance cycle.

**Presence / Absence Detection**

In the car park the system must enable single or groups of luminaires to be dimmed down to 20% of their output in response to sensor(s) detecting occupancy. Presence detection sensors must be located in as indicated in the control schedule to facilitate presence or absence detection as required.

Presence detector will be located in toilets to dim the lighting output from 50% to 100%.

In the office an absence detector will be installed to switch off the lights when personnel is not detected.

**Emergency Lighting**

Emergency lighting is designed to facilitate the safe egress of a building or space in the event of failure of mains power supply to the normal lighting.

It is critical for the safety of users of the building and should be given careful consideration throughout the detail design phase of the project.

Emergency lighting needs to be provided to external escape routes and final muster locations.

The emergency lighting design for the Homer Road Gateway development will use a stand-alone system. This will be detailed on an area-by-area basis at the detail stage of the design (Stage 3).

**Guidance documents**

Emergency lighting must be designed to comply all mandatory, regulatory and legal design guidance documents including some/all of the following:

- BS 5266 Part 1:2016; Emergency lighting – Part 1: Code of practice for the emergency escape lighting of premises

- CIBSE LG12 – Emergency lighting 'Lighting for the built environment', 2015

**Performance requirements**

The following performance requirements will be used for the emergency lighting strategy;

**Open areas (anti-panic lighting)**

A minimum of 0.5lux must be achieved at any point on the floor within a central core area which excludes a border of 0.5m from the wall or any fixed obstructions

**Escape route**

A minimum of 1.0lux must be achieved at any point on the 2m wide central line of the escape route. 0.5lux must also be achieved over 50% of the entire width of the escape route.

**Refuge points**

A minimum of 5lux on horizontal floor, and signs will be provided.

Refer to BS 5266 Part 1 for full technical requirements of emergency lighting.

On-going coordination of emergency lighting design with fire strategy (escape routes, muster points, crash barriers, call points, firefighting equipment, first aid points, hazardous areas, non-illuminated signage etc.) will be the responsibility of the client or the nominated representative. Emergency signage design, self-illuminated or otherwise, will be the responsibility of the architect and electrical consultant.

## 8.9 Detection, Fire & Security

**Lift Car communication system**

An evacuation lift emergency intercom/communication system between car and all evacuation floors will be provided. This system will only operate when the fire alarm system has been activated.

The evacuation lift system will have the following characteristics:

- Caller ID and location are shown on each station's LCD display.
- Voice communication is achieved using sensitive microphones and digitised speech such that a soft voice 2 metres away is clearly heard.
- All called stations are hands-free. A "Press to Call" button is present to contact the master station.
- If more than one station makes a call simultaneously, the master station will display the number in the queue and prioritise them.
- The function menu access is protected with a security pass code, which can be user selected.
- Different ringing tones are available to differentiate between the types of call, i.e. alarm calls or normal intercom calls.

A fire-fighting lift intercom/communication system will also be provided. The system will include a face plate intercom within the lift car and a face plate intercom external and adjacent to the lift car doors on each landing level (usually adjacent to the lift car call buttons).

The fire fighting system will have the following characteristics:

- 5 slave stations can be added to the master station.
- Adjustable high sensitivity microphone and speaker volume controls.
- Connection between stations is by a "daisy chain" arrangement of 4 wires.
- The PSU has integral monitoring of battery and mains power failure.
- System integrity monitoring is continuous during system idle mode.
- Conforms to EMC regulations EN61000-6.1 and EN6100-6.3


**Figure 8.7: face plate external on lobby level and adjacent to lift car doors – usually independent of lift car call buttons**


**Figure 8.8: face plate internal within lift car – usually independent of lift car call buttons**

The intercom system described above will only operate either:

- When the fire alarm system has been operated; or
- When the evacuation lift car has been overridden.

### 8.9.1 Fire Detection System

The minimum level of fire alarm and detection system required for the car park is category L1.

The car park area will be protected with linear heat detectors, installed in compliance with BS EN 5839-1. The linear heat detection system will comprise a power supply unit, a sensor cable, junction boxes at the beginning of each cable, test boxes at the end of each cable and an interface to link it to the main addressable fire panel.

The system will be in accordance to BS9999, BS5839 Part 1, the requirements of Building Control and the Local Fire Officer.

The system will utilise analogue addressable technology with wiring configured as loops connecting, fire alarm panels, repeater panels, detection devices, interfaces and sounders.

The main fire alarm control panel will be located on the B02 Floor adjacent to one of the stair cores, where it is easily accessed by the fire brigade.

Fire alarm cabling throughout will be routed on dedicated steel wire cable tray. All fire alarm cabling is to be of the 'enhanced' category and be provided with a red outer sheath to comply with BS5839-1, meeting the PH120 classification when tested in accordance with BSEN 50200 and the 120 minute survival time when tested in accordance with BS 8434-2.

Batteries and chargers to the system will be sized to provide sufficient power for 24-hour quiescent operation followed by ½ hour at full output of sounders.

The system will comprise the following; fire alarm and repeater panels, automatic smoke and heat detectors, break-glass call units, electronic sounders and xenon beacons for DDA purposes. In areas where there are likely to be high levels of noise, for example in plantrooms, it is recommended that visual notification is provided - for example by flashing beacons.

Detectors

Linear heat detectors will be used throughout the parking areas, while standard multi-sensor detectors will be used in the changing facility areas.

Air aspiration will be used within lift shafts and in the substation;

Manual call points should be provided adjacent to all storey exits on all floors in accordance with BS 5839-1. Manual call points will be provided with covers to guard against accidental activation, particularly in the public areas and the logistics routes. Manual call points will be coloured red and positioned adjacent to all external doors with additional units located along

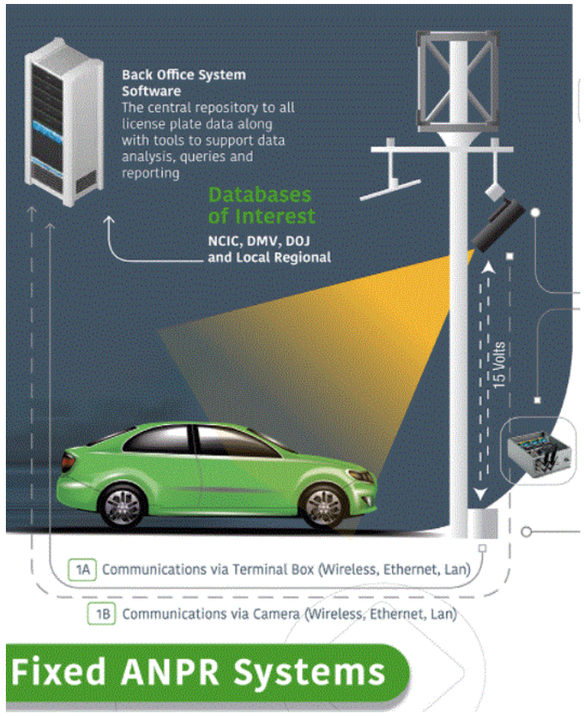
Fire alarm interface units will be provided as required to a number of emergency systems. These include:

Outputs to:

- Lifts
- Security systems – car access control
- Disabled refuge and toilet alarm systems.

Lifts will automatically return to the B02 Floor whereupon doors will open for a preset time and then close, disabling landing call buttons. Adjacent to all lifts' final landing floor will be provided a fireman's override switch that places the lift under fireman's control.

**Parking Security System**
A parking access and revenue control system (PARCS) to manage access control and payments will be implemented together with an ANPR system.




The system will have remote operation management via intercom calls and will employ personnel (Operatives) to undertake tasks both on site and remotely.

The elements of the PARCS described below will operate as a fully integrated system.

**Pay on Foot Station**
Pay on Foot stations (PoF) will be located within the primary stair core lobby at all level. The stations will have audio/visual two-way intercoms, with the cabinet designed to contain the equipment to supply the relevant features and be suitable for disabled access and a pinhole camera (to be connected by others to an NVR by IP).

The exact requirement for the number of paying station will need to be confirmed during the next design stage.

There will be 10no. pay on foot stations, 2no. per floor, which will be supplied from the floor's distribution board located in the riser.

**Electric Arm Barrier**
3no. barriers will be installed at ground floor level, and will consist of a cabinet containing motor and control equipment with a removable arm. The arm should be articulated when the barrier is placed in a location where height is restricted.

The barrier must have the following characteristics:

- When closed the arm is locked to prevent the arm being "raised" manually
- The arm must raise in less than 2 seconds.
- The arm will cause minimal injury or damage if the barrier closes on a person or vehicle
- The arm (or mounting) will shear if impacted to protect the motor and housing
- The arm can be replaced easily with the minimum of tools
- The arm must be visible at night, e.g. using lights and/ or reflector strips
- The arm can be mechanically locked in the open position
- The barrier has sensors to alert the PARCS if The barrier remains in the "up" position
- The barrier arm has been broken off
- The barrier fails to open when commanded to do so .
- An intercom system will be -linked to the Council's car park management office during operational hours.

### 8.9.2 CCTV

The car park should be suitably covered by CCTV relayed back to the council's security control room.

If a CCTV system is installed it must include a digital recorder (DVR) that allows for the images to be downloaded along with the appropriate software to enable them to be viewed on another system. The digital recorder must be kept in a secure office, ideally separate to that of the CCTV system. It is strongly recommended that if there is no on-site management, a network enabled digital recorder is used.

This will permit off-site review and download as appropriate by the managing agents.
As a general guide the following issues should be considered:

- CCTV cameras should be capable of providing images from which the person shown can be identified .
- All pedestrian and vehicle access points should be fitted with such CCTV cameras
- All lifts should be fitted with such CCTV cameras.
- Other known crime generating areas (such as bicycle or motorcycle parking areas) should be fitted with such CCTV cameras

Static cameras should be positioned to ensure that:

- Upon entry the front of the vehicle is viewed where possible
- The registration plate is easily readable when the vehicle is stationary at the barrier and a view of the front seat occupants is available
- The recorded image of the vehicle registration number is not obscured by date, time and/or recording mode
- Upon exit, the images of the vehicle registration number recorded are not obscured by the flow of traffic

Cameras installed on pedestrian entrances and exits should comply with the following:

Provide clear facial recognition for evidential purposes

Entrances and entrances should always be kept to a minimumIf there are too many pedestrian entrances or other areas of access to cover without large installations, designers should consider the following options:

- Installing cameras at ground floor lift lobbies, stairwells and ramps,offers better protection to the upper levels
- Fitting grilles/barriers to create natural choke points so that pedestrians can be channelled past a particular camera

**Card Access Control**

A online door Access Control system will be provided to access the office area, plantrooms and risers.

The system will refer back to the local IT racks located in the GF plantroom and will be linked to the wider site network.

The system will consist of proximity card readers and be online and IP based.

The physical appearance and specification of the devices are to be fit for purpose in terms of robustness, durability, functionality, infection control, and aesthetics and are to be subject to approval from the design team.

The principle for access control system will generally follow the below strategy.

The system will include the following as a minimum:

- Magnetic locks and strike plates

- Door Ironmongery
- Swipe access reader (only at secure line doors)
- Face recognition monitors for each access point
- Push to Exit green button
- Emergency green break glass unit
- Fire alarm interfaces
- Power supplies unit with 3hr battery backup
- Standby power supplies
- Data supplies
- Control panels
- Access control hubs
- Proximity cards
- Card printers
- Door status monitoring device
- Audio intercom receiving set c//w over ride facility to release the door lock located at the Labs
- Cable type - Power cables (compliant with CPR spec Dca s2 d2 a1) Thermosetting insulated
- and thermoplastic sheathed LSHF cables
- Cable type - ELV cables (compliant with CPR spec Cca, S1b, d2, a2) Thermosetting insulated
- and thermoplastic sheathed (LSHF) cables
- Provide 10% Spares and consumables
- Provide As-built information and technical literature for O&M manual
- The access control system will be online - Mains powered door access control.
- Will require power and data, door locking mechanism, Card/Face recognition Reader, Push to
- Exit button and Emergency Break Glass

The power supply Unit will require a fire alarm interface and live connection to the network data base.

**Design standards**
Some of the key design standards are described as below.

- BSEN 50133-1: 1996
- BS4737/EN50131
- NACOSS requirements.
- BS7671:2008 + A3:2015
- BS EN 60839-11-1 - (Agree Security grading with the client)
- BS EN 60839-11-2 - (Agree Security grading with the client)
- BS EN 61386-23
- BS 7671:2008 Amendment 3:2015

**IT/DATA System**
The main requirement for the car park ICT system is to provide the backbone for the car park control barriers and security that operate throughout the building and site. The IT architecture will be designed and developed in line with the Council's IT specialist. The communication system deployed throughout the site will support the communications and IT needs for the following functions and systems:

- Data communications
- Voice communications
- Telephony systems
- Mobile telephony systems
- Information display systems
- Fire notifications

Outlets will be provided as standard RJ45 outlets and the allocation as voice or data will be carried out by the departmental IT management. All cabling will be CAT6 U/ UTP.

The structure cabling works undertaken will be installed in accordance with the following requirements:

- ISO/IEC 11801 - Information Technology – Generic Cabling for Customer Premises – Class A to F
- ISO/IEC 14763-3 - Information Technology – Implementation and Operation of Customer Premises Cabling –Testing of Optical Fibre Cabling
- BS EN 68025 for optical communications
- BS EN 60950 for data communications
- BS 7671 17th Edition of the IEE wiring regulations.

The IT structured wiring system will be robust and flexible and arranged to enable integration of all technology systems, security, lighting controls, etc) onto the same cabling system and to possibly be combined onto a converged microprocessor control / monitoring system.

3no No. 1200x800 rack or similar approved by the Council will be located inside one of the risers at B02 level.as shown in the electrical layouts.

**Smart parking systems**
The car park will be implemented with a smart parking technology and a parking guidance system with displays showing free spaces at each floor.

The Smart Park system comprises of in-ground and OHI vehicle detection sensors, which are installed per bay and link up to a network of WiFi enabled SmartSpots, which in turn feed real time data into a Smart Cloud platform.

Once installed, operators can manage the parking needs of their community using the visibility that the SmartCloud dashboard provides. This not only shows live parking events, but affords users detailed site information such as parking trends and abuse of parking spaces, meaning informed decisions can be made around how the status of each individual bay is regulated. As well, detailed reports can be generated, and analysts also have the power to generate customised, targeted reporting themselves, without having to bring in external IT contractors.

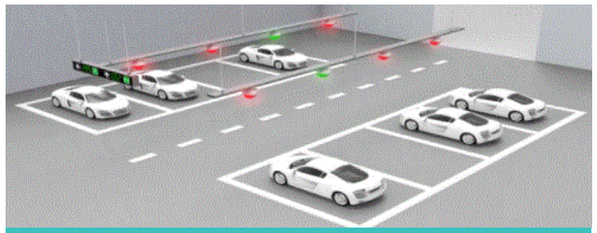


Figure 8.9


Figure 8.10

## 8.10 Electrical Utility Loads

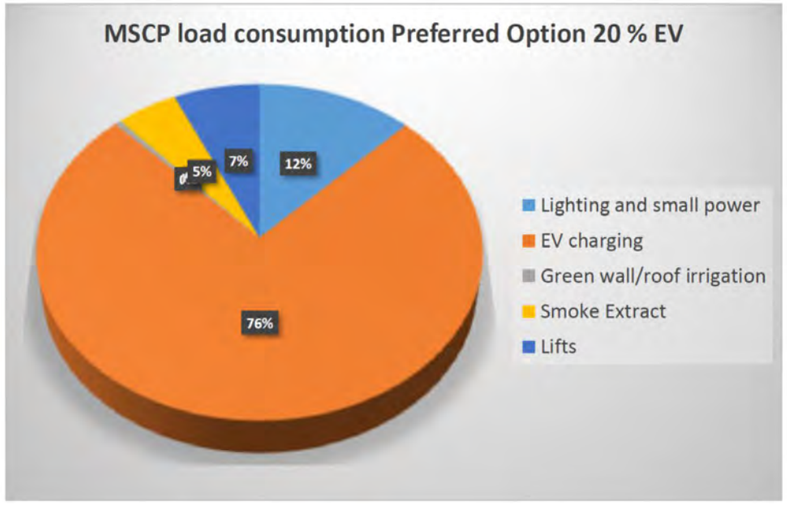
The calculated maximum demand load for the car park has been estimated as 905 kW including EV changing points.

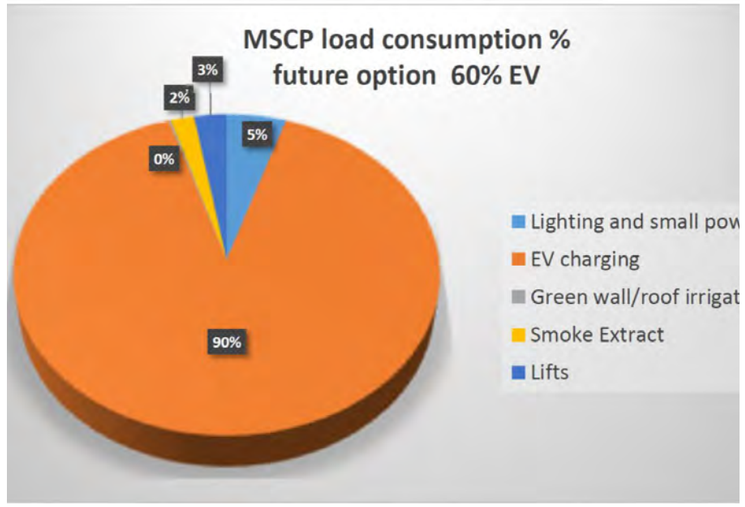
This figure can be broken down as following:

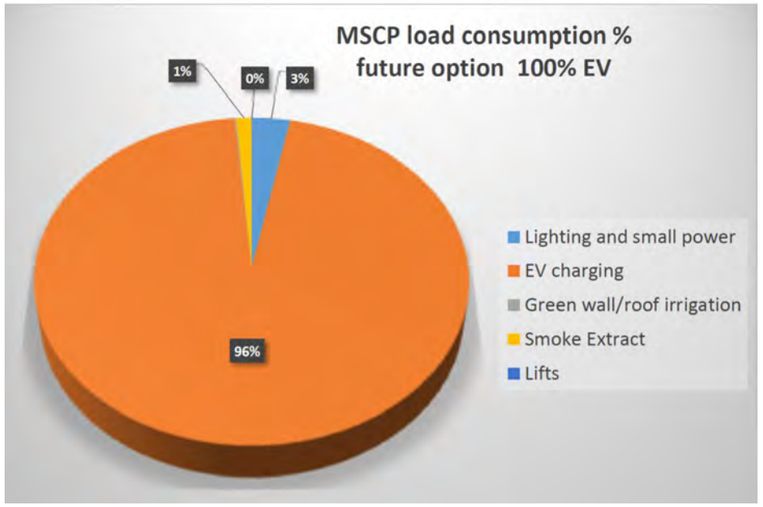
- 262 kW - MSCP load, including :
    - smoke Extract system;
    - Fire-fighting lifts;
    - Evacuation Lifts;
    - Roof Irrigation System
    - general lighting;
    - small power loads
- 388 kW - EV charging points. This figure is based on an installation of 10% points of the parking spaces (400 spaces), with 70% of these based on 7.4kW (slow charging) , 20% based on 22kW (fast charging), and 10% based on 43 kW (rapid charging).

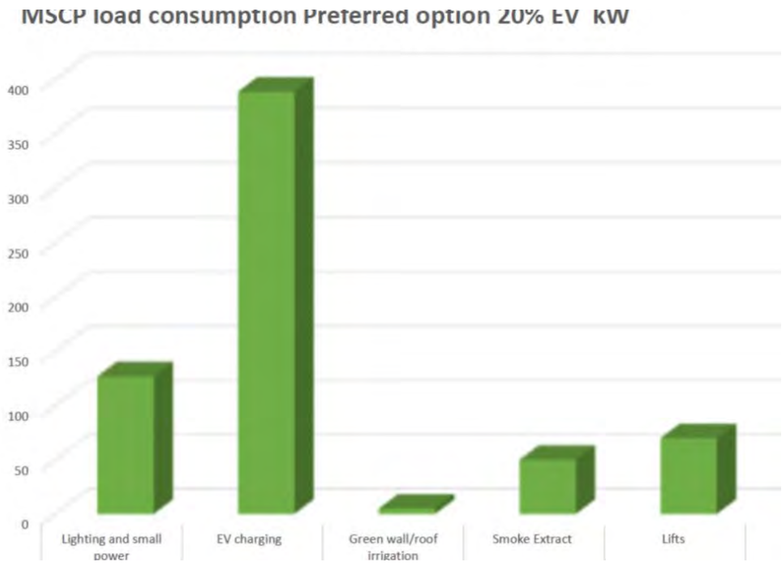
The MSCP load would be supplied from a new car park substation.

In the pictures below the load consumptions per type of load for 3no. different EV charging future options are compared.

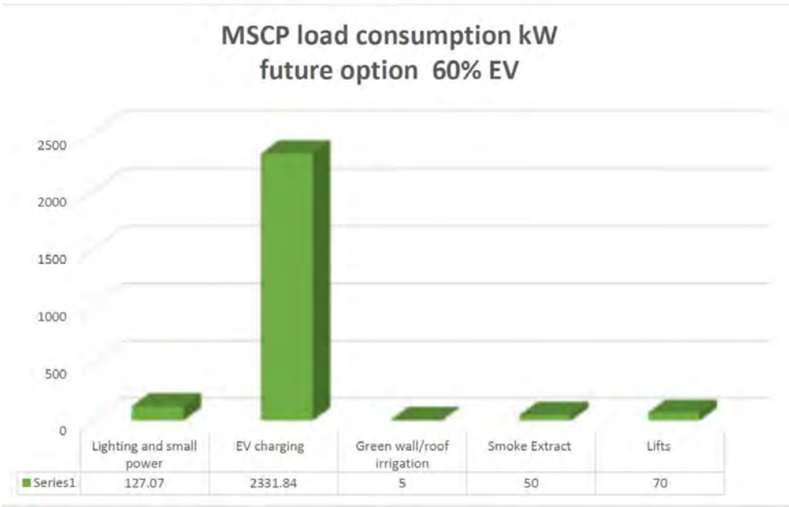


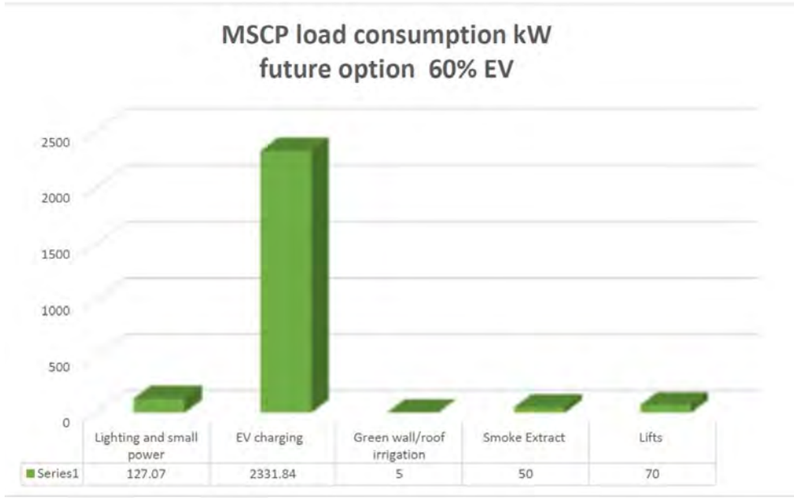




8.11 Load comparison. 20% EV charging option




8.12 Load comparison. 60% EV charging option




8.13 Load comparison. 100% EV charging option

# 9.0 Utilities

## 9.1 Introduction

This chapter describes the existing utility infrastructure located within and immediately surrounding The SEAM Site (Phase 1). Existing utility infrastructure has been identified from a combination of asset plans from various relevant utility providers, and also from Topographical and Ground Penetrating Radar (GPR) Surveys carried out within the site.
This chapter also describes how estimated loadings have been derived for the proposed re-development of the site.

## 9.2 Existing Utilities

### 9.2.1 Electricity

Within the Phase 1 development site area, below ground electrical cabling has been identified from GPR Surveys. A main cable route enters the site from County Way at the south-west corner of the site, and runs through the existing car parks, extending all the way to the northern edge of the site, with various spurs extending towards lighting columns and payment machines. This cable route extends under the proposed footprint of the Multi Storey Car Park.

Other than a short length where this cable route enters the site at the south-west corner, this cabling is not shown on Northern PowerGrid asset plans. It is therefore assumed that these electrical cables are Low Voltage (LV) and will become redundant upon redevelopment of the site.

Beyond the Phase 1 site boundary, Northern PowerGrid asset plans show that there are established LV networks within the public highway domain serving existing adjacent development. 33kV routes are also indicated close to the site boundary close both at the Old Mill Lane / County Way junction to the north, and at the Regent Street / County Way junction to the south.

### 9.2.2 Gas

Within the Phase 1 development site area, one below ground gas main has been identified from GPR Surveys. This extends from County Way to the south-west and runs parallel to the adjacent Digital Media Centre (DMC) building under the initial access road into the existing car parks on the site. The gas main then extends up to the DMC building and appears to serve this building alone. This gas main is also identified on Cadent Gas asset plans of the area, where it is shown as a 90mm Low Pressure Main.

This existing gas main would need to be diverted or retained as part of the development proposals.
Beyond the Phase 1 site boundary, Cadent Gas asset plans show that there are established Low Pressure networks within the public highway domain, serving existing adjacent development. These extend into the site to the south-west, as described above, and close to the site to the north, within Old Mill Lane.

### 9.2.3 Potable Water

Within the Phase 1 development site area, only one short length of water pipework was identified from GPR Surveys. This enters the site towards the north and appears to be connected to a single fire hydrant within the existing car parks on the site. This connection is not shown on Yorkshire Water asset records, which also show no other existing water mains within the site.
Beyond the Phase 1 site boundary, Yorkshire Water asset plans show that there are existing water mains within the surrounding public highway domain, including a 5-inch cast iron main within Regent Street to the south of the site, and both 9-inch and 180mm mains within Old Mill Lane to the north of the site.

### 9.2.4 Drainage

Within the Phase 1 development site area, there are two separate surface water drainage networks identified on GPR Surveys. Neither of these are shown on Yorkshire Water asset plans, and it is therefore assumed that these are private, and appear to be draining the existing car parks on the site.
The first network appears to drain the southern part of


Figure 9.1: Photograph of the DMC02 building

the site, with a 150mm outfall pipe shown discharging from the site eastwards Eldon Street, where it is presumed this connects to the public surface water sewer system. The second network appears to drain the northern areas of the site, including the area under the proposed footprint of the Multi Storey Car Park with a 150mm outfall pipe shown discharging from the site northwards Old Mill Lane, where again it is presumed this connects to the public surface water sewer system. It is presumed both of these systems will become redundant upon redevelopment of the site.

Beyond the Phase 1 site boundary, Yorkshire Water asset plans show both foul and surface water sewer networks in the surrounding public highway domain, which generally convey flows from west to east. In Eldon Street to the south-east of the site, the asset plans show a 450mm diameter surface water sewer and a 225mm diameter foul sewer. In Old Mill Lane to the north of the site, the asset plans show a 680mm diameter surface water sewer and a 300mm diameter foul sewer.

### 9.2.5 Telecommunications

Within the Phase 1 development site area, there are several telecommunications cables identified on GPR Surveys. These are situated towards the southern end of the existing car parks within the site. Some of this existing cabling appears to serve CCTV within the car park, but the purpose of other cable routes is not clear from the survey. It may be that some of these cable routes served the previous council buildings which used to occupy the central area of the site and are now redundant.

No assets are indicated within the site boundary on asset plans received from Cable & Wireless, CityFibre, Virgin Media, or Vodafone. BT Openreach asset plans do indicate above and below ground cable routes towards the north of the site, though these do not appear to have been identified on the GPR Survey. Again, it is possible that these cable routes served the previous council buildings which used to occupy the central area of the site and are now redundant. Beyond the Phase 1 site boundary, there are established telecommunications networks within the surrounding public highway domain indicated on various providers' asset plans, most notably BT Openreach and Virgin Media.

## 9.3 Proposed Utilities

### 9.3.1 Electricity

The peak electrical demand from Phase 1 of the proposed SEAM development has been estimated as approximately 2,250kVA. This estimate is based on the following key assumptions:

- Peak electrical demand from the MSCP estimated as 1085kW, understood to include 20% provision of Electric Vehicle (EV) charging
- Peak electrical demand from Active Travel Hub estimated as 156kW
- Peak electrical demand from proposed Retail Units and Hotel in Development Plot 1 estimated as 730kW
- Peak electrical load per proposed dwelling (assume all electric scenario) of 3.0kW, with a diversity of 0.7

A capacity enquiry and budget estimate request for the supply of electricity to the development has been submitted to Northern PowerGrid, the incumbent Distribution Network Operator (DNO). A response to this enquiry is currently awaited. Should any offsite network reinforcement works be required, these will be confirmed once a response has been received from Northern PowerGrid. In addition, requests for budget estimates have also been submitted to three Independent Distribution Network Operators (IDNOs) for comparison.

In the absence of any responses to the above enquiries, it is currently presumed that two new final distribution sub-stations will be required to serve the Phase 1 development, with HV electrical supply to these two sub-stations most likely to enter the site from Old Mill Lane to the north and run within a Primary Utilities corridor within the footway / public realm alongside the Primary Service Road. Indicative locations for the two new sub-stations are shown on the Proposed Utility Routing drawing in Appendix D.

Connections from the two new sub-stations will be formed into the different Phase 1 development components, with the first sub-station situated towards the north of the site likely to supply the MSCP, and the second sub-station situated towards the centre of the Phase 1 site likely to serve the Active Travel Hub and Development Plots 1 & 2.

### 9.3.2 Gas

The UK Government's Spring Statement of 2019 announced that from 2025, they will introduce a "Future Homes Standard" that will require new homes to be highly energy efficient and prevent the use of fossil fuel heating systems. Whilst this doesn't currently cover non-residential buildings, non-fossil fuel heating systems are likely to continue to become more common.

As a result, it is therefore presumed that none of the proposed buildings on Phase 1 of the site wide development will be gas heated, and that therefore there will be no requirement for gas to be supplied to the development. If gas were to be required, it is likely to enter the site from Old Mill Lane to the north and run within the Primary Utilities corridor within the footway / public realm alongside the Primary Service Road extending beyond the southern end of this service road to supply the Active Travel Hub.

### 9.3.3 Potable Water

- The peak water demand from Phase 1 of the proposed site wide development has been estimated
- as 6.2l/s, based on the following key assumptions:
- Daily water demand from the MSCP of 3,000 litres
- Daily water demand from the ATH of 1,500 litres
- Daily water demand from residential buildings based on 120 litres/person/day as recommended in The Code for Sustainable Homes (2010)

A Pre-Planning Enquiry has been submitted to Yorkshire Water to confirm whether there is sufficient spare capacity within the existing local network to supply the development. A response to this enquiry is currently awaited. Should any offsite network reinforcement works be required, these will be confirmed once a response has been received from Yorkshire Water. In the absence of any responses to the above enquiry, it is currently presumed potable water supply to the development will be most likely to enter the site from Old Mill Lane to the north and run within a Primary Utilities corridor within the footway / public realm alongside the Primary Service Road.

### 9.3.4 Drainage

Proposals for new drainage infrastructure to serve the development are described in Chapter 6 of this document.

### 9.3.5 Telecommunications

New telecommunications connections are currently presumed to be most likely to enter the site from Old Mill Lane to the north and run within a Primary Utilities corridor within the footway / public realm alongside the Primary Service Road.

A search on BT Openreach's website suggests that Full Fibre to the Premises (FTTP) is not currently available in the area, but that Superfast Fibre to the Cabinet (FTTC) is available, offering speeds of up to 80Mbps.

# 10.0 Transport

## 10.1 Introduction

### 10.1.1 Background

The Blueprint for The Seam project proposes the comprehensive redevelopment of 7 plots of land located on either side of County Way, which runs north-south through the site between Old Mill Lane and Regent Street.

The transportation vision for the development is create virtually a car free with existing and new public spaces that are dominated by pedestrians and cyclists.

A significant proportion of The Seam masterplan proposes to redevelop existing Council owned and operated car parking. Specifically Phases 1 (Plots 1 & 2), Phase 2 (Plots 3 & 4), and Phase 3 (Plot 5).

Plot 7 within Phase 3 is a private car park (barrier controlled) for The Core building.

It was, however, recognised that demand car parking will remain in this part of the town centre, particularly for commuters using the railway station and some town centre employees. Consideration of and potential for The Seam land uses, such as residential and commercial uses, to also be able to use the proposed facility.

Figure 10.1 refers.

### 10.1.2 Phase 1

Phase 1 of The Seam is currently a surface car park with spaces for a total of 444 vehicles which are split between long stay and short stay, as shown below:

- The Seam Lower Red Bays (Short Stay) = 182
- The Seam Lower White Bays (Long Stay) = 262

Source: Barnsley Council Commercial Services

Currently a portion of the white bays (approximately 60 spaces) at the northern end is being used as a temporary Covid test centre.

Phase 1 is proposed to contain a Multi-Storey Car Park (MSCP) for approximately 400 car parking spaces.

10.1.3 Purpose of Section 10

The purpose of this section of the report are to:

- Summarise the work to validate the Blueprint assumption for the capacity of the MSCP;
- Set out the vehicular access to the MSCP from the highway; and
- Explore possible options for improvements, if required, to the off-site movement network with a focus upon the junction of County Way with Old Mill Lane

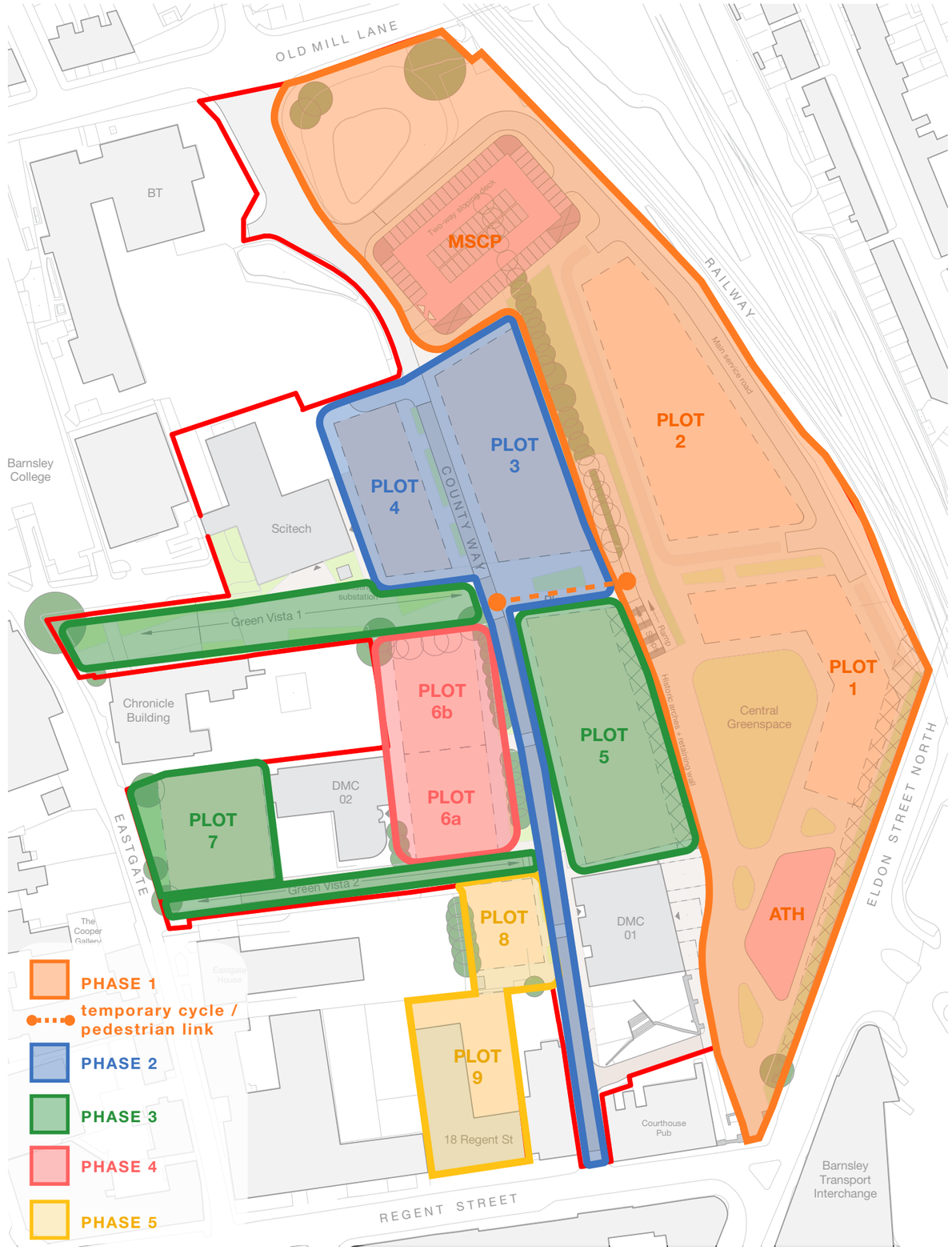



Figure 10.1: The Seam Phasing & Plots

## 10.2 Validation of MSCP Capacity

### 10.2.1 Current Parking Supply (The Seam)

There are currently 921 public car parking spaces within the boundary of The Seam project. They break down as follows:

- The Seam Lower Red Bays (Short Stay) = 182
- The Seam Lower White Bays (Long Stay) = 262
- The Seam Upper (Long Stay) = 477

*Source: Barnsley Council Commercial Services*

Currently 60 spaces at the northern end of Seam Lower are being used as a temporary Covid test centre.

### 10.2.2 Current Parking Occupancy

Barnsley Council are currently collecting car parking occupancy data for all car public car parks in the town centre daily. The project team has received parking data for the following periods:

- Weekdays – Week beginning 04th October 2021 to the week beginning 01st November 2021
- Saturday – Week beginning 27th September 2021 to the week beginning 01st of November
-

Occupancy is measured on weekdays and a Saturday for the time periods of 08:30, 12:00, and 16:00.

#### 10.2.2.1 Summary Weekday Data

Below is a summary of the findings from the weekday data.

- The average daily occupancy across the 5-week survey period for all 3 car parks was 41%. This equates to on average total occupancy of 435 spaces.

- The maximum occupancy by week does not deviate significantly from the survey period average. The maximum average occupancy was as follows:

o Seam Lower Red = 37% / 67 spaces (Week 8)
o Seam Lower White = 30% / 79 spaces (Week 5)
o Seam Upper All = 70% / 334 spaces (Week 5)

#### 10.2.2.2 Summary Saturday Data

Below is a summary of the findings from the analysis of the Saturday data.

- The average Saturday occupancy across the 6-week survey period for all 3 car parks was 61%. This equates to on average occupancy of 578 spaces.
- The maximum observed average occupancy for each car park across the survey period does not deviate significantly for Seam Lower White Bays from the survey period average. However, the Lower Red Bays and Upper All does show a significant increase in demand. The data collected shows that the maximum average occupancy was as follows:

o Seam Lower Red = 99% / 180 spaces (week 8)
o Seam Lower White = 31% / 81 spaces (Week 5)
o Seam Upper All = 98% / 467 spaces (Week 5)

Taking this trend, the aggregate maximum Saturday occupancy is 467 spaces.

#### 10.2.2.3 Wider Town Centre Capacity

The data shows that there is capacity across the town centre car parks to accommodate displaced parking.

The data shows that, for example, the most modern parking facility for shoppers in the Glass Works during the same period peak at 64% capacity (298 vehicles) with space for an additional 167 vehicles.

Across the whole town centre, during the survey period, the survey data shows that occupancy by type of user is as follows:

- Weekday Commuter = 45%
- Weekday Shopper = 23%
- Saturday = 51%

#### 10.1.2.4 Conclusions

The findings were discussed with the Council on the 19th November 2021. This concluded that current occupancy levels of The Seam car parks will continue, and that there is sufficient capacity across the parking network. As such, a 400 space car park is a valid assumption.

**Figure 10.2: Car Parking within the Boundary of The Seam**

## 10.3 Vehicular Access to MSCP

### 10.3.1 Options Considered

The design team considered several different layout options for the car park to maximise efficiency and minimise the costs. In terms of access and egress there were 3 configurations that were considered:

1. Access and Egress onto County Way.
2. Access and Egress onto County Way, with a separate parking facility at lower ground with access/egress on new road associated with Plots 1 and 2.
3. Access from Plot 1 & 2 access road and egress onto County Way.

Through consultation with the Council, it was decided that the most efficient layout would be option 3 listed above. One of the key considerations for the placement of the entrance from the lower ground floor from the new access road is that it provides significant space for vehicles to queue to enter during busy times. This reduces the risk that queueing vehicles may block back on to Old Mill Lane, which is a road safety hazard.

Access and egress is via 2 x lanes, with the egress being dedicated right and left turn lanes, subject to agreement with the Local Highway Authority.

To further reduce the risk of queueing back on Old Mill Lane, either from high demand and / or failure of barriers, it is proposed that access will be barrier free with Automatic Number Plate Recognition (ANPR).

Exit will be barrier controlled for both security of users' vehicles and revenue protection.

Figure 10.3 shows vehicle tracking through the car parking using both access and agrees lanes.

### 10.3.2 Access Route / Road

The Seam Blueprint proposed a new access road along the eastern boundary of Phase 1 to provide access to Plot 1 and Plot 2. This has been taken forward in this stage of the masterplan.

The road makes use of the existing junction onto County Way at the northern end of the Seam Lower car park. Moves around the proposed footprint of the MSCP, providing access, and then southward to serve Plot 1 and Plot 2. key design considerations in determining the geometry and alignment of the road were:

- Forward vehicle to vehicle visibility as the road turns around the northeast corner of the MSCP.
- Sufficient off-set from the eastern boundary to incorporate potential need for vehicle retention to stop vehicles entering operational railway land.
- Provision of 2m width footway around the edge of the MSCP and onwards to Plot 1 and Plot 2.
- Sufficient width to allow turning into the MSCP access and safe passing of the vehicles using the route, for example refuse trucks.

The main change to the Blueprint layout was to address the insufficient vehicle to vehicle visibility. The in-bound lane has been shifted slightly north to allow for an acceptable visibility envelope to be achieved. An overrun area, which can be a ghost island or an opportunity for gateway landscaping, is to be provided on the bend.

Figure 10.4 shows the layout on approach to the MSCP.

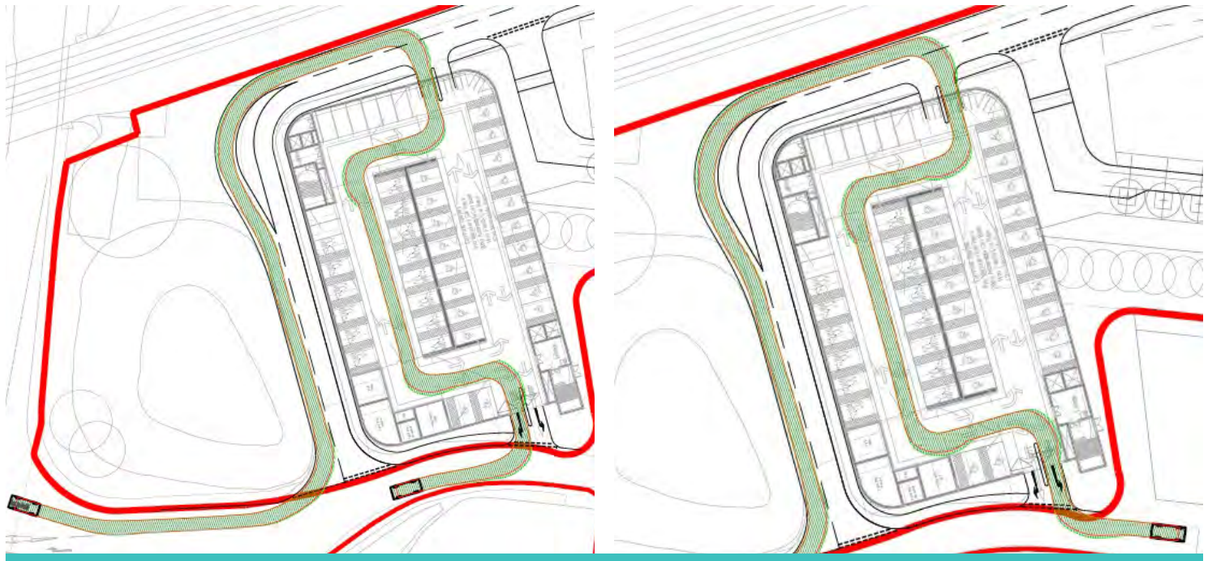


Figure 10.3: Tracking Through the MSCP

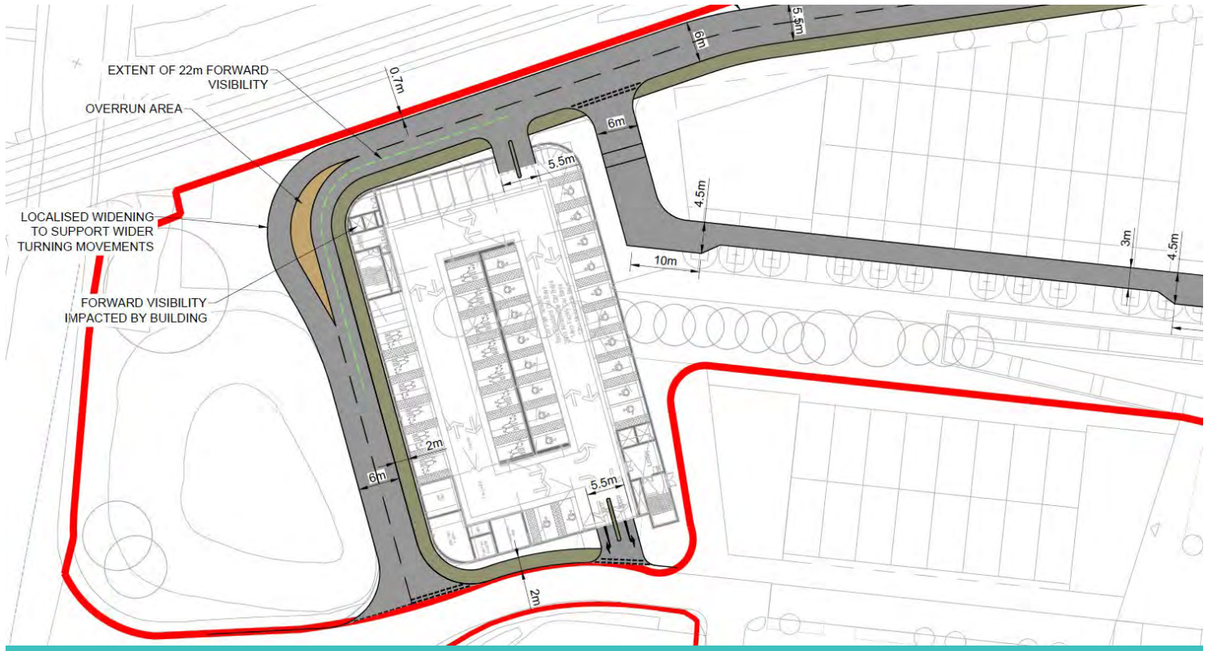



Figure 10.4: Proposed Layout of Access Road to MSCP and Plot 1 and Plot 2

## 10.4 Off-Site Infrastructure

The brief for Phase 1 required the design team to develop options for the junctions of County Way with Old Mill Lane and Regent Street with Eldon Street.

This report (MSCP) sets out potential options for County Way / Old Mill Lane junction – Section 10.4.1 of this report. The team were tasked with preparing a Transport Assessment for a Phase 1 to 5 to accompany a planning application for Phase 1. The conclusions are summarised in Section 10.4.2 of this report.

### 10.4.1 Off-Site Infrastructure

The design team meet the Local Highway Authority 12th December 2021 to discuss the approach to potential interventions to the junction of County Way with Old Mill Lane. The key points raised were:

- The Council's traffic signals team are unlikely to support signalisation of this junction given the proximity to the critical junctions of Old Mill Lane / Huddersfield Road (A635) to the west, and Old Mill Lane / Eldon Street North, to the east.
- The junction has a large footprint and makes it difficult for pedestrians to cross. The mouth of County Way is very wide and the only safe crossing point for Barnsley College, directly opposite County Way, is a narrow refuge 20m to the west.
- The production of options for the junction to improve for pedestrians is sufficient for informing the costings for Phase 1 but will need to be revisited during the Transport Assessment.

The design team have prepared 2 options for the junction to improve the environment for pedestrians to allow for safer crossing of Old Mill Lane and mouth of County Way. Option 1 is shown in Figure 10.5 and Option 2 is shown in Figure 10.6.

#### 10.4.1.1 Option 1

Option 1 proposes to remove the diverge taper from the Old Mill Lane westbound (left turn) and widen the footway and refuge island. This reduces the width of County Way to cross by approximately 3 to 4m. The option proposes to introduce a pedestrian refuge on Old Mill Lane to the east.

#### 10.4.1.2 Option 2

Option 2 is the same as Option 1, but reduces the number of lanes on County Way to 1 and widens the narrow footway on the west side of County Way by 2m.

### 10.4.2 Transport Assessment

The design team met with the Local Highway Authority on the 11th November 2021 to discuss the scope of a Transport Assessment that covers Phase 1 to Phase 5 of The Seam Blueprint.

The scope of the Transport Assessment to examine possible wider implications of The Seam development is agreed to take place in the next stage of work.

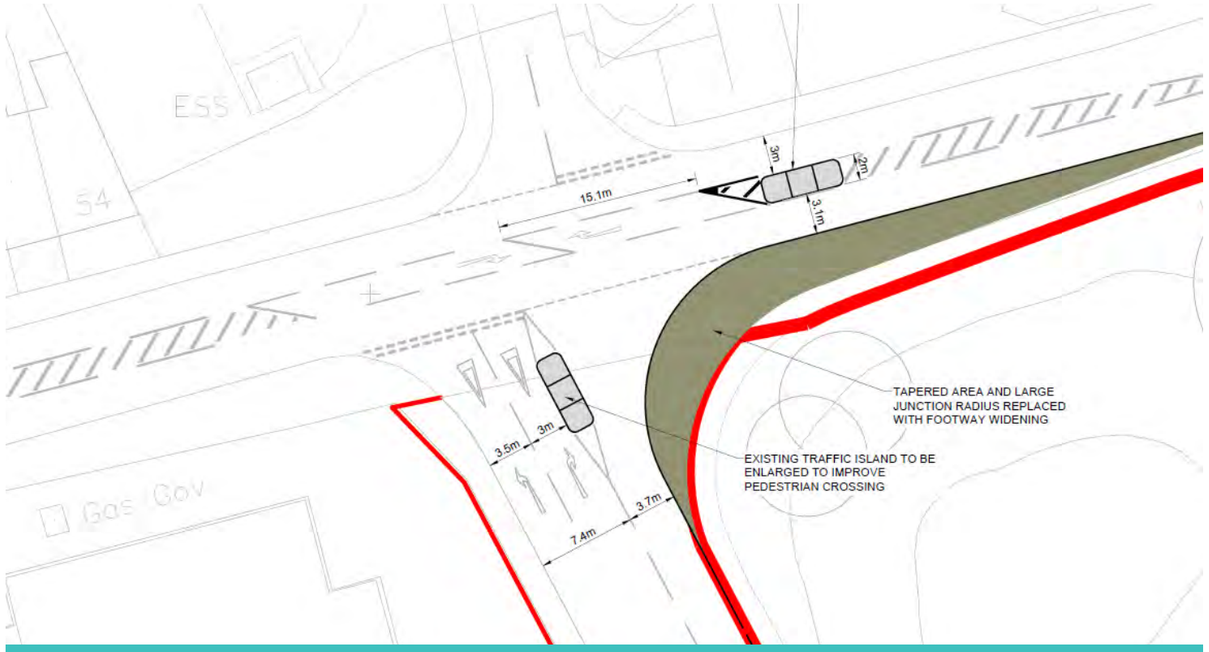



Figure 10.5: Option 1 County Way / Old Mill Lane

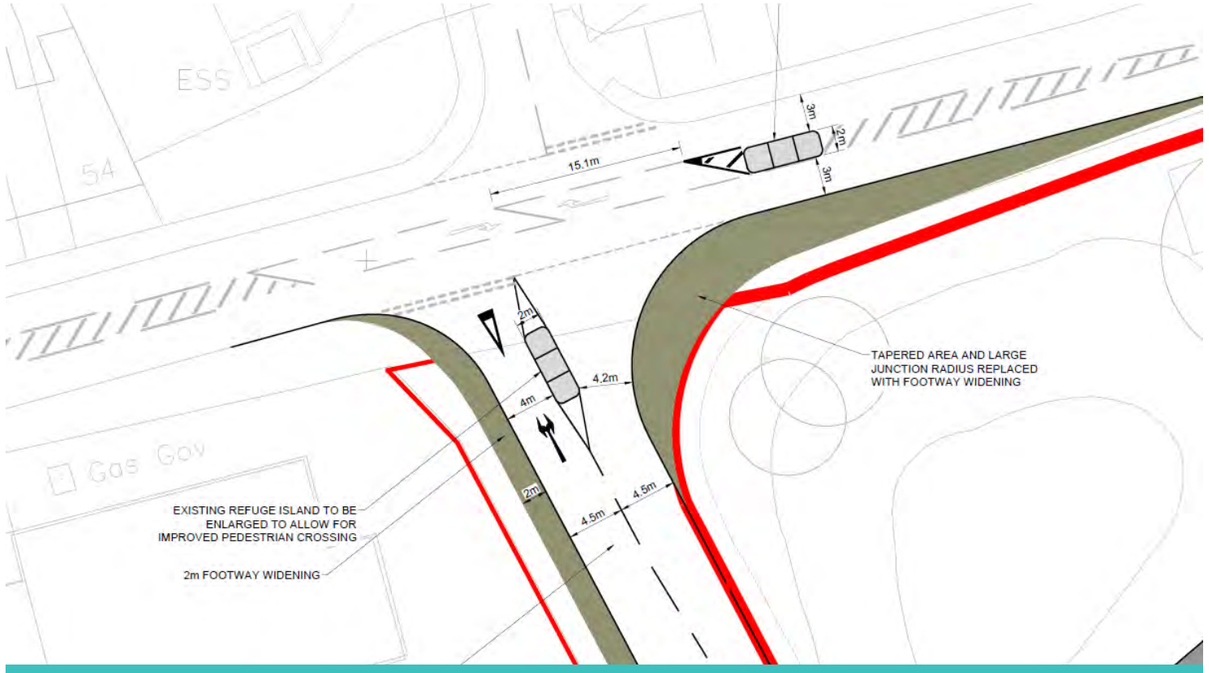



Figure 10.6: Option2 County Way / Old Mill Lane

# 11.0 Sustainability

## 11.1 Introduction

Reflecting Barnsley Metropolitan Borough Council's (BMBC's) strong sustainability and climate change agendas, sustainable development is a key driver and major priority for the Seam. Jointly appointed to develop the overall sustainability strategy, the BDP and Arcadis sustainability consultants have worked closely with BMBC and the design team to develop the sustainability outcomes and targets (referred to as "outputs" within this document) for the Active Travel Hub (ATH), multi-storey car park (MSCP), Plots 1 and 2, and the public realm.

This section of the report details:

- The methodologies employed to derive the sustainability outcomes and outputs.
- The agreed strategy, including measurable, ambitious and unambiguous outputs.
- Where applicable, the design response, to date.

## 11.2 Methodology

Establishing the Vision and Outcomes:

The vision and outcomes reported have been developed through:

A review of the sustainability objectives and targets set out within:

- o Barnsley Local Plan 2012 – 2033
- o Barnsley Zero Carbon Sustainable Energy Action Plan 2020 – 2025
- o The Seam Barnsley Digital Campus Development Blueprint

- A workshop with the design team and Barnsley Metropolitan Borough Council (BMBC). The aim of the workshop, held on 18th November 2021, was to:
  - o Review and agree the overall vision and outcomes for Phase 1.
  - o Highlight any wider ambitions or stretch targets.
- Further liaison with the design team and BMBC to further develop the outcomes in line with their overarching ambitions. This included separate meetings with BMBC's Sustainability and Climate Change Group Leader.

Establishing the Outputs and the Sustainability Strategy:

The purpose of establishing the outcomes was to allow them to serve as underlying design principles, underpinning the overall strategy, and allowing the project team, supported by the BDP and Arcadis Sustainability Consultants, to set measurable, ambitious and unambiguous targets / outputs relevant to environmental, social and economic sustainability.

Based on each outcome, a number of outputs and KPIs were established, based on best practice. Best practice was established through a review of the following documents and frameworks:

- Barnsley Local Plan 2012 – 2033
- Barnsley Zero Carbon Sustainable Energy Action Plan 2020 – 2025
- Barnsley Sustainable Travel SPD (Draft document November 2021)
- LETI Climate Change Emergency Design Guide
- UKGBC guidance
- RIBA 2030 Climate Challenge (v2)
- BREEAM New Construction 2018
- BREEAM Communities
- WELL Building Standard v2
- WELL Building Standard Communities
- Home Quality Mark
- CEEQUAL v6
- Future Buildings Standard
- Future Homes Standard
- Living Buildings Challenge

The KPIs and outputs set have been linked to the Barnsley Council Plan 2021 - 2024, which sets out key ambitions for the Borough, and to demonstrate the alignment the Phase 1 delivery with Barnsley's sustainability and climate change agenda:

**Barnsley - the place of possibilities**

| Healthy Barnsley | Learning Barnsley | Growing Barnsley | Sustainable Barnsley |
|---|---|---|---|
| People are safe and feel safe. | People have the opportunities for lifelong learning and developing new skills including access to apprenticeships. | Business start ups and existing local businesses are supported to grow and attract new investment, providing opportunities for all. | People live in great places, are recycling more and wasting less, feel connected and valued in their community. |
| People live independently with good physical and mental health for as long as possible. | Children and young people achieve the best outcomes through improved educational achievement and attainment. | People have a welcoming, safe and enjoyable town centre and principal towns as destinations for work, shopping, leisure and culture. | Our heritage and green spaces are promoted for all people to enjoy. |
| We have reduced inequalities in health and income across the borough. | People have access to early help and support. | People are supported to have safe, warm, sustainable homes. | Fossil fuels are being replaced by affordable and sustainable energy and people are able to enjoy more cycling and walking. |

**Enabling Barnsley** We are a modern, inclusive, efficient, productive and high-performing council

For completeness, and to demonstrate the holistic and joined up approach to sustainability throughout Phase 1, the strategy presented in this document contains outcomes and outputs for the ATH, MSCP, Plots 1 and 2, and the public realm areas.

It should be noted that the sustainability strategy should remain a live document, incorporating any future updates relevant to design changes, industry trends or Council policies and agendas.

## 11.3 The Sustainability Vision

Following the workshops described in Section 11.2, the following overarching vision was agreed for Phase 1:

"To lead by example through the development of a digital SMART campus which is climate resilient and supports the 2045 "Zero45" net zero carbon target for the Borough of Barnsley. This is achieved by demonstrable contributions to the local community, wellbeing, reduced carbon emissions, and the restoration and enhancement of the natural environment. The masterplan aims to be a catalyst for carbon reduction across the local, regional, national and international communities, aspiring to be an exemplar beacon of sustainability within the built environment."

## 11.4 Sustainability Strategy

Please note the sustainability strategy should be read alongside the Landscape and Public Realm Concept Design Strategy, the Active Travel Hub Stage 2 report, and the supporting sections of this report.

| Outcome | Topic | Output | Concept Design Response Summary | Links to Barnsley Council Plan: Healthy Barnsley | Learning Barnsley | Growing Barnsley | Sustainable Barnsley | Measurement / Indicators | Metric / KPI Reference |
|---|---|---|---|---|---|---|---|---|---|
| **1. Transport and Connectivity** | | | | | | | | | |
| 1.1 In support of Barnsley's zero carbon strategy, the scheme contributes to a reduction in health inequality, improved local air quality and general health and wellbeing, and increased fossil fuel free local travel. Improvements in connectivity and quality external environments increase footfall within the area, thereby supporting local businesses, increasing revenues, and reducing crime rates.<br><br>Also refer to topics:<br>- 2.1 Multi-Functional Green Space<br>- 6.1 External Spaces | Emerging Sustainable Travel SPD Compliance | **ALL PHASE 1:**<br>A transport assessment and travel plan will be produced, in line with the emerging Sustainable Travel SPD requirements, to further inform the design and promote sustainable transport measures. | The design response will be confirmed following receipt of the interim / final transport assessment and travel plan. This will occur in the next stages of design. | ● | ● | ● | ● | Improved health and social outcomes including contributions to a reduction in presentations to GPs regarding issues such as respiratory illnesses, obesity and mental health issues such as depression.<br><br>Reduced vehicular transmissions including carbon monoxide, particulate matter and nitrogen oxides.<br><br>Increased footfall within the area and increased revenue for local businesses.<br><br>Further indicators and measures are to be confirmed on receipt of the interim / final transport assessment and travel plan. | Sustainable Travel SPD (Draft Document November 2021) |
| | Cycle Storage | **ACTIVE TRAVEL HUB:**<br>The use of bicycles as a mode of transport is promoted.<br><br>**PLOTS 1 & 2:**<br>The use of bicycles as a mode of transport is promoted. Safe and secure cycle storage is provided for residents of Plots 1 and 2. The number of cycle storage spaces required is informed by a transport assessment. Alternatively, the following is met:<br>- Studios/1 bedroom dwellings - storage for 1 cycle for every two dwellings<br>- 2/3 bedroom dwellings - storage for 1 cycle<br>- 4 + bedrooms - storage for 2 cycles | The ATH, by the very nature of its design and purpose, will promote active travel and the use of bicycles, thereby improving health and wellbeing, and reducing transport-based emissions.<br><br>The current design comprises:<br>• 98 standard spaces<br>• 5 accessible spaces<br>• 15 secure lockers for foldable bikes<br>• 4 vertical lockers for standard sized cycles<br><br>Currently, 100% of the entire provision has been assumed to require charging facilities (i.e., E-bike charging).<br><br>To support the requirements of frequent and longer stay users, lockers, showers, toilets and drying facilities are provided. Security has also been a key consideration, with double-fob entry and CCTV provided. A lobby arrangement has been proposed with two entrances to prevent 'tailgating' to gain access to the cycle storage area.<br><br>With regards to Plots 1 and 2, the requirements of this output will need to be reflected in the drawings and specifications, moving forward. | ● | | ● | ● | The number of safe and secure cycle storage spaces meet or exceed the requirements of this output.<br><br>Improved health and social outcomes including contributions to a reduction in presentations to GPs regarding issues such as respiratory illnesses, obesity and mental health issues such as depression.<br><br>Reduced vehicular transmissions including carbon monoxide, particulate matter and nitrogen oxides. | Barnsley Local Plan 2012–2033<br><br>BREEAM Communities<br><br>Home Quality Mark |

| Outcome | Topic | Output | Concept Design Response Summary | Healthy Barnsley | Learning Barnsley | Growing Barnsley | Sustainable Barnsley | Measurement / Indicators | Metric / KPI Reference |
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| **1. Transport and Connectivity** | | | | | | | | | |
| *(continued)*<br>1.1 In support of Barnsley's zero carbon strategy, the scheme contributes to a reduction in health inequality, improved local air quality and general health and wellbeing, and increased fossil fuel free local travel. Improvements in connectivity and quality external environments increase footfall within the area, thereby supporting local businesses, increasing revenues, and reducing crime rates.<br><br>Also refer to topics:<br>- 2.1 Multi-Functional Green Space<br>- 6.1 External Spaces | Pedestrian and Cyclist Routes | **PUBLIC REALM:**<br>Dedicated and safe cycle paths are provided from the site entrance to cycle storage, and connect to off-site cycle paths, where possible. For safety purposes, these are segregated from vehicles and pedestrians as appropriate:<br>- On low speed streets, below 20mph (30km/h), cyclists can be integrated with vehicles<br>- On busy streets or where there are higher traffic speeds there should be clearly defined cycle lanes<br>- Separate cycle tracks should be introduced where space allows<br>- Pedestrians and cyclists can share the same space, but steps must be taken to segregate the two, for example, a raised kerb or clear markings. Where pedestrians and cyclists share the same space but segregation is not possible, a minimum width of 3 metres should be provided.<br><br>Dedicated and safe footpaths are provided, where required. | As per the details in the Landscape Strategy, three alternative cycle routes have been considered:<br><br>1. Connecting route via the ramp and Promenade: This link allows cyclists to move through the lower areas of the masterplan and connect back onto County Way via the proposed ramp. Concerns have been raised about the risk of conflict between pedestrians and cyclists moving at speed especially along the ramp.<br><br>2. Promenade Route routing behind the MSCP: The link directs cyclists through the new space, providing opportunities for dedicated cycle path integrated into the public realm. Routing behind the MSCP appears to be less direct and could put cyclists off taking this route.<br><br>3. County Way cycle route: This route follows the line of County Way, avoiding a route through the Phase 1 project area. This route is straight and direct and could re-connect between the pub and DMC01.<br><br>Cycle route provision and layout will be considered further in the following stages.<br><br>Traffic running across the site will be restricted. However, where roads and pedestrian routes cross / run in parallel, dedicated pedestrian pathways will provided.<br><br>Compliance with the remaining requirements are to be considered as the design progresses.<br><br>Please refer to the Landscape and Public Realm Concept Design Strategy for further details. | ● | | ● | ● | The number and design of dedicated cycle and pedestrian cycle paths and routes meet or exceed the requirements of this output.<br><br>Reduced collisions between cyclists / pedestrians and motor vehicles.<br><br>Improved health and social outcomes including contributions to a reduction in presentations to GPs regarding issues such as respiratory illnesses, obesity and mental health issues such as depression.<br><br>Reduced vehicular transmissions including carbon monoxide, particulate matter and nitrogen oxides.<br><br>Increased footfall within the area and increased revenue for local businesses. | Barnsley Local Plan<br><br>BREEAM Communities<br><br>BREEAM NC 2018<br><br>Sustainable Travel SPD (Draft Document November 2021) |
| | Quality Cyclist and Pedestrian Environments | **PUBLIC REALM:**<br>Quality external environments have been designed in order to promote active travel and movement. This is demonstrated through at least two of the following being present at regular intervals along at least 75% of active travel routes:<br>- Seating<br>- Trees, planters and/or other landscaped/biophilic elements<br>- Natural (e.g. landscape elements such as trees) or man-made shading devices intended to block direct sunlight and glare<br>- Artistic installations | Based on the current landscape and public realm design, a variety of open space and green space typologies and planting will be provided alongside key travel routes. Although street furniture and artistic installations will be decided in the following design stages, based on the current design intentions, that the requirements of this output will be met. For further details please refer to the Landscape and Public Realm Concept Design Strategy (3rd Edition). | ● | | ● | ● | The number of elements / features meet or exceed the requirements of this output.<br><br>Improved health and social outcomes including contributions to a reduction in presentations to GPs regarding issues such as respiratory illnesses, obesity and mental health issues such as depression.<br><br>Reduced vehicular transmissions including carbon monoxide, particulate matter and nitrogen oxides.<br><br>Increased footfall within the area and increased revenue for local businesses. | BREEAM Communities |

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| **1. Transport and Connectivity** | | | | | | | | | |
| *(continued)*<br>1.1 In support of Barnsley's zero carbon strategy, the scheme contributes to a reduction in health inequality, improved local air quality and general health and wellbeing, and increased fossil fuel free local travel. Improvements in connectivity and quality external environments increase footfall within the area, thereby supporting local businesses, increasing revenues, and reducing crime rates.<br><br>Also refer to topics:<br>- 2.1 Multi-Functional Green Space<br>- 6.1 External Spaces | Connectivity | **PUBLIC REALM:**<br>A connected campus is created, identifiable by its use of planting, where varied green space and green infrastructure links combine to establish legible active travel routes throughout the site. | A movement framework has been developed as part of the Landscape Strategy to determine the layout and design of the streetscape, and hence promote sustainable modes of movement and transport.<br><br>As per the details in the Landscape Strategy, the change of level along the edge creates a distinct landscape setting with proposed ramp, sloping and terraced landscapes and attractive walkways. At the core of the public realm masterplan there is an opportunity to establish an attractive network of routes, and green spaces based along a main north-south axes that leads towards the town centre.<br><br>As per the details in the Landscape Strategy (section "Movement Strategy), the 'Promenade' will generate the greatest footfall and will be founded on the creation of a high quality public realm and a diverse and high quality green landscape infrastructure, which will interface with a new greenspace, proposed development and ATH building and other community facing amenities, such as DMC01, a cafe and other leisure uses. New tree planting and a green infrastructure of bio-diverse rich planting will give rise to a greener neighbourhood with strong sustainable principles.<br><br>Current proposed active travel routes will allow easy navigation around the development using key features to aid navigation. As the design progresses, the following principles shall remain embedded within the design:<br>- New routes into the development are a continuation of existing routes from the surrounding area<br>- Routes connect residential areas to, and between, community focal points in the development and surrounding area<br><br>As per the current landscape designs, the primary, secondary and tertiary routes identified create legible travel routes. All will be provided with tree planting and green space provision. | ● | | ● | ● | The number and design of active travel route meets or exceed the requirements of this output.<br><br>Improved health and social outcomes including contributions to a reduction in presentations to GPs regarding issues such as respiratory illnesses, obesity and mental health issues such as depression.<br><br>Reduced vehicular transmissions including carbon monoxide, particulate matter and nitrogen oxides.<br><br>Increased footfall within the area and increased revenue for local businesses.<br><br>Improved real-estate value. | BREEAM Communities |
| | Wayfinding | **PUBLIC REALM**<br>Wayfinding signage detailing directions and route information is provided to aid active travel around the development and into the surrounding area, contributing to accessibility, reduced stress and user empowerment. Signage includes the following:<br>- Forward-facing street map that includes street names<br>- Basic cardinal directions<br>- Designation of active travel routes<br>- Identification and location of, distance to and/or time to key community focal points such as those within an 800m walk distance or bicycle ride<br><br>Where appropriate and feasible, wayfinding is connected to the SMART Technology Strategy. | Wayfinding solutions will be developed in the later stages of the design. | ● | | ● | ● | The signage design and links to SMART technologies meets or exceed the requirements of this output.<br><br>Improved health and social outcomes including contributions to a reduction in presentations to GPs regarding issues such as respiratory illnesses, obesity and mental health issues such as depression.<br><br>Reduced vehicular transmissions including carbon monoxide, particulate matter and nitrogen oxides.<br><br>Increased footfall within the area and increased revenue for local businesses.<br><br>Improved real-estate value. | BREEAM Communities<br><br>WELL Communities |

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| **1. Transport and Connectivity** | | | | | | | | | |
| *(continued)*<br>1.1 In support of Barnsley's zero carbon strategy, the scheme contributes to a reduction in health inequality, improved local air quality and general health and wellbeing, and increased fossil fuel free local travel. Improvements in connectivity and quality external environments increase footfall within the area, thereby supporting local businesses, increasing revenues, and reducing crime rates.<br><br>Also refer to topics:<br>- 2.1 Multi-Functional Green Space<br>- 6.1 External Spaces | Safety and Security | **PUBLIC REALM:**<br>Street layouts and the design of pedestrian and cycle routes are safe and secure by incorporating the following:<br>- In residential areas, all streets and open spaces are overlooked<br>- All access points and routes through the site are well lit, direct and overlooked<br>- Pedestrian crossings are designed to ensure safety for all users<br>- A clear distinction is made between public, semi-public and private external spaces<br><br>Design measures are incorporated into the masterplan to ensure safety with regard to large vehicles, pedestrian and cyclist movement. As a minimum, vehicle delivery areas are not accessed through parking areas and do not share pedestrian and cyclist routes. | Compliance with these requirements will be demonstrated as the design progresses and the site layout is confirmed. Current safety features include, for example, provision of HMV bollards, and well lit cyclist and pedestrian routes. | ● | | ● | ● | The number of safety measures meet or exceed the requirements of this output.<br><br>Provision of appropriate cycle and pedestrian paths.<br><br>If required, number of pedestrian crossings.<br><br>Reduced local crime rates.<br><br>Reduced collisions between cyclists / pedestrians and motor vehicles. | BREEAM Communities<br><br>BREEAM NC 2018<br><br>Home Quality Mark |
| | Car Sharing | **MULTI-STOREY CAR PARK:**<br>To promote car sharing, priority parking spaces are provided for at least 5% of the total car parking capacity. Spaces are located nearest the development entrance.<br><br>Where appropriate, the promotion of car sharing may be linked to the SMART Technology Strategy. | This concept and outcome will be considered further in the next stages of the design. | ● | | ● | ● | The % car sharing spaces meets or exceed the requirements of this output.<br><br>Improved health and social outcomes including contributions to a reduction in presentations to GPs regarding issues such as respiratory illnesses.<br><br>Reduced vehicular transmissions including carbon monoxide, particulate matter and nitrogen oxides. | BREEAM Communities<br><br>BREEAM NC 2018 |
| | Electric Vehicle Charging Points | **MULTI-STOREY CAR PARK:**<br>At least 10% of parking spaces incorporate electric vehicle charging points. The minimum charging point specification shall be mode "3", 32AMP, 7kW.<br><br>Infrastructure is provided for future provision, and to meet a 20% target.<br><br>**PLOTS 1 & 2, PUBLIC REALM:**<br>If private / in-plot parking is provided, 1 EV charging point is provided per dwelling. Where unallocated parking is provided for residents, EV charging points are provided for at least 10% of spaces. The minimum charging point specification shall be mode "3", 32AMP, 7kW. | The current MEP design of the MSCP includes charging points for 10% of parking spaces. Of this 10%:<br>- 70% will be slow charging spaces (7.4kW)<br>- 20% will be fast charging spaces (22kW)<br>- 10% will be rapid charging spaces (43kW)<br><br>Infrastructure allowing for future additional provision (20% of parking spaces) is allowed for in the design.<br><br>The requirements and responses for the remainder of the development will be confirmed in the next stages of design. | ● | | ● | ● | The % EV charging points >7kW meets or exceed the requirements of this output.<br><br>Improved health and social outcomes including contributions to a reduction in presentations to GPs regarding issues such as respiratory illnesses.<br><br>Reduced vehicular transmissions including carbon monoxide, particulate matter and nitrogen oxides. | BREEAM NC 2018<br><br>Building Regulations Part S (2021)<br><br>Home Quality Mark<br><br>Sustainable Travel SPD (Draft Document November 2021) |

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| **1. Transport and Connectivity** | | | | | | | | | |
| *(continued)*<br>1.1 In support of Barnsley's zero carbon strategy, the scheme contributes to a reduction in health inequality, improved local air quality and general health and wellbeing, and increased fossil fuel free local travel. Improvements in connectivity and quality external environments increase footfall within the area, thereby supporting local businesses, increasing revenues, and reducing crime rates.<br><br>Also refer to topics:<br>- 2.1 Multi-Functional Green Space<br>- 6.1 External Spaces | SMART Parking Technologies | **ACTIVE TRAVEL HUB AND MULTI-STOREY CAR PARK:**<br>As part of the wider SMART Technologies Strategy, SMART technologies are employed to reduce traffic congestion, improve parking management, reduce pollution and optimise the use of available spaces. | As per the MEP strategy, allowance has been made for an IoT-based system within the ATH and MSCP to allow for the communication of free and occupied bike parking (ATH) and car parking (MSCP) spaces over web or mobile applications. The SMART parking system comprises of bike sensors, which are installed per cycle bay and link up to a network of WiFi enabled SmartSpots, which in turn feed real time data into a SmartCloud platform. This will not only show live parking events, but affords users detailed site information such as parking trends and abuse of parking spaces, allowing informed decisions to be made around how the status of each individual bay is regulated. | ● | | ● | ● | Improved health and social outcomes including contributions to a reduction in presentations to GPs regarding issues such as respiratory illnesses.<br><br>Reduced vehicular transmissions including carbon monoxide, particulate matter and nitrogen oxides.<br><br>Increased footfall within the area and increased revenue for local businesses.<br><br>Reduced overhead costs associated with parking meters and enforcement effectiveness. | Bespoke |
| **2. Biodiversity and Green Infrastructure** | | | | | | | | | |
| 2.1 Opportunities for nature are increased. This is achieved through the provision of quality habitats which are joined up at all scales, and which enhance human health and wellbeing, support wildlife corridors, enhance climate resilience and deliver environmental benefits.<br><br>Also refer to topics:<br>- 1.1 Quality Cyclist and Pedestrian Environments<br>- 1.1 Connectivity<br>- 3.1 Urban Heat Island Mitigation<br>- 3.2 Nature-Based SUDs Solutions<br>- 6.1 Edible Landscapes | Multifunctional Green Space | **ALL PHASE 1:**<br>A network of multifunctional green infrastructure assets and public green spaces are delivered, in line with Barnsley's Green Space Strategy and Green Infrastructure Strategy. Consultation has taken place with Barnsley Metropolitan Borough Council, existing residents and potential users of the development to understand the desired uses, design, quantity and location of accessible and natural green space.<br><br>An ecosystem service approach is adopted with regards to green space and green infrastructure design. | Sustainability and delivery of ecosystem services have been key drivers for the design of Phase 1. As detailed in the Landscape and Public Realm Concept Design Strategy, through the creation of the 6 character areas, a number of different green space and green infrastructure typologies are proposed:<br><br>1. Parade Promenade: Although largely hard surface, trees and planters will be provided.<br><br>2. Central Green Space: A large open lawn enclosed by colourful planting.<br><br>3. The Gardens (Green Seam): A natural setting with displays of form, colour and texture of varying plants. The space will be rich in biodiversity with structured mixed planting for all year round interest.<br><br>4. The Activity Spine (Building Threshold): Soft landscape edges will be shaped to accommodate established desire lines.<br><br>5. Public realm around Plot 2: Although largely hard surface, soft landscaping, trees and planters may be provided.<br><br>6. Southern Gateway Arrival: The Gateway marks the town entrance into the Digital Campus and therefore impressions of the 'green' nature of the public realm.<br><br>Furthermore, street trees, pocket parks, and planters will be provided throughout the development. A 200m2 green roof space is also proposed to the ATH.<br><br>Together, the landscape design will offer numerous ecosystem services, including, for example:<br>- Opportunities for recreation, as well as providing aesthetic and "spiritual" (also referred to as sense of place) services<br>- Mitigation and control measures relating to water quality, noise, air quality and light pollution<br>- Climate change mitigation and reduction of the urban heat island effect, shading and biotic cooling<br>- Management of surface water run off and flood risk management<br>- Improvement in biodiversity<br><br>Consultation and development of the ecosystem services approach will be considered further in the next stages of design. | ● | | ● | ● | Increased number of green space typologies and % cover of green space and green infrastructure.<br><br>Increased percentage of surface water attenuation resulting from nature-based SUDS solutions.<br><br>Improved health and social outcomes including contributions to a reduction in presentations to GPs regarding issues such as respiratory illnesses, obesity and mental health issues such as depression.<br><br>Reduced mortalities resulting from heatwaves.<br><br>Improved air and water quality.<br><br>Reduced flood risk and surface water runoff, and subsequent local flooding events.<br><br>Improved ecological / biodiversity value (% biodiversity net gain - DEFRA / Natural England).<br><br>Increased footfall within the area and increased revenue for local businesses.<br><br>Improved real-estate value. | Barnsley Local Plan 2012–2033<br><br>BREEAM Communities<br><br>Home Quality Mark |

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| **2. Biodiversity and Green Infrastructure** | | | | | | | | | |
| 2.2 The natural environment is improved and is an attractive place to live, work and play in, helping to secure further inward investment, improve health and wellbeing and promote social cohesion.<br><br>Also refer to topics:<br>- 1.1 Quality Cyclist and Pedestrian Environments<br>- 1.1 Connectivity<br>- 3.1 Urban Heat Island Mitigation<br>- 3.2 Nature-Based SUDs Solutions<br>- 6.1 Edible Landscapes | Biodiversity | **ALL PHASE 1:**<br>Through the production of a net gain plan (as per the Environment Act), adverse impacts on habitats will be minimised. This applies to both the pre-development and post-development biodiversity value of onsite habitats, the biodiversity value of any offsite habitat produced in relation to the development, and any statutory biodiversity credits purchased (if applicable, plus any further requirements set out in secondary legislation). | Following the completion of the ecology survey, a net gain plan will be established. It is thought, however, that a net gain will be easily achieved based on the ecological improvements proposed for the site. | ● | | ● | ● | Improved ecological / biodiversity value (% biodiversity net gain - DEFRA / Natural England).<br><br>Improved health and social outcomes including contributions to a reduction in presentations to GPs regarding issues such as respiratory illnesses, obesity and mental health issues such as depression.<br><br>Reduced mortalities resulting from heatwaves.<br><br>Improved air and water quality.<br><br>Improved local air quality.<br><br>Reduced flood risk and surface water runoff, and subsequent local flooding events.<br><br>Increased footfall within the area and increased revenue for local businesses.<br><br>Improved real-estate value. | Barnsley Local Plan 2012–2033<br><br>BREEAM Communities<br><br>CEEQUAL v6<br><br>Home Quality Mark<br><br>RIBA 2030 Climate Challenge v2 |

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| **3. Climate Resilience** | | | | | | | | | |
| 3.1 The development is resilient to future impacts of climate change. Appropriate and robust analysis demonstrates that increases in rainfall, summertime temperatures and flood risk will be managed effectively, and potable water consumption minimised.<br><br>Also refer to topics:<br>- 2.1 Multi-Functional Green Space<br>- 2.2 Biodiversity<br>- 3.2 Nature-Based SUDS<br>- 6.3 Overheating | Urban Heat Island Mitigation | **ALL PHASE 1:**<br>Localised temperatures are reduced and thermal comfort improved. At least 75% of all non-occupiable or non-mechanical rooftops (excluding areas with photovoltaic installations) meet one or more of the following:<br>- Uses a green roof system that includes at least a 2-inch covering of hardy groundcover<br>- Low-sloped roofs (slope ≤ 2:12) have a three-year aged solar reflectance index (SRI) of 64, or an initial SRI of 82<br>- Steep-sloped roofs (slope > 2:12) have a three-year aged SRI of 32, or an initial SRI of 39<br><br>**PUBLIC REALM:**<br>Localised temperatures are reduced and thermal comfort improved. For 50% or more of pedestrian-accessible street segments in the project and for 50% of roadways in the project, one or more of the following is met:<br>- Pavements provide shade with trees or with architectural devices or structures that have a three-year aged solar reflectance (SR) value of at least 0.28, or an initial SR of at least 0.33 at installation<br>- Roads use paving materials with a three-year aged solar reflectance (SR) value of at least 0.28, or initial SR of at least 0.33 at installation | In line with the current proposals, >75% of the ATH roof area comprises either green roof or photovoltaic panels. The green roof specification will be defined in the following stages, however the current design is in line with this output.<br><br>This issue will be addressed further in the following stages of design. The requirements will need to be reflected within the drawings and specifications for Plots 1 and 2. | ● | | ● | ● | The % applicable surfaces meets or exceed the requirements of this output.<br><br>Reduced mortalities resulting from heatwaves.<br><br>Increased footfall within the area and increased revenue for local businesses.<br><br>Lower energy bills (associated with any required mechanical cooling). | WELL Communities |

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| **3. Climate Resilience** | | | | | | | | | |
| *(continued)*<br>3.1 The development is resilient to future impacts of climate change. Appropriate and robust analysis demonstrates that increases in rainfall, summertime temperatures and flood risk will be managed effectively, and potable water consumption minimised.<br><br>Also refer to topics:<br>- 2.1 Multi-Functional Green Space<br>- 2.2 Biodiversity<br>- 3.2 Nature-Based SUDS<br>- 6.3 Overheating | Regulated Water Consumption | **ACTIVE TRAVEL HUB, MULTI-STOREY CAR PARK:**<br>Issues around future water scarcity are managed through the specification of low-water-consuming fittings. A 40% reduction against baseline water consumption is achieved, in line with the BREEAM 2018 Wat 01 methodology (or any future revision thereof).<br><br>**PLOTS 1 & 2:**<br>Issues around future water scarcity are managed through the specification of low-water-consuming fittings. Potable water consumption is limited to 75 litres/person/day. | In line with the BREEAM pre-assessment produced for the ATH (see Section 7 for further details), water consumption is anticipated to be reduced to a minimum of 40% reduction over a notional baseline. This can be achieved through the following specification:<br><br>• WCs: 3.75 litre effective flush volume<br>• Wash-hand basin taps: 5 litres/min<br>• Showers: 6 litres/min<br>• Kitchenette taps (if provided): 6 litres/min<br>• Kitchen taps (pre-rinse nozzles only): 7.30 litres/min<br>• Domestic sized dishwashers: 40 litres/use<br>• Commercial sized dishwashers: 7.5 litres/rack<br><br>The same rational can be applied to the MSCP.<br><br>The technical details above should form part of the Stage 3 specification to ensure compliance. Technical requirements for Plots 1 and 2 will need to be defined at a later date, and once the proposals have been developed further. | | | ● | ● | Reduced water consumption (% reduction or litres/person/day).<br><br>Reduced water bills. | BREEAM NC 2018<br><br>RIBA 2030 Climate Challenge v2 |
| | Unregulated Water Consumption | **ALL PHASE 1:**<br>The potable water demand relating to the irrigation of planting is offset through one or a combination of the following solutions:<br>- Planting relies solely on precipitation, during all seasons of the year<br>- Drip-fed subsurface irrigation incorporating soil moisture sensors. The irrigation control should be zoned to permit variable irrigation to different planting assemblages. This should link to the SMART Technologies Strategy<br>- Reclaimed/recovered water from a rainwater collection or waste water recovery system, with appropriate storage. This includes borehole water<br>- All planting specified is restricted to contextually appropriate species that thrive without irrigation and will continue to do so in those conditions likely as a result of climate change, i.e. typically warmer and drier conditions | The offsetting of potable water with regards to irrigation will be considered in the following stages of design. That said, as part of the drainage strategy, the project will work to alleviate storm-water runoff as part of a sustainable drainage system strategy (SUDs), by allowing the surface water to be directed into soft planted areas for natural absorption and slow percolation in the soil layers. | | | ● | ● | Reduced water consumption (litres of water saved and / or % offset through reclaimed / recovered water),<br><br>Reduced water bills. | BREEAM NC 2018 |
| | Potable Water Offsets | **ACTIVE TRAVEL HUB, MULTI-STOREY CAR PARK, PLOTS 1 & 2:**<br>The design allows for the future installation of greywater / or rainwater harvesting tanks (as appropriate). | Allowance has been made for a greywater harvesting tank within the MSCP design, and for a rainwater harvesting tank within the ATH design.<br><br>For Plots 1 and 2, allowance for either or options must be made within future design proposals. | | | ● | ● | Layouts allow for future integration of appropriately sized rainwater and / or greywater harvesting tanks (size tbc.)<br><br>Reduced water consumption.<br><br>Reduced water bills. | Bespoke |
| | Water Leak Detection | **ACTIVE TRAVEL HUB, MULTI-STOREY CAR PARK:**<br>Water leak detection systems which are capable of detecting major water leaks on the mains water supply within the building and between the building and the utilities water meter are provided.<br><br>Flow control devices (e.g. PIRs and solenoid valves) that regulate the water supply to each WC area or sanitary facility, according to demand, are provided. | Water leak detection and flow control devices will be incorporated into the design in the following stages. | | | ● | ● | Reduced water consumption.<br><br>Reduced water bills.<br><br>Reduced maintenance costs resulting from water damage to properties. | BREEAM NC 2018 |

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| **3. Climate Resilience** | | | | | | | | | |
| 3.2 As a result of the development, there is improved protection from flooding through increased water storage capacity, enhanced water quality, a reduction in the amount of pollution to the water environment and the creation of new habitats for wildlife.<br><br>Also refer to topics:<br>- 2.1 Multi-Functional Green Space<br>- 2.2 Biodiversity<br>- 3.1 Rainfall Events (Peak Rate of Runoff)<br>- 3.1 Rainfall Events (Volume of Runoff) | Rainfall Events (Peak Rate of Runoff) | **PUBLIC REALM:**<br>Drainage measures are specified so that the peak rate of run-off from the site to the watercourses (natural or municipal) is no greater for the developed site than it was for the pre-development site / achieves a 30% betterment. This will comply with the 1-year and 100-year return period events. Allowance will be made for climate change, in line with best practice. | Based on the current drainage design, this will be achieved. Please refer to Section 6 of this report for further details. | ● | | ● | ● | Reduced flood risk and surface water runoff, and subsequent local flooding events. | Barnsley Local Plan 2012–2033<br><br>BREEAM Communities<br><br>BREEAM NC 2018<br><br>CEEQUAL v6<br><br>Home Quality Mark |
| | Rainfall Events (Volume of Runoff) | **PUBLIC REALM:**<br>Drainage design measures are specified so that the post-development run-off volume, over the development lifetime, is no greater than it would have been prior to the assessed site's development / achieves a 30% betterment. This will be for the 100-year 6-hour event, including an allowance for climate change. Any additional predicted volume of run-off for this event will be prevented from leaving the site by using infiltration or other SUDS techniques. | Based on the current drainage design, this will be achieved. Please refer to Section 6 of this report for further details. For further details regarding the SUDS strategy, please refer to the concept design response summary of output 3.2 f | ● | | ● | ● | Reduced flood risk and surface water runoff, and subsequent local flooding events.<br><br>Improved water quality. | Barnsley Local Plan 2012–2033<br><br>BREEAM Communities<br><br>BREEAM NC 2018<br><br>CEEQUAL v6<br><br>Home Quality Mark |
| | Nature-Based SUDs Solutions | **PUBLIC REALM:**<br>Where feasible the use of nature based solutions and sustainable urban drainage (SUDS) measures such as raingardens, swales and tree pits will be maximised within the drainage strategy. | The outline drainage strategy for Phase 1 aims to implement a variety of SUDS features in accordance with the CIRIA SuDS guidance and Local policy. It is proposed for as many SUDS features as possible to be put forward for adoption by Yorkshire Water under an S104 agreement to ensure that sufficient maintenance of the SuDS features is applied in the future.<br><br>In line with the Design and Construction Guidance and the suitability of the site, the following adoptable SuDS features are proposed to be incorporated into the drainage strategy:<br><br>- Bioretention systems, e.g. rain gardens or tree pits<br>- Storage basins, which are depressions in the ground that are normally try but are designed to store water to provide attenuation (and are comprised of vegetation)<br>- Tanks / geo-cellular tanks<br><br>The bioretention areas and detention basin are proposed to be integrated into the central green open space in the public realm area in the south of the site. However, in order to maintain the amenity value of the area, the proposed features are to be designed offline, only providing attenuation in extreme rainfall events.<br><br>Non-adoptable features such as permeable paving within the hard landscaped areas and blue/green roofs on proposed flat roofs, are to also be included in the drainage strategy to provide additional storage.<br><br>Based on the current proposals, the public realm, MSCP and ATH are proposed to be constructed first with Plots 1 and 2 proposed to be developed at a later stage within Phase 1. At present, it is assumed that Plots 1 and 2 are to be developed for residential purposes. Depending on the structural/architectural design of the Plots, it is encouraged for these developments to incorporate source control SuDS, where feasible. Therefore, the use of blue/green roofs and rainwater harvesting should be considered as part of the design.<br><br>However, to ensure there is no detrimental impact on the infrastructure that will be in place prior to the development of Plots 1 and 2, an allowance for surface water attenuation from these areas has been incorporated into SUDs features located in the public realm. | ● | | ● | ● | Fewer localised flooding events (on and offsite).<br><br>Improved water quality.<br><br>Improvements in ecological / biodiversity value (% biodiversity net gain - DEFRA / Natural England).<br><br>Improved real-estate value. | Barnsley Local Plan 2012–2033<br><br>BREEAM Communities<br><br>BREEAM NC 2018<br><br>CEEQUAL v6<br><br>Home Quality Mark<br><br>WELL Communities |

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| **4. Energy and Operational Carbon** | | | | | | | | | |
| 4.1 Businesses and residents benefit from reduced running costs and are less reliant on natural resources. Barnsley residents and businesses have improved quality of life, and health and socioeconomic inequalities are reduced across the Borough. | Net Zero Operational Carbon | **ACTIVE TRAVEL HUB, MULTI-STOREY CAR PARK, PLOTS 1 & 2:**<br>In line with current best practice, e.g. the UK Green Building Council (UKGBC), LETI and RIBA 2030 Climate Challenge guidance, and in support of Barnsley's 2045 net zero target, a route to achieving net zero operational carbon for the multi-storey car park, Active Travel Hub and residential units of Plots 1 and 2 will be investigated. Any available district heat networks will be utilised, where appropriate.<br><br>Alongside a costing exercise, the requirements and outcomes of the net zero carbon study will be implemented, as far as practically and technically possible.<br><br>Nature-based carbon capture programmes will be considered for any required offsetting. | High level net zero operational carbon solutions have been proposed at Concept Design, as detailed below. These will need to be developed further at the following stages, and as the proposals develop.<br><br>With regards to heat networks, BMBC are currently assessing opportunities to create a new district heat network within Barnsley Town Centre to provide lower-carbon, locally generated heat for residential and commercial properties. At present, no allowance has been made for this within the utilities strategy, however, this will require further updates if, and when, a district heating scheme is brought forward as an option, and the likely heating demand of the various plots is established.<br><br>MSCP:<br>It is currently understood that the car park will not be covered by Part L, is not a habitable area and will not be heated. It is advised, however, that any energy demand is offset via PVs, with PV provision maximised on the canopy. All energy demands, e.g. lighting, should be reduced as far as practically possible. To support this approach, and as per the MEP strategy, the building services engineering design will implement the following strategies:<br>• Use of the most onerous envelope performance as is commercially available at construction.<br>• Construct with the minimum air permeability, be mechanically ventilated, with appropriately sized and shaded windows.<br>• Mechanically ventilate generally, with openable windows as required.<br>• Efficient building engineering systems with heat recovery where possible to minimise resource consumption and pollution.<br>• Reduce wasted energy and water wherever feasibly possible.<br>• Use renewable energy sources wherever practical.<br><br>ATH:<br>Based on the Future Building Standard, it is recommended that in order to become NZC, a minimum carbon reduction of 27% over the current Part L 2013 should be achieved. This needs to be accompanied by:<br>• Low carbon heating (likely electric heat pumps)<br>• An increase in fabric standards<br>• Renewable energy sources (PVs)<br>• Smart metering and access to energy consumption data.<br><br>The Future Building Standard will be implemented in 2025. It will deliver buildings that are 'zero carbon ready' and do not feature a fossil fuel heat source. From 2022 to 2025 interim changes to Part L 2013 through this standard will produce 27% less CO2 emissions compared to current standards.<br><br>More specifically, and as per the MEP strategy, the building services engineering design will implement the following strategies:<br>• Use of the most onerous envelope performance as is commercially available at construction.<br>• Construct with the minimum air permeability, be mechanically ventilated, with appropriately sized and shaded windows.<br>• Mechanically ventilate generally, with openable windows as required.<br>• Efficient building engineering systems with heat recovery where possible to minimise resource consumption and pollution.<br>• Reduce wasted energy and water wherever feasibly possible.<br>• Use renewable energy sources wherever practical.<br><br>As per the M&E strategy, a space heating target of <15kWh/m2/yr has been set, in line with current LETI guidance.<br><br>The approach to net zero operational carbon should be further investigated at RIBA Stage 3. Once the full and final energy model is available, requirements for offsetting, is necessary, can be established.<br><br>Plots 1 & 2:<br>Based on the Future Home Standards, a minimum 31% reduction in CO2 emissions will be required (over the current Part L 2013). A fabric first approach will be adopted, focusing on high standards of fabric insulation (e.g. high performing triple glazed windows with a whole unit U-value of less than 1.0 W/m m2K, and low air Permeability (< 1 m3/h/m 2at 50 Pa). In line with the Future Homes Standard, Plots 1 and 2 will be fully electric and will not be connected to the gas grid. | ● | | ● | ● | Energy use intensity value (kWh/m2/year)<br><br>Space heating demand (kWh/m2/year)<br><br>Reduced carbon emissions (kWh/year, kWh/m2, kgCO2e/m2, tCO2e and /or % reduction against baseline)<br><br>Reduced operational costs.<br><br>Improved air quality, e.g. a reduction in NOx emissions where gas boilers are no longer used.<br><br>Improved health and social outcomes including contributions to a reduction in presentations to GPs regarding issues such as respiratory illnesses.<br><br>Improved real-estate value. | Future Buildings Standard<br><br>Future Homes Standard<br><br>UKGBC Guidance<br><br>LETI Climate Emergency Design Guide<br><br>RIBA 2030 Climate Challenge v2 |

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| **4. Energy and Operational Carbon** | | | | | | | | | |
| *(continued)*<br>4.1 Businesses and residents benefit from reduced running costs and are less reliant on natural resources. Barnsley residents and businesses have improved quality of life, and health and socioeconomic inequalities are reduced across the Borough. | Low Energy External Lighting | **PUBLIC REALM:**<br>Low energy external light fittings are provided within the construction zone. The fittings meet the following:<br>- Have an average initial luminous efficacy of not less than 70 luminaire lumens per circuit Watt.<br>- Are fitted with automatic controls to prevent to prevent operation during daylight hours.<br>- In areas of intermittent pedestrian traffic (e.g. bin and bike stores), presence detection is specified. | This issue will be addressed in the following stages of design. | ● | | ● | ● | The lighting specification meet or exceeds the requirements of this output.<br><br>Reduced operational costs.<br><br>Reduced carbon emissions. | BREEAM NC 2018 |
| | Building Energy Metering | **ACTIVE TRAVEL HUB:**<br>In order to monitor and reduce energy consumption, and to reduce the performance gap, energy metering systems are installed so that at least 90% of the estimated annual energy consumption is assigned to the end-use categories, as follows (and as applicable):<br>- Space heating*<br>- Domestic hot water*<br>- Humidification<br>- Ventilation (major fans)<br>- Pumps<br>- Lighting and small power<br>- Renewable or low carbon systems (separately)<br>- Controls<br>- Any other major energy consuming plant or systems, where appropriate.<br><br>The energy consuming end uses listed will be easily identifiable to building users, e.g. through labelling or data outputs.<br><br>*Space heating and hot water can be metered together where it is impractical to sub-meter these separately. | This is currently reflected within the MEP strategy. | ● | | ● | ● | Metering specification meets or exceeds the requirements of this output.<br><br>Reduced operational costs.<br><br>Reduced carbon emissions. | BREEAM NC 2018 |
| | Low and Zero Carbon Technologies | **ACTIVE TRAVEL HUB, MULTI-STOREY CAR PARK, PLOTS 1 & 2:**<br>Renewable energy opportunities are exploited and battery storage technologies incorporated, where feasible.<br><br>Opportunities to utilise mine water heating will be investigated, and where possible and feasible, utilised. | The current MEP strategy proposes 235m$^2$ of roof mounted PVs at 35kW to the ATH, and 1450m$^2$ roof mounted PVs at 250kW to the MSCP.<br><br>An initial assessment concluded that there is insufficient PV area available to charge a battery capable of meeting the ATH's and MSCP's energy demands. As such, battery storage has been discounted for these two buildings.<br><br>A renewables strategy for Plots 1 and 2 will need to be undertaken by the developers.<br><br>Previous rotary boreholes identified potential mine working voids beneath the site. However, the investigations were not sufficiently targeted. Further investigations will be required in the following stages to establish whether the utilisation of mine water for heating is viable. | ● | | ● | ● | Reduced operational costs.<br><br>Reduced carbon emissions. | Barnsley Local Plan 2012–2033<br><br>Bespoke<br><br>BREEAM NC 2018 |

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| **5. Resource Efficiency and Embodied Carbon** | | | | | | | | | |
| 5.1 The scheme contributes to a sustainable circular economy and a reduction in embodied carbon emissions, supporting the Barnsley Net Zero Carbon agenda and targets, improving mental and physical health and wellbeing, and promoting the local economy and local skillsets. The impact on the Borough's waste on the environment is minimised. | Recycled and Reclaimed Materials | **ALL PHASE 1:**<br>At least 25% (by volume) of suitable / useable material from demolition or de-construction on site will be incorporated into the project.<br><br>**PUBLIC REALM:**<br>At least 15% of road or path construction material is locally reclaimed or constituted from recycled material. | This issue will be addressed in the following stages of design. The requirements will need to be reflected within the drawings and specifications for Plots 1 and 2. | ● | | ● | ● | The % recycled or reclaimed materials meet or exceed the requirements of this output.<br><br>Reduced vehicular transmissions (associated with the transport of new materials) including carbon monoxide, particulate matter and nitrogen oxides.<br><br>Improved health and social outcomes including contributions to a reduction in presentations to GPs regarding issues such as respiratory illnesses. | BREEAM Communities<br><br>CEEQUAL v6 |
| | Locally Sourced Materials | **ALL PHASE 1:**<br>Manufacturer locations for materials adhere to the following restrictions:<br>• 20% or more of the materials construction budget come from within 500km of construction site.<br>• 30% of the total materials construction budget come from within 1000km of the construction site or closer.<br>• An additional 25% of the materials construction budget come from within 5000km of the construction site.<br>• The remaining 25% of materials may be sourced from any location.<br><br>Exclusions may apply where materials with lower overall embodied carbon values are procured (compared to the locally sourced alternative). | This issue will be addressed in the following stages of design. The requirements will need to be reflected within the drawings and specifications for Plots 1 and 2. | ● | | ● | ● | The % recycled or reclaimed materials meet or exceed the requirements of this output.<br><br>Increased local spend and increased revenue for local businesses.<br><br>Reduced vehicular transmissions (associated with the transport of new materials) including carbon monoxide, particulate matter and nitrogen oxides.<br><br>Improved health and social outcomes including contributions to a reduction in presentations to GPs regarding issues such as respiratory illnesses. | Living Building Challenge |
| | Modular Construction and Prefabrication | **ALL PHASE 1:**<br>A feasibility study will be carried out to investigate the use of modular construction and prefabrication . This will include both services and building elements.<br><br>Modular construction / prefabrication will be used where the feasibility study has shown this will reduce deliveries, waste, time and resource spent on site. | This issue will be addressed in the following stages of design. The requirements will need to be reflected within the drawings and specifications for Plots 1 and 2. | ● | | ● | ● | Reduced vehicular transmissions including carbon monoxide, particulate matter and nitrogen oxides.<br><br>Improved health and social outcomes including contributions to a reduction in presentations to GPs regarding issues such as respiratory illnesses.<br><br>Reductions in on site waste generation and waste to landfill.<br><br>Fewer reported accidents at work (relevant to construction site activities). | BREEAM NC 2018<br><br>CEEQUAL v6<br><br>UKGBC Circular Economy Programme |

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| **5. Resource Efficiency and Embodied Carbon** | | | | | | | | | |
| *(continued)*<br>5.1 The scheme contributes to a sustainable circular economy and a reduction in embodied carbon emissions, supporting the Barnsley Net Zero Carbon agenda and targets, improving mental and physical health and wellbeing, and promoting the local economy and local skillsets. The impact on the Borough's waste on the environment is minimised. | Material Efficiency | **ALL PHASE 1:**<br>At each stage of the project, opportunities for materials efficiencies relevant to design, specification and construction will be identified and implemented, where appropriate, to reduce the quantity of materials required, waste, and all subsequent and associated carbon emissions. | This issue will be addressed in the following stages of design. The requirements will need to be reflected within the drawings and specifications for Plots 1 and 2.<br><br>Moving forward, design teams will need to consider the following at each stage of design to promote material efficiency:<br>- Increasing the utilisation factor of structural members<br>- Designing to standard material dimensions to reduce off-cuts and waste on site<br>- Removing redundant materials from the design<br>- Using materials that can be recycled or reused at the end of their service life<br>- Making use of recycled or reclaimed materials<br>- Designing for deconstruction and material reuse<br>- Using pre-fabricated elements where appropriate to reduce material waste<br>- Consider using an 'exposed thermal mass' design strategy to reduce finishes<br>- Avoiding over-specification of predicted loads<br>- Using lightweight structural design strategies<br>- Making use of bespoke structural elements where this will reduce overall material use<br>- 'Rationalisation' of structural elements<br>- Optimising the foundation design for embodied environmental impact. | ● | | ● | ● | Cost savings as a result of materials and waste minimisation.<br><br>Reduced on site waste generation and waste to landfill.<br><br>Reduced vehicular transmissions including carbon monoxide, particulate matter and nitrogen oxides.<br><br>Improved health and social outcomes including contributions to a reduction in presentations to GPs regarding issues such as respiratory illnesses. | BREEAM NC 2018<br><br>UKGBC Circular Economy Programme |
| | Future Disassembly / De-Construction | **MULTI-STOREY CAR PARK, PUBLIC REALM:**<br>At least 15% (by volume) of components or pre-fabricated units used can be easily separated on disassembly / de-construction into material types suitable for recycling or reuse.<br><br>**ACTIVE TRAVEL HUB, PLOTS 1 & 2:**<br>Design features that will enable and facilitate future disassembly and functional adaptation will be incorporated within the design. | This issue will be addressed in the following stages of design. The design and nature of the MSCP will likely exceed this target, however.<br><br>The requirements will need to be reflected within the drawings and specifications for Plots 1 and 2. | ● | | | ● | Reduced carbon emissions associated with the production of new products and materials (applicable to future projects). | BREEAM NC 2018<br><br>CEEQUAL v6<br><br>UKGBC Circular Economy Programme |
| | SMART Waste and Recycling | **ALL PHASE 1:**<br>Informed by the SMART Technologies Strategy and in collaboration with DMC and Barnsley College, SMART Waste and recycling projects are piloted to promote resource efficiency to SMEs and residents across the campus. | Compliance with this output will be explored and developed in the following stages of design. | ● | ● | ● | ● | Number of projects piloted.<br><br>Contribution to living lab and learning opportunities and reduced waste. | Bespoke |

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| **5. Resource Efficiency and Embodied Carbon** | | | | | | | | | |
| *(continued)*<br>5.1 The scheme contributes to a sustainable circular economy and a reduction in embodied carbon emissions, supporting the Barnsley Net Zero Carbon agenda and targets, improving mental and physical health and wellbeing, and promoting the local economy and local skillsets. The impact on the Borough's waste on the environment is minimised. | Net Zero Embodied Carbon | **ACTIVE TRAVEL HUB, MULTI-STOREY CAR PARK, PUBLIC REALM:**<br>In line with the LETI, UKGBC and / or RIBA 2030 Climate Challenge guidance, using the RICS Whole Life Carbon Assessment for the Built Environment professional statement 2017, different low embodied carbon superstructure, substructure, hard landscaping and services options will be investigated, with the aim to meet either of the following embodied carbon targets:<br><br>- Target embodied carbon of <970kgCO2e/m2<br>- Stretch target embodied carbon of <750kgCO2e/m2 | A formal embodied carbon analysis should take place in the next stages to further inform the design with regards to low carbon materials, and to meet the relevant targets.<br><br>Although formal analysis of each asset (in full) has not yet taken place, embodied carbon has been considered as part of the Concept Design. Following an optioneering exercise and the latest Inventory of Carbon and Energy database for carbon figures (applicable to Stages A1 - A3, 'cradle to gate'), the recommended structural frame option for the MSCP (Option G1 - precast double tee steel frame) has been selected on the basis of being the most sustainable and lowest embodied carbon solution, whilst still achieving the requirements of the brief, minimising internal columns and likely being one of the quicker options to construction (thereby reducing further emissions related to site and installation works). Please refer to Section 5 of the Multi-Storey Car Park Stage 2 report for further details.<br><br>Further narrative and analysis on low carbon options will be provided in the next stages of the design. | ● | | ● | ● | Reduction in embodied carbon associated with the development (kgCO2e/m2).<br><br>Increased local spend and increased revenue for local businesses.<br><br>Reduced vehicular transmissions including carbon monoxide, particulate matter and nitrogen oxides.<br><br>Improved health and social outcomes including contributions to a reduction in presentations to GPs regarding issues such as respiratory illnesses.<br><br>Cost savings as a result of materials and waste minimisation.<br><br>Reduced on site waste generation and waste to landfill. | LETI<br><br>RICS Whole Life Carbon Assessment Framework<br><br>RIBA 2030 Climate Challenge v2<br><br>UKGBC |
| **6. Health and Wellbeing** | | | | | | | | | |
| 6.1 The development supports measures which address issues of health inequality, obesity and heart disease, and contributes towards good physical and mental health, including encouraging active travel and non-sedentary behaviour.<br><br>Also refer to topics:<br>- 1.1 All topics<br>- 2.1 Multi-Functional Green Space<br>- 2.2 Biodiversity<br>- 3.1 Urban Heat Island Mitigation<br>- 3.2 Rainfall Events (Volume of Runoff)<br>- 3.2 Nature-Based SUDs Solution<br>- 6.2 All topics<br>- 6.3 All topics | Interior Fitness Circulation | **MULTI-STOREY CAR PARK, PLOTS 1 & 2:**<br>At least one staircase will be open to regular occupants, servicing all floors of the project and is aesthetically designed through the inclusion of at least two of the following on each floor:<br>- Artwork<br>- Light levels of at least 215 lux when in use<br>- Windows or skylights that provide access to daylight<br>- Natural design elements (e.g. plants, water features, images of nature)<br>- Gamification<br><br>Stairs will ideally be physically or visually located before any lifts, and signage provided directing building users to stairs. | This issue will be addressed fully in the following stages of design. Consideration has been given to interior fitness circulation with regards to the MSCP staircase, with openable windows provided to allow for natural ventilation and daylight ingress.<br><br>The requirements of this output will need to be reflected within the drawings and specifications for Plots 1 and 2. | ● | | | ● | The design meets or exceeds the requirements of this output.<br><br>Improved health and social outcomes including contributions to a reduction in presentations to GPs regarding issues such as obesity and mental health issues such as depression.<br><br>Improved real-estate value. | WELL Building Standard v2 |

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| **6. Health and Wellbeing** | | | | | | | | | |
| *(continued)*<br>6.1 The development supports measures which address issues of health inequality, obesity and heart disease, and contributes towards good physical and mental health, including encouraging active travel and non-sedentary behaviour.<br><br>Also refer to topics:<br>- 1.1 All topics<br>- 2.1 Multi-Functional Green Space<br>- 2.2 Biodiversity<br>- 3.1 Urban Heat Island Mitigation<br>- 3.2 Rainfall Events (Volume of Runoff)<br>- 3.2 Nature-Based SUDs Solution<br>- 6.2 All topics<br>- 6.3 All topics | External Activity Spaces | **PUBLIC REALM:**<br>A variety of activity spaces are provided to encourage movement and exercise, taking into account different age ranges and physical and neurological needs. | As per the Landscape Strategy, the Northern Plot 2 public realm is conceived as a flexible, community focused outdoor space with the capacity to be used for a range of activities including play, community garden and green space. The topography in the space is relatively even, up to the retaining wall and sloped planted bank with existing mature trees, which define the upper and lower Courthouse. Open space around Plot 2 is limited, so the concept aims to utilise activity within the confines of pocket spaces and linear design responses.<br><br>The concept ideas also propose opening up the steps and ramp between the upper and lower tier in order to maximise viewpoints across the valley and create further opportunity for community to meet and socialise. This is explained in more detail within the Landscape Strategy report.<br><br>Another key consideration with regard to facilitating activity is the inclusion of power sources and WiFi to enable the use of technology for events and temporary pop-up facilities. This will need to be integrated seamlessly into the design. As well as being a relaxing space, the Central Green will incorporate an element of activity. This use will tie in to the wider philosophy of the green, allowing for small scale activity within the defined social spaces of the design.<br><br>Yoga, pilates, stretching and body weight exercises would all be suitable for the Central Green space and would compliment the lush, green, calm feel. By not defining specific areas for exercise and activity, we allow the layout to be more flexible for users to make decisions about where to undertake exercise, based on the time of day, sunlight direction, other events etc.<br><br>The Central Green will be designed to allow integration of temporary active uses, such as table tennis. Tables could be set up in a similar way to other events tying into wider Campus activities.<br><br>Opportunities for a Pump Track for children are also incorporated within the design. | ● | | ● | ● | The design meets or exceeds the requirements of this output.<br><br>Improved health and social outcomes including contributions to a reduction in presentations to GPs regarding issues such as obesity and mental health issues such as depression.<br><br>Increased footfall within the area and increased revenue for local businesses.<br><br>Improved real-estate value. | WELL Communities |
| | Edible Landscapes | **ACTIVE TRAVEL HUB, PLOTS 1 & 2, PUBLIC REALM:**<br>Where appropriate and feasible, communal food growing spaces or edible landscapes are provided for use by residents of Plots 1 and 2 and the Active Travel Hub. For residences, it is suggested that >50m2 or 1m2 per residential unit of growing space is provided. For the Active Travel Hub, it is suggested that >18.5m2 of growing space is provided. | Edible landscapes are currently under consideration. The will be considered further in the next stages of design. | ● | ● | ● | ● | The area of edible landscape meets or exceeds the requirements of this output.<br><br>Improved health and social outcomes including contributions to a reduction in presentations to GPs regarding issues such as obesity and mental health issues such as depression.<br><br>Increased footfall within the area and increased revenue for local businesses.<br><br>Improved real-estate value. | Home Quality Mark<br><br>WELL Building Standard v2<br><br>WELL Communities |

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| **6. Health and Wellbeing** | | | | | | | | | |
| 6.2 Social cohesion and mental health is supported by the provision of high quality social spaces which are fully accessible, considering all physical and neurological needs.<br><br>Also refer to topics:<br>- 1.1 Quality Cyclist and Pedestrian Environments<br>- 1.1 Connectivity<br>- 1.1 Wayfinding<br>- 1.1 Safety and Security<br>- 2.1 Multi-Functional Green Space<br>- 6.1 All topics<br>- 6.3 All topics | Nature Based Design (Biophilic Design) | **ACTIVE TRAVEL HUB, MULTI-STOREY CAR PARK, PLOTS 1 & 2:**<br>Social cohesion and mental health is supported by the provision of high quality internal social spaces.<br><br>The following are integrated throughout internal spaces, including common circulation routes, shared seating areas and rooms and workstations (where applicable):<br>- Natural materials, patterns, shapes, colours, images or sounds<br>- Plants (e.g., potted plants, plant walls) or views of nature | The biophilic design strategy will be developed in the following stages, however, based on the current design of the ATH and MSCP, building users in occupied spaces will have views out into nature and the surrounding green spaces, thereby alleviating feelings of stress and supporting mental health and wellbeing. | ● | | ● | ● | The design meets or exceeds the requirements of this output.<br><br>Improved health and social outcomes including contributions to a reduction in presentations to GPs regarding issues such mental health issues, including depression.<br><br>Improved real-estate value. | Living Building Challenge<br><br>WELL Building Standard v2 |
| | Sense of Belonging and Connection to Place | **ALL PHASE 1:**<br>Social cohesion and mental health is supported by the provision of high quality internal and external social spaces.<br><br>Buildings and the public realm contain features intended solely for the celebration of culture, spirit and place.<br><br>This will be linked to the SMART Technology Strategy, where feasible and appropriate. | The landscape and public realm provides an array of different, high quality, external spaces of varying use and design. This is represented by the six character areas, all of which will be furnished with varying degrees and types of planting and soft landscaping, hard landscaping, street furniture, and other installations. As described in the Landscape Strategy, the six character areas are:<br><br>1. Parade Promenade: This is the main connecting avenue linking through the Digital campus. The paved surfaces are designed to create a visual continuity, and the levels to be adjusted to create a step free accessible route. The Promenade will be a location for linear pop-up markets such as flea markets and flower markets, creating interest and a feeling of connection to place.<br><br>2. Central Green Space: The central community green space, enclosed by colourful planting, will comprise a large open lawn to encourage activity in the summer, with infrastructure to allow for covering the space in winter for activities. This will naturally draw residents into the area.<br><br>3. The Gardens (Green Seam): The Gardens will comprise a natural setting with displays of form, colour and texture of varying plants. Creating a distinct and clear visual identity linking through the public realm, the space will be rich in biodiversity with structured mixed planting for all year round interest.<br><br>4. The Activity Spine (Building Threshold): This area will highlight main building entrances with a distinctive surface treatment. Areas of uplift will be enhanced with warmer, lighter tones using granite trims and finishes. Soft landscape edges will be shaped to accommodate established desire lines.<br><br>5. Public realm around Plot 2: Providing access to the Plot 2 residential development, landscape treatments will be defined for residential demarcation. It will be of high quality aesthetic and open character, and will create the opportunity to incorporate informal play along the linear route.<br><br>6. Southern Gateway Arrival: The Gateway marks the town entrance into the Digital Campus and therefore impressions of the 'green' nature of the public realm. The public realm palette, including surfacing will be cohesive with the overall design whilst create a notable entrance point. The design layout will aim to open and invite people into the public realm area.<br><br>The current landscape design also maximises viewpoints with scenic views over the landscape, encouraging a sense of belonging and connection to place.<br><br>The approach to public art will be developed in the following stages, however this may take the form of:<br>- Stand alone artwork where the public realm provides a platform to house artwork<br>- Artwork integrated into public realm components (e.g. surfaces, raised walls, furniture etc.)<br>- Artwork overlaid as digital art / interactive lighting (aligning with the SMART Technology Strategy)<br><br>As per the requirements of the sustainability strategy, high quality internal spaces will also be provided, with designs incorporating, for example, biophilic elements and healthy materials. | ● | ● | ● | ● | The design meets or exceeds the requirements of this output.<br><br>Improved health and social outcomes including contributions to a reduction in presentations to GPs regarding issues such mental health issues, including depression.<br><br>Increased footfall within the area and increased revenue for local businesses.<br><br>Decreased local crime rates.<br><br>Improved real-estate value. | WELL Building Standard v2<br><br>WELL Communities |

| Outcome | Topic | Output | Concept Design Response Summary | Healthy Barnsley | Learning Barnsley | Growing Barnsley | Sustainable Barnsley | Measurement / Indicators | Metric / KPI Reference |
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| **6. Health and Wellbeing** | | | | | | | | | |
| *(continued)*<br>6.2 Social cohesion and mental health is supported by the provision of high quality social spaces which are fully accessible, considering all physical and neurological needs.<br><br>Also refer to topics:<br>- 1.1 Quality Cyclist and Pedestrian Environments<br>- 1.1 Connectivity<br>- 1.1 Wayfinding<br>- 1.1 Safety and Security<br>- 2.1 Multi-Functional Green Space<br>- 6.1 All topics<br>- 6.3 All topics | Inclusive and Accessible Design | **ALL PHASE 1:**<br>The design allows for multiple uses for different users, including children, the elderly and disabled people with consideration given to safety, comfort, disturbance and security. The design adheres to UK accessible design laws and standards. | The design brief for the Seam and its components delivers facilities that accommodate the needs of all users. With regards to the ATH, cycle parking is an integral aspect of any cycle network, as well as the wider transport system including other public transport modes. The availability of secure cycle parking at interchange points has a significant influence on cycle use and the efficiency of the network. The fear or direct experience of vandalism or theft can deter cycling, which in turn can reduce the return on any investments made to deliver new routes and transport infrastructure enhancements. The ATH brief explicitly aims to address this concern by providing a modern facility that caters to all users and their respective cycling needs.<br><br>Proximity to Barnsley Railway Station is essential for cyclists and site users with mobility impairments. For short stay users the primary concern would be convenience of access, while having a safe place to secure their cycle. With longer stay parking however, security is the primary concern. Such users are more likely to trade convenience for additional security, shelter from weather, and secure access.<br><br>Further examples of inclusive and accessible design are details within the landscape strategy, for example the ramp provision alongside step provision to aid with level changes, and different character areas, each intended for different uses (see previous output for further details). All internal and external spaces will be safe and comfortable, in line with the requirements of the sustainability strategy, e.g. external spaces are overlooked, and issues such as thermal comfort will be addressed in both internal and external spaces. The response to this output will continue to be developed as the design progresses, with issues such as audio and visual accessibility in the materials specification, the use of technology to support audio and visual accessibility and facilities to support parents explored further. | ● | | ● | ● | The design meets or exceeds the requirements of this output. The development is wheelchair friendly and incorporates audio/visual accessibility features.<br><br>Improved health and social outcomes including contributions to a reduction in presentations to GPs regarding issues such mental health issues, including depression.<br><br>Increased footfall within the area and increased revenue for local businesses.<br><br>Improved real-estate value. | Barnsley Local Plan 2012–2033<br><br>BREEAM Communities<br><br>UK Part M Regulations |
| | Digital Connectivity | **ALL PHASE 1:**<br>The development achieves the requirements below relevant to digital infrastructure OR WiFi networks:<br><br>- Digital infrastructure: A "dig once" principle is adopted, whereby all new buildings must install internet cables or fibre optics cables when laying underground lines. The development is provided with provider-neutral wiring that any Internet service carrier can connect to from an access point in or near the building.<br><br>- WiFi Networks: A network of free-to-use WiFi hotspots or zones is available in public spaces. The network covers at least 75% of the public use area owned, operated or managed by the project owner. | The current SMART and digital infrastructure strategy confirms that free-to-use WiFi will be available across the site. | ● | ● | ● | ● | The % WiFi cover or digital infrastructure meets the requirements of this output.<br><br>Increased footfall within the area and increased revenue for local businesses.<br><br>Improved real-estate value.<br><br>Improved socioeconomic outcomes. | BREEAM Communities<br><br>Sustainable Travel SPD (Draft Document November 2021) |

| Outcome | Topic | Output | Concept Design Response Summary | Healthy Barnsley | Learning Barnsley | Growing Barnsley | Sustainable Barnsley | Measurement / Indicators | Metric / KPI Reference |
|---|---|---|---|---|---|---|---|---|---|
| **6. Health and Wellbeing** | | | | | | | | | |
| 6.3 Steered by the health metrics proposed in the RIBA 2030 Climate Challenge (version 2) documentation, the unintended consequences of poor health and wellbeing are avoided through avoidance of overheating and poor indoor air quality, and through the promotion of natural light in occupied spaces, thereby enhancing quality of life and promoting physical and mental wellbeing.<br><br>Also refer to topics:<br>- 3.1 Urban Heat Island Mitigation | Overheating | **ACTIVE TRAVEL HUB, MULTI-STOREY CAR PARK, PLOTS 1 & 2:**<br>All occupied spaces achieve 25-28°C maximum for 1% of occupied hours. | This issue will be addressed in the following stages of design. The requirements will need to be reflected within the performance requirements for Plots 1 and 2. | ● | | ● | ● | The PMV, PPD, and % occupied hours meet the thresholds of the relevant standards (e.g. CIBSE TM52 or CIBSE TM59).<br><br>Improved health and social outcomes.<br><br>Reduced mortalities resulting from heatwaves.<br><br>Reduced energy costs resulting from mechanical cooling. | RIBA 2030 Climate Challenge v2 |
| | Healthy Materials | **ACTIVE TRAVEL HUB, MULTI-STOREY CAR PARK, PLOTS 1 & 2:**<br>The following thresholds will be met for all occupied spaces:<br>- Total VOCs: <0.3mg/m3<br>- Formaldehyde: <0.1mg/m3 | This issue will be addressed in the following stages of design. The requirements will need to be reflected within the specifications for Plots 1 and 2. | ● | | ● | ● | Post construction, but pre-occupation, air quality testing confirming the total VOC emissions are <0.3mg/m3 and formaldehyde emissions <0.1mg/m3.<br><br>Reductions in non-elective admissions and presentations to GPs relevant nose, ear, eye and throat irritation. | BREEAM NC 2018<br><br>RIBA 2030 Climate Challenge v2<br><br>WELL Building Standard v2 |
| | Healthy Sunlight Exposure | **ACTIVE TRAVEL HUB, MULTI-STOREY CAR PARK, PLOTS 1 & 2:**<br>At least 75% of occupied spaces receive sufficient daylight and a view out. | This issue will be addressed in the following stages of design. It is thought, however, that this will be achieved for the ATH and MSCP.<br><br>The requirements will need to be reflected within the drawings and specifications for Plots 1 and 2. | ● | | ● | ● | The % floor area meets or exceeds the requirements of this output.<br><br>Improved health and social outcomes including contributions to a reduction in presentations to GPs regarding issues such mental health issues, including depression.<br><br>Reduced energy costs resulting from a lower artificial lighting demand. | Living Building Challenge |

| Outcome | Topic | Output | Concept Design Response Summary | Healthy Barnsley | Learning Barnsley | Growing Barnsley | Sustainable Barnsley | Measurement / Indicators | Metric / KPI Reference |
|---|---|---|---|---|---|---|---|---|---|
| **6. Health and Wellbeing** | | | | | | | | | |
| *(continued)*<br>6.3 Steered by the health metrics proposed in the RIBA 2030 Climate Challenge (version 2) documentation, the unintended consequences of poor health and wellbeing are avoided through avoidance of overheating and poor indoor air quality, and through the promotion of natural light in occupied spaces, thereby enhancing quality of life and promoting physical and mental wellbeing.<br><br>Also refer to topics:<br>- 3.1 Urban Heat Island Mitigation | Healthy Entrances | **PLOTS 1 & 2:**<br>Where apartment blocks (or retail units within Plots 1 & 2) are provided, all regularly used building entrances (not individual dwelling entrances) incorporate the following:<br>- The building includes an entryway system composed of grilles, grates, slots or rollout mats or removable carpet tiles that are at least the width of the entrance and 3m long in the primary direction of travel (sum of indoor and outdoor length).<br>- One of the below is in place to slow the movement of air from outdoors to indoors:<br>- Building entry vestibule with two typically closed doorways.<br>- Revolving entrance doors. | This issue will be addressed in the following stages of design. The requirements will need to be reflected within the drawings and specifications for Plots 1 and 2. | ● | | | | The number of compliant entrances meet or exceed the requirements of this output.<br><br>Improved health and social outcomes including contributions to a reduction in presentations to GPs regarding issues such respiratory illnesses. | WELL Building Standard v2 |
| **7. Sustainable Communities and Social Value** | | | | | | | | | |
| 7.1 Social value opportunities and an approach to procurement which prioritises local suppliers and manufacturers supports the local economy and local communities, enhancing their quality of life and benefiting health and wellbeing.<br><br>Also refer to topics:<br>- 5.1 Locally Sourced Materials<br>- 5.1 SMART Waste and Recycling | Fair Payment | **ALL PHASE 1:**<br>In accordance with the Construction Supply Chain Payment Charter, main contractors will pay their Tier 1 supply chain within 30 calendar days from the end of the calendar month in which the work is carried out or products are supplied. | This issue will be addressed in the following stages of the development, and should form part of the contractor's tender requirements. | | | ● | ● | The contractor's payment policy reflects these requirements.<br><br>Reductions in the number of working days lost due to labour disputes. | Bespoke |
| | Community Benefits and Social Value | **ALL PHASE 1:**<br>There is local labour and engagement with under-presented groups and apprentices on the project. Local is defined as being within the sub-region.<br><br>Demonstrate that more than 50% of workers are from the sub-region (South Yorkshire). Alternatively, adhere to BMBC's requirements for local workforces. | This issue will be addressed in the following stages of the development, and should form part of the contractor's tender requirements. | ● | ● | ● | ● | Increased percentage of local labour and apprentices. | CEEQUAL v6 |
| 7.2 The integration of SMART technologies and digital infrastructure within buildings and the public realm create a 'living laboratory' for digital experimentation and creativity, enhance the overall user experience of the space, and assist in the reduction resource consumption and improved air quality.<br><br>Also refer to topics:<br>- 1.1 Wayfinding<br>- 1.1 Car Sharing<br>- 1.1 SMART Parking Technologies<br>- 1.4 Car Sharing | SMART Technologies | **ALL PHASE 1:**<br>SMART technologies and digital infrastructure are integrated within buildings and public realm to create a 'living laboratory' for digital experimentation and creativity. | SMART Technologies and Digital Art is one of the key public realm themes. As detailed in the landscape strategy, digital technology can enhance placemaking by creating meaningful experiences for people in the Digital Campus by fusing fixed components such as connected<br>street furniture, digital wayfinding features, with mobile and personal devices, including smartphones and wearable products.<br><br>As described in previous sections, SMART Technologies will be integrated into the development, e.g. regarding car sharing and parking. Infrastructure in the form of fibre ducting and chambers, additional power points, and IoT gateways and sensors will be provided to allow for future SMART technology integration. Examples of opportunities include:<br>• Digital artists augmenting building facades with either projection or through the interface of screens. Also using walls (e.g.. existing arches) and facades as canvases for artists to interact digitally with the public.<br>• Screens displaying data, for example Andrea Polli's Particle Falls (2008–2018), an installation showing the quality of the air with streams of blue pixels when it is pure and red spots when it is saturated with PM2.5 particles.<br>• Light Installations using LED technology software, lenses, to create of dazzling virtual spaces<br>• Immersive technology such as Augmented Realities to invite visitors to interact with public space.<br>• Sculptures, for example artists like Ken Kelleher reimagine the digital sculpture with the use of computers to render what place sculpture could occupy in urban spaces.<br>• The use of data to encourage engagement, e.g. realtime data from hire bikes including location and journey map, gamification of carbon offsets for car journeys to the Seam, displays of Barnsley and regional data sets and energy and water consumption, and displays of air quality. | ● | ● | ● | ● | The SMART Technologies strategy meets or exceeds the requirements of this output.<br><br>Increased learning opportunities for the local community. | Bespoke |

| Outcome | Topic | Output | Concept Design Response Summary | Healthy Barnsley | Learning Barnsley | Growing Barnsley | Sustainable Barnsley | Measurement / Indicators | Metric / KPI Reference |
|---|---|---|---|---|---|---|---|---|---|
| **7. Sustainable Communities and Social Value** | | | | | | | | | |
| 7.3 As a result of local community consultation, the development improves health and wellbeing and reduces crime and vandalism (including littering) through and creating a sense of place and pride in place. | Community Engagement | **ALL PHASE 1:**<br>Local communities and stakeholders have influenced the development proposals.<br><br>The community and stakeholder engagement process meets the requirements of the BREEAM New Construction 2018 Man 01 Stakeholder Consultation (interested parties) and BREEAM Communities G01 Consultation Plan issues, demonstrating that teams have considered public space, local heritage, amenity uses, inclusive design and diverse uses, alongside local priorities into design.<br><br>All relevant stakeholders have been consulted regarding the effects on neighbours that are expected to occur during both the construction and operation of the completed works. | Consultation activities have commenced, including consultation with the local community on the Active Travel Hub. Further consultation activities will take place in the next stages to inform the design.<br><br>Moving forward, in order to comply with this output, a consultation plan should be put in place. This will need to be reviewed by the BMBC. Consultation should also be undertaken early enough for the community and stakeholders to influence key decisions. | ● | | ● | ● | Consultation events are carried out in line with the requirements of this output. The design incorporates the outputs of the consultation events, as appropriate.<br><br>Reduced local crime rates. | BREEAM Communities<br><br>BREEAM NC 2018<br><br>CEEQUAL v6 |
| 7.4 A sustainable community and buildings are delivered, resulting in improved environmental, social and economic sustainability. | Sustainability Frameworks | **ACTIVE TRAVEL HUB:**<br>The design, construction and operation of the Active Travel Hub is supported by frameworks including BREEAM and the WELL Building Standard. The building achieves BREEAM Very Good, as a minimum.<br><br>**MULTI-STOREY CAR PARK, PUBLIC REALM AND PLOTS 1 & 2:**<br>The design, construction and operation of these assets are supported by frameworks including BREEAM, WELL Building Standard and the Home Quality Mark, and achieve the targets set out in this strategy. | Why way of compliance with the sustainability strategy, the development will be supported by the relevant frameworks. The frameworks should be revisited throughout the design, however, and additional sustainability and wellbeing features incorporated, where appropriate.<br><br>A BREEAM pre-assessment exercise has been undertaken for the ATH, proposing a strategy for achieving BREEAM 'Very Good'. For further details please refer to the Active Travel Hub Stage 2 Report. | ● | ● | ● | ● | BREEAM 'Very Good' certification for the Active Travel Hub.<br><br>The measurements and indicators will encompass numerous environmental, social and economic sustainability benefits. | Barnsley Local Plan 2012–2033 |
| | Life Cycle Costing | **ALL PHASE 1:**<br>All major design or specification changes relevant to the sustainability strategy are supported by a life cycle costing exercise to ensure the subsequent operational expenditure is not compromised due to savings in capital expenditure. | The use of life cycle costing exercises to inform major design changes will be applied in the following stages. | ● | ● | ● | ● | Reduced operational expenditure.<br><br>Improved environmental performance. | Bespoke |

## 11.5 Next Steps

In order to ensure that the sustainability strategy remains embedded within the design, the appointment of a Sustainability Advisor is advised. The Sustainability Advisor will oversee the delivery of the strategy, undertaking regular workshops with the project team and reviews of proposals in order to ensure they align with sustainability outcomes and outputs. Part of the role will also be to assign responsibilities for outputs to key project team disciplines, ensuring all parties are aware of the requirements for each output within the strategy.

As mentioned in Section 11.2, the sustainability strategy should remain a live document, incorporating any future updates relevant to design changes, industry trends or Council policies and agendas.

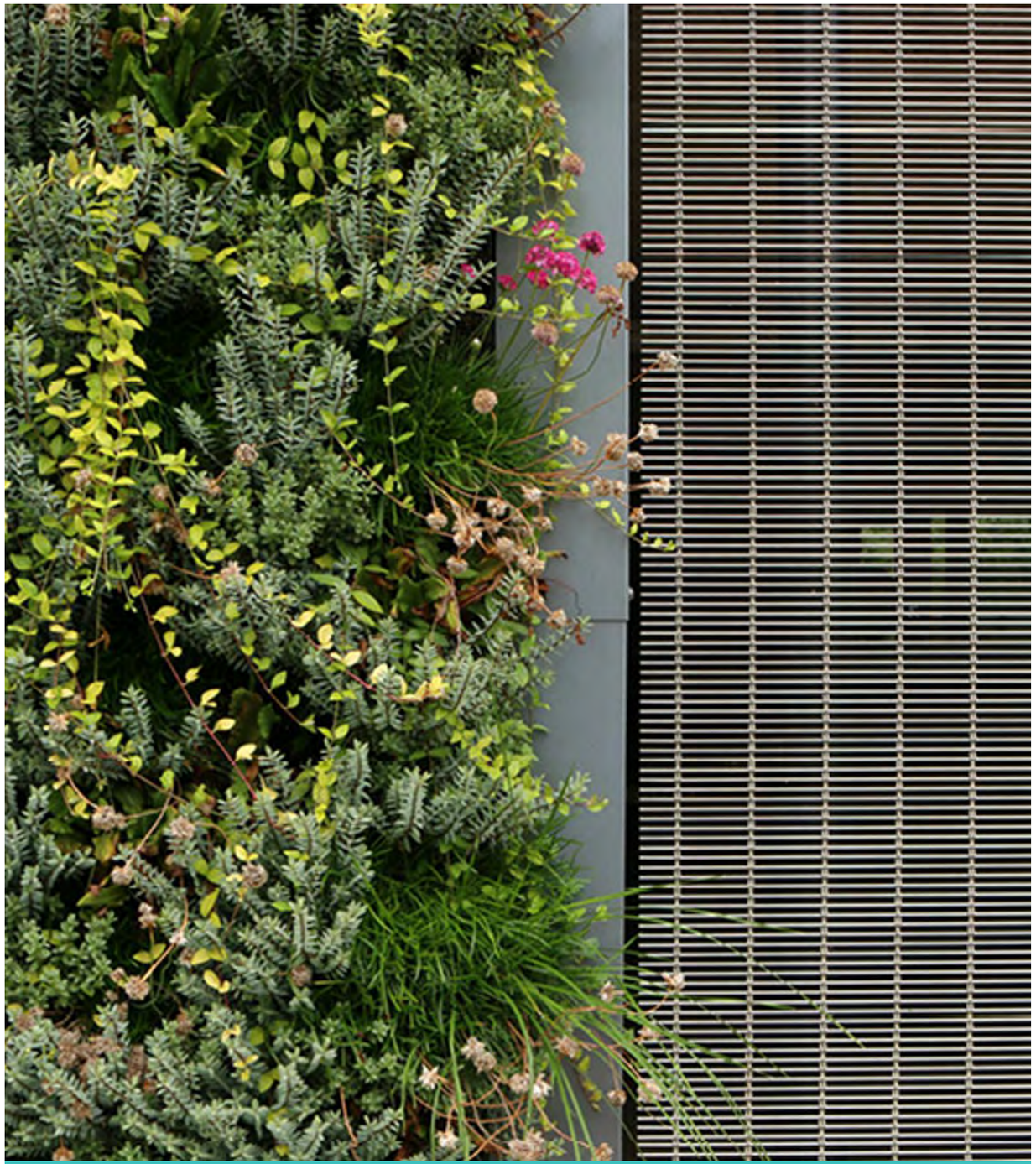

Figure 11.1: Multi-storey car park precedent image

Figure 11.2: Multi-storey car park precedent image

# 12.0 Smart Technology

## 12.1 Smart Narrative for the SEAM

The starting point for our work was to create a consensus view of what 'smart' means within the context of the aspirations for BMBC, the community it serves and the embryonic businesses that will bring the SEAM to life. To get to this view Arcadis hosted two well attended workshops drawing in stakeholders from the community, academia, and business. Two overriding themes emerged. Digital start-up businesses of the kind that will be drawn to the SEAM told us that whilst basic digital infrastructure (high performance broadband, mobile coverage and WiFi) was important, space to collaborate was probably the key ingredient. We heard from the former CEO of one City Centre IOT focussed accelerator, that lack of a café in the purpose-built facility was one of her biggest regrets. Engagement with the wider community was also complicated by the ability to open up the ground floor as community space because of difficulties in securing access to the higher floors of the building, which were only overcome by further investment in remedial actions. This latter point is important because the second key theme that emerged from the workshops was the need for the SEAM to engage with the community and describe outcomes in practical terms showing benefit to the people and businesses of Barnsley and the wider South Yorkshire city region.

The need for the SEAM to explain itself in practical terms is at the heart of our smart proposal. Rather than seek to conceal the digital workings of the campus and the work of companies based in the SEAM hidden inside the buildings, our approach is to expose, inform and educate. The routes of fibre networks passing through the campus will be sketched out on the paving surface. Street furniture-mounted Internet of Things (IOT) gateways will connect to sensors in the soil, air quality and movement sensors. Information signage with QR codes will explain how fibre carries traffic to the internet and what the gateways and sensors are doing. Realtime information will be displayed on the public screen in the central green space. The same screen will allow visitors to browse cameo videos of the companies based in the SEAM and what they do. An event programme will be used to attract visitors to the campus, free public space WiFi will encourage people to stay, explore and engage. Interactive streetlights, recording and replaying shadows will bring a playful note to the engagement offer.

The outdoor spaces of the SEAM will become a place for experimentation for local businesses and academia. BMBC have plans for a local and regional IOT network which could potentially be managed from the SEAM. This network will deliver a range of practical applications far beyond the SEAM campus (ranging from air quality monitoring to more specialist applications such as informing better gritting decisions using road temperature sensors) but will support the innovation agenda of the SEAM. Hinged lighting columns will allow new sensors and radio equipment to be installed simply and quickly, supporting that experimental agenda.

The multi-storey carpark and active travel hub are potentially uncomfortable bed-fellows but we can use the smart agenda to explain how both are part of one transitional journey. A barrierless and ticketless parking solution will give a real-time view of car park occupancy. These vehicle journeys could be turned into a carbon target to be offset by active travel; hire bikes could use IOT tracking to record mileage (and do more such as give insight for road repairs and potential future cycle routes) and a parking premium could even be applied at busy times to subsidise bike hire and fund carbon offset. All of this information will be visualised on the Big Screen.


Figure 12.1: Multi-storey car park precedent image

# 13.0 Health and Safety

## 13.1 CDM

During Stage 2 the emerging design and strategies have been reviewed from a CDM perspective, with the design team discussing issues as a group.

This extends to undertaking risk reviews and production of Designers Risk Assessments. The aim is remove / mitigate risks where possible within the design stages.

A copy of the current Designers Risk Assessments is included on the page opposite.

A Pre-Construction Information Pack can be found in CDM Appendix L.

## 13.2 Principal Designer

The Stage 2 design for the Multi-Storey Car Park, Active Travel Hub and the public realm is currently being progressed as one distinct project for Principal Designer activities.

Design risks are reviewed holistically as a team through design team meetings / risk workshops, while each individual discipline is responsible for the review and production of its own Designers Risk Assessments (DRAs). The DRAs are issued to the Principal Designer (PD) for inclusion in the Significate Hazard and Risk Register which as a live document, will be reviewed at regular intervals in Design Team Meetings and CDM workshops.

The first issue of the Pre-Construction Information Pack (PCIP), see Appendix L, has been issued to BMBC for review and comment. As with the Risk Register, the PCIP will be reviewed and updated on a regular basis as the design progresses in the pre-tender period. On completion, the PCIP and Risk Register will be issued with the Tender pack to the Principal Contractor in order to include relevant information into the Construction Phase Information Plan.

Figure 13.1: Photograph of the DMC01 building at night

# PRINCIPAL DESIGNER - SIGNIFICANT HAZARD & RISK REGISTER

BDP.

**Professions:**

| | | |
|---|---|---|
| Principal Designer | PD | BDP |
| Architect | ARC | BDP |
| MEP Engineer | MEP | BDP |
| C&S Engineer | CS | BDP |
| Landscape | LAN | BDP |
| Sustainability | SUS | BDP |
| Cost Consultant | CC | Arcadis |
| Geotechnical Engineer | GEO | Arcadis |
| Utilities Engineer | UTL | Arcadis |
| Fire Consultant | FIR | Arcadis |
| Transport Consultant | TRN | Arcadis |
| Project Manager | PM | Arcadis |

**Project No:** P3002270
**Project:** The Seam, Barnsley Digital Campus - Phase 1
**Document No:** SEAM-BDP-XX-XX-SH-N-09001
**Revision:** P01
**Issued by:** Simon Trickett
**Date :** 20 December 2021
**NOTES:**

OPEN
CLOSED
RESIDUAL RISK

| Hazard No. | Stage | Significant Hazard / risk | Location | Date logged | Designer's Action : Eliminate / Reduce / Control | Design Owner | Remaining Significant Risk / Future Control Measure | Where Recorded: RR / PCI / CPHSP / Drawings | Risk Status : Open / Closed / Residual in H&SP | Date closed | Reason for Closure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **BDP Arch** | | | | | | | | | | | |
| AR 01 | Construction | Public access and servicing access to existing DMC 01 building during construction | DMC 01 | 20/12/2021 | Recognise and highlight constraints. To be considered further in conjunction with detailed phasing strategy. Sufficient access to be maintained at all times. | ALL | Detailed phasing strategy to be developed and interface controls put in place. Reduce interface via careful consideration to phasing, Controls via buffer zones, provision of separate routes etc | RR | OPEN | | |
| AR 02 | Construction | Servicing access to existing Courthouse pub during construction | Road accessing site off County Way to north / rear of the Courthouse pub | 20/12/2021 | Recognise and highlight constraints. To be considered further in conjunction with detailed phasing strategy. Sufficient access to be maintained at all times. | ALL | Detailed phasing strategy to be developed and interface controls put in place. Reduce interface via careful consideration to phasing, Controls via buffer zones, provision of separate routes etc | RR | OPEN | | |
| AR 03 | Construction | Close proximity of railway line to eastern boundary | Eastern boundary | 20/12/2021 | Recognise and highlight constraints of associated easments in proposals. | ALL | Engagement required with Network Rail to review outline site proposals. Detailed phasing strategy to be developed and interface controls put in place. Controls via buffer zones, provision of separate routes etc | RR | OPEN | | |
| AR 04 | In Use | Maintenance access to DMC 01 building (large crane) | DMC 01 / ATH | 20/12/2021 | Extent of crane accommodated in siting of ATH footprint. Sufficient hardstanding area to be allowed for within design of public realm. | ALL | Detailed risk assessments and method statements in place before carrying out maintenance activities. | RR | RESIDUAL RISK | | |
| AR 05 | In Use | Maintenance access to MSCP, Plots 1 and 2 adjacent to live railway. | Eastern boundary | 20/12/2021 | Sufficient access allowed for within design. | ALL | Working adjacent to railway guidance and procedures to be followed to ensure all risks are mitigated. Detailed risk assessments and method statements in place before carrying out maintenance activities. | RR | RESIDUAL RISK | | |
| AR 06 | In Use | Possible Poor Air Quality - Exposure to $NO^2$ above the annual mean Air Quality Objective (AQO) | Whole Site | 20/12/2021 | Air Quality Assessment survey recommended to be undertaken due to proposed residential uses on the site. We are aware that the neighbouring 'Eastern Gateway' site on the other side of the railway found there to be a risk in the vicintiy of exposure to NO2 above the annual mean Air Quality Objective (AQO). | BMBC | Undertake recommended AQA survey to understand if there are any impacts upon design. | SLR Report Ref: 416.09094.00001 - Harborough Hill, Barnsley– Air Quality Assessment | OPEN | | |
| AR 07 | In Use | Possible destination for suicide attempt | MSCP | 07/01/2021 | Barrier height at roof level is enhanced from guidance within regulations to dissuade the opportunist from attempting suicide. At roof level the supporting structure for the photovoltaic panels maye extend to the perimeter, detail to be finalised. CCTV to be incorporated within the scheme. | Arch | Preventing suicides in public places guidance to be reviewed. Workshop with Designing Out Crime Officer to be arranged. | RR | RESIDUAL RISK | | |
| **BDP C&S** | | | | | | | | | | | |
| CS 01 | Construction | Public access & usage adjacent to live construction site | Whole site | 18/01/2022 | Recognise and highlight constraints. Considered during initial phasing proposals | ALL | Detailed phasing strategy to be developed and interface controls put in place. Reduce interface via careful consideration to phasing, Controls via buffer zones, provision of separate routes etc | RR | RESIDUAL RISK | | |
| CS 02 | Construction | Maintaining existing buildings' services during construction resulting in excavation adjacent / over live services | Whole site | 18/01/2022 | Highlight the requirement that existing services are fully surveyed and understood. | MEP/C&S | Detailed surveys (further GPR / scans / CCTV / trial pits) to determine specific service routes and details. Modifications / additions are congniscant of ongoing demands and new routing minimises interface | Drawings | RESIDUAL RISK | | |
| CS 03 | Construction | Ground Risk - Contamination, ground gas, groundwater etc | Whole site | 18/01/2022 | Review of preliminary Site Investigations and outlined | C&S | Ensure further Site Investigation is undertaken (plot specific) to determine and mitigate risks associated the ground | RR | OPEN | | |
| CS 04 | Construction | Risk of un-logged Coal Mining on site | Whole site | 18/01/2022 | Intrusive coal mining survery undertaken to understand magnitude of risk. | C&S | Further on-plot surveys to also cover coal mining potential and assessment to be made on a plot by plot basis | RR | OPEN | | |
| CS 05 | Maintenance | Condition of existing drainage | Whole site | 18/01/2022 | Highlight the need for further GPR and CCTV survey information. Sought local knowledge of drainage system and its condition | C&S | undertake a full CCTV survey at the next stage to determine condition of existing sewers. Continue to liaise with local authority and seek advice from specialist | RR | OPEN | | |
| CS 06 | Workplace risks | Existing Retaining walls - risk of collapse due to increase in overburden | Whole site | 18/01/2022 | Preliminary visual survey undertaken and further survey work and associated risks highlighted | C&S | Undertake recommended surveys to fully understand the construction, condition and impact adjacent developments will have on the walls | RR | OPEN | | |
| CS 07 | Construction | Temporary instability of MSCP beams during installation of slabs | MSCP | 18/01/2022 | Where possible, steelwork shall be designed to withstand temporary torsional loading. Where not practical, the construction sequence should minimise this risk by loading the beam progressively and sequentially. There still may be a need for temporary ties to provide lateral and torsional restraint to beams. | C&S | Risk to be higlighted on design drawings | Drawings | OPEN | | |
| **BDP Landscape** | | | | | | | | | | | |
| LAN 01 | | | | | | | | | | | |

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| **BDP MEP** | | | | | | | | | | | |
| MEP 01 | | | | | | | | | | | |
| **Arcadis Geotechnical** | | | | | | | | | | | |
| GEO 01 | Construction | Existing Retaining Walls - Eldon Street RW - Details of soil nails / ground anchors unknown. Potential for development to adversley affect anchors and stability of RW. | Whole site | 19/01/2022 | Reduce risk by undertaking detailed investigations and geotechnical stability analysis. Use design solutions which can avoid anchor locations. Specialist piling advice to be sought when in proximity to soil nails. | Arcadis | Exclusion zones to be clearly set out and marked onsite/fenced off as appropriate. | RR | OPEN | | |
| GEO 02 | Pre Construction | New development surcharge on retaining walls. Loadings within zone of influence could have detrimental impact (destabilising effect) on wall. | Whole site | 19/01/2022 | Site investigations and stability analysis to inform exclusion zones/easement behind the wall. Surcharge loads to be elimated or reduced to magnitudes no greater than current use. Building loads to be transferred to soil/rocks outside of retained element (e.g. pile foundations). | Arcadis | Hazards risk to be clearly commincated on all design drawings related to the zone of influence of the retaining walls. | RR | OPEN | | |
| GEO 03 | Construction | Existing retaining walls – Temporary construction loads/surcharge, e.g. piling rigs, excavators, cranes, MEWPs etc, may have destabilising effect on the wall. | Whole site | 19/01/2022 | Exclusion zone/easement behind wall with loads limited to equivalent of current uses. If loading cannot be avoided, temporary propping to be used to ensure stability is maintained. | Arcadis | Exclusion zones to be clearly set out and marked onsite/fenced off as appropriate. | RR | OPEN | | |
| GEO 04 | In Use | Contamination and Made Ground: The HBS GIR identified human health risks from polycyclic aromatic hydrocarbons and asbestos containing materials in the Made Ground. Ground gas and groundwater monitoring in the HBS GIR are also incomplete. | Whole site | 19/01/2022 | Supplementary geo environmental ground investigation required to infill data gaps and update the conceptual site model. | Arcadis | To be updated following completion of the supplmentary geo environmental ground investigation. | Hamson Barron Smith 'Ground Investigation Report' ref. 23-24-18-1-8011/GIR1 (June 2018) | OPEN | | |
| GEO 05 | In Use | Coal Mining - A CMRA undertaken by Hydrock (in previous Blueprint masterplan commission) identified there is a moderate to high risk of shallow coal workings beneath parts of the site. | Whole site | 19/01/2022 | Hydrock have undertaken a supplementary mining investigation to infill data gaps and produce an updated mining risk assessment report based on the findings. | Arcadis | To be updated following issue of the mining risk assessment report. | Hydrock 'Coal Mining Risk Assessment' ref. 15398-HYD-XX-XX-RP-GE-0001 (14 August 2020) and 'Coal Mining Ground Investigation Report' ref. 15398-HYD-XX-XX-RP-GE-0003 (20 January 2021) | OPEN | | |
| **Arcadis Utilities** | | | | | | | | | | | |
| UTL 01 | | | | | | | | | | | |
| **Arcadis Transport** | | | | | | | | | | | |
| TRN 01 | | | | | | | | | | | |

# 14.0 Fire Safety

The fire safety engineering proposals are for the new Multi-Storey Car Park (MSCP) building, which is considered as an open-sided car park.

The general fire safety guidance used for such an open-sided car park building will be the recommendations of BS 9999:2017.

## 14.1 Requirement B1: Means of Warning and Escape

### 14.1.1 Fire Detection and Fire Alarm

The provision of Automatic Fire Detection (AFD) within the building will be required to meet the following in accordance with BS 5839-1:

- Category L4 system to the fire-fighting shafts (i.e., detection installed within defined stairs, lobbies and any corridors).
- Category M system to the main car park floor plates of a typical open-sided car park upper level (i.e., manual call points installed from the escape side of the car park entering an escape route from the storey level / car park).
- Category L5 system to any enclosed areas (which are not open-sided, which allows the smoke ventilation systems to be operated, i.e., the lower ground levels / parts which are enclosed).

A single Main Fire Alarm Panel (MFAP) will be provided within the main fire-fighting lobby from the building, of which will be used as the main stair / access point for the fire service. A Repeater Fire Alarm Panel (RFAP) will be provided within the secondary fire-fighting lobby to the other side of the building.

It is noted that the building as a whole will be proposed to be designed to raise a simultaneous evacuation alarm throughout all areas / parts of the whole building.

The fire alarm panel should be located at the main entrance to the building. A repeater panel will also be required to the entrance at the community facility end / flat entrance end of the building.

### 14.1.2 Alarm Strategy

A single-stage alarm strategy will be adopted (i.e., a single knock system with no investigation period), i.e., a single device will give an immediate evacuation alarm signal throughout the whole building.

### 14.1.3 Escape Signage

Escape signage will be designed and installed in accordance with both BS EN ISO 7010 and BS 5499-4, to suit the proposed layouts.

Safety signage will be provided to all fixed and portable first aid fire-fighting equipment locations, manual call points and any other fire & life safety related equipment and devices.

Additional signage for PRMs will be required to identify the evacuation lifts and direct PRMs to use evacuation lifts as their immediate escape.

### 14.1.4 Emergency Lighting

Emergency lighting will be designed and installed in accordance with both BS 5266-1 and BS EN 1838, to suit the proposed layouts.

Either emergency lighting should be designed to maintain normal lighting lux levels in the fire-fighting shaft for 3 hours or the normal lighting should be maintained to provide such lighting levels for no less than 3 hours.

### 14.1.5 Active Fire Protection (Sprinklers)

There are no Building Regulations requirements for sprinkler protection to be provided within this building. However, in light of recent fire incidents (best practices and lessons learned, including the new technology surrounding EV Charging points), it is recommended to provide a zoned fire service operated dry pipe foam/ water spray deluge system with open type sprayer nozzles (i.e., in accordance with BS EN 13565-2 or similar to be agreed at RIBA Stage 3). Such a system will not be automated nor have any pumps / tanks and will be solely consisting of an inlet fire service connection and dry pipework with open nozzles, to be used upon the discretion of the attending fire service with flexibility for both water spray and/or foam aspirating.

### 14.1.6 Evacuation Strategy

The entire building will adopt a simultaneous evacuation strategy.

### 14.1.7 Assembly Point / Rendezvous Point (RVP)

A suitable assembly muster point will be provided as a rendezvous point (RVP) located and designated to land adjacent to the car park.

### 14.1.8 Horizontal and Vertical Means of Escape

Horizontal and vertical means of escape from all areas of the building will meet the recommendations of BS 9999.

The lower ground levels are open to one side; however, they will require to meet specific requirements similar to a basement. Please refer to the Fire Safety Strategy report for more information.

### 14.1.9 Assisted Evacuation for PRMs

It is noted that the building will not have any on-site management. PRMs are expected to make their escape unassisted. Therefore, the evacuation plan will not and cannot rely on the assistance of any management nor the attending Fire & Rescue Service.

Two evacuation lifts will be provided (one evacuation lift within each stair core).

PRMs will be expected to be directed to use the evacuation lifts provided to make their escape from an upper / lower floor level. Please refer to the Fire Safety Strategy report for more information.

## 14.2 Requirement B2: Internal Fire Spread (Linings)

The internal linings of a room or area of a multi-storey open-sided car park (any materials or products in lining any partition, walls, ceilings, floors or other internal structure) will be Class A1 rated.

### 14.2.1 Thermoplastic Materials

It should be noted that no thermoplastic materials are to be used in the external wall construction or any internal walls, windows, doors, diffusers or roof lights of the proposed works (including any attachments to the external walls).

## 14.3 Requirement B3: Internal Fire Spread (Structure)

### 14.3.1 Structural Fire Resistance

The structural fire resistance of the MSCP building is required to achieve a minimum of FR 90 minutes fire resistance rating to load bearing capacity (R), including all columns, beams, floors and primary structural elements.

Any attachments to the external walls will require to be reviewed.

### 14.3.2 Compartmentation

Each full floor storey level will each be a structural fire resistant / compartment floor i.e., lower ground levels, ground floor, upper floor levels and the roof level should be provided as sufficient fire-resistant construction to load bearing, integrity, and insulation (REI).

The compartmentation and fire-resistant construction requirements will be identified and provided in accordance with the recommendations of Tables 22, 23, 29 and 30 of BS 9999.

Please refer to the Fire Safety Strategy report for more information.

### 14.3.3 Cavity Barriers and Fire Stopping

Concealed spaces are required to be split by cavity fire barriers and any service penetrations are required to be fire stopped effectively both in accordance with BS 9999.

### 14.3.4 Ventilation Ducts, Service Ducts/Shafts and Service Pipes

Service pipes, drains etc passing through any floor/roof soffit will be fire stopped in accordance with Table 31 of BS 9999.

Services, ducts or shafts passing through a fire resisting element (such as a wall, floor, ceiling / soffit etc) will maintain the fire integrity and insulation of such an element to one or more of the following methods:

- Method 1 – thermally activated fire dampers (unless passing through a compartment or located on an escape route); or
- Method 2 – fire-resistant enclosure; or
- Method 3 – protection using fire-resisting ductwork; or
- Method 4 – automatically activated fire and smoke dampers triggered by the buildings AFD system.

## 14.4 Requirement B4: External Fire Spread

### 14.4.1 External Fire Spread / Boundary Conditions

The building is new and unprotected openings should be in accordance with both BS 9999 and BR187 for such open-sided car park buildings.

- Unprotected openings areas are required to be greater than 5% of the floor area, required to each façade at each level.
- Unprotected openings area shall be restricted to no more than 40% allowable unprotected area of the full height of each façade at each level.

Any walls / areas around the allowable unprotected areas (not including protected stair enclosures) shall be provided as 90 minutes fire resistant construction (from the internal face of the internal wall construction).

The external fire spread analysis of the proposed boundary conditions will be reviewed, please refer to the fire strategy report for more information.

### 14.4.2 External Walls

The materials for any cladding / external wall construction should be Class A1 (Class A2-s1,d0 will be subject to further approving authority approvals). This includes all components of the external wall construction such as trays and membranes etc. and any attachments.

### 14.4.3 Roof

The roof should either be designed as a compartment floor (especially where means of escape is required over that area of roof) or where not part of an escape route, should achieve a minimum of BROOF(t4), this is classified as being on a suitable non-combustible substrate or fire rated ceiling below and impenetrable within 60 minutes (we recommend a non-combustible substrate and ceiling construction is applied to a minimum of 90 minutes fire resistant construction.

Solar PV panels (where located over a roof) shall be provided on non-combustible material (such as slabs/ballast or another suitable non-combustible material method). Separated from each other as well as adjacent walls / services etc with sufficient fire breaks.

### 14.4.4 Solar PV Panels

All solar PV panels are considered as a fire risk / spread of fire hazard, therefore, as noted above sufficient separation and fire breaks are required.

The inverters should be located within a fire-resistant enclosure such as a plant room, with a minimum of 90 minutes fire resistant construction.

Fireman's override isolation switches shall be provided at the head of each stair / Solar PV Panel access point, so that the attending fire service can isolate the solar PV panels (these shall be suitably signed).

## 14.5 Requirement B5: Access and Facilities for Fire Service

### 14.5.1 Vehicle Access

The building will have access to within 50% or greater of the perimeter of the building.

Suitable access into each fire-fighting stair core to provide access to the internal parts of the building will be provided, which is considered as reasonable access.

Any external roads will be provided as suitable hard standings for fire service vehicle access points, which will be in accordance with the recommendations of Table 20 of BS 9999 (i.e., for a pump appliance with a 3.7m clear width, a 3.7m clear height and a minimum carrying capacity of 14 tonnes).

Vehicular fire appliance access will be able to be made to within 18m of each fire-fighting access point / fire-fighting stair and inlet point.

### 14.5.2 Personnel Access

Access directly into the building for fire service personnel is considered reasonable, this is via two fire-fighting access points, provided by the fire-fighting shafts at adjacent ground level.

Two fire-fighting shafts (provided with 120 minutes fire resistant construction) are required for this building. Fire-fighting shafts are consisting of:

- Ventilated & protected fire-fighting lobby
- Fire-fighting stair
- Dry rising fire mains
- Fire detection and fire alarm

### 14.5.3 Dry Risers

Dry rising fire mains are required to be provided within each fire-fighting shaft.

Landing valve outlets are required to be located within each fire-fighting shaft, with an outlet at each full landing level. Hose distances shall be 45m or less within the floor plate of the building.

Breaching inlets are required at the adjacent ground level / fire-fighting access points to each fire-fighting shaft. The inlet will be visible from the vehicular fire appliance approach / access route.

### 14.5.4 Fire Hydrants

Fire hydrants should be within 90m of the fire-fighting access points.

It would appear that the existing hydrant provision is not considered reasonable (based on a map/street review). This should be confirmed by the local water authority / fire authority. Therefore, new fire hydrants are required to be provided to the site.

### 14.5.5 Solar PV Panels

Fireman's override isolation switches shall be provided at the head of each stair / Solar PV Panel access point, so that the attending fire service can isolate the solar PV panels.

### 14.5.6 Smoke and Heat Ventilation (Typical Upper Levels Car Park)

Typically for upper levels, which are considered as open-sided and have opposing openings areas (each of 5% of the floor area or greater) will therefore be required to have natural smoke ventilation. Natural smoke ventilation should be provided to two or more sides (preferably each façade) which are open to air. These façades shall be each be provided with a minimum opening area calculated as 5% of the floor area of that level (usually measured up to a ramped area) of the next level, i.e., split half levels.

Natural smoke vent openings to each façade shall be no more than 40% of the façade area.

### 14.5.7 Smoke and Heat Ventilation (Lower Ground Levels)

Lower ground levels (whilst are not listed specifically as a basement), will each have a perimeter area enclosed / covered by ground. therefore, each lower ground level will be provided with suitable natural smoke ventilation to one or more predominant sides of adjacent ground level(s). These adjacent ground level(s) / façade shall be each be provided with a minimum opening area calculated as 5% of the floor area of that level (usually measured up to a ramped area.

Natural smoke vent openings to each façade shall be no more than 40% of the façade area.

Stagnant areas are not allowed, and as such, the natural smoke ventilation will be supplemented with strategically located mechanical jet/impulse fans to mechanically assist the natural smoke ventilation (known as a hybrid system).

### 14.5.8 Smoke and Heat Ventilation (Fire-

### Fighting Lobbies)

The fire-fighting lobbies at each level are each required to be provided with 1.5m2 free vent area AOV opening directly to outside. These will be designed to be installed to as close to the soffit at high-level as practicable to vent each fire-fighting lobby at each floor level.

### 14.5.9 Smoke and Heat Ventilation (Fire-Fighting Stairs)

Fire-fighting stairs at the head of each stair are each required to be provided with a 1.0m2 free vent area AOV vent opening at the head of stair through the roof of the stair.

This is required to be automatic either upon detection of smoke/fire within the fire-fighting shaft (stair, lobbies and/or corridors) or upon the buildings fire alarm activation.

### 14.5.10 Emergency Power Supplies

Secondary power supplies will be provided to all relevant fire & life safety systems (including the fire-fighting lifts, AOVs, evacuation lifts, automatic fire detection systems, and emergency lighting etc.).

Emergency lighting will either be battery combined back-up or integral to each device.

Automatic Fire Detection (AFD) will be battery back-up, integral to the panel.

Automatic opening vents (AOVs) will either be battery combined back-up or integral to each device.

The two fire-fighting lifts will be provided with sufficient secondary power supply (usually a secondary/standby generator).

The two evacuation lifts will be provided with sufficient secondary power supply (usually a secondary diverse route protected in FR construction and FR cabling, taken from the primary intake). A risk assessment is required to provide sufficient secondary power supply to the two evacuation lifts.

All power and cabling required for any fire & life safety systems listed above will be specified and installed in accordance with BS 8519.

Please refer to the Fire Safety Strategy report for more information.

## 14.6 Evacuation for PRMs

PRMs require an evacuation strategy to meet the Equality Act 2010.

As such, two evacuation lifts are proposed, which can be used to evacuate any upper floor level or lower ground level (as required).

A disabled refuge point (an area of 1400mm by 900mm) will be provided immediately in front of each evacuation lift on each floor level (within the fire-fighting shaft).

There are no requirements to provide any emergency voice communication (EVC) systems to these lobbies as there is no on-site management to call for assistance.

It is expected that any PRMs will be required to evacuate unassisted and shall not rely upon the attending Fire & Rescue Service or any emergency services. Therefore, the directions and signage will direct any PRMs to use the evacuation lifts to make their immediate evacuation. The refuges are only a waiting point should the evacuation lift already be in use or to afford a rest (should it be required).

## 14.7 Fire Safety Strategy Report

All the points above for the MSCP car park building as a whole is considered reasonable in meeting the functional requirements of Part B of Schedule 1 to the Building Regulations (subject to review and approval by the approving authorities and relevant stakeholders).

# 15.0 Appendices

BDP.