The London Institute of Medical Sciences
RIBA Stage 2 Report

27.02.2018
Rev 02

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BUROHAPPOLD ENGINEERING

Cover Image: LMS Concept Sketch

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RIBA Stage 2 Report
Document control and issue sheet

Document history

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Authorisation

Reviewed by			
Name	Project role	Signature	Date
Project Board			
Bryan Little/ Susan Simon	MRC		
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Contents

1 Introduction

1 Introduction
1.1 Executive Summary

Overview
This document presents the Concept Design (RIBA Stage 2) and provides a summary of the proposals to create a new Institute building for the for the London Institute of Medical Science. The purpose of this report is to provide a strategic overview of the project's status and bring together a broad range of information at a single point in the project's development.

Architectural Summary
RIBA Stage 2, which has been undertaken from September 2017 to February 2018, primarily deals with key issues surrounding the conceptual design including further development of the brief alongside outline proposals for architectural, structural and services systems. This has been the focus of the design team, which culminates in this report. Through user consultations and benchmarking other similar buildings as well as the current Medical Research Council (MRC) & Imperial College London (ICL) facilities the design team have been able to interrogate the brief and suggest how efficiencies might be made.

Key items that have been reviewed include the building identity, entrance location/ sequence, rationalisation of the building plan to maximise efficiency, social spaces, interior strategy and landscape design.

Following on from the Stage 1 design, the design team has worked hard to maximise efficiencies whilst taking on board user consultation and Building Working Group feedback. With the on-going coordination of structures, lab planning and MEP each discipline has created a Revit BIM model on which the design will be developed through the later RIBA Work Stages.

This report concludes with a series of recommendations and next steps. The aim of this is to list out residual design issues/ decisions/ information required for the Stage 3 design.

1 Introduction
1.2 Project Background

The MRC LMS aims to be at the forefront of innovative biomedical research and in partnership with Imperial College London and others, to promote the translation of its research for maximal benefit. The institute will train and mentor the next generation of clinical and non-clinical scientists and strive to enhance the public's interest, understanding and trust in science.

The MRC LMS (formerly the MRC Clinical Sciences Centre, CSC) is a core-funded MRC Institute. Located on the Imperial College Hammersmith Hospital campus, it has strong partnerships with Imperial's Faculty of Medicine, as well as with the Faculties of Engineering and Natural Sciences. This access to medicine, physics, chemistry and engineering affords the Institute superb support for delivering on its multidisciplinary remit to strengthen the interface between clinical and basic science. LMS is located in close proximity to Imperial's White City Campus development which will provide local access not only to academic chemists and engineers, but also to industrial collaborations and expertise in entrepreneurship and innovation. The first phase of Imperial West hosts space for spin-outs and more than 70 start-ups, while the Research & Translation Hub will contain research and incubator space for 1000 researchers alongside 50 spin-out companies, designed to accelerate the commercialisation of research. This exceptional environment underpins the world leading fundamental and translational biomedical research at LMS and at Imperial College.

LMS pioneers the study of gene regulation and gene-environment interactions, capitalising on its unparalleled strengths in basic epigenetic mechanisms, physiology and metabolism, genomics and imaging, combined with bioinformatics, biostatistics and imaging. The Institute's strap line, "Genes in discovery, inheritance and health" summarises both its strengths and ambition. It reflects LMS's commitment to fundamental science, its application for understanding disease and its determination to use this knowledge to improve human health across generations. The Institute currently comprises circa 35 investigator-led groups supported by eight research facilities.

At the most recent QuinQuennial Review (QQR) by the MRC, the quality of the Institute's research and its proposals for the future were strongly endorsed, with research funding of £89.2M awarded for the period April 2016-March 2021. Among the Institute's noted strengths were:

- World-leading research programmes and outstanding examples of strengths in epigenetics, genomics, metabolic homeostasis and cardiovascular disease;
- The establishment of a new, interdisciplinary Integrative Biology Section, bringing together computational and experimental expertise and showing a promising focus on single cells and molecules;
- Involvement of leading international collaborators in the Institute's programmes; productive links with Imperial College, which promote and enhance interdisciplinary training and research;
- Innovative clinical science training programmes, producing clinicians with a strong foundation in basic research; innovative basic science career pathways;
- And field-leading public engagement.

The existing facilities restrict the opportunities for collaborative working as research groups are spread across many buildings on campus. A new building for the LMS aims to bring these groups together, creating new opportunities for inter-disciplinary collaboration.

This report describes the engagement of the Building Working Group, MRC & Imperial's Estates and Finance in the interrogation and development of the LMS's initial brief.

This report is the conclusion of RIBA Stage 01 which seeks to define a clear brief, budget and scope of the project.

During this stage the team have investigated the site opportunities and constraints paying particular attention to the existing contaminated slab and sub-station which sits centrally on the site of the recently demolished Cyclotron Building.

An area schedule has also been agreed through briefing and user consultations with key researchers and staff who will be homed within the new facility. A summary of the areas and cost is included below.

The next step is to establish a dialogue with the London Borough of Hammersmith & Fulham planning authority and to develop the concept design with other design consultants.

Accommodation:

- Laboratory Space
- Shared Technical Hub
- Office / Write-Up
- Specialist Facilities
- Cafe/ Social Space

1. To create a building that has a strong identity which is representative of the Institute and solidifies its position within the Hammersmith Hospital Campus.

2. To create a building that supports the world-class research of the LMS whilst being flexible, affordable and efficient through innovative design.

3. To create a building that fosters collaboration through comfortable and eclectic spaces that are characterful, well used and well loved.

4. To create laboratory spaces that are clinical and write-up neighbourhoods that are homely, like working from your kitchen table.

5. To create a landmark.

1 Introduction
1.4 RIBA Stage 2 Definition

RIBA Plan of Work 2013

This project is structured in accordance with the Royal Institute of British Architects (RIBA) Plan of Work 2013. This provides a framework which maps out the delivery of a building project from initial concept and feasibility, through to building design, procurement and construction in a series of defined stages.

RIBA Stage 2 Concept Design - Core Objectives

Prepare Concept Design, including outline proposals for structural design, building services systems, outline specifications and preliminary Cost Information along with relevant Project Strategies in accordance with Design Programme. Agree alterations to brief and issue Final Project Brief. This involves developing the following core project objectives:

- Spatial requirements
- Occupancy levels
- Primary functions & activities
- Quality objectives
- Project outcomes
- Sustainability aspirations
- Project budget

Extract from RIBA Plan of Work 2013

2 Location

2 Location

2.1 Campus & Wider Area Site Analysis

Located at the north-east corner of the Hammersmith Hospital Campus, the site is both surrounded by a complex of buildings and sits on the site boundary line where it neighbours open green land.

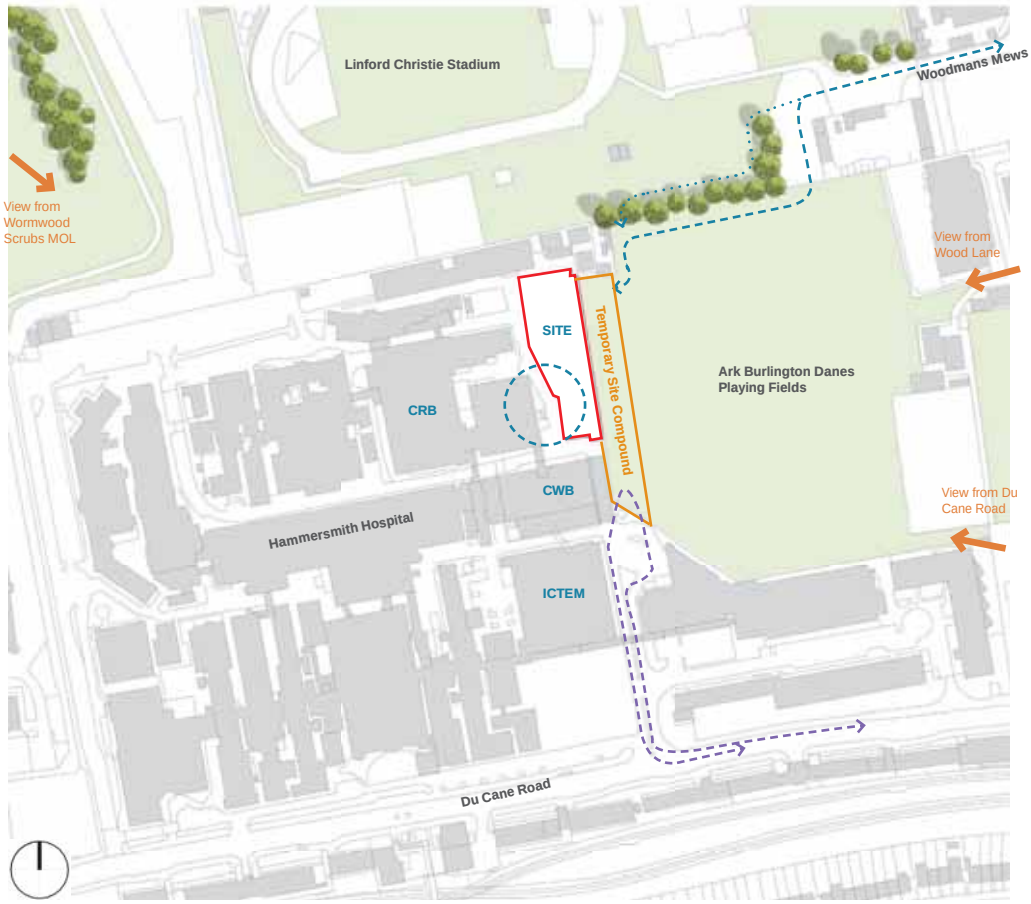
There are both constraints and opportunities within the wider campus and surrounding area. A few of the considerations are;

Site Logistics - The site has very limited access with the only vehicular access shared with an ambulance route. It is also landlocked with little room for manoeuvre. The site logistics throughout construction therefore become challenging requiring access through neighbouring land. This challenge will also effect on-going building maintenance.

Key Views - There are a few key views from surrounding areas of the site which need to be carefully considered. The three key views are from Du Cane Road, Wood Lane and from Wormwood Scrubs Metropolitan Open Land.

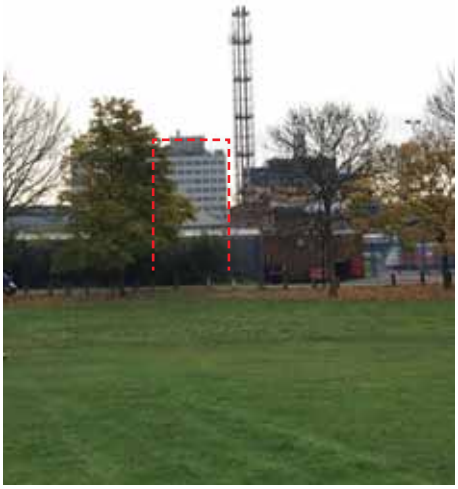
Masterplan - The campus does not have a masterplan which has led to a lack of order. Wayfinding, access and massing also becomes challenging due to the lack of future planning.

Placemaking - Due to the lack of masterplan, we feel there is a great opportunity to create a distinct place surrounding the LMS with the potential of becoming the social heart of the Imperial Hammersmith Hospital Campus.



2 Location
2.1 Campus & Wider Area Site Analysis

View from Across Adjacent Sports Pitches



View from Wormwood Scrubs Park

2 Location

2.2 Site Opportunities & Constraints

2.2.1 Site Constraints

1. Vehicle access limited to 4.4m height restricting servicing access.
2. Principle entrance route shared by an ambulance 'blue route' and the route to the heart attack unit.
3. Limited view of the site under The Commonwealth Building restricting visibility and natural way-finding.
4. Live substation in the middle of the site.
5. A backfilled radioactive area remaining from the previous Cyclotron Building demolition.
6. There is a requirement for a servicing vehicle access route down the West side of the site for surrounding buildings. This limits the scope to re-design and create a place in-front of the new building.
7. Limited width of the site at the South end creating a very narrow floor plate.
8. Proximity to The Commonwealth Building.

2 Location

2.2 Site Opportunities & Constraints

2.2.2 Site Opportunities

1. Great long distance views towards The City and over Wormwood Scrubs Metropolitan Open Land.
2. Opportunity to encourage a social centre to the Hammersmith campus with a close adjacency to the Wolfson Education Centre cafe.
3. Key long distance views of the site on the approach to the campus offering an opportunity to create an iconic building for the LMS Institute.
4. Permeable pedestrian flows throughout the campus offering many routes through existing campus buildings to the new LMS Institute building.

2 Location
2.3 Site Photographs

View of the Site from CRB Cafe

Site from North End

Relationship Between Wolfson & Site

Southern Corner of the Site from CWB Underpass

2 Location
2.4 Surrounding Context Photographs

'Elevated' Campus with Link Bridges at High Level

Metal Vertical Panel Facade of Burlington Danes

High-tech ICTEM Building Aesthetic

Vertical Grids

Linear Grids

Varying Heights & Styles Across the Campus

3 Stage 2 Development

3 Stage 2 Development

3.1 Stage 2 Timeline

The following timeline notes the User and Client meetings, design reviews and building visits that the design team have carried out throughout RIBA stage 2 as well as a fortnightly Design Team Meeting. The primary areas of development and the lessons learnt from the building visits are documented in Appendix A.

STAGE 1

START OF STAGE 2

29th September 2017
Stage 1 Report
Stage 1 Proposal

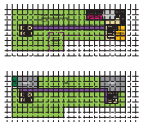
October 2017
Project Board
Approval of Option 04 - Stage 1 Report

18th October 2017
Design Review
Engineering Design Note Review

9th October 2017
Building Visit
H1 CBS Building Visit

24th October 2017
Building Visit
Burlington Danes Visit & CBS Options Review

20th October 2017
User Group Meeting
CBS Location, Briefing Areas and Project Priorities

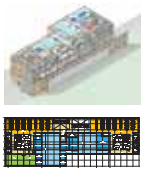


3rd November 2017
User Consultation
In-Vitro Imaging Briefing, CBS Facility Briefing, Cryo-EM Suite Briefing and Bioinformatics Briefing

3rd November 2017
User Group Meeting
Building Focus - Role of the Atrium

14th November 2017
Building Visit
CVR Building Visit

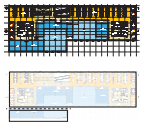
23rd November 2017
User Group Meeting
Typical Floor Diagram



29th November 2017
Design Review
Engineering Design Note Review & Substation Review

1st December 2017
User Group Meeting
Reception Location and Building Diagram

1st December 2017
Internal Design Review
Architectural Moves and Spatial Quality



4th December 2017
Design Team Workshop
GA Coordination Workshop & Core Layout Discussion

12th December 2017
User Consultation
Electrophysiology Briefing

13th December 2017
GLA Presentation
Building Diagram, Internal Layouts and Overall Massing

3 Stage 2 Development

3.1 Stage 2 Timeline

19th December 2017
Building Visit

The Francis Crick Institute

10th January 2018
Review

BMS Review with ICL/ Powell Systems

11th January 2018
User Consultation

Tech Hub Briefing

11th January 2018
Design Team Workshop

LMS Programme Discussions

12th January 2018
User Group Meeting

Typical Floor Layout & Entrance Location

12th January 2018
User Group Meeting

Review of Science Spaces Brief and Inclusion of ICTEM

17th January 2018
Review

District Heating Review

18th January 2018
Client Presentation

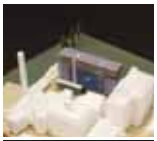
Way-finding & Entry Sequence

24th January 2018
Design Team Workshop

GA Coordination Workshop

26th January 2018
Review

Substation Review



29th January 2018
Planning Meeting

Design Update

29th January 2018
User Consultation

CBS Briefing

2nd February 2018
Project Team Workshop

Programme & Procurement

8th February 2018
User Consultation

In-Vitro Imaging Briefing

9th February 2018
Client Meeting

Stage 2 Report Page Turn

END OF STAGE 2

3 Stage 2 Development
3.2 Overall Building Development Summary

The Cyclotron Building

Beginning of Stage 2

Stage 2 WIP Developed Proposal

Building Identity Concept Development

3 Stage 2 Development
3.2 Overall Building Development Summary

The following summarises some of the key decisions and developments made in the design and briefing of the LMS throughout RIBA Stage 2.

Building Diagram & Occupancy
- The Stage 1 building occupancy was reviewed and a decision was made to increase the full capacity of the building. If the project budget exceeds available funding, a decision will be made to shell floor(s) to meet the budget.
- The reception and secure line is to be located on the ground floor whilst the seminar room and social areas are located on the top floor - benefiting from the views.
- The CBS facility is located on the first floor.
- Five typical floors make up the body of the building maximising efficiency and reinforcing a clear building diagram with a legible plan.

Entrance Location
- The location of the entrance has been discussed to be either on the south end or on the western facade of the building, both with advantages and disadvantages.
- The current proposal is for the entrance to be located on the west in order to allow a greater opportunity for place-making and a broader pedestrianised zone. This design solution is however still in development moving into RIBA Stage 3. A clear signage and wayfinding strategy is to be developed in the later stages.

CBS Location & Facility Size
- A decision was made to not split the CBS facility across two floors due to difficulties in servicing and providing dedicated vertical transportation for CBS users. The facility was therefore to be across a single floor, located on either the first floor or top floor. Through an external appearance, area and servicing study it was decided that the facility is to be located on the first floor and form part of the 'plinth' of the building.
- A revised schedule of accommodation developed through user consultation was agreed (935sqm to a revised 784sqm).

Atrium
- It was agreed that an atrium would benefit the space with natural daylight and visual connection between floors with little cost impact.
- The atrium was straightened to be a vertical atrium as the travelling atrium was no longer feasible when the building occupancy was increased. The vertical atrium also increased efficiencies as it omitted the 'space under the stair'.

Typical Floor Plans

Plan Diagram & Adjacencies
- Numerous pressures on the building diagram including efficiency, deep and dark labs and lab to write-up sapce relationship resulted in an agreed simplificaiton of the building form.
- There is now direct access from the office spaces into the primary laboratories.
- Tech hub and support facilities are primarily located in the centre of the plan with a design ambition of grouping darker areas whilst allowing more transparent areas to allow visibility and natural light.

Shared and Cellular Offices
- Shared offices are along the East facade of the building with plenty of natural light.
- The space factor for users within the shared offices are all equal in order to allow for greater flexibility. The space factor for wet laboratory and bioinformatic researchers is currently ~5sqm/per person which can flex to ~4sqm/ per person to allow for a greater occupancy.
- PI offices are to be located in two clusters. The offices will be at the North end of the building and in one further cluster which can vary across the typical floors as long as they sit within the office area (cannot displace 'blue' science space).
- PI offices and shared office space that are not internalised due to the cellular office location must be balanced and will require further review during RIBA Stage 3.
- The cellular office space factor has reduced to 5sqm. This reduction has been made due to space restrictions as the space on the South end is not seen as usable for cellular offices.
- There is currently a maximum of no.7 cellular office per typical floor giving a total of no.35 across the typical floors.
- There are currently no.4 cellular administration offices located alongside a shared office on the top floor. This space allowance is to be reviewed in RIBA Stage 3.

Meeting Spaces
- There are 2 x 6 person meeting rooms on each floor located at the south end of the plan. These meeting rooms can open up to create one 12 person meeting space for larger group meetings.
- Informal breakout/ meeting space is provide behind the cellular offices in the centre of the plan to allow for informal PI and researcher meetings as well as general collaboration.

Breakout
- Break out space would better allow for future expansion and flexible working if it was also appropriate to use for work stations. The breakout space was therefore primarily moved to the central spine of the floor plan adjacent to the shared office spaces.
- A tea-point is located within the central spine within close proximity to the atrium and breakout space. The number of tea-points has increased to 5 in order to provide one per floor.

WC & Change
- No.3 shower and changing rooms have been provided on Level 01 for the general building users. This provision is to be reviewed alongside cycle storage in RIBA Stage 3.
- No.4 WCs plus no.1 accessible WC has been provided on all typical floors off a lobby by the south core.

Ground Floor Servicing
- A delivery garage is located on the ground floor adjacent to the existing substation. The location of this garage allows for vehicles to turn and reverse using the access road opposite.
- Bin storage is provided next to the delivery garage. The size and requirements for this store is to be reviewed in RIBA stage 3.
- A further goods store in the delivery garage for the CBS is also to be reviewed in RIBA stage 3.
- A gas store is proposed to be external at the North end of the building. Size and requirements to also be reviewed in RIBA stage 3.
- Ground floor critical plant which requires vehicle access are located at the North end of the plan.
- Plant serving the CBS facility are located centrally on a dropped floor slab to allows for 6m floor to floor.

Building Access
- A central feature staircase leads from ground floor up to the 9th floor through the atrium.
- Two fire escape stairs serve all levels.
- No.2 passenger lifts serve the building from the reception area.
- A third passenger lift serves the building from the North core.
- A goods lift is provided to the North end of the building.
- A passenger lift in each core is designated as a firefighting lift.

Building Identity
- The building identity has been developed and the design priority has been to create an iconic building representive of the Institute.

3 Stage 2 Development
3.3 Area Schedule Development

NB: Further analysis on the development of the shedule of accommodation can be found within Section 12 of this report.

The adjacent graphics demonstrate the changes in the working area schedule from the given brief area schedule in the ITT document to the revised Stage 2 working area schedule. The stage 1 scaled working area schedule was developed through an iterative process of cost review against total areas, detailed in the Stage 1 report. Since the issue and sign-off of the Stage 1 report, development through continued user consultation has informed the revised schedule of accommodation which both accounts for achievable occupancy as well as meeting user requirements.

ITT Document
The brief schedule given in the ITT document was given for a total of 49 PIs with a differentiated allocation for MRC and ICL.

Stage 1 Scaled Area Schedule
During RIBA stage 1 the area schedule was scaled for the purposes of finding an achievable occupancy. At the end of RIBA stage 1 the design team proposed a schedule which accommodated 30 PIs which assumed a reduced CBS facility on the ground floor.

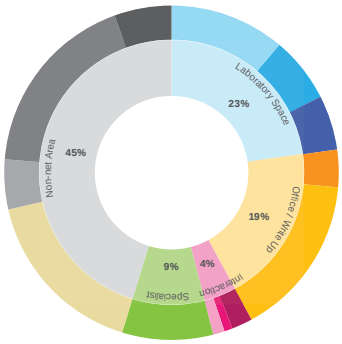
Stage 2 Revised Area Schedule
During RIBA Stage 2 there have been a few key decisions affecting the area schedule:

- The limited area for the CBS facility, as assumed in RIBA Stage 1, was not seen to be fit due to the project priority to provide this new facility. A study exploring the occupancy levels achieved with a full CBS facility prompted discussions about the requirement for shell and core floors as the building occupancy was too low otherwise with no future flexibility for expansion in the event of additional funding becoming available. A decision was made to propose a larger building to accommodate an occupancy of 30 PIs at full capacity.
- A reduced CBS schedule of accommodation was agreed increasing the occupancy to 32 PIs at full capacity.
- The proportion of secondary support and primary laboratory has been revised and re-balanced after being scaled in RIBA Stage 1. The support space allocation was adjusted to meet the area specified in the ITT document and throughout continued user consultation these spaces have adjusted to meet user requirements. '3.4 Science Brief Development' summarises the changes in more detail.

ITT Document Brief

49 PIs
514 Researchers

BUILDING OCCUPANCY	No.
Wet Lab PIs	44
Dry Lab PIs	5
Wet Lab Researcher	436
Dry Lab Researcher	55
Imaging Lab Researcher	8
Research Other (Admin, GEO, transgen, WAPI)	15
Research sub total	**563**
Admin	24
Management (incl. Dir, Ops Dir, HR etc)	6
Non research sub total	**26**
TOTAL POPULATION	**593**

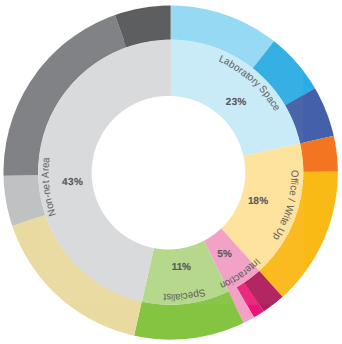


Total Area (GIA) = 15,245 sqm
(including external plant & existing substation)

Stage 1 Scaled Area Schedule

30 PIs
297 Researchers

BUILDING OCCUPANCY	No.
Wet Lab PIs	26
Dry Lab PIs	4
Wet Lab Researcher	234
Dry Lab Researcher	36
Imaging Lab Researcher	5
Research Other (Admin, GEO, transgen, WAPI)	22
Research sub total	**327**
Admin	17
Management (incl. Dir, Ops Dir, HR etc)	8
Non research sub total	**25**
TOTAL POPULATION	**352**

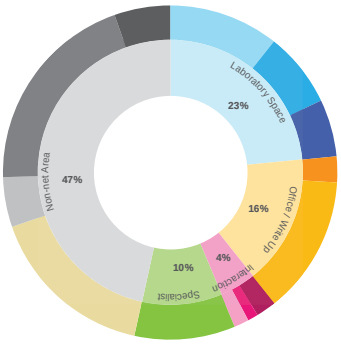


Total Area (GIA) = 11,009 sqm
(including external plant & existing substation)
with scaled CBS & secondary lab areas

Stage 2 Revised Area Schedule

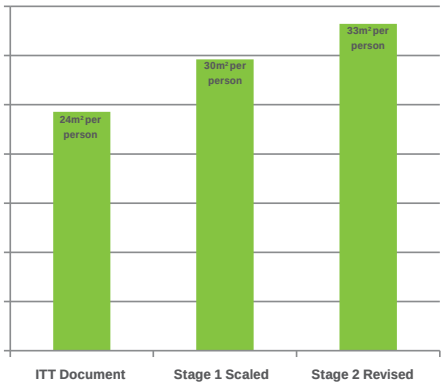
30 PIs
330 Researchers

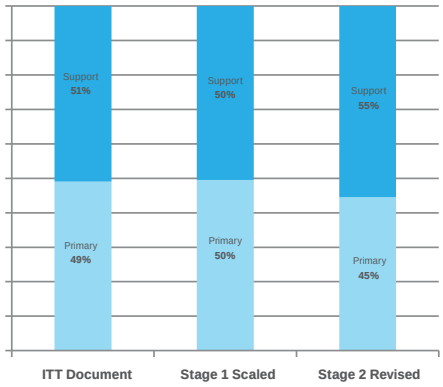
BUILDING OCCUPANCY	No.
Wet Lab PIs	26
Dry Lab PIs	4
Wet Lab Researcher	234
Dry Lab Researcher	36
Imaging Lab Researcher	8
Research Other (Admin, GEO, transgen, WAPI)	22
Research sub total	**330**
Admin	18
Management (incl. Dir, Ops Dir, HR etc)	8
Non research sub total	**26**
TOTAL POPULATION	**356**

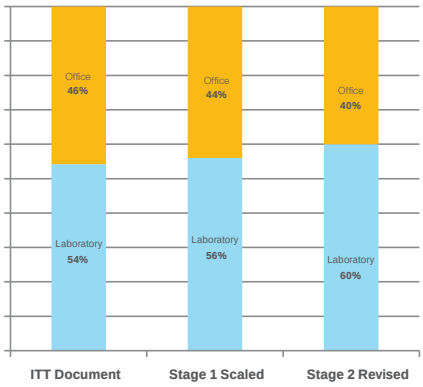


Total Area (GIA) = 11,913 sqm
(including external plant & existing substation)

3 Stage 2 Development
3.3 Area Schedule Development







Area per Person

Total gross internal area (GIA) per person including all net and non-net areas.

The RIBA Stage 1 report recommended an increased space factor in the laboratories from 4sqm to 5sqm. This recommendation was discussed with the Building Working Group and accepted as a brief development which bettered the GIA per person from the ITT document schedule to the Stage 1 scaled schedule. However, the space factors should continue to be discussed in Stage 3 once there is an understanding of which groups, and the secondary spaces that they require, are moving into the new building.
Since the Stage 1 developed brief the area per person has increased further due to the following:

- A higher proportion of support and tech hub space reduces the primary laboratory space available.
- A full (not scaled) CBS facility is to be provided.
- A larger social/ cafe area provided with a capacity to host a large Institute event.

This area per person should be read understanding that this accounts for a large area for the CBS facility. The area per person without the CBS facility is 27sqm per person.

Primary vs Support Laboratories

Primary laboratories vs a total of all shared secondary and direct secondary laboratory spaces.

The amount of support and tech hub space has increased since the ITT and Stage 1 scaled area schedule. The RIBA Stage 1 briefing commentary noted that the higher provision of support spaces was expected in biomedical buildings and the Stage 2 revised ratio is still comfortably sitting within Hawkins\Brown's benchmarking data for similar building types. The balance between primary and support is to be further reviewed once groups moving into the new facility are identified and confirmed.

A higher support space provision reduces the number of PIs however, further review of space factors for laboratory and office space could increase the occupancy numbers.

Laboratory vs Office

All primary, shared secondary and direct secondary laboratory spaces vs. all shared and cellular office space.

The laboratory vs office space has moved to be better in line with Hawkins\Brown's benchmarking data as the office space ratio has decreased. The LMS is however proposing space for bioinformatic researchers which does increase the office space provision compared to other research buildings.

The space factors at RIBA Stage 1 for the wet lab researchers and dry lab researchers for the shared office space were 4sqm and 7sqm respectively. During user consultation these space factors were discussed and it was agreed that all researchers are allocated the same area. The Stage 2 revised schedule allocates 5sqm per researcher in shared office space with the ability to flex to 4sqm per person for a greater occupancy.

3 Stage 2 Development
3.4 Science Brief Development

Science Development Summary

User Consultation
During Stage 2, Abell Nepp undertook a series of briefing sessions with User Representatives for the science-related technical facilities; they included CBS, In-Vitro Imaging, CryoEM, Electrophysiology, Genomics, Proteomics, Flow Cytometry and Histology. The key purpose was to gather additional information to confirm the area requirements, review design concept layouts, and outline architectural and engineering criteria. These sessions included revisiting their current facilities.

The existing Equipment Asset Register was considered; however, it was acknowledged that it was not fully accurate. To the extent possible, some equipment was confirmed or added in the discussions with the Users, however, the schedule of significant architectural engineering equipment will need to be completed during RIBA Stage 3.

-
- Outputs:
- Comparative Schedule of Accommodation
- Equipment Lists
- Key Room Criteria Sheets
- General Arrangement Plans
-

Brief Confirmation

- Confirmed the space for specialist technology hubs would be as briefed and would not be affected if the quantity of researchers changed.
- Confirmed proportionate scaling/relationship of secondary and primary science space, except for Freezer Storage; 2no darkenable and 2no radioisotope rooms; and 1no cold rooms per floor.
- Acceptance of CBS location at Level 1.
- Confirmed there would not be any distinctions made between MRC and ICL allocation.
- Acceptance of shell floors.
- Confirmed that half of the PIs require a space in the wet lab, and half of the 'dry'/bioinformatics PI and research teams will require a wet lab space.

Affected Occupancy/Areas

- Primary and secondary wet lab space reduced to accommodate under-briefed allocation and increased expansion requirements for the Technical Hubs, e.g. Proteomics, Genomics, Flow Cytometry, CryoEM, and In-Vitro Imaging.
- Primary wet lab's area per person ratio was reduced to accommodate either increased secondary requirements that were originally under-briefed (e.g. freezer storage, on-floor consumables and waste storage) or new secondary requirements from user consultations (e.g. CTRs and imaging/darkenable rooms for worm and yeast groups).
- Central wash-up and media Kitchen, tissue culture, and equipment rooms were scaled down proportionately to revised total researchers.
- Overall primary wet lab allocation was reduced for full wet groups due to 'dry' user requirements.
- Increased secondary allocation reduced available areas for freezer storage per floor. (See freezer calculation on the following page).
- TC rooms are smaller than existing CRB provisions following efficiency study. We are providing 2 to 3no 20sqm rooms on each floor rather than larger 40sqm rooms that can't be easily segregated/distributed amongst users. 300sqm of tissue culture was requested which can be accommodated. However, potentially fewer MBSCs can be provided than the assumed existing 45no MBSCs. (See tissue culture calculation on the following pages).

Stage 2 Area Assumptions Made

Science Area Static (no change from original brief)

- 2no Darkenable Rooms required within whole building (across 5 science floors)
- 2no Radioisotope Rooms required within whole building (across 5 science floors)

Science Area Increased (from original brief)

- 5no Cold Rooms required (1 per science floor)
- 8no freezers required per floor (with central archive freezer store located on ground floor to achieve 60no freezers in whole building)
- lab coat and hand wash zone at each entrance to the science and laboratory spaces
- Controlled Temperature Room (CTR) and Imaging Room required for Worm Groups
- CTR, Imaging, Dust and Growing Room required for Yeast Groups
- Genomics requires additional area for shared services/ facility
- Pre-PCR (Genomics) requires additional area for equipment
- Proteomics requires additional area for shared services/ facility
- Flow Cytometry requires additional area for shared services/facility
- CryoEM requires additional area for future proofing
- In-Vitro Imaging requires additional area for equipment (e.g. SM Microscopes and darkenable room).
-

Science Area Decreased (from original brief)

- Small to medium Equipment Rooms provided on each science floor, with small equipment 'zones' within open wet lab
- No large Tissue Culture (TC) rooms, only medium 20sqm based on early studies of TC efficiency
- Total 280sqm TC distributed across 5 floors (approximately 14no TCs total; 3no per floor)
- Reduced Central Wash-up and Media Kitchen for scale of building
- Histology requires less area (existing room only 15sqm)
- Imaging Expansion can be accommodated in the future, at detriment of equipment/storage rooms

3 Stage 2 Development
3.4 Science Brief Development

STAGE 2 BRIEF DEVELOPMENT

FREEZER ALLOCATION

STAGE 1
The original brief requested 96sqm of space for ultra-low temperature (ULT) freezer storage (-80) for MRC users, with additional (nonspecific) allocation for ICL users; assume circa 120sqm. With the current design, the freezers are allocated 24sqm per floor; 4 floors for MRC and one for ICL.

With the larger ULT freezers requiring 3sqm each (including clearances), 40no ULT freezers can be accommodated within 120sqm total; 8 freezers per floor. However, the original brief requested 60no freezers within the MRC's 96sqm space allowing for only 1.5sqm/freezer. To correct this, the total freezer allocation has been increased to 225sqm, almost double the original brief, with 45sqm per floor required over 5 floors (15 freezers per floor).

STAGE 2
MRC confirmed that 60no ULT freezers must be accommodated within the new building based on their existing quantities of 50-60 freezers, which is just enough for existing 35 groups. The Client confirmed that as occupancy numbers must reduce at this stage, ICL allocation should be accommodated in all figures, not as an addition. This allocation would be 24sqm per floor, over 5 floors (8 freezers per floors) plus a 60sqm archive store (20no ULT freezers).

As 45sqm per floor cannot be accommodated due to other constraints for secondary support spaces, the archive store needs to be considered and placed somewhere yet to be confirmed.

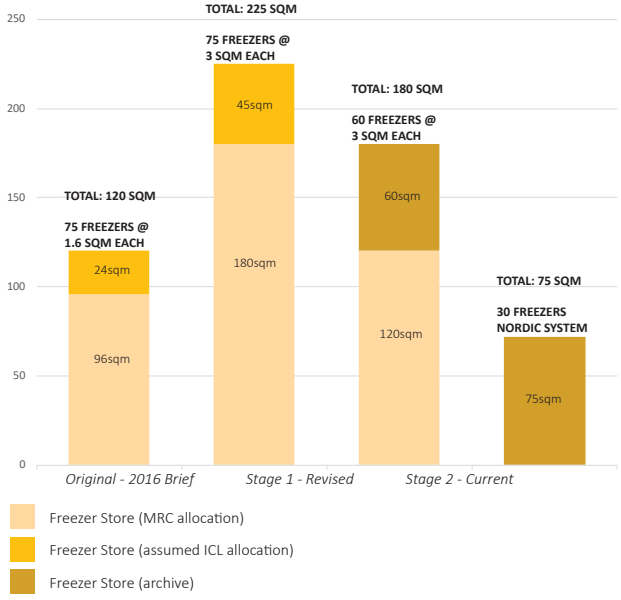
STAGE 3
The Primary Lab Zones can accommodate the freezers in their open bays, but space for the archive freezer store has not been identified. Per the table opposite, newer, smaller footprint ULT freezers can be considered, but the compact built-in by Nordic, being considered by Imperial College on other projects, would require only half the space.

Original briefed area figures are being allocated within on-floor areas. Thus, a smaller freezer footprint can be considered, or a more compact built-in central solution. The following models are to be explored (refer to table opposite):

- New Brunswick Innova U725 (to match existing CRB models)
- Thermo Fisher Scientific ULT Premium TSX
- Eppendorf CryoCube F740 (modelled in current proposal)
- Built-in Nordic chest freezers

The location for the archive freezer could be in the current substation space if it is removed. It should also be noted that the freezer store should not be located above or adjacent to the CryoEM Suite due to EMI/vibration concerns.

BRIEF COMPARISON - FREEZER TOTAL BUILDING AREAS



Note: figures assume no shared clearances

ULT REQUIREMENTS FOR 43,500 LITRES

Make	Model	Capacity	Footprint	Capacity/ sm	ULT Freezers	Overall Footprint	Notes
New Brunswick	Innova 725	725 ltr	**2.27 sm**	319 l/sm	**60 no**	**136 sm**	Matches existing CRB models
Eppendorf	CryoCube F740	740 ltr	**2.35 sm**	315 l/sm	**59 no**	**138 sm**	
ThermoFisher Scientific	Premium TSX	816 ltr	**2.23 sm**	365 l/sm	**53 no**	**119 sm**	
Nordic	Built-in	1440 ltr	**2.37 sm**	608 l/sm	**30 no**	**72 sm**	** Shared 1.2m front aisle

3 Stage 2 Development
3.4 Science Brief Development

STAGE 2 BRIEF DEVELOPMENT

TISSUE CULTURE ALLOCATION

STAGE 1
The original brief requested 300sqm of Tissue Culture for MRC users, with an additional 102sqm allocation for ICL users. Spaces were divided as follows:
- 7no 40sqm TC Rooms for MRC (280sqm);
- 1no 20sqm TC Room for MRC (20sqm);
- 2no (assumed) 40sqm TC Rooms for ICL (80sqm);
- 1no (assumed) 20sqm TC Room for ICL (22sqm).

STAGE 2
The Client confirmed that as occupancy numbers must reduce at this stage, ICL allocation should be accommodated in all figures, not as an addition. Thus, the total area to be allocated in the LMS building to Tissue Culture is 300sqm, resulting in 60sqm of TC per floor.

Due to the nature of the building site and layout, proposed science spaces are narrow creating short rooms accessed from the circulation science corridor. Larger TC rooms are therefore not beneficial as larger Tech Hub requirements cannot be accommodated. Thus, the design team proposed to divide the areas differently to those areas briefed.

Abell Nepp investigated the most efficient room dimensions for Tissue Culture (using a 3.3, module) to logially distribute the 300sqm. See opposite table for area required for MBSC numbers and associated efficiency.
Note: we have assumed that each room has X number of MBSCs with a corresponding length of back table for incubator, microscope, etc. plus each room has a zone for HWB, lab sink and bench space/shelving.

Conclusions:
- The areas provided at Stage 1 allow for 44 MBSCs for MRC and 14 MBSCs for ICL.
- working with reduced figures in Stage 2, we are assuming for 44 MBSCs for 35 groups.
- even numbered MBSCs per room are more efficient than odd numbered one.
- existing distribution and efficiency gains per additional MBSC in a room suggests that TC rooms of 3 or 4 MBSCs are most efficient.
- ideally, we would avoid 1 and 2 MBSC rooms unless the science or layout constraints permits it.
- Three quarters of the existing rooms have 1 or 2 MBSCs in them, representing 60% of the groups.

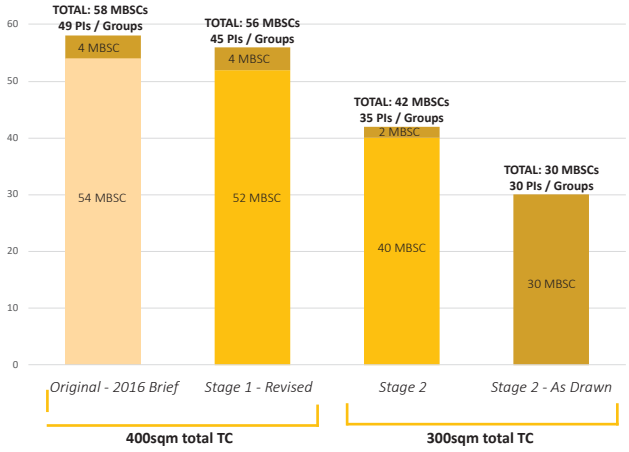
Recommendations:
With a Client goal to provide more consolidation, collaboration and sharing between research groups in the new building, and maximising space efficiency, we would aim for 3-4 MBSC rooms in this case to reduce the number of smaller ones. However, as noted by the Client, some types of work (e.g. human cell work and antibiotic free environments) will require the smaller facilities and until groups are provisionally assigned their space/floor within the building, the division of these areas is hard to determine. Additionally, as we are met with further secondary support constraints due to the layout form/massing, larger areas are less common, and are tyically required for the Tech Hubs, lending smaller 20sqm spaces to TC. Therefore, the current Stage 2 proposal allows 3no 20sqm TC rooms per floor, and 30no MBSCs within the building for circa 30 Research Groups. Area is being met, but MBSC numbers are possibly under.

STAGE 3
A review of TC allocation and MBSC numbers is required by the Client. PIs and Research Groups need to be assigned to floors to determine their TC requirements and if they are being provided. TC areas may need to be combined and located centrally to provide more MBSCs per square meter, meaning Tech Hubs will be pushed out of the building.

MBSC QUANTITIES AND ASSOCIATED EFFICIENCIES

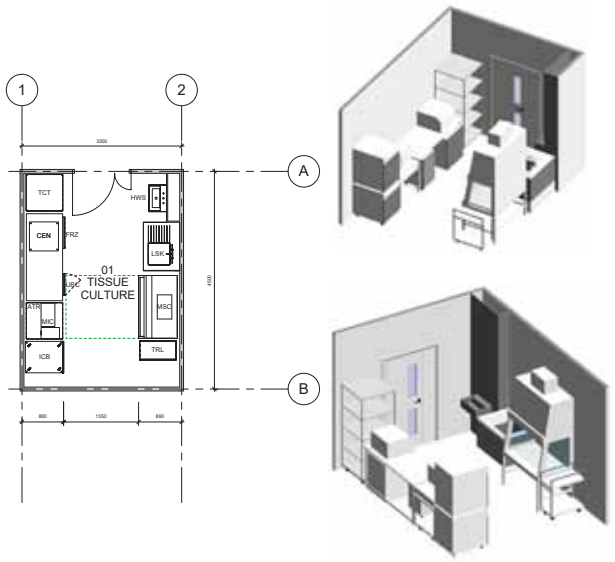
MBSCs / Room	Space Reqd	Area/ MBSC	Efficiency	% change
1	15 nsm	14.9 nsm	100%	
2	20 nsm	9.9 nsm	67%	33%
3	25 nsm	8.3 nsm	56%	11%
4	30 nsm	7.4 nsm	50%	6%
5	35 nsm	6.9 nsm	47%	3%
6	40 nsm	6.6 nsm	44%	2%

BRIEF COMPARISON - MBSC TOTAL BUILDING QUANTITIES

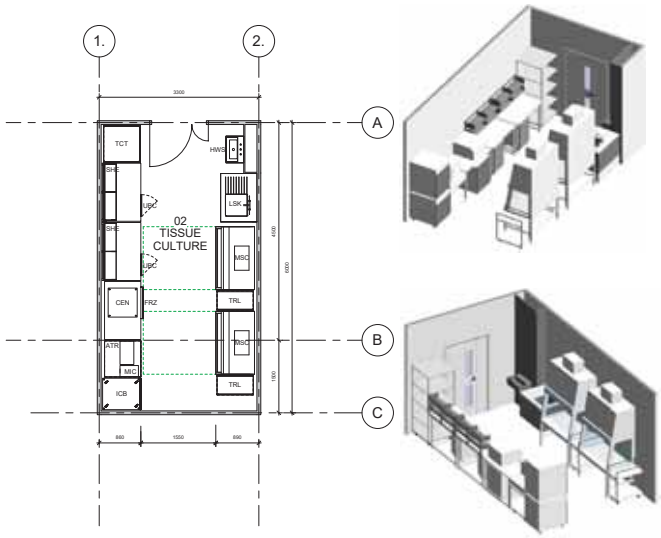


3 Stage 2 Development
3.4 Science Brief Development

KEY ROOM DEVELOPMENT AND PROPOSALS
TISSUE CULTURE STUDY - SMALL AND MEDIUM MODULES



TISSUE CULTURE: Area 14 sqm

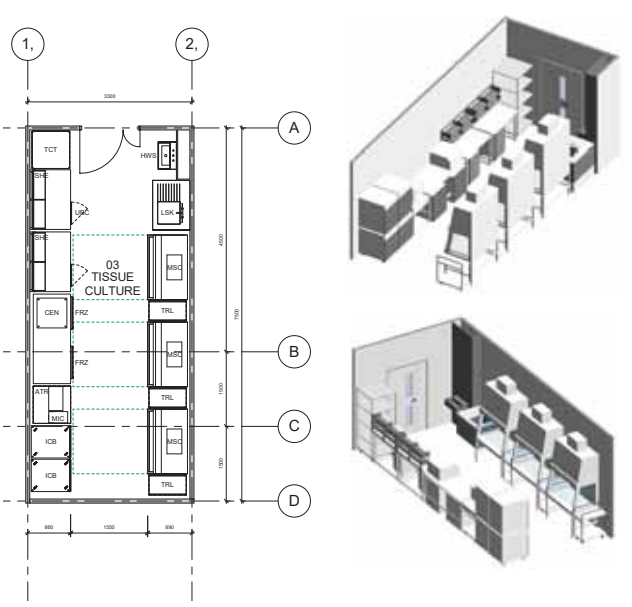


TISSUE CULTURE: Area 19 sqm

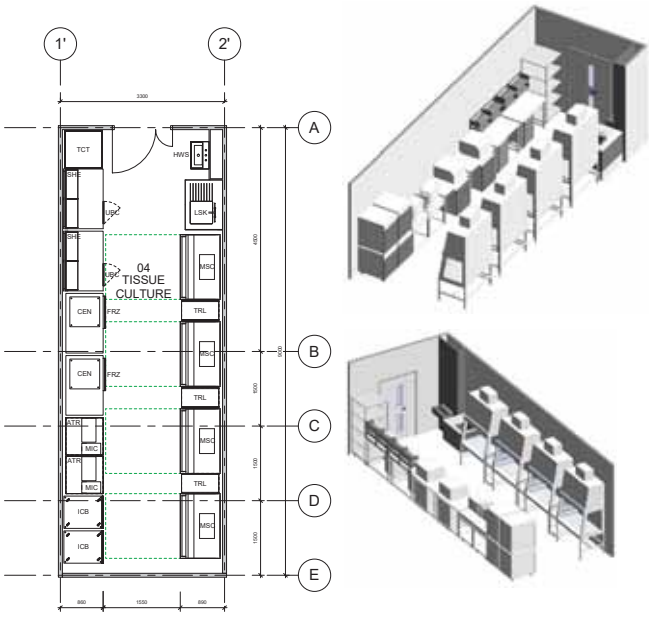
MSC - Microbiological Safety Cabinet
ICB - Incubator stacked (of a pair)
ATR - Anti-vibration Trolley for Microscope
FRZ - Refrigirator/Freezer Combination
MIC- Microscope
SHE - Shelving (bench mounted)
LSK - Laboratory Sink Unit with IPS
HWS - Handwash Station
UBC - Mobile under-bench cupboard unit
TCT - Tall Consumables Trolley
CEN - Centrifuge
TRL - Trolley

3 Stage 2 Development
3.4 Science Brief Development

KEY ROOM DEVELOPMENT AND PROPOSALS
TISSUE CULTURE STUDY - LARGE AND EXTRA LARGE MODULES



TISSUE CULTURE: Area 24 sqm



TISSUE CULTURE: Area 28 sqm

MSC - Microbiological Safety Cabinet
ICB - Incubator stacked (of a pair)
ATR - Anti-vibration Trolley for Microscope
FRZ - Refrigirator/Freezer Combination
MIC- Microscope
SHE - Shelving (bench mounted)
LSK - Laboratory Sink Unit with IPS
HWS - Handwash Station
UBC - Mobile under-bench cupboard unit
TCT - Tall Consumables Trolley
CEN - Centrifuge
TRL - Trolley

3 Stage 2 Development
3.4 Science Brief Development

Utilisation of ICTEM

Increased secondary requirements from user consultation has highlighted that additional primary science space is required to maintain an adequate ratio. Due to building area restrictions, the increased area is not achievable and occupancy numbers have reduced as a result. To achieve desired occupancy numbers, Abell Nepp carried out a study to understand the implications of utilising ICTEM Level 2. Through Client confirmation, the following restrictons were understood:

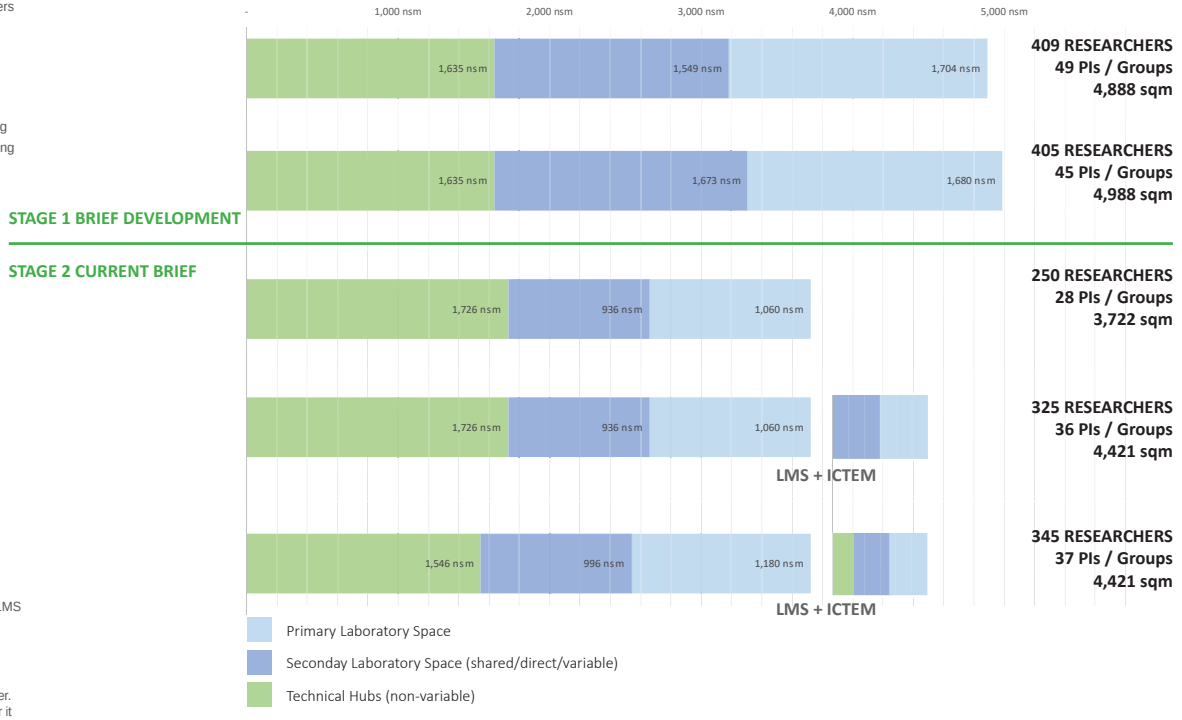
- CBS must be accommodated in the new LMS building
- Imaging must be accommdoated in the new LMS building
- Histology must be accommodated in the new LMS building
- Client to confirm if Genomics, Proteomics and Flow Cytometry can be located in ICTEM
- Client to confirm if Drosophila Suite can remain in ICTEM

Two scenarios are therefore possible:

ICTEM FULL LAB AND WRITE-UP
- 8 PIs
- 75 researchers
- 300sqm Primary Lab Space
- 299sqm Secondary Support Lab Space
- total 36 PIs across both buildings
- reduces the amount of PIs within the new LMS building
- maintains all Tech Hubs within the new LMS building

ICTEM LAB + TECH HUB SPACE
- 5 PIs
- 55 researchers
- 220sqm Primary Lab Space
- 219sqm Secondary Support Lab Space
- 160sqm Tech Hub Facilities
- total 37 PIs across both buildings
- increased the amount of PIs and groups within the new LMS building
- split of Tech Hubs may be functionally inappropriate

All areas are assumed to centreline of walls at Stage 2. Net areas will be calculated through Stage 3. The original 2016 and NBBJ brief denotes a 4sqm space factor per researcher. ICTEM level 2 also accomodates this space factor, however it is advised that 4sqm is smaller than industry norms. The brief has been developed and compared on this basis. A typical 5sqm can adopted to provide more generous laboratory space, however, to ensure adequate seconday support is achieved per laboratory, technical hubs and/or researchers will need to be relocated external to the new LMS building.



4 Proposal

4 Proposal
4.1 Summary

The Stage 2 proposal has a total GIA of 11,446m2 compared to the working area schedule of 11,829m2.

Science spaces
The current lab provision is under. This will have to be further developed in Stage 3 once an understanding of who will be occupying the space is understood. Secondary space provision can then be honed, and primary lab space adjusted in turn.

Office
Cellular office space currently has an under provision with discussions continuing about cellular office locations and quantity. Meeting space provision and shared office provision may transfer over into cellular office space.
Shared office is currently over provided with the capacity to cater for a higher occupancy should the number of research groups increase and to accommodate for storage.

At a space factor of 5sqm per researcher (both Wet and Dry) the current office space could cater for 350+ people (researchers and admin staff). This will be developed further in Stage 3 alongside storage, meeting and breakout space solutions.

Meeting Space
Meeting space has an over provision with the south end of the plan currently assigned to meeting rooms due to the user request not to have cellular offices located there. There is also meeting space in the internal areas behind central cellular offices.

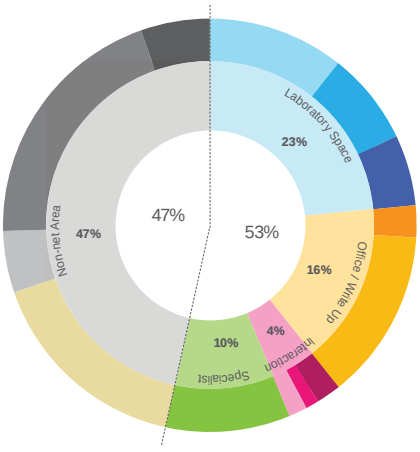
Collaboration & Social
Collaboration space is located in shared office areas which allow flux for higher occupancies. Social space is higher in order to enable an Institute wide event.

Other/ Specialist
The current in-vitro imaging space provision is over the original ITT brief and the CBS area currently accommodates the brief requirements.

Non-net
The plant area includes a 140sqm provision for the data centre and data hubs throughout the building. The circulation space within the laboratories has also now been moved from designated lab space to circulation.

It is worth mentioning that once the exact science space requirements have been ascertained the 'sliding scale' of write-up and lab space provision can be further adjusted.

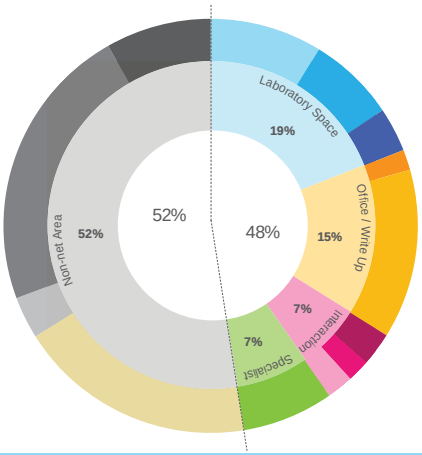
Stage 2 Working Area Schedule (28 - 30 PIs)



Primary Laboratories	1202
Shared Secondary Laboratories	858
Direct Secondary Laboratories	655
Cellular Office	312
Shared Office	1670
Meeting Space	230
Collaboration Space	120
Social Space	170
Other - Specialist	1152
Circulation	1942
Balance	574
Plant (inclu. roof plant)	2387
Engineering	643

Total Area (GIA) = 11,913 sqm
(including external plant & existing substation)

Stage 2 Proposal



Primary Laboratories	1124
Shared Secondary Laboratories	874
Direct Secondary Laboratories	445
Cellular Office	205
Shared Office	1698
Meeting Space	335
Collaboration Space	224
Social Space	266
Other - Specialist	916
Circulation	2129
Balance	423
Plant (inclu. roof plant)	2879
Engineering	1057

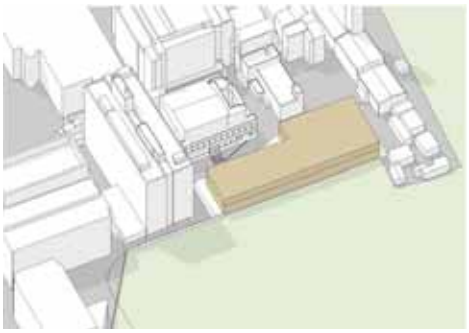
Total Area (GIA) = 11,574 sqm
(including external plant & existing substation)

4 Proposal
4.2 Architectural Articulation
4.2.1 Massing

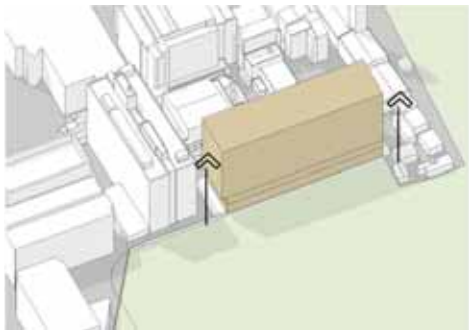
The building form, mass articulation and identity responds to the site and the brief, to create an Institute with an identity. The following moves make up the LMS proposal.

1. **The Site** - Outlined at the north-east corner of the Imperial College Hammersmith Hospital Campus.
2. **The Plinth** - The building sits atop a functional plinth housing the CBS facility and adjoining plant. This is a feature that must be carefully considered from an architectural perspective. It is key to ground the building whilst giving the plinth character and giving The Institute a ground floor presence on campus.
3. **The Typical Floor**s - The typical floors sit above the plinth. For flexibility, efficiency and adaptability, these floors are consistent across all floors.
4. **The Neighbourhoods** - To reinforce the concept of human-scale, intimate internal working environments, the building is divided up into 'neighbourhoods'.
5. **Character** - Each neighbourhood can be articulated and detailed in differing ways to create unique characters to each neighbourhood whilst breaking up the building mass.
6. **Addressing the Campus** - The western elevation is key as it addresses the campus. Landscaping can be used at ground floor to highlight and enhance the entrance.
7. **Material** - The use of materials is key in creating a building as a landmark that stands out in a concrete and brick campus.
8. **Identity** - The central stair is an opportunity to give the building an external as well as internal identity. The stair neighbourhood could act as a beacon on approach from Du Cane Road.

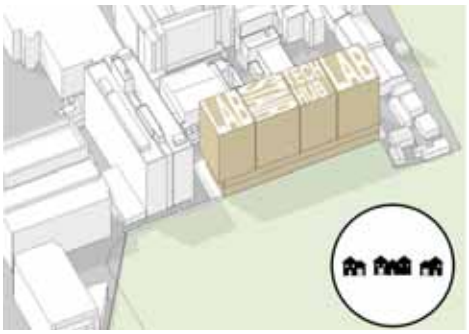
1 The Site



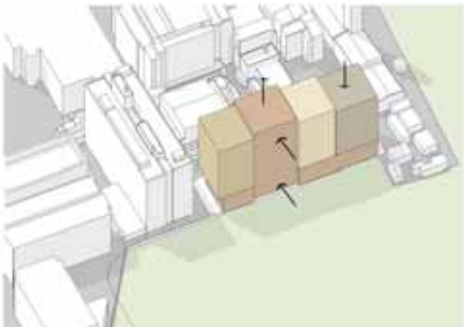
2 The Plinth



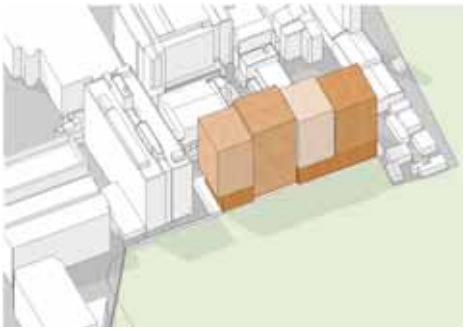
3 The Typical Floors



4 The Neighbourhoods

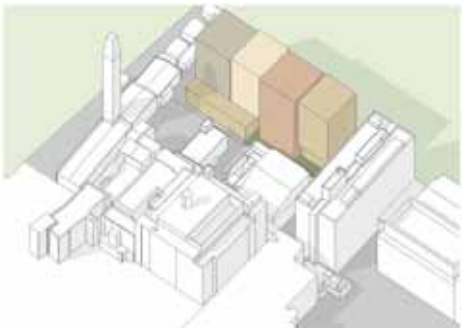


5 Character

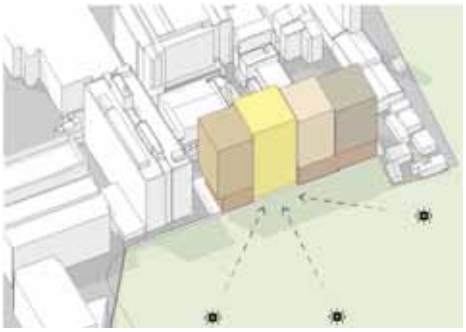


6 Addressing the Campus

Working Model



7 Material

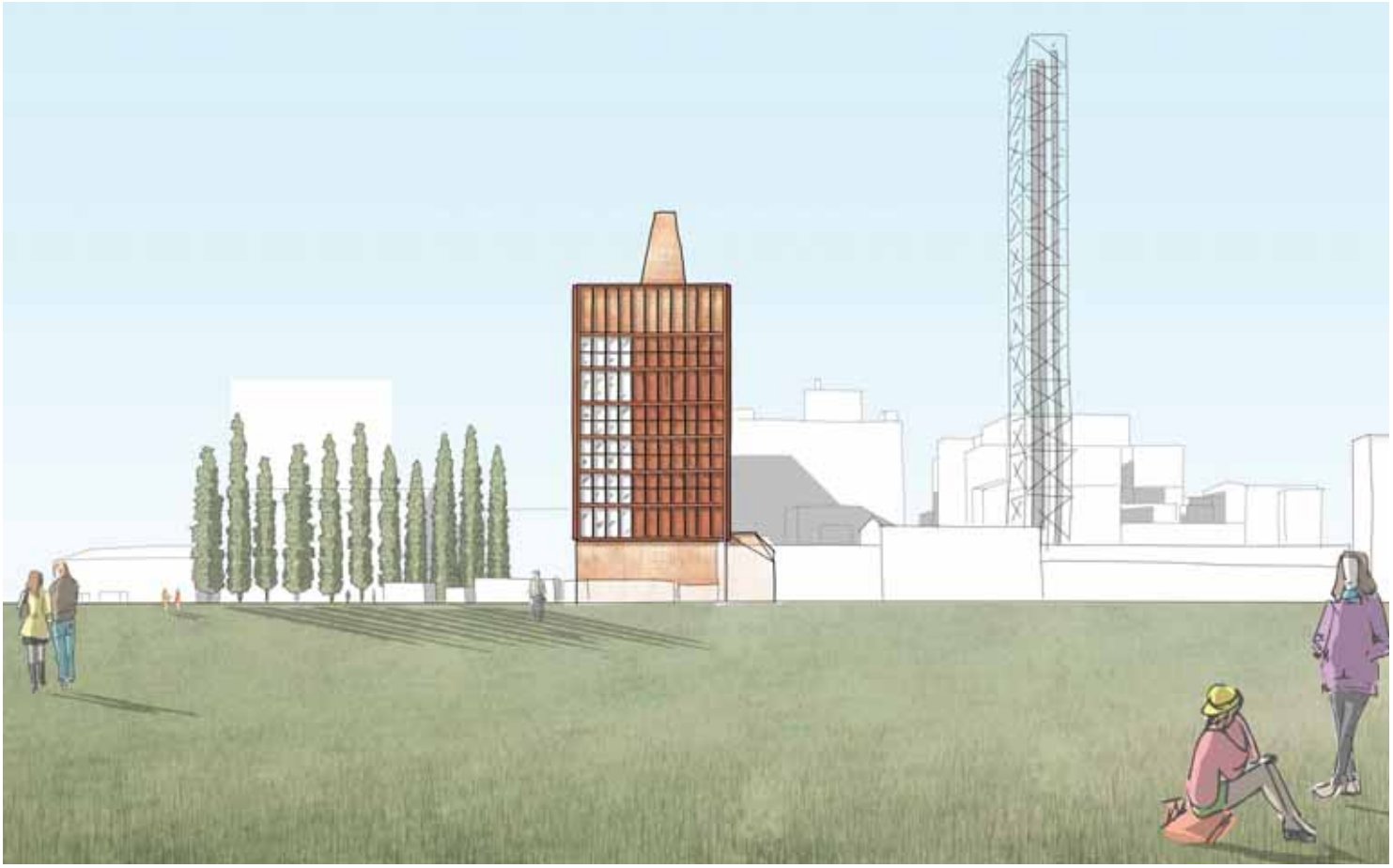


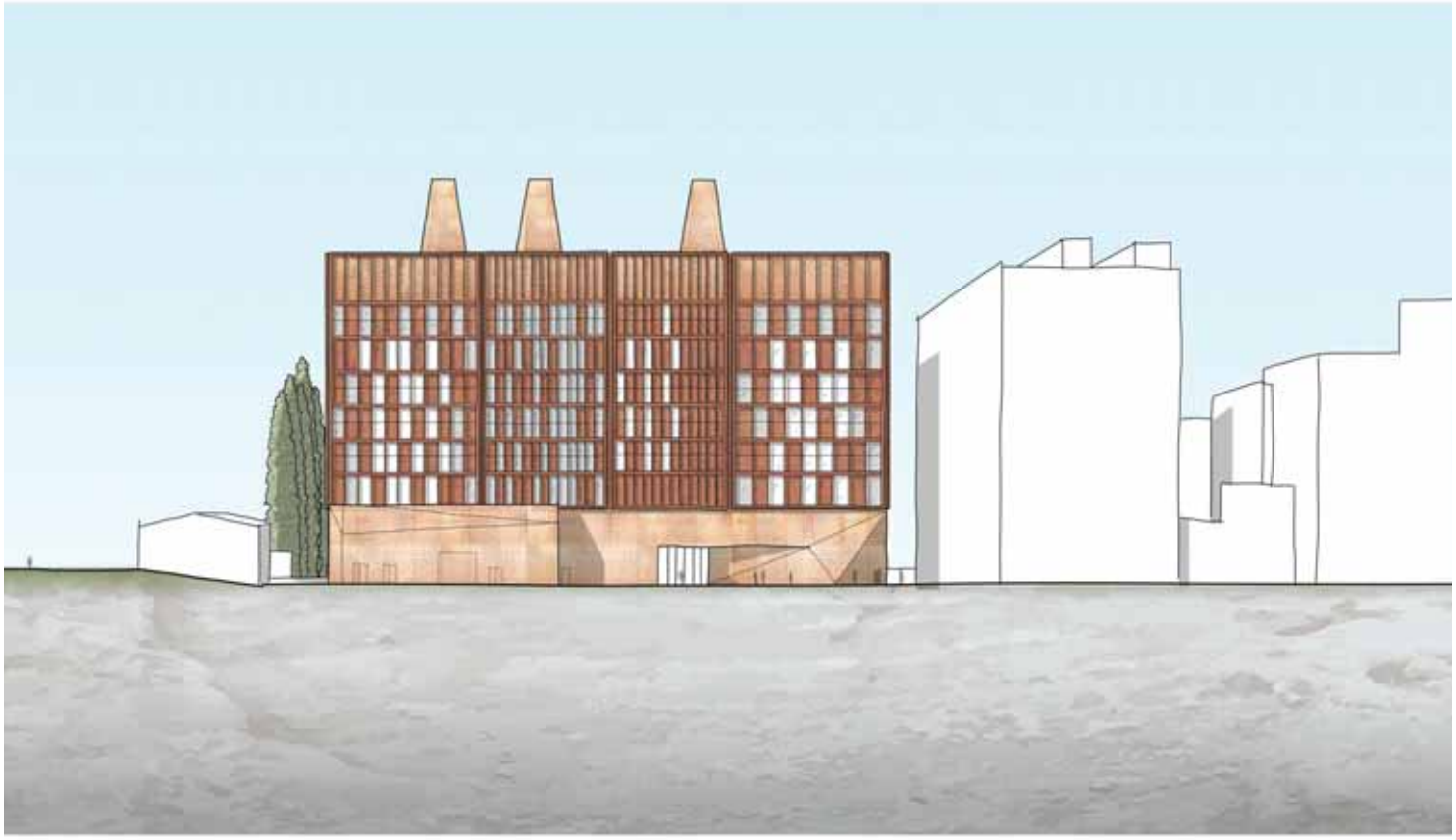
8 Identity

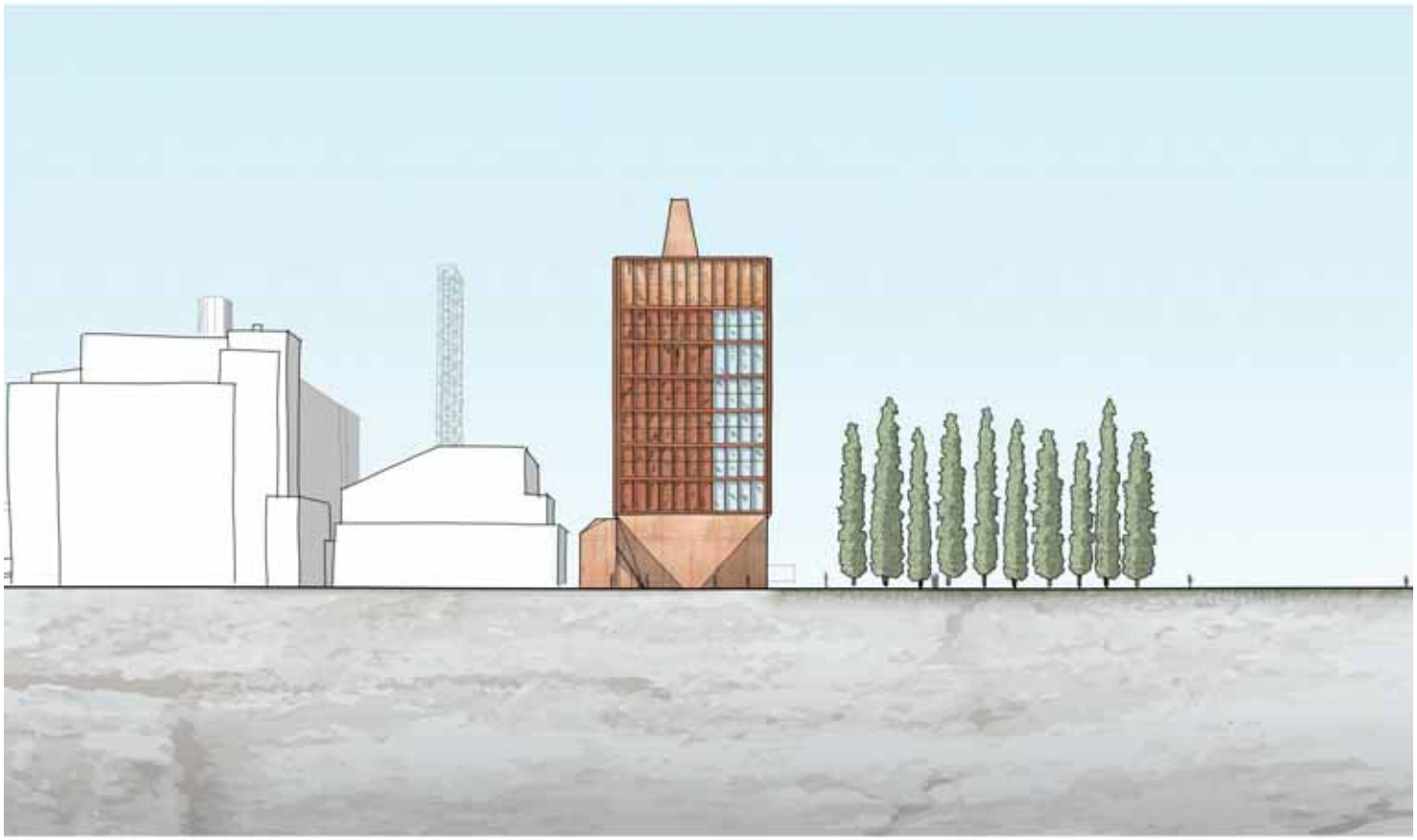
Working Model

4 Proposal
4.2 Architectural Articulation
4.2.2 Materiality & Elevational Treatment

The materiality and elevational treatment is key in creating a landmark building for the Institute. Precedents have been chosen which use colour, pattern and texture to create animated buildings whilst allowing flexibility internally.







4 Proposal
4.2 Architectural Articulation
4.2.1 Place on the Campus - Entrance

The building materiality stands out amongst the campus buildings and acts as a defining feature for the London Institute of Medical Sciences building. Once on the campus a framed view under The Commonwealth Building allows visibility to the building from Du Cane Road.

Artwork could be used to develop the Institute's identity further. The art could be a building wide pattern or colouring or a single piece on the south wall visible from Du Cane Road.

Once close to the building, a carved and sculpted base helps to lead visitors around the building to the entrance on the West facade.




Facade Artwork & Defining Features



Sculptural Plinth Architecture

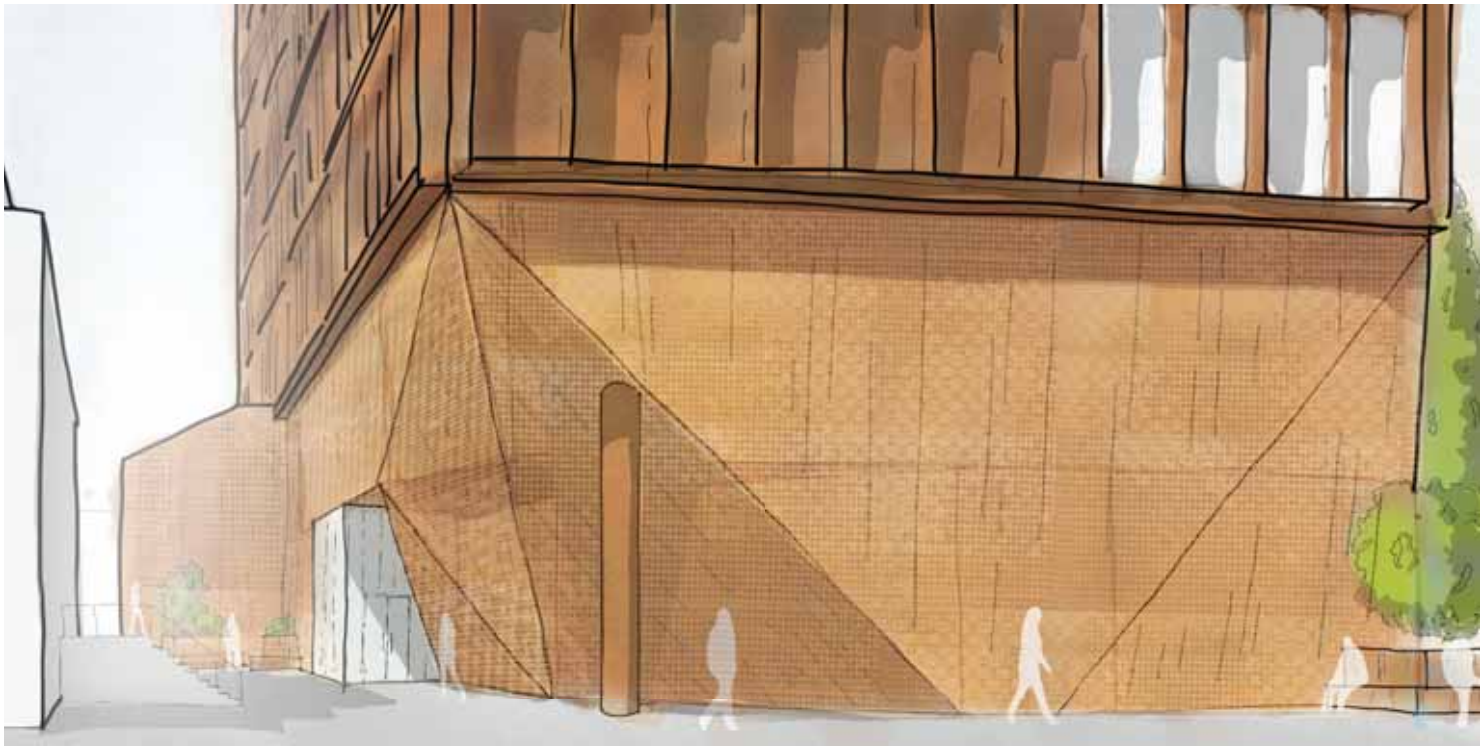
1 **Current View from Du Cane Road**

2 **Concept View from Du Cane Road**

3 **Carved Corner Creating a Path**

4 **Chamfered Edges to Exaggerate Entrance**

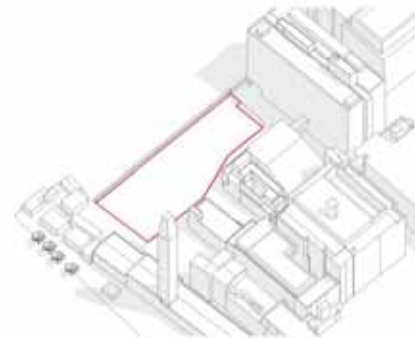
4 Proposal
4.2 Architectural Articulation
4.2.1 Place on the Campus - Entrance



Sketch showing how sculpture and materiality can be used to give the Institute an identity and presence at ground floor. Patterned 'mesh' could be used to create a unique feature. Backlighting, integrated seating and planting can also be used to activate this area of the campus.

4 Proposal
4.3 Building Organisation

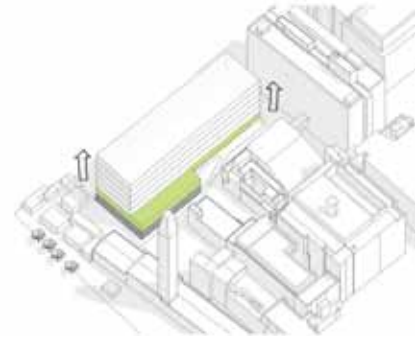
Following from the architectural massing proposal diagrams, the building organisation diagrams show how the programme sits within the mass.



Site Boundary

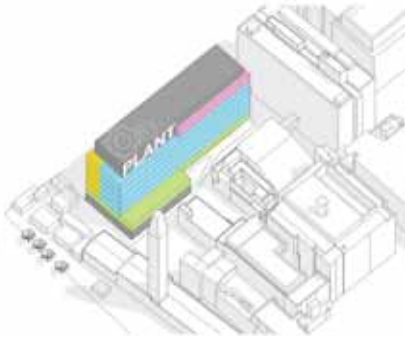
Functional Plinth

Programme Divide

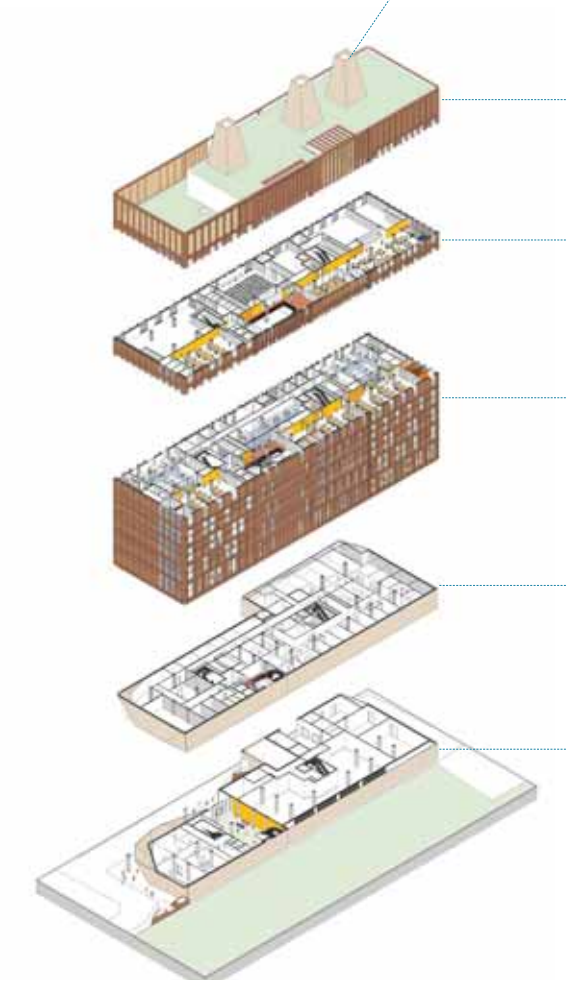


Typical Research Floors

Top Floor Social



Roof Plant



Chimneys

The safe extract and dispersion of air in a lab building is an innevitablity. In this instance, the chimneys are celebrated and referenced through the building by the use of materiality. These decorative elements may form points of interaction/ collabortion within the floors - a real celebration of science within the building.

Plant

The top floor is dedicated to plant, both internal and external enclosed within a unified facade treatment.

Social, Seminar, Administration & Plant

A large social area for the building users to come together is situated on the top floor with a terrace area becoming a courtyard type space within this social space. A 120 person seminar room sits centrally at the top of the central stair. An administration office uses the south/east end of the building. Plant makes use of the west side of the building.

Typical Science Floors (x5)

The typical science floor provides the primary laboratory, laboratory support and tech hubs for the building. Adjacent to these science spaces are the open plant write-up offices. PI offices are both at the north end and centrally next to a central stair in the atrium. Collaborative areas sit between the science and office spaces with meeting rooms and informal meeting break-out dispersed across the plan.

CBS Facility

The CBS facility uses most of the 1st floor with the associated plant on ground floor. The south end of the floor plan has a plant area serving the Cryo-EM on ground floor. Other facilities such as shower and change for the building users are also located in the south end.

Plant & Imaging

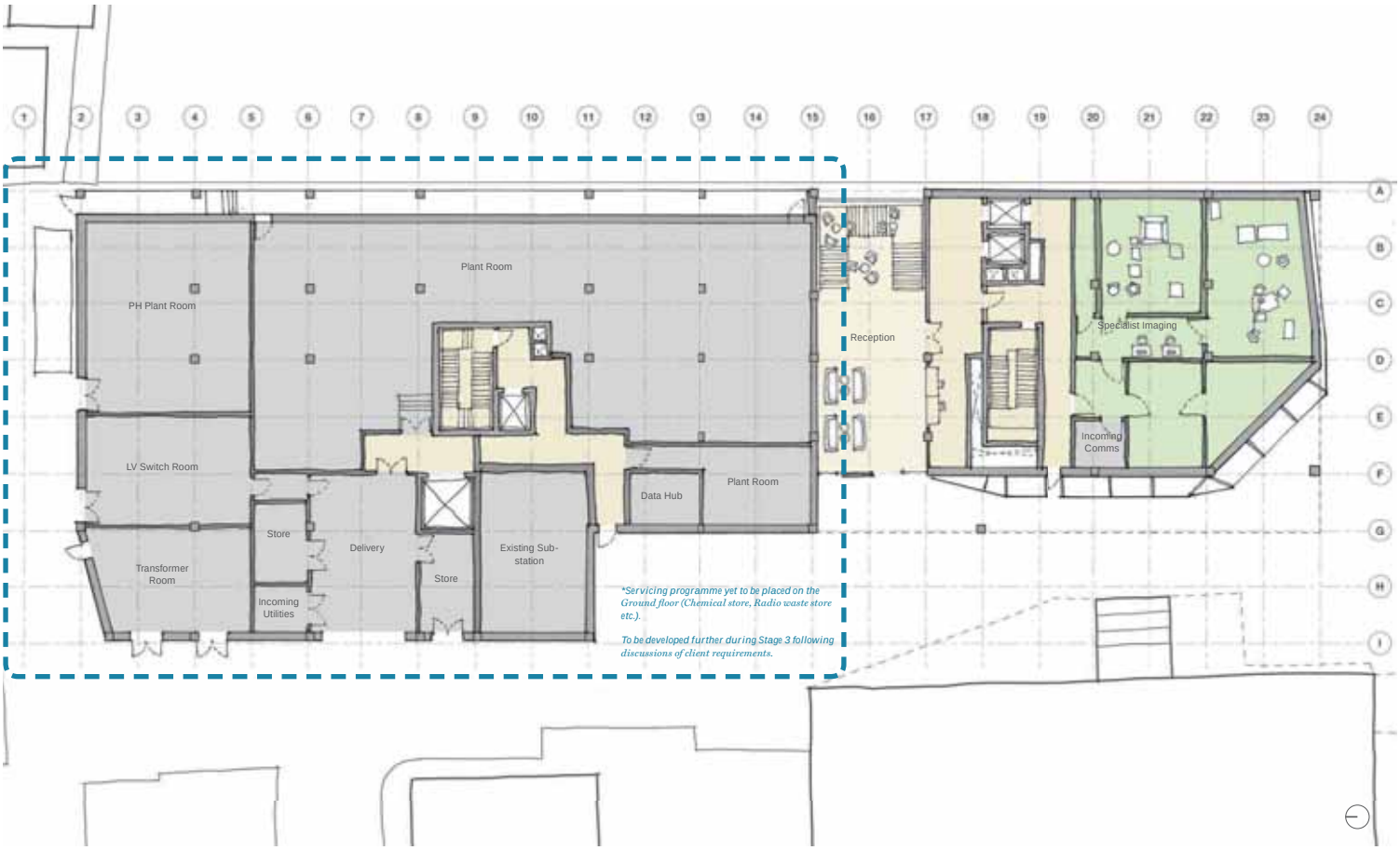
The ground floor houses the reception area where there will be the primary secure line into the building. The Cryo-EM suite is sited on the south end. The North end of the plan is primarily plant servicing the CBS facility on the 1st floor. There is also other plant areas and a secure delivery garage with associated stores.

Sectional Perspective

4 Proposal

4.3 Building Organisation - Ground Floor 1:100 @A1

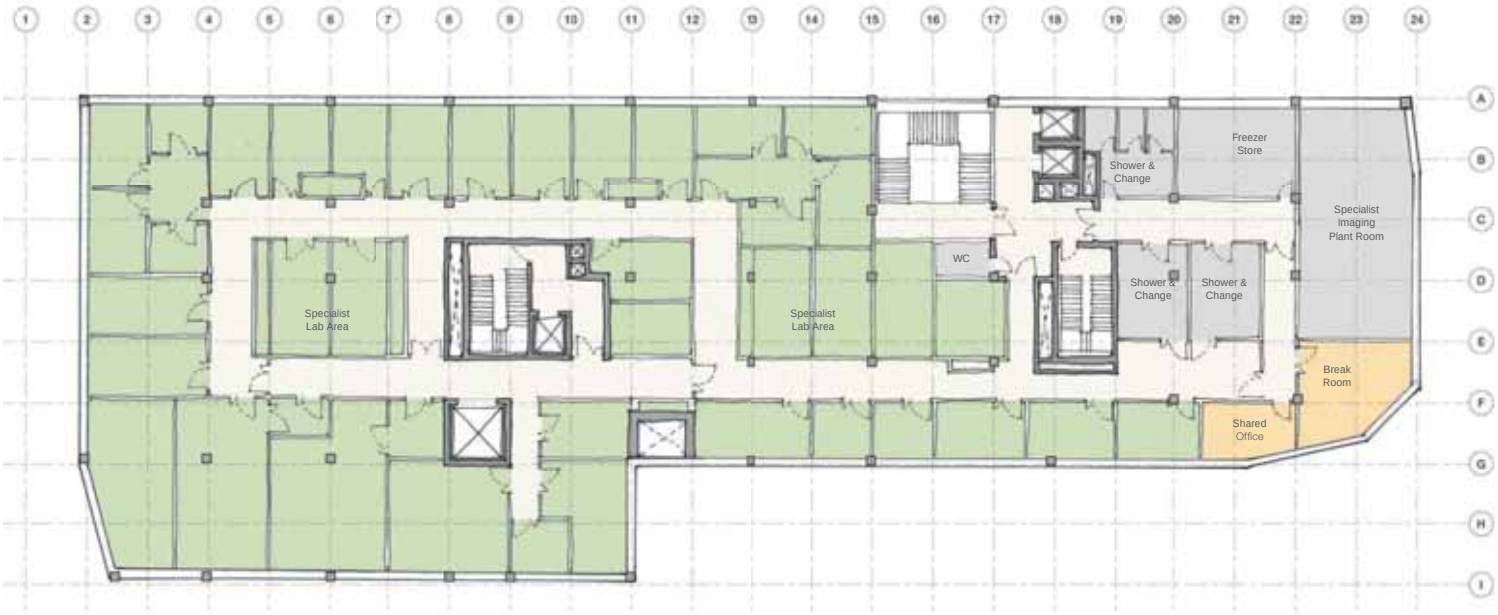
Please refer to layouts in '6 Laboratory Design' for science/ laboratory layouts.



4 Proposal

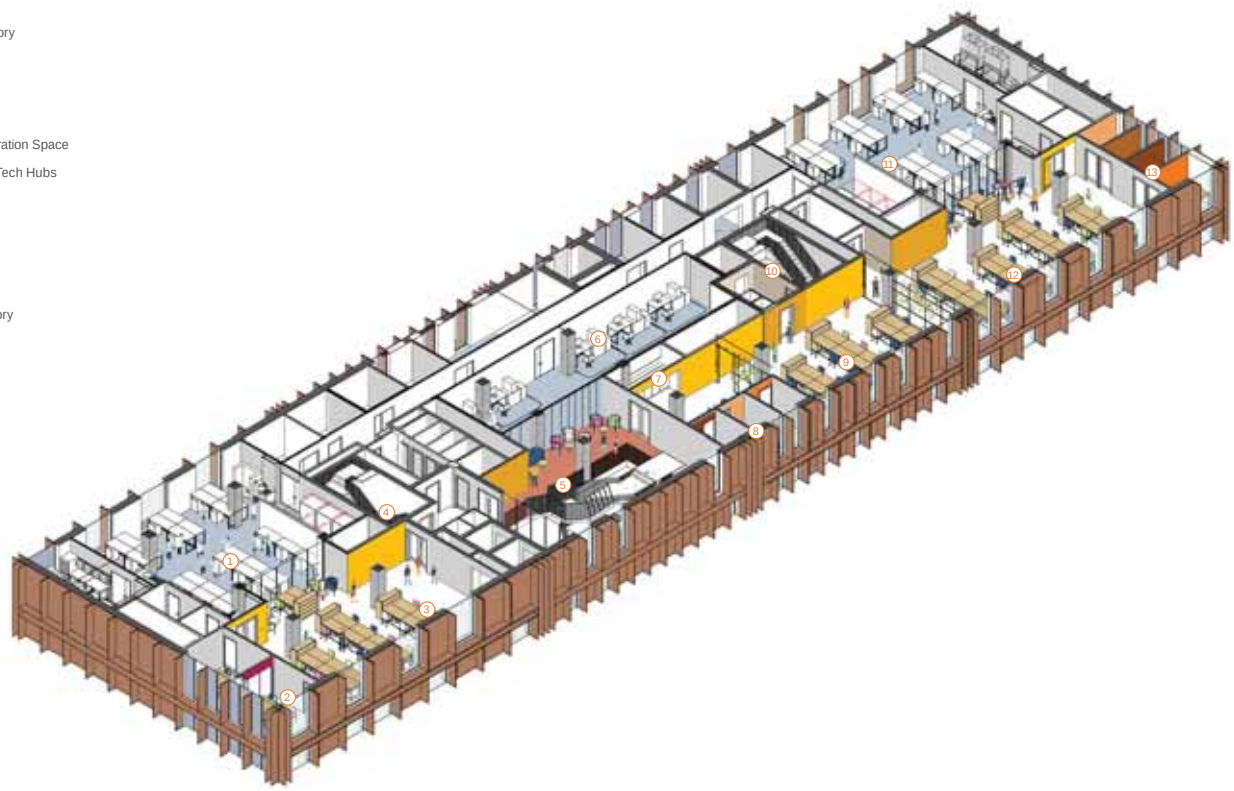
4.3 Building Organisation - First Floor 1:100 @A1

Please refer to layouts in '6 Laboratory Design' for science/ laboratory layouts.



4 Proposal
4.3 Building Organisation - Typical Floor Axonometric

1. South Primary Laboratory
2. Meeting Rooms
3. Shared Office
4. South Escape Core
5. Central Stair & Collaboration Space
6. Laboratory Support & Tech Hubs
7. Tea Point
8. Cellular Offices
9. Shared Office
10. North Escape Core
11. North Primary Laboratory
12. Shared Office
13. Cellular Offices



Science & Office
Typical Floor

4 Proposal

4.3 Building Organisation - Second Floor 1:100 @A1

Please refer to layouts in '6 Laboratory Design' for science/ laboratory layouts.

4 Proposal

4.3 Building Organisation - Third Floor 1:100 @A1

Please refer to layouts in '6 Laboratory Design' for science/ laboratory layouts.

4 Proposal

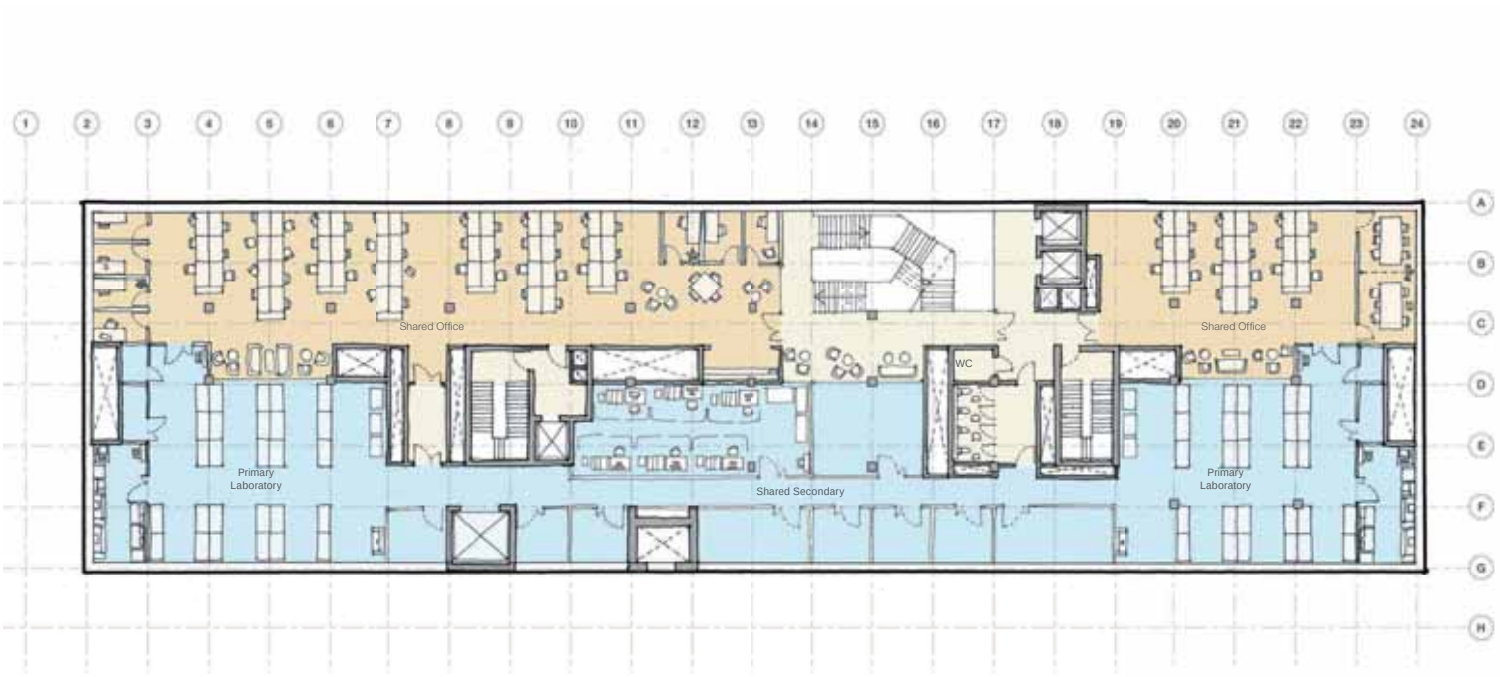
4.3 Building Organisation - Fourth Floor 1:100 @A1

Please refer to layouts in '6 Laboratory Design' for science/ laboratory layouts.

4 Proposal

4.3 Building Organisation - Fifth Floor 1:100 @A1

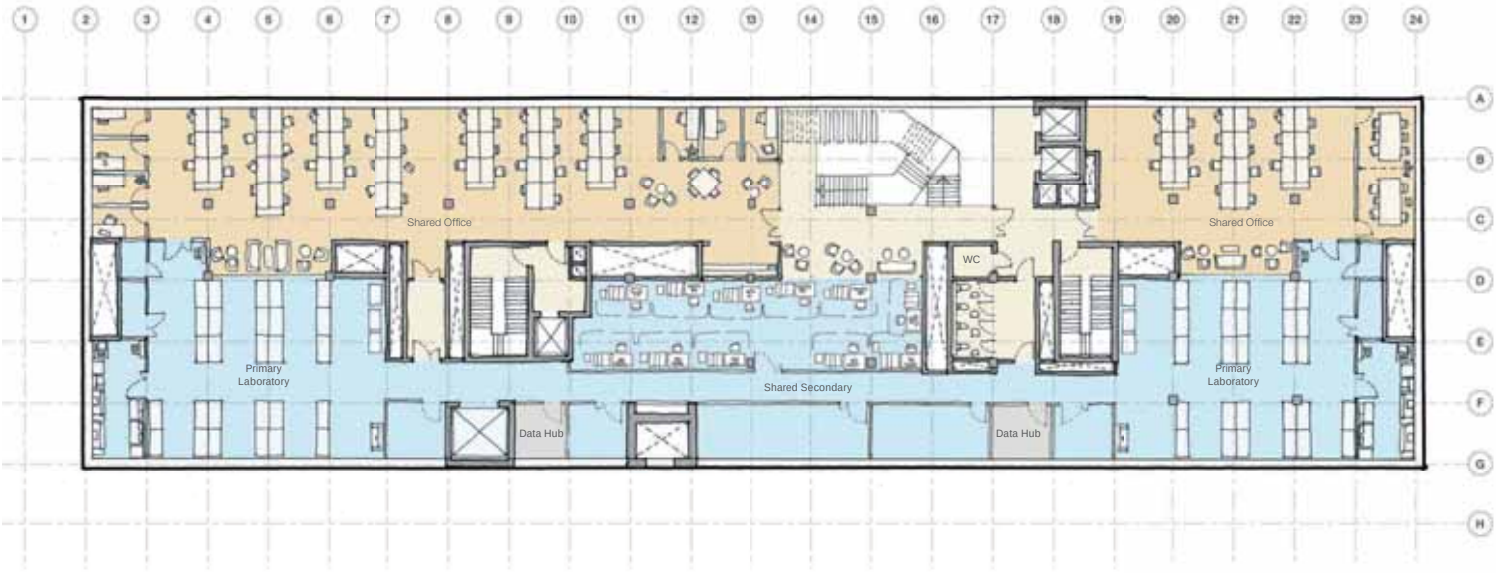
Please refer to layouts in '6 Laboratory Design' for science/ laboratory layouts.



4 Proposal

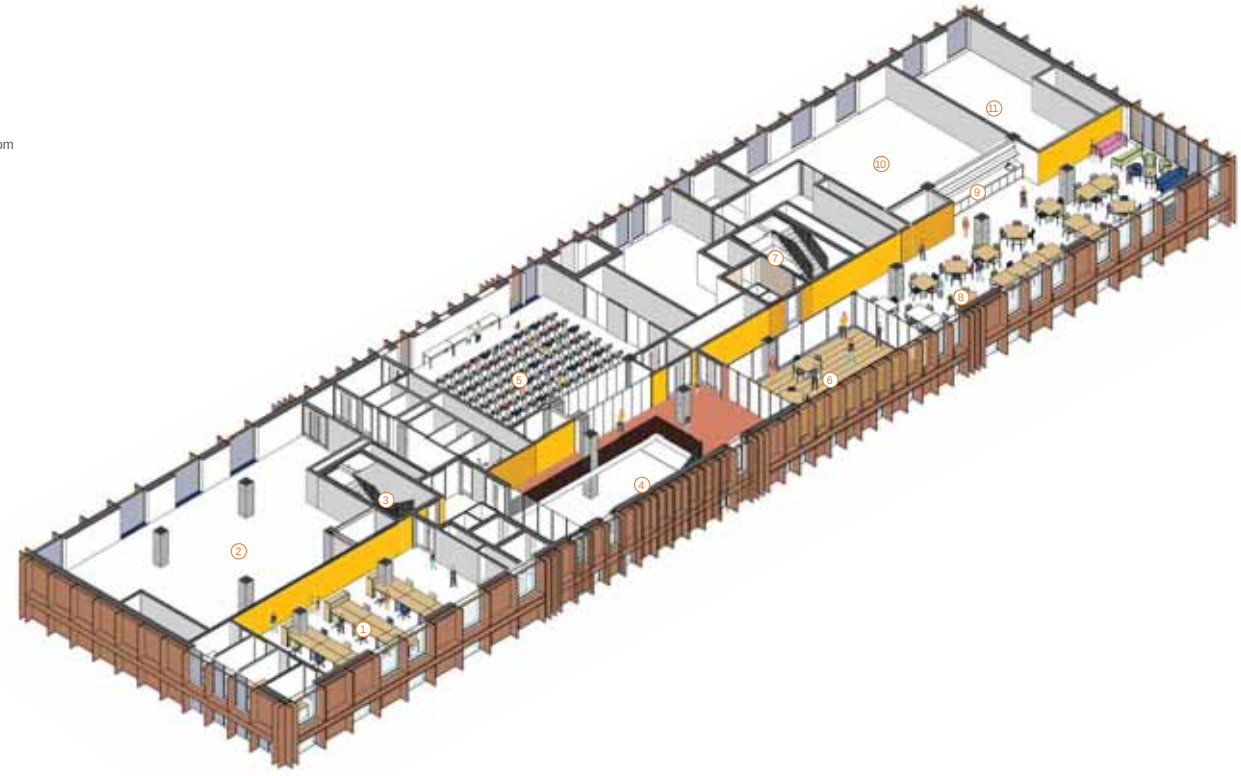
4.3 Building Organisation - Sixth Floor 1:100 @A1

Please refer to layouts in '6 Laboratory Design' for science/ laboratory layouts.



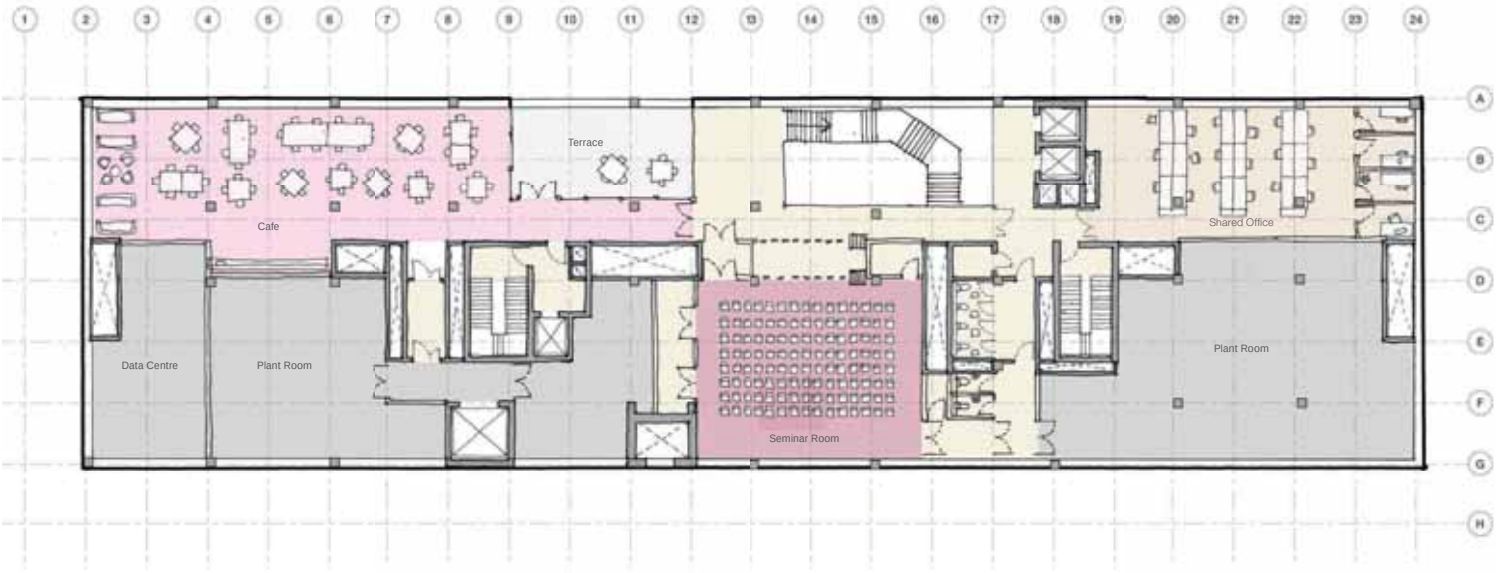
4 Proposal
4.3 Building Organisation - Top Floor Axonometric

1. Administration Offices
2. Plant
3. South Escape Core
4. Central Stair
5. 120 pers Seminar Room
6. External Terrace
7. North Escape Core
8. Cafe/ Social Space
9. Tea Point
10. Plant
11. Data Centre

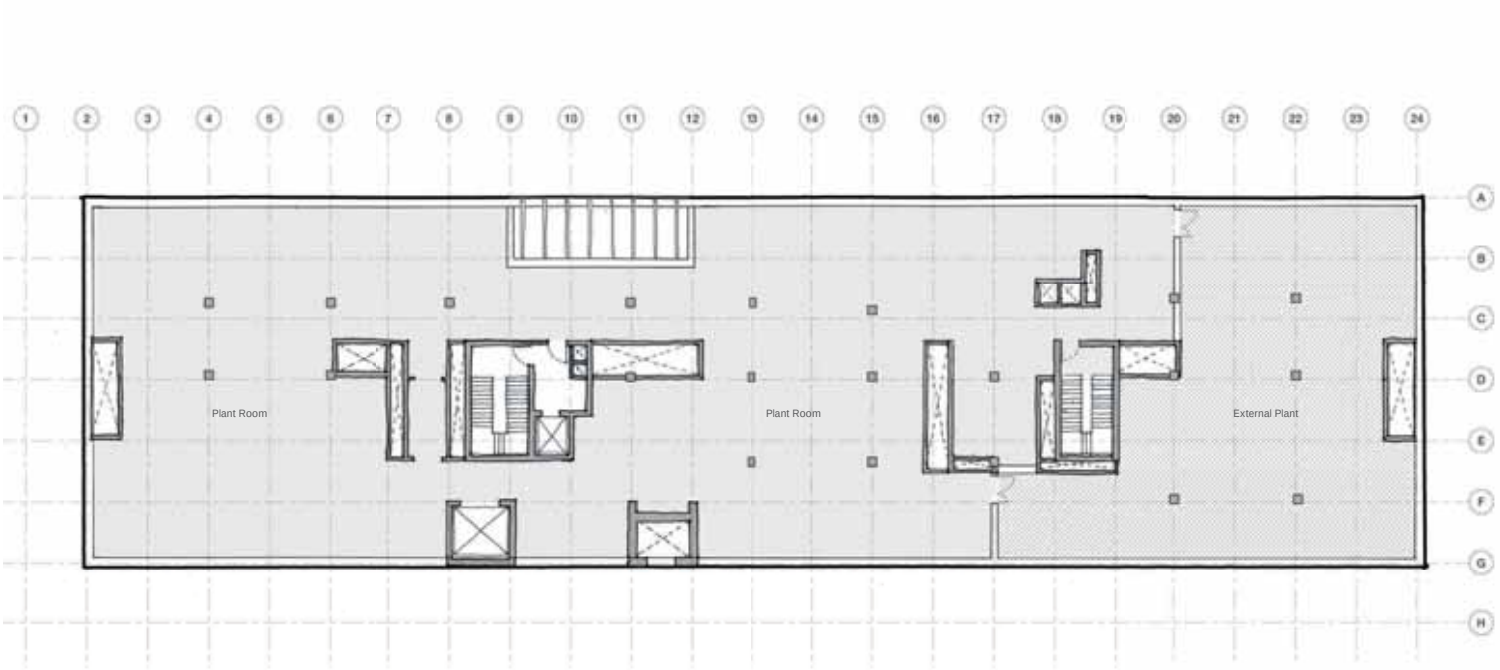


Social, Administration & Plant
7th Floor

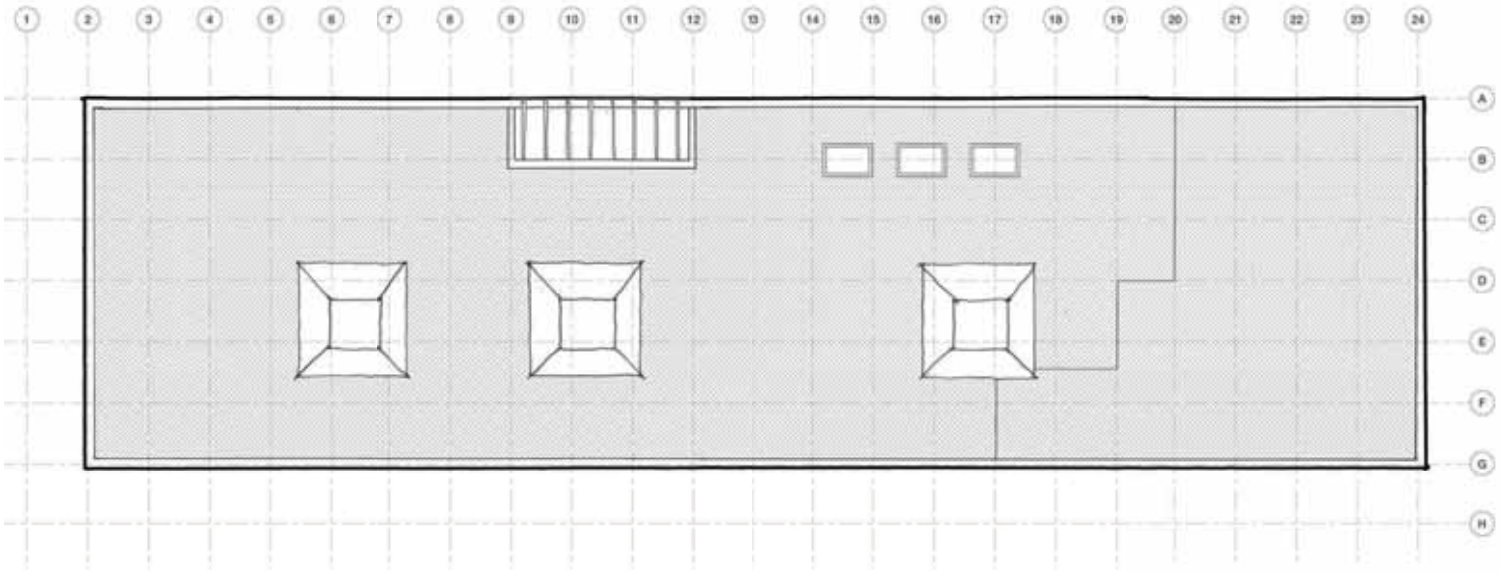
4 Proposal
4.3 Building Organisation - Seventh Floor 1:100 @A1



4 Proposal
4.3 Building Organisation - Eighth Floor 1:100 @A1

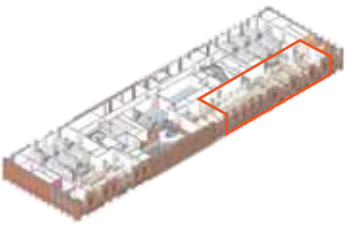


4 Proposal
4.3 Building Organisation - Roof Plan 1:100 @A1

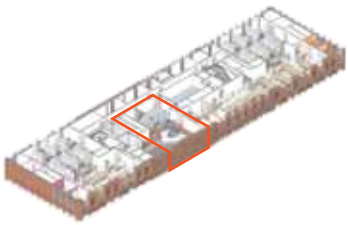


Reception & Entrance Lounge
Ground Floor

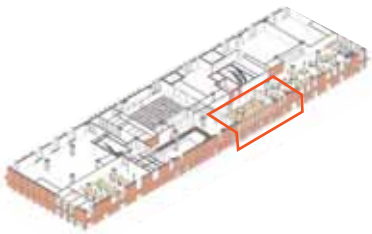
Shared Office View
Typical Floor



Laboratory to Atrium View
2nd Floor



Cafe to External Terrace View
7th Floor



5 Interior Design