Flexibility report: LOR-CO-SW-RP-0012
Response to Trust Flexibility Policy

Revision History

Revision	Date	Reason
F1	08/02/12	Initial information

Contents

Report by P Hall (LOR)

1. Executive Summary

This report summarises the findings against the Trust's Whole Hospital policy on 'Flexibility' (Appendix A) and issues raised around MRI scanners and their installation and replacement. This is summarised as follows:

- Site Master planning:
  I. Future removal of TKT – full demolition would not be possible with the new helipad located on the roof; however the TKT could be subject to a full refurbishment (including external cladding). The new development (3Ts) is a stand-alone scheme with regard to services and systems and would not be directly affected by any works to TKT.
  II. Expansion to Stage 3 – Limited future flexibility (below level 03) in this area based on Trust's confirmed preferred construction option with regard to reuse of existing foundations and LINACs etc. However, construction above L03 is a possibility.
  III. Restaurant Site – No provision is currently made for 'linking' any new development to this area to the 3Ts, however this could be possible via a link bridge directly into Stage 2.
  IV. St Mary's Site – there are no natural lines of communications to either of the school sites thus this has not been incorporated into the design.
  V. Future car parking expansion has been excluded from this report.

- Structure:
  I. Grid Spacing – Due to constraints of HBN 4 (particularly single bed rooms, en-suites and adjacent corridors), the 3Ts structural grid is set at 8.1m x 9.3m which provides the optimal use of space for accommodation and also provides a reasonable compromise on the number and size of columns with an appropriate slab thickness.
  Additional flexibility could be investigated around the Imaging floors (L04/L05) where currently the design provision is for localised slab strengthening around MRI proposed positions. Currently the localised slab is designed to support 12t 3 Tesla MRI. Further study would be required to review whole floor suitability.
  II. Interstitial Floors – These are not included in the scheme. This would have significantly added to the overall height of the scheme, which was already subject to constraints due to planning issues. Services will in the main part be accessed via the central corridors and via access panels.
  III. Floor penetrations – Plant rooms have been planned to B02, L06 and Level 11 to minimise riser requirements and provide more flexibility. Future provision for additional penetrations has been established by the use of cruciform arrangements to the column heads to allow 2nr penetrations at 90% of column locations.
- Rooms:
  I. General – where common functions have been identified, standard repeatable rooms have been established.
  II. Sizes – Over 100 standard rooms have been identified across the scheme (this equates to circa 1800 rooms) and this has lead to a degree of modularisation, with the design of services also being incorporated into the standardisation.
  III. Divisibility of 4 Bed Bays – subject to space availability, this could be achieved relatively easily with minor disruption into 2nr single rooms or other clinical space.

IV. Flexibility between ICU units – the current scheme and design works are based around the specific ITU clinical functions and the operational briefs established through clinical review meetings. This will be further developed through the 1:50 room design process.

V. Lift/Stair Cores – Where possible stair/lift cores and MEP systems have been kept to a perimeter layout to minimise impacts on patient areas.

- Services:

  Future flexibility for services within the scheme has been provided for via:
  - additional capacity within the central plant and distribution networks,
  - distribution space,
  - replacement of plant,
  - the ability to modify and extend networks
  - the provision of terminal outlets.
  - the structure for an additional 2nr PV arrays on the Stage 1 roof.
- Equipment:

  LOR have assessed the potential routes for the replacements of the MRI magnets based on the 3.0 Tesla MRI units. The current proposed locations of these scanners are on L04 and L05. Routes have been detailed showing the extents of disruption to the departments. Where possible this has been kept to a minimum by ensuring the design is robust (ceiling heights extended, services routed away, door sizes increased). This strategy will require review and agreement by the Trust for the routes to be finalised. Based on discussions through the equipment work stream, the assumption is that all other equipment can be broken down and removed through doors/lifts etc.

2. Introduction

This report has been written in response to the Trust's Whole Hospital Policy on Flexibility, BSUH-CL-SW-PO-B87 (*Appendix A*)
Also covered in this report is PMI 46 on MRI Scanners and the implications on installation and replacement and Laing O'Rourke's proposal to this.
LOR has sought input from BDP to address the areas considered by the Trust as key areas to promote overall flexibility.

3. Architectural – Site Master planning

- *Future Demolition of TKT Tower – Trust requirement*

Originally the helipad was to be located on the roof of stage 1, however due to issues raised during consultation with English Heritage this scenario was changed to that of the current scheme with the Helipad now located on roof of the TKT with the accompanying trauma lift 'attached' to the side. To enable the Trust to demolish the TKT, a new location for the helipad would need to be considered. This would need to include detailed aerodynamic testing. However, the TKT could be fully refurbished to the extent of removing all finishes back to the structural frame whilst maintaining the operation of the helipad.
The new construction of the 3Ts scheme is completely independent from TKT with regards to services and systems and should TKT be demolished in the future then 3Ts would be able to run as a 'stand alone' building(s). The link bridges are constructed in such a way that these could also be removed and allow TKT and/or 3Ts to continue to function.

- *Expansion to Stage 3 Site*

LOR in conjunction with WSP advised the Trust of 3 construction options for the area of land to the east of Stage 1 (Stage 3 FM compound). These options were:
A: remove lids and walls to existing LINAC bunkers and use the remains as structural support;
B: remove the bunkers but keep the split levels beneath the service yard;
C: provide new continuous wall to the north and provide 2 full storeys of accommodation beneath the service yard.
(Refer to Appendix D WSP-ST-ST3-SK-001 to 0010 rev F01)
The Trust confirmed to LOR that the design should proceed under option A and this has been used to take the scheme up to its current planning application status. This option does limit future flexibility in this area by extensively increasing the future costs of providing levels below L03. It would be a relatively straightforward exercise to construct additional floors above the service yard, subject to the usual structural checks on foundations etc and the height requirements of the loading bay vehicles.

- *Restaurant Site – not a Trust requirement*

There is currently no provision for connecting a link bridge from stage 2 to any future redevelopment of the restaurant site. However any future development could link back to stage 2 building street via a bridge. This would subject to structural and architectural design checks.

- *St Mary's Site – Trust requirement*

There is no natural line of communications expansion to either of the schools sites thus this has not been incorporated into the current design.

- Note - Future Car Parking expansion has not been included in this report.

4. Structure

- *Grid spacing: Trust requirement*

From experience, calculation and review of solutions for a number of construction sectors, LOR would opt for a structural grid of 7.8m x 7.8m. However due to constraints of Healthcare design (HBN 4), in particular to incorporate the single bedrooms and associated en-suite and corridor, this could not be achieved. The grid spacing currently designed is 8.1m x 9.3m. This provides an optimal use of space for accommodation layouts (in particular the requirements of the single bedrooms) and also provides a reasonable compromise on the number of columns and their size with an appropriate slab thickness. It allows for a large number of room types to easily fit into this layout. Fewer columns would lead to larger columns and also thicker slabs. This would reduce the area of service void space available and would also alter the tie in to adjacent floors/levels in TKT and across the Trust site.

The structure of the floors, which are currently designed for the provision of imaging services, has been designed to allow for a 3 Tesla MRI to be located to suit current 1:200 departmental layouts on both L04 and L05. The higher load allowance for the MRI locations is:

- Total superimposed dead load of 3.25kN/m^2 and a live load & partition of 11.0kN/m^2.
- This equates to one number 12 tonne scanner being located at each strengthened location.
- The surrounding floor areas and other hospital floors have a lighter load capacity.
- To provide the option of future flexibility around the imaging department and floors, further study is required. This will revolve around imposed loads and the cost options surrounding strengthening whole floors as opposed to the current localised options.

Where agreed with Trust through user group consultation; for rooms containing large equipment located on the external wall, the strategy of replacement of equipment has been allowed through the external wall by removable facade panels. See appendix C LOR-CO-ST1-SK-003.
For such rooms in an inbound location a strategy has been provided (see appendix C LOR-CO-ST1-SK-001 and 002) which provides a level of detail to illustrate the impact to the clinical service.

- *Interstitial floors – Trust requirement*

The 3Ts scheme has had to give careful consideration of the overall height of the building due to planning issues and interstitial floors would have dramatically added to the overall height of the scheme. The only situations in which the floors may still be considered appropriate are above theatres. Within the 3Ts scheme the theatres have their own dedicated plant room on the floor directly above thus removing the need for an interstitial floor. The services are accessed via central corridor locations (where possible) and through access panels to all serviceable equipment.

- *Floor penetrations- not a Trust requirement*

The efficient planning of the plant rooms in the basement, level 6 and level 11 has led to minimising the service riser dimensions and provides more flexibility. The only provision is for current services need and no redundant penetrations are provided against future needs under the current proposal. However within the current proposal a cruciform

arrangement has been specified at 90% of columns. This allows for 2nr penetrations at each column, which provides a degree of flexibility for any future provision.

5. Rooms

- *General – Trust requirement*

Wherever identified as having common functions standard repeatable rooms have been established.

- *Sizes – Trust requirement*

Due to the complexities associated of the functions within the clinical brief, the tight site and the SOA it was not possible to extensively standardise room *sizes* in such a way as rooms could be reused for new uses without adaptation in the future. However over 100 standard rooms have been identified across the scheme which equates to circa 1800 rooms.

- *Modularisation – Trust requirement*

Similarly to the response to *size of rooms*, the spaces currently shown in the provision are to match SOA and clinical brief, however in the case of making larger spaces smaller this could achieved with minor alterations/adaptions. Throughout the production of the SOA similar room designations have been standardised, to as closely as possible bring a level of modularisation. Services have also been designed to allow for easy modularisation, but the scale of work required would depend on what clinical function the rooms were being adapted for.

- *Divisibility of four bed bays – Trust requirement*

Whilst this has not been a specific consideration as part of the design process to date, it could easily be achieved by division of the large 4 bed open spaces and common toilet facilities into single rooms with relatively minor disruption or significant alteration. Subject to space availability this would equate to 2nr single rooms.

- *Flexibility between ICU Units – Trust requirement*

The current scheme and design works to date have been based around specific ICU clinical functions and operational brief throughout the clinical review meetings. How the units operate and the flexibility of those units will be tested through the 1:50 process.

- *Lift/Stair cores – Trust requirement*

Wherever possible stair cores, lifts and MEP systems as well as minimal use of load bearing structures have been avoided in core inpatients areas and moved to a perimeter layout to allow for easier reconfiguration.

6. Services

A detailed response on the MEP engineering systems in context of future flexibility has been issued to the Trust BDP-ME-SW-RP0035 rev F01 (see appendix B)
This report provides an overview of measures which are being incorporated within the design of the mechanical, electrical and public health services installations to provide future flexibility within the 3Ts buildings only. This includes capacity within the central plant and distribution networks, the provision of distribution space, facilities for the replacement of plant, ability to modify and extend networks and the provision of terminal outlets.

The Energy Centre is intended to provide electricity and hot water for the 3Ts and a large part of the retained estate. It is not planned to provide energy or utilities to other future development on the site, however the plant installed on the 3Ts site will incorporate additional capacity to support load growth within the 3Ts building during its life span. These are summarised as:

- Medical Gases Plant 10-15%
- Heating Boilers 5%
- Cooling Plant (chillers) 10%
- Hot water plant 5%
- 11kv/400v power transformers 15% minimum
- Main LV switchboards 15% minimum
- LV distribution networks 15% minimum
- Stand By Generators – provision included for installation of a further generator.
- PV has been included on the eastern most fingers. However the remaining 2nr roofs will be future proofed to receive PV at a later date. This is likely to take the form of a supporting structure and service connections, but will be finalised through the next level of design.

The primary systems have also where possible been designed to allow a degree of flexibility and additional capacity including:

- HVAC & Public Health – main vertical risers will have 10-15% spare space; heating and cooling riser mains and circulating pumps will be sized with 10% spare capacity; largest anticipated pipe sizes will be installed at each floor with reducers for current capacity; with medical gases a spare branch with local LVA will be provided at each floor.
- Electrical services – cable calculations and ratings for the primary LV distribution networks will be based on a future 15% increased capacity; Bus-bar rising mains will incorporated 15% spare capacity (minimum); sub-main switchboards will incorporate 15% spare capacity (minimum); Spare MCCB out going ways will be provided (15%); spare cubicle space provided;

The secondary systems have also where possible been designed to allow a degree of flexibility and additional capacity including:

- HVAC & Public Health – services to departments will incorporate means of isolation to allow changes/upgrades without affecting other departments; departmental sub-mains for piped services will be sized to permit 10% load growth.
- Electrical services – MCB distribution boards will include an average of 15% spare capacity; MCB distribution boards will have spare out going ways for MCB's (14% spare); MDB's will be provided with one spare port for future use; Circuit terminals designed to provide extra 15% growth; electrical containment 15% spare capacity; IPS systems will provide 25% spare capacity
- Drainage – multiple vertical drainage stacks provided across the scheme to provide a flexibility of connection locations

The electronic systems to be installed throughout the hospital (CCTV, fire alarms, access control, Nurse Call, BMS) will incorporate spare capacity and flexibility to account for future localised changes of operational requirements and/or re-configuration of departments etc. They will be extendable, typically modular in design and should account for any major changes of operational requirements.

The exact scope of spare capacity for each individual system will be provided at commencement of build and will be defined as the design progresses. The above figures are based on the current scheme design.

7. Equipment Installation

The potential route for the replacement of an MRI magnet following the conclusion of the 1:200 departmental layouts has been assessed.

The design team have reviewed replacement routes and options and the sketches provided (Appendix C) indicate possible routes and any implications to Trust's service in terms of time frame needed for this task. This includes a solution for all MRI's located in Stage 1 (Level 04 & 05).

Based on a 3.0 Tesla MRI the following design considerations have been identified and will be incorporated into the detailed design elements of the scheme:

- Ceilings within rooms must not be tied into the walls (independent frame).
- Clear distance between floors and ceilings will be 3000mm minimum.
- Services must not be installed in walls to be removed.
- Door sets of full width doors with a removable top panel to be provided within corridor to ensure minimal disruption to trauma theatre.
- Weight allowed to support 13t
- Temporary fire rated partitions to be installed to ensure fire strategy compliance.
- Removable external facade panel – locations to be agreed.

Each MRI is located at a different point on L04/L05 therefore only some of the items noted above will be applicable to establishing a clear replacement route whilst others may not. Each proposed route is indicated on the sketches in Appendix C with each of the 'design elements' noted.

8. Conclusion

LOR have reviewed the Trust WHP on Flexibility in line with the current proposed scheme and have provided a detailed response to each of the elements raised above. Where possible the scheme has allowed for future flexibility of the Trust's clinical, maintenance and general running operations. Trust operational procedures have been taken into account and in some cases these have set precedence over the choices made within the design. This report documents the response of the design to date and incorporates decisions agreed with the Trust through the process.

Appendix A –Trust Whole Hospital Policy –Flexibility (BSUH-CL-SW-PO-0087 ver 1a)

Document Information Cover Sheet
ASITE DOCUMENT REFERENCE: BSUH-CL-SW-PO-B87
DOCUMENT TITLE: WHP FLEXIBILITY
REVISION: Version 1a
PUBLISHED BY: Gary Speirs
PUBLISHED DATE: 11/08/10
OUTLINE DESCRIPTION/COMMENTS ON CONTENT: *Provided as part of Whole Hospital Policy provision for the 3Ts scheme, following LOR queries raised in May, June and July 2010* *** This policy is now released for use on the 1:50 process. A review will be programmed to ensure that the design is adhering to the policy.* *** The prevailing 3Ts SOA takes precedence over any specific room sizes identified in this policy (SOAs will be removed from policies).* *** Circulation specifications will adhere to the new design guide for circulation (being finalised as at document date).* *** Disability access agreements resulting from the Access Workshop (due August 2010) will determine access design requirements for policies.*

Brighton and Sussex University Hospitals NHS Trust

3Ts Hospital Redevelopment
Teaching • Trauma • Tertiary care

Brighton & Sussex University Hospitals NHS Trust

3Ts Programme

Whole Hospital Policy

Flexibility

Preamble

The 3Ts Programme – the development of a leading teaching, trauma and tertiary care centre for the south east region - is a generational opportunity for health care services across that region. It is more than just a building programme – it is a programme of development of complex secondary and tertiary care services to allow the Trust to realise its ambition to be amongst the best Teaching Hospitals in the Country. This will allow the Trust to provide the best and safest possible care for the residents of Brighton & Hove, Sussex and beyond.

It goes without saying that the facility must be of the highest possible quality and must meet the ambitions of the Trust and its staff in delivering this best and safest possible care. It also goes without saying that this will be a facility which will be a legacy for the region for 60-100 years: 100 years ago, most of the clinical services we take for granted such as complex imaging, specialised surgery, and developments in general medicine were not thought of. Many of the treatments that are provided are for conditions that were not yet discovered or understood.

In 100 years time, the building we are planning will have changed function many times and the developments in clinical care will be as unrecognisable to us as our current facilities and technology would be to our great-grandparents.

Although it is impossible to be able to anticipate precisely how the practice of medicine in its broadest sense will change in that time, what we can do is to ensure that the legacy, which is left to our successors, is as flexible as possible and can be adapted with relative ease to meet future requirements.

There is little empirical evidence as to what constitutes a truly flexible hospital (or indeed any other non-standard) facility. John Weeks' concept (from the 1960s) described a facility which was "long life and loose fit" with "indeterminism" built in from the start. These principles can be applied to hospital facilities today, but in a time of tightening economic circumstances and more specialised interventions this is a significant challenge.

General Overarching Principles

There are four key areas that will promote overall flexibility: in the site masterplanning, the structure of the building, in the mechanical and electrical services within the building and the overall internal design and layout of the facilities. Taking each one in turn:

- **Site masterplanning**: the design must allow, at some stage for the potential future removal of the Thomas Kemp Tower as this is now 40 years old. The new facilities must not be dependant upon systems and services which are currently in TKT. Any bridge links should be capable of removal;

- **The structure:** the structural grid of the facility should reflect the need to change the internal layout with relative ease – a grid which is too densely packed will mean that turning a series of smaller spaces into larger ones will mean that there will be intrusive columns in the new space. The grid should be as widely spaced as possible whilst not compromising the structural integrity of the building. The Principal Supply Chain and its designers will need to be able to demonstrate that the distance between columns is optimised and the value for money calculations which sit behind the proposals which are put forward. On the floors which are currently identified for provision of imaging services, the structure should allow for the future provision of much heavier imaging equipment – for example 5T magnets for MRI;

- **M&E services**: the distribution of M&E services should be optimised to ensure that these can be replaced and changed with the minimum of disruption to services within the building – it is no use tightly packing service distribution routes to the point at which additional power or ventilation supplies cannot be added later. At floor-by-floor level and room-by-room level, it should be possible to easily add small power (switched socket outlets) into the space – without introducing external trunking and inelegant spurs off the existing systems. It should also be possible to demonstrate how medical gas systems can be extended from the ward floor to other areas. The M&E design should also allow for mechanical ventilation to be introduced through the entire building at some future date;

- **Layout and internal design:** there has been a tendency in the NHS over the last 10 years to produce a building full of bespoke spaces. Although this is immediately convenient for the wishes of clinicians and planners this determines the building too rigidly. The Trust will provide a list of rooms that can be standardised across the facility. Odd-shaped and sized rooms must be strictly avoided – if space planning generates some "spare" space then this should be identified outwith the scope of the brief and should not be used to meet the brief. Where possible, room sizes should be multiples of each other so that rooms can be combined into larger usable spaces or sub-divided to achieve the same aim.

Specifically

The US-based Hospital Advisory Company in its report "Hospital of the Future" has identified some key high-value areas for flexibility that could be addressed – as this is one of the first times such an analysis has been presented in one place. The table below identifies these and provides a Trust commentary on desirability:

HAC Recommendation	Trust Commentary
Pre-wired vertical expansion easier if top floor shelled to minimise disruption when "building up"	It is unlikely that, given, the constraints on site development for heritage considerations, we will be able to achieve a shell floor on the top of either stage.
Pre-wired horizontal expansion easier if "building spine" concept incorporated with central ancillary and utility system; cheaper and less disruptive than vertical option but available land needed.	In principle, this should be adopted, especially if car parking goes underground and we are left with development space to the east of the Stage 1 building or beyond onto the St. Mary's site.

HAC Recommendation	Trust Commentary
Interstitial floors of 2-3m built between regular floors to house mechanical, electrical and plumbing system.	This would be desirable if the whole hospital could be rebuilt on this basis. Adoption of this throughout the development would be likely to increase the building height (difficult for heritage considerations) overall. It may be worth looking at this above the imaging and theatre floors.
Medical gas in headwalls, larger rooms, outboard toilets to allow room to flex from general inpatient accommodation to ITU.	Not required throughout the building. If the ITU floor is agreed, it may make sense to look at this on the floor above.
Allow large equipment to be installed through external walls via knock out panels.	Wherever possible and practical.
Provide support for future diagnostic and treatment equipment in upper floors.	Investigate implications up to floor 7 in Stage 1.
Perimeter layout of stairs, lifts and mechanical, electrical and plumbing systems; minimal use of load bearing structure in core inpatient areas to allow for easier reconfiguration.	Wherever possible.
Specialise ITUs sparingly.	Specialisation will be required (especially for neuro ITU) but, if the whole critical care function (except cardiac) is included, this should allow flex between units so long as they are designed to do this.
Multi-bed bays	Four bed bays should be easily convertible into single rooms in the future.
Reserve capacity for power and IT systems	Ample number of electrical sockets – double the number on standard RDS; Continuous wireless access required; RFID infrastructure to be in place.
Wall mounted IT versus computers on wheels	The future of patient entertainment systems is in some doubt. Each bed space should have the IT wiring, power supply and wall support to allow future migration for Trust IT systems into the same platform as the patient entertainment system.

Appendix B - Detailed M&E response on Flexibility (BDP-ME-SW-RP-0035 rev F01)

P2001647 – Brighton 3Ts

Building Services Engineering: Design Statement on Flexibility

Outline Description: Measures incorporated in the design of the MEPH systems to provide future flexibility

Produced by: Paul Niblock and Paul Thompson

Doc No: BDP-ME-SW-RP-0035

Issue: Draft Issue for Comment

Rev: F01

Published Date: 29 July 2011

BDP.

1.0 Introduction

The following statement provides an overview of measures which are being incorporated within the design of the mechanical, electrical and public health services installations to provided future flexibility within the 3Ts buildings. This includes capacity within the central plant and distribution networks, the provision of distribution space, facilities for the replacement of plant, ability to modify and extend networks and the provision of terminal outlets.

This report considers M&E engineering systems only and we would recommend further co-ordination with the architects and structural engineers to integrate these proposals into an overall plan for flexibility within the building.

2.0 Plant Capacity

The central M&E plant within the 3T's building is intended to serve the 3T's only. This comprises the Stage 1 and Stage 2 buildings and the service yard. It is not planned to provide energy or utilities from the 3T's building to any other future development on the site.

However the plant will incorporate additional capacity to support load growth within the 3T's building during its lifespan. This provision is summarised in the table below:

2.1 Mechanical Services

Service	Additional Capacity	Notes
Medical Gases Plant: Oxygen VIE Medical Vacuum Medical Compressed Air	 15% 15% 10%	The configuration of the medical gases supply system is described in the Medical Gases System Scope (BDP-ME-SW-SW-0003. This describes the type, size and location of the primary and secondary supplies for each gas. System demands will be calculated in accordance with the flow rates and diversities set out in HTN02-01 section 4.0 and Table 13. The flow rates will be uplifted by the percentages indicated to give the spare capacity. In the case of oxygen systems and the use of CPAP ventilators/anaesthetic machines etc and appropriate spare capacity allowances requires further review with the Trust.
Heating Boilers	5%	Given that the hospital is fully mechanically ventilated and the envelope unlikely to change excessive additional boiler capacity is not required and would be detrimental to plant efficiency. The 5% allowance will allow for example, a typical outpatients floor to be converted to a critical care floor with the increased ventilation rate and hence air heating load.
Cooling Plant (Chillers)	10%	The spare capacity takes account of the output from the tri-

		generation system in addition to the conventional chiller plant. Distribution mains and pumps will also be sized with a 10% spare capacity.
Hot water plant	5%	The 5% allowance will allow for example, a typical outpatients floor to be converted to a ward floor with the increased hot water demand.

2.2 Electrical services

Service	**Additional spare capacity**	**Notes**
Incoming electrical supply to 3Ts development	See Note	Refer to Site Wide Electrical Master plan (BDP Report DP-EL-SW-RP-0008) for an analysis of future load growth and provision.
11kV/400V power transformers	15% (minimum)	
Main LV switchboards	15% (minimum)	The rating of the bus-bars and incoming ACB will include a minimum 15% spare capacity. Spare MCCB out-going ways will be provided – a minimum of 15% will be provided with a range of frame sizes with ratings between 800A and 160A. Spare cubicle space will also be available for future retro-fitting of additional MCCB devices. The exact scope of the cubicle space will be defined once the switchboard designs are further developed.
LV distribution networks	15% (minimum)	The cable calculations and selection of ratings for equipment will be developed on the basis that loads may increase by up to 15%.
Stand-by generators	Refer to note	Refer to Engineering Report on Standby Generators (BDP Report BDP-EL-SW-RP-0009) Option B for detailed description. The proposal is to provide three standby generators, two of which will have capacity sufficient capacity to support the anticipated essential demands in the building (i.e. those which are essential for the delivery of in-patient care) with the third generator in reserve. A load shedding strategy will be employed whereby "non-essential" loads, equipment and departments will not be supported by the stand-by generators during a mains failure condition. This will include shedding of approx 66% of the chilled water cooling capacity.

		The load shedding will ensure the scope of the essential loads is below the capacity of the stand-by generators. The difference between the capacity of the stand-by generators and the "essential" maximum demand will equate to the spare capacity. It is anticipated that the spare capacity of the stand-by generators will equate to less than 10% of their rated capacity (in order to achieve maximum benefit from the stand-by generators). All three generators running will be designed to support the entire building load. Provision is included within the scheme to facilitate installation of a fourth generator at a future date. This would account for significant increases of "essential" supplies or if there is a change of the hospital's operational requirements during mains failure conditions to provide full back-up of all loads.

3.0 Plant Replacement

A strategy for major plant replacement is described in detail in BDP report BDP-ME-SW-RP-0003.

The FM lifts in the main North Core serve all floor levels and can be used to transport plant, equipment and components, subject to the following limitations:

- FM lift capacity = 2,500 kg.
- Internal dimensions of the lift car = 1,800mm (W) x 2,700mm (L)
- The dimensions of the door opening to the lift car = 1,800mm.

The design and specification of plant equipment will, wherever possible, ensure that it can be transported via the FM lifts. Where appropriate, equipment will be selected and specified to be of modular construction, or be easily be broken down into component parts, such that it can be transported via the FM lifts for assembly in the plant rooms. Where plant exceeds the capacity of the FM lifts alternative replacement strategies have been provided as set out in the aforementioned plant maintenance and access strategy.

4.0 Primary Distribution

4.1 HVAC and Public Health

- The hospital is designed to be full mechanically ventilated and cooled and the primary distribution spaces (vertical risers and ceiling voids) have been established to reflect this requirement.

- The main vertical risers in the north cores will incorporate 10-15% spare space to enable future vertical services to be installed if necessary
- The heating and cooling pipework rising mains and circulating pumps will be sized with10% spare capacity.
- Variable speed drives on the primary heating and cooling pumps sets will control the flow rates to suit the actual building loads and hence achieve energy efficiency.
- On heating, cooling, hot and cold water risers, the sub-main branch tee connections and main isolating valves to each floor will be installed at the largest anticipated line size for a floor, with reducers to suit the initially required line size for the department. This will allow services to be isolated at he riser if increase diameter sub-mains pipelines are required to suit a department refit. All flow measuring and commissioning valves will of necessity be installed at the line size appropriate to the initial flow rates required and will require replacement in the event of a re-fit.
- On medical gases, a spare branch connection with local LVA will be provided for each gas on each floor.

4.2 Electrical Services

- The cable calculations and selection of ratings for the primary LV distribution networks will be developed on the basis that loads may increase by up to 15%.
- The Bus-bar rising mains will incorporate 15% spare capacity (minimum).
- Sub-main switchboards will include a minimum 15% spare capacity on the rating of the bus-bars and incomer device.
- Spare MCCB out-going ways will be provided – a minimum of 15% will be provided with a range of frame with ratings of 160A.
- Spare cubicle space will also be available for future use and flexibility. The exact scope will be defined once the sub-main switchboard designs are further developed.

4.3 ICT

- There will 2No. BDR rooms in Stage 1 of the development and a further two in Stage 2...
- Each BDR room can accommodate 4No. 800x800mm racks.
- Stage 1 of the development will be provided with three hub rooms on each floor. The hub rooms are vertically stacked providing a route for cable distribution through the buildings. This provides a highly flexible arrangement enable diverse routing of cabling.
- Stage 2 of the development will be provided with two hub rooms per floor in a similar stacked arrangement to stage 1.
- Each hub room can accommodate 2No. ICT wiring frames.
- The frames will accommodate the wiring racks, active equipment and other associated equipment to support operation of the RJ 45 outlets provided at "Day One". As each bed is provided with 6No general outlets together with dedicated outlets for voice, patient entertainment and patient monitoring and each work station is provided with 2No. outlets, then "spare" capacity is provided within the network. Additional spare space within the individual frames will be available for future use – the scope will be defined as the design of the ICT scheme is developed. It will depend on the number of outlets back to each hub.

5.0 Secondary Distribution

5.1 HVAC and Public Health

- Ceiling void depths accommodate fully mechanically ventilated departments (refer to report BDP-ME-SW-RP-0002 for analysis)
- Services to all departments will incorporate means of isolation to enable changes and upgrades without affecting other departments.
- Piped services distribution systems (heating, cooling water and medical gases) departmental submains will be sized to permit 10% load growth within the department. (provided total system flows remain within overall system spare capacity limits previously identified)

5.2 Drainage

- Vertical drainage stacks will be located at every internal column, providing a flexible array of stacks.

5.3 Electrical Services

- MCB Distribution Boards: The rating of the bus-bars and incomer device will include an average of 15 % spare capacity.
- MCB Distribution boards will have spare out-going ways for MCBs. The boards will accommodate 8 Harton connectors, seven used and one prewired for future growth (circa 14% spare). The distribution boards will also be provided with 20mm knockouts for services requirements over 20amp SPN. Spare ways will typically be. 6 SPN or 2 TPN
- Modular Wiring: The circuits are fed by Modular Distribution Box's (MDB's). The MDB's can be manufactured with 6 or 9 ports with each multi-circuit "home" run typically comprises 6No or 9No circuits. Generally, each MDB will be provided with one spare port for future use to provide local flexibility and spare capacity to support localised refurbishment and for additional equipment. If all ports in and MDB are used due to circuiting issues, 2 spare ports will be provide in the next nearest MDB.
- The circuit terminals being either sockets or lighting components would be designed to accommodate an extra 15% growth by extending the circuits by adding additional terminals.
- Electrical Containment: 15% spare space will be available on cable baskets for future installation of LV distribution cables.
- IPS Systems: Typically, each IPS will be rated at 10kVA – each IPS will loaded to a maximum of 8KVA based on assessments provided by specialist equipment suppliers, providing 25% spare capacity
- Central UPS Systems will be rated to serve all the IPS systems when running at full load.

5.4 ICT

- Space will be available on containment baskets for future installation of additional ICT cables (15% minimum)
- The hospital will be provided with wireless coverage throughout (subject to any restrictions in specialist medical areas)

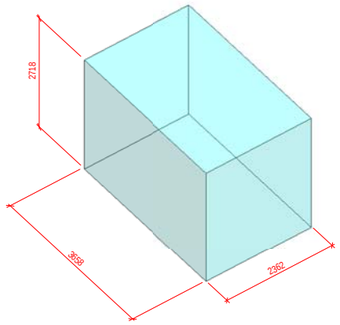
6.0 Provision of Outlets

- Horizontal bed head trunking in wards will provide flexibility in the location of outlets, the ability to add or remove outlets or the ability to replace the entire trunking run with minimal impact on the room structure
- Small power and data outlets in clinical areas will be provided in accordance with recommendations of HTMs and HBNs, and as defined during the 1:50 process.
- At each work station position, 2no. twin socket outlets will be provided.
- Highly serviced non clinical areas will be served by horizontal compartmentalised and screened dado trunking which can accommodate future installation of additional small power sockets and or data.
- Rj45 data outlets will be provided within individual rooms and spaces in accordance with recommendations of HTMs and HBNs, and as defined during the 1:50 process. These are currently likely to be cat 6e terminals but will be designed to accept cat 7 in the future.
- Any requirements for spare RJ 45 outlets in specific rooms/spaces should be defined as part of this process.
- At each work station position, 2no. RJ45 outlets will be provided. This configuration should provide spare capacity within the network, as 1No. RJ45 outlet should be capable of supporting voice and data applications for an individual work-station. The second outlet could be considered to be spare.
- Medical gases outlets will be provided according to the recommendations of HTM02-01 & HTM08-03 or as agreed during the 1:50 –process. Trunkings will incorporate separate containment within the trunking and branch pipe sizes will generally permit the addition of one outlet per bed head for each gas type. This assumes general purpose outlets only and excludes high demand uses such as CPAP and Anaesthetic Machines. The overall number of addition outlets which can be supported will be limited by the spare capacity on the main infrastructure referred to previously.

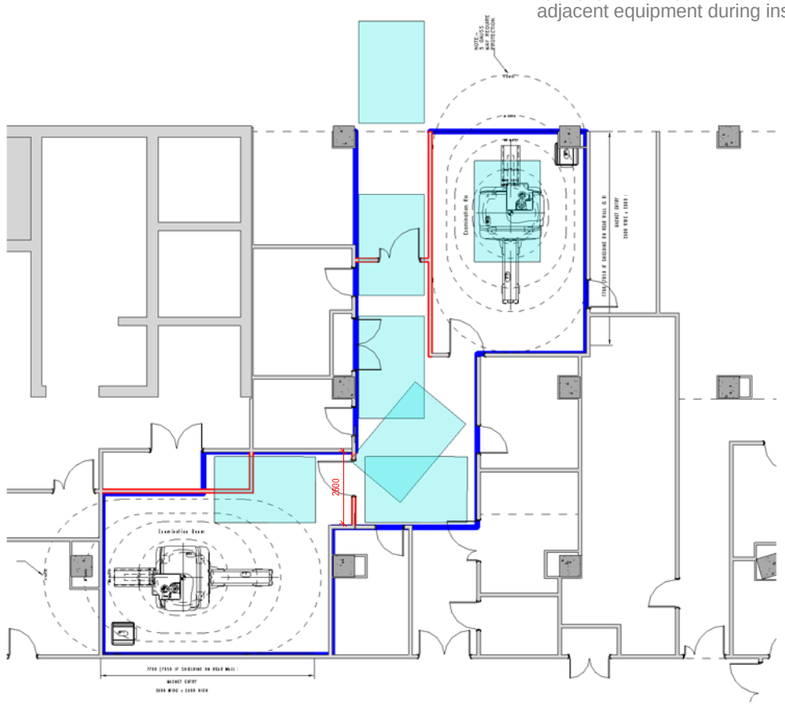
7.0 Electronic Systems

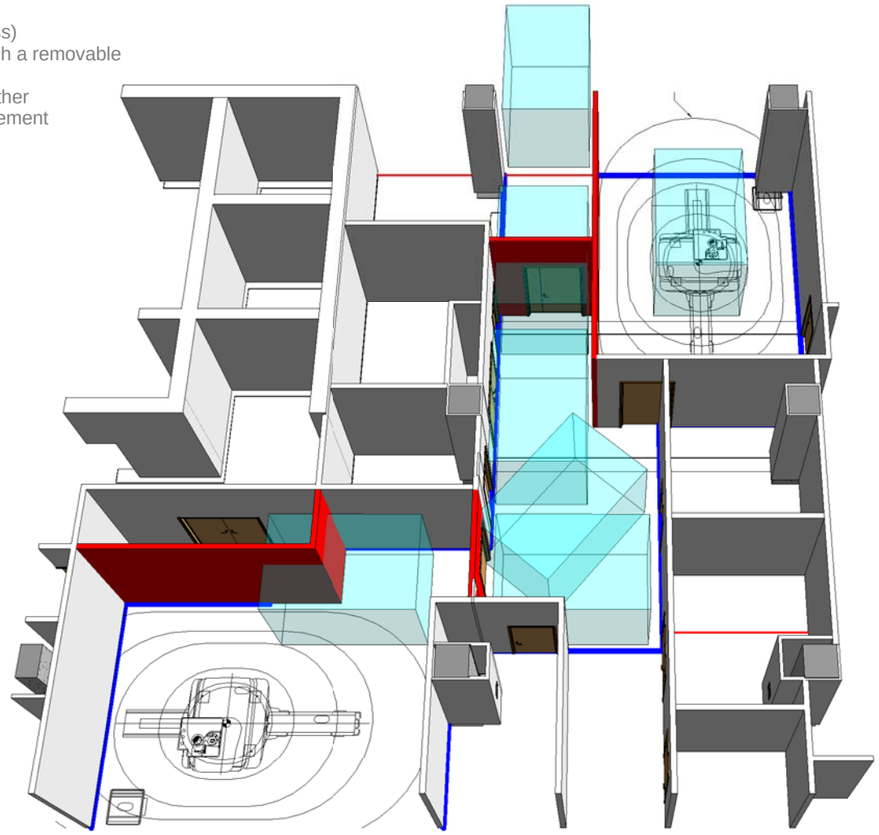
- The design of electronic systems (e.g. CCTV, fire alarms, access control, Nurse Call, BMS) will incorporate spare capacity and flexibility to account for future localised changes of operational requirements and/or re-configuration of departments etc.
- The systems will be extendable, typically modular in design. This will provide further future-proofing, and will account for major changes of operational requirements and/or major re-configuration/refurbishment of departments.
- The exact scope of spare capacity to be provided at "Day One" will be defined as the designs of the individual systems are progressed. A sensible and realistic approach needs to be considered for each system

Appendix C – MRI replacement strategy sketches (LOR-CO-ST1-SK-0001, 2, 3 F01)



Notes:
1 Ceilings in the rooms will need to be on a subframe and not tied into walls in disposal hold and patient prep area. The clear distance between the floor and the ceiling must
be 3m minimum, this creates a potential problem of insufficient space for services between ceiling and soffit.
2 Scaffold contruction must be capable of withstanding a load of 13.5 tonnes, implies a fully designed scaffold deck. Potential problems - this will disrupt the south service road for 2 weeks.
3. The two red shaded walls cannot have services within them, as they will need to be removed and replace during every MRI change.
4. The likely timeframe to carry out all of these works is 4 weeks, The area highlighted in blue will be compromised for this duration. This
does not include commissioning. This timeframe includes the following:-
• Removing Door sets and partitioning
• Removing ceilings
• Removing Facade panels
• remove existing magnet
• Install new magnet
• Replace Facade Panel
• Reinstate Partitioning
• Reinstate Ceiling/Lighting
• Reistate Doorsets
• Re-decorate area
• Commisionsing (excluded from 4 week process)
5. The installation route proposed enters through a removable facade panel.
6) Equipment supplier to identify influence on other adjacent equipment during installation & replacement





NOTES

STATUS A / B / C

CLINICAL LEAD/S

NAME SIGNATURE

TRUST CHANGE MANAGER

NAME SIGNATURE

LoR DESIGN MANAGER

NAME SIGNATURE

LOR-CO-ST1-SK-0002
Rev: F01

KEY PLAN

STAGE:
2 1 3

N

REVISION / DESCRIPTION DRAWN CHECKED DATE

REVISION / DESCRIPTION DRAWN CHECKED DATE

REVISION / DESCRIPTION DRAWN CHECKED DATE

REVISION / DESCRIPTION DRAWN CHECKED DATE

CLIENT
Brighton and Sussex University Hospitals NHS
NHS Trust

LAING O'ROURKE

Laing O'Rourke Plc.
Bridge Place, Anchor Boulevard, Admirals Park, Crossways, Dartford, kent. DA2 6SN
Telephone: (01322) 29 6200 Fax: (01322) 296262

PROJECT TITLE
Brighton 3Ts

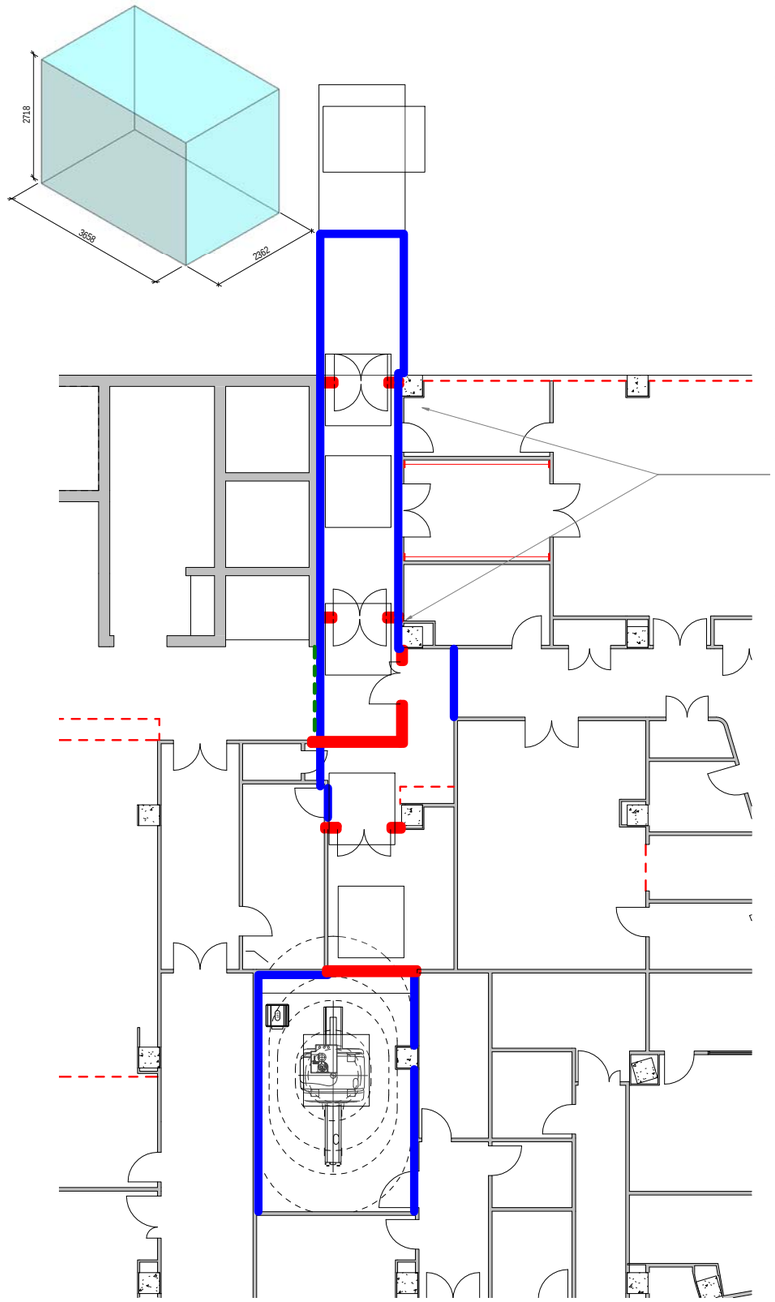
DRAWING TITLE
L4 imaging (cold) (inbound)

SCALE
1 : 100
@ A1

DATE

LOR-04-M3-Imaging1

REVISION
1



Notes:
The following notes are Laing O'Rourkes Consideration of the construction issues and timescales. These still need to be confirmed by the Trust via a specialist equipment installer. Where issues noted relate to base construction, the design and construction will be adjusted as necessary.

1.Ceilings in the rooms will need to be on a subframe and not tied into walls in store - equipment. The clear distance between the floor and the ceiling must be 3m minimum,
this creates a potential problem of insufficient space for services between ceiling and soffit.

2. Scaffold contruction must be capable of withstanding a load of 13.5 tonnes, implies a fully designed scaffold deck. Potential problems - this will disrupt the south service road for 2 weeks.

3. The red shaded walls cannot have services within them, as they will need to be removed and replace during every MRI change.

4. The likely timeframe to carry out all of these works is 4 weeks, The area highlighted in blue will be compromised for this duration. This does not include commissioning. This timeframe includes the following:-

- Removing Door sets and partitioning
- Removing ceilings
- Removing Facade panels
- remove existing magnet
- Install new magnet
- Replace Facade Panel
- Reinstate Partitioning
- Reinstate Ceiling/Lighting
- Reistate Doorsets
- Re-decorate area
- Commisionsing (excluded from 4 week process)

5. It is proposed to provide 2 sets of full width doors with removable top panel. This means the corridor to trauma theatre is not copromised by the removal and reinstating of partitions and doorsets. Likely time frame to the removal of doors and overhead panel is 0.5 days.

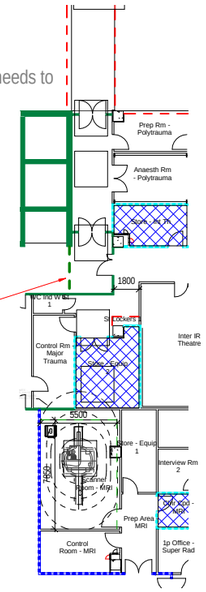
6. The proposed installation route for the MRI 3.0 T magnet enters through the link bridge at level 05.
BDP/WSP
to confirm that the design will accomodate the parameters

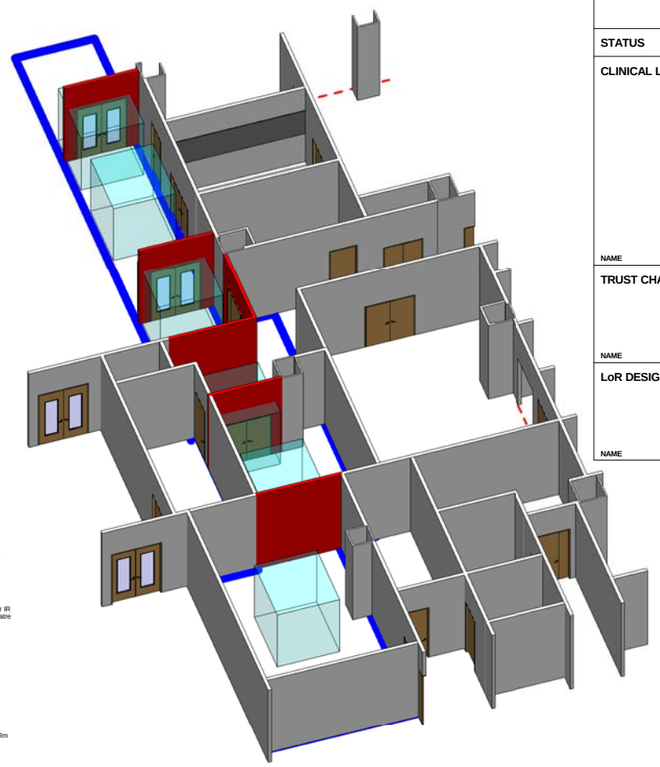
- H= 2718
- W = 2362mm
- L= 3658
- Weight = 13t

7. During the time that the route through the link bridge is compromised. Operationally, the Trust needs to set in place temporary measures to account for the following:
Trust Fire evacuation strategy
Security

Clinical Operational Brief – including the re-routing of the patient journey to the Polytrauma theatre.

Temporary Fire Rated Partition





NOTES

STATUS A / B / C

CLINICAL LEAD/S

NAME SIGNATURE

TRUST CHANGE MANAGER

NAME SIGNATURE

LoR DESIGN MANAGER

NAME SIGNATURE

LOR-CO-ST1-SK-0001
Rev: F01

KEY PLAN

STAGE:
2 1 3

REVISION / DESCRIPTION DRAWN CHECKED DATE

Brighton and Sussex University Hospitals NHS
NHS Trust

LAING O'ROURKE

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Bridge Place, Anchor Boulevard, Admirals Park, Crossways, Dartford, kent. DA2 6SN
Telephone: (01322) 29 6200 Fax: (01322) 296262

PROJECT TITLE
Brighton 3Ts

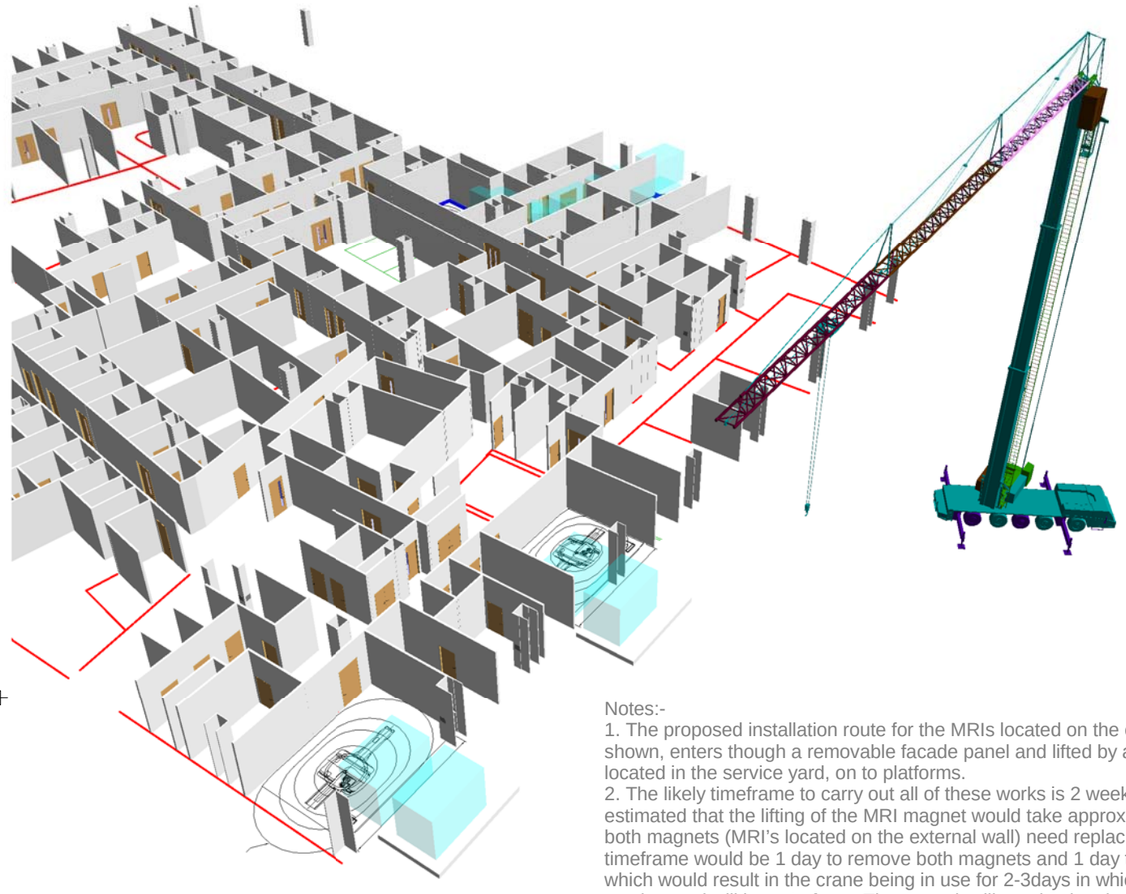
DRAWING TITLE
L5 Hot imaging replacement of MRI Magnet (inbound) Proposed route

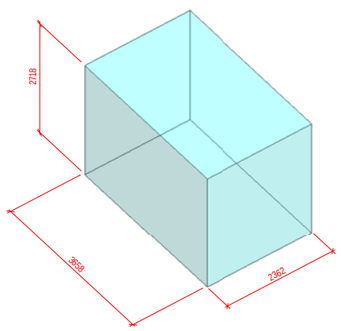
SCALE
As indicated @ A1

DATE

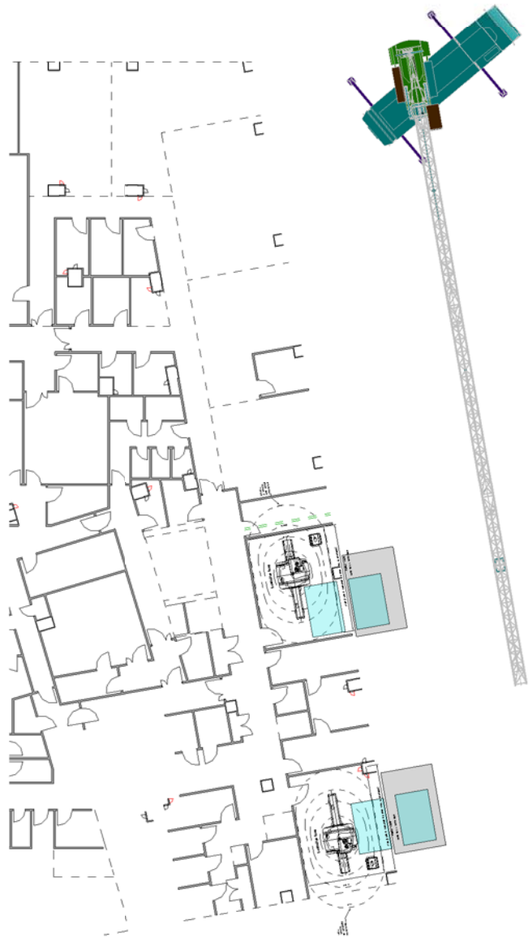
LOR-L05-M3-Imaging(hot)

REVISION
1





Notes:-
1. The proposed installation route for the MRIs located on the exteral wall, shown, enters though a removable facade panel and lifted by a crane, located in the service yard, on to platforms.
2. The likely timeframe to carry out all of these works is 2 weeks. It is estimated that the lifting of the MRI magnet would take approx 1 day. If both magnets (MRI's located on the external wall) need replacing the likely timeframe would be 1 day to remove both magnets and 1 day to replace, which would result in the crane being in use for 2-3days in which the service yard will be out of use. The carpark will need to be closed off for approx 3 days, which for operational purposes may need to be carried out and out of hours for the removal and re- fitting of the facade panels and replacement of the Magnet.
4. The likely timeframe to carry out all of these works is 4 weeks, The area highlighted in blue will be compromised for this duration. This does not include commissioning. This timeframe includes the following:-
• Removing ceilings
• Removing Facade panels
• Remove existing magnet
• Install new magnet
• Replace Facade Panel
• Reinstate Ceiling/Lighting
• Re-decorate area
• Commisionsing (excluded from 4 week process)



NOTES

STATUS A / B / C

CLINICAL LEAD/S

NAME SIGNATURE

TRUST CHANGE MANAGER

NAME SIGNATURE

LoR DESIGN MANAGER

NAME SIGNATURE

LOR-CO-ST1-SK-0003
Rev: F01

SITE PLAN

STAGE:
2 1 3

N

REVISION / DESCRIPTION DRAWN CHECKED DATE

REVISION / DESCRIPTION DRAWN CHECKED DATE

REVISION / DESCRIPTION DRAWN CHECKED DATE

REVISION / DESCRIPTION DRAWN CHECKED DATE

CLIENT
Brighton and Sussex University Hospitals NHS
NHS Trust

LAING O'ROURKE
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PROJECT TITLE
Brighton 3Ts

DRAWING TITLE
L4 imaging (cold) replacement of MRI magnets (external wall location) proposed route

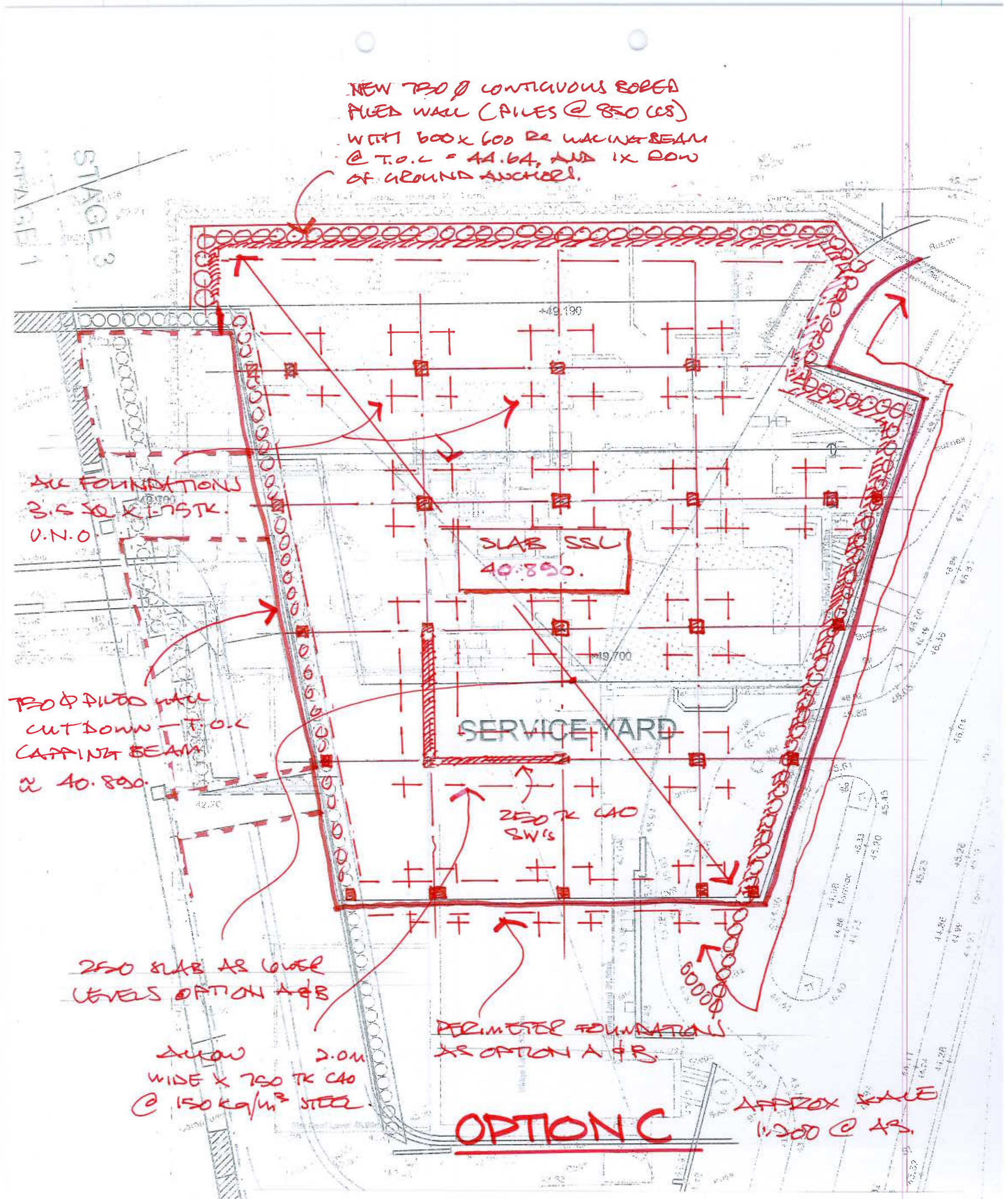
SCALE
1 : 200
@ A1

DATE

LOR-LO4-M3-Imaging2

REVISION
1

Appendix D – Stage 3 Construction Options A, B & C (WSP-ST-ST3-SK0001-0010 F01)



Project			Status	
BRIGHTON STS.				
Date 16.11.2010. By RL Checked	Job no. 2454 0305	Section	Sheet no.	Rev F01
Rev	Date	Details WSP-ST-ST3-SK-0009		Tel / Fax
Part OPTION C - LEVEL 1 PLAN.				

WSP

Project			Status	
BRIGHTON STS				
Date 16.4.2010 By DK Checked	Job no. 2454 0305.	Section	Sheet no.	Rev F01
Rev / Date / Details WSP-ST-ST3-SK-0008				Tel Fax
Part OPTION C - SKETCH SECTION - N.T.S.				

REF

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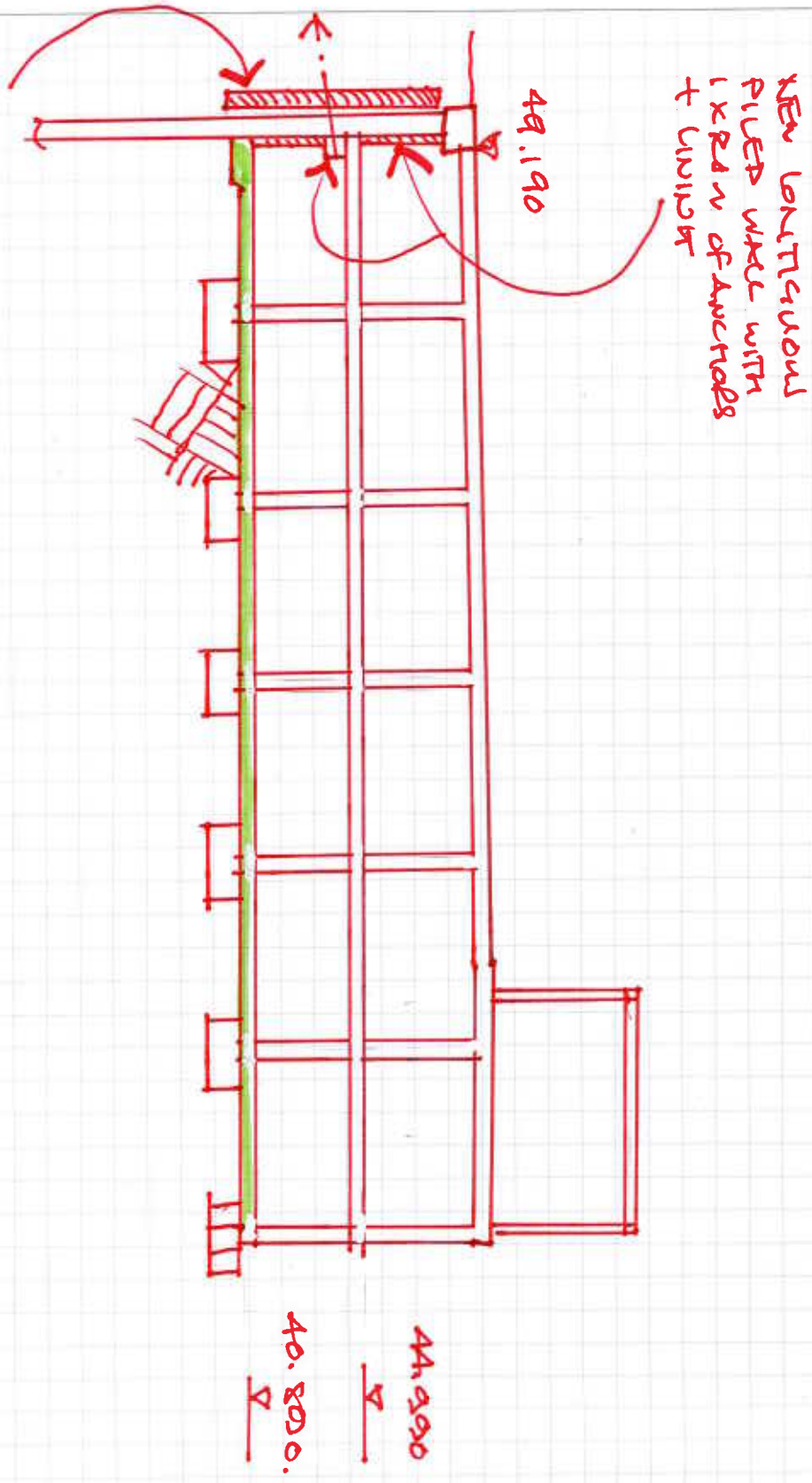
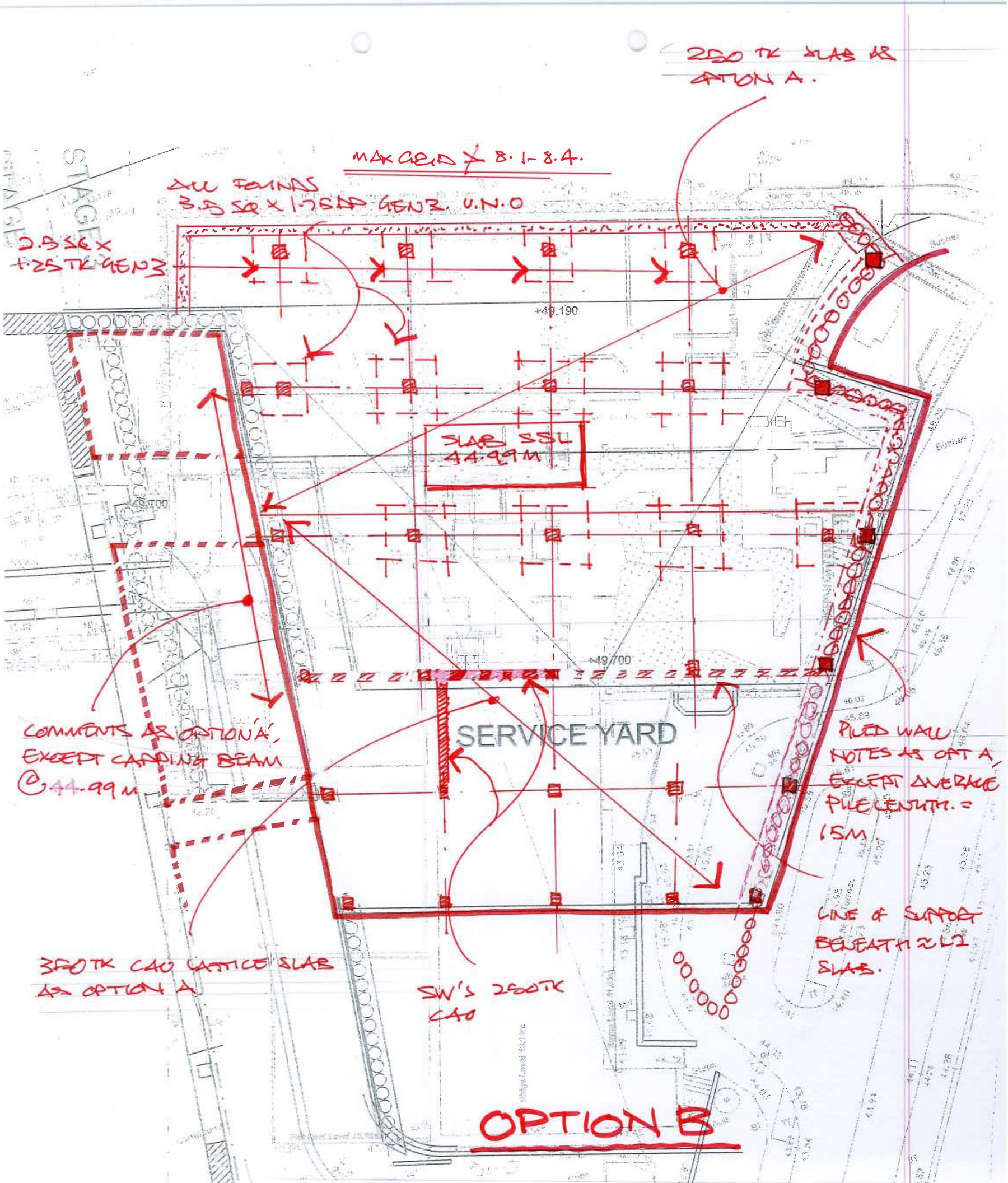


OPTION C

NORTH-SOUTH SECTION.



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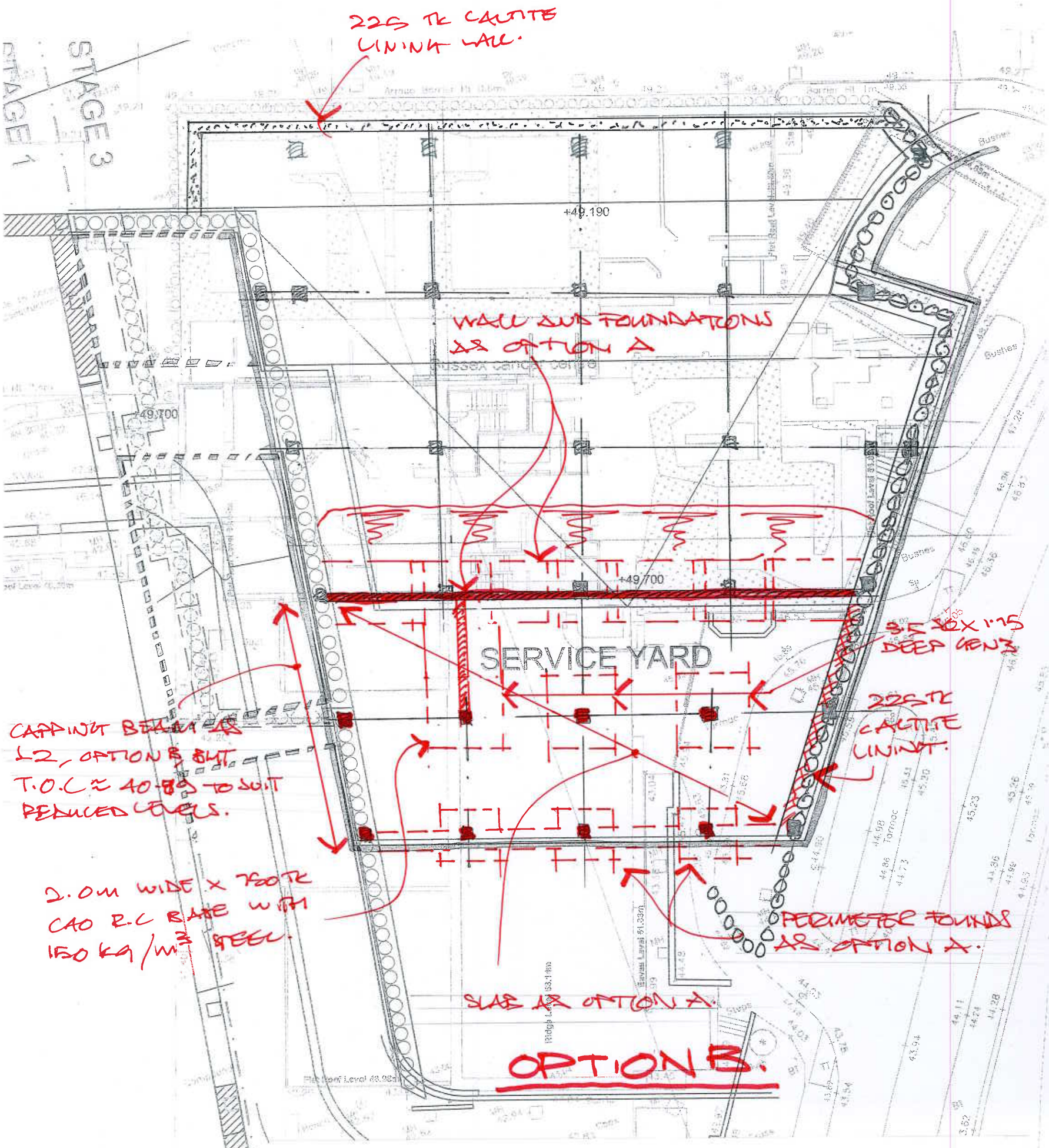
BRIGHTON ST'S.				
Date 16.11.2010 By DC Checked	Job no. 24534 0305.	Section	Sheet no.	Rev P01
Rev	Date	Details WSP-ST-ST3-SK-0007		Tel / Fax
Part OPTION B - LEVEL 2 (REDUCED)				

WSP



Project			Status	
BRIGHTON STS				
Date 16.11.2010. By DC. Checked	Job no 2454 0305.	Section	Sheet no.	Rev F01
Rev	Date	Details WSP-ST-ST3-SK-0006		Tel / Fax
Part OPTION B - LEVEL 1 (REDUCED).				

WSP

WSP

Project	Status
BRUNEI DT'S	

Date	Job no.	Section	Sheet no.	Rev
16.4.2010.	245430S.			F01

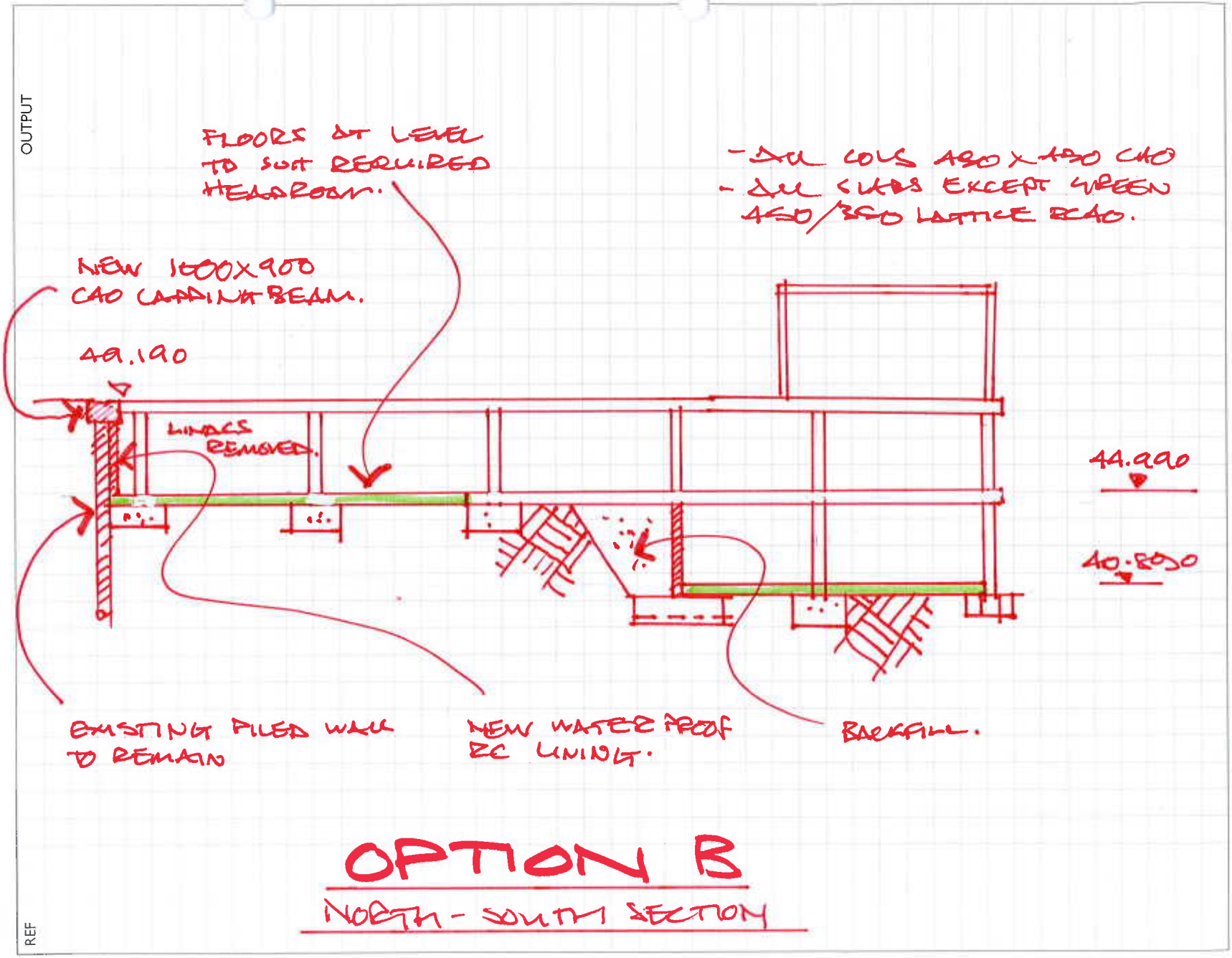
By DC
Checked

Rev	Date	Details
		WSP-ST-STR-SK-0005

Tel
Fax

Part OPTION B - SKETCH SECTION - N.T.S.

OUTPUT



OPTION B

NORTH - SOUTH SECTION

REF

A- CUT BACK EXIST. RAFT SLABS TO SAW-CUT EDGE, DOWEL IN LOWERED SLAB

ALL FOUNDATIONS 3.5 x 3.5 SQ x 1.75 DEEP UON 3.

BUNKER WALLS + TOP PART of WALL REMOVED - L3 SLAB CAST ON TOP

STAGE 3

STAGE 1

250 TK CAO SLAB - WITH EDGE THICKENING DOWELLED INTO EXISTING. 30 kg/m² STEEL.

CONTIGUOUS WALL INSTALLED AT L3, CUT DOWN TO APPROX L2 - CAPPING BEAM 1100 x 1000 C40

600 Ø RC PILED WALL WITH 1000 WIDE X 900 DP RC40 CAPPING BEAM - PILES AVERAGE 9M LONG. T.O.C CAPPING BEAM @ L2.

LINE OF SUPPORT BENEATH L2 SLAB.

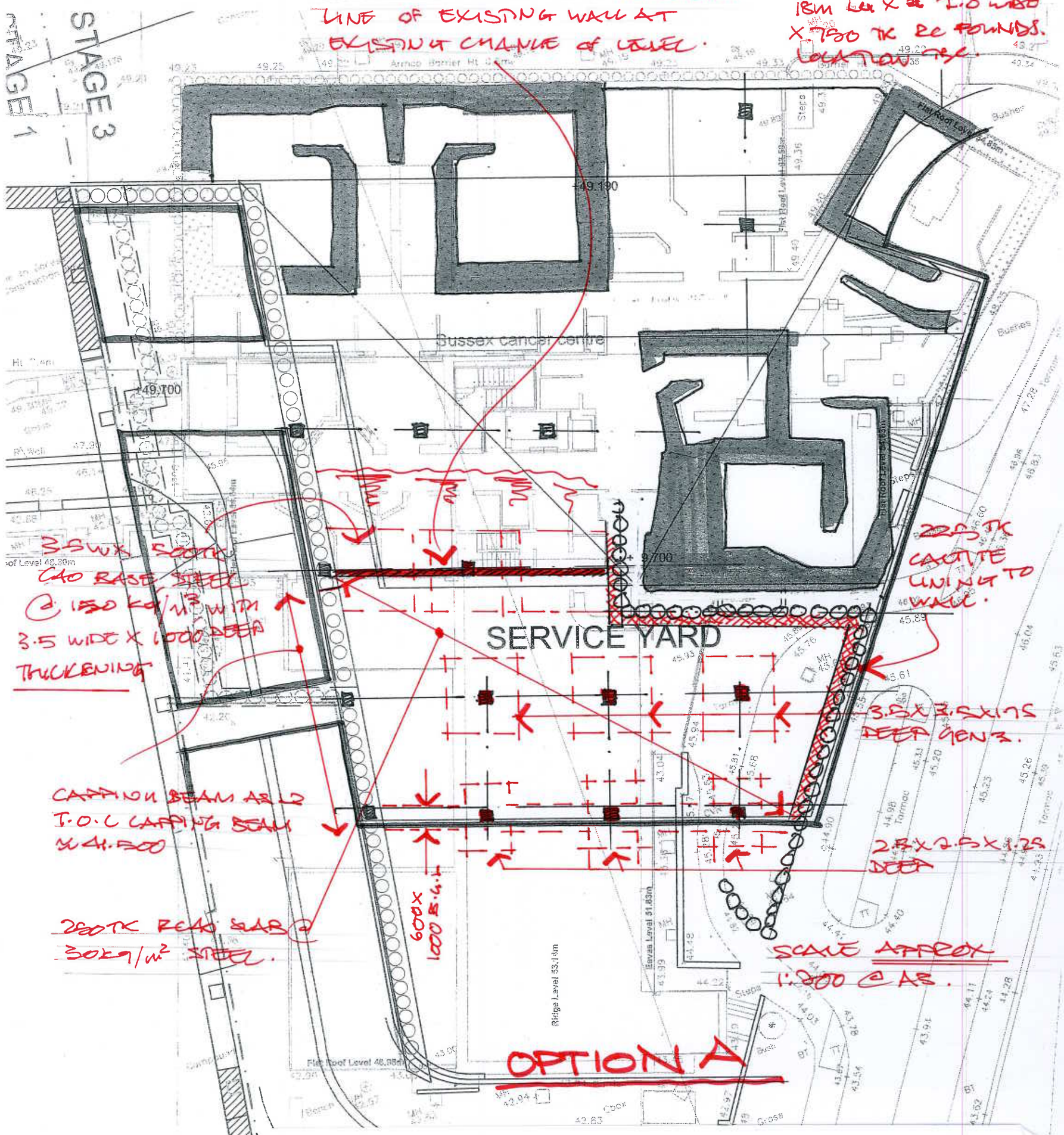
350 TK CAO LATTICE SLAB. THROUGHOUT. ALL COLS 450 x 450 C40 @ 175 kg/m³.

SCALE APPROX 1:200 @ A3.

OPTION A

Project			Status	
BRIGHTON ST'S.				
Date 6.11.2010 By Checked	Job no. 245A 0305	Section	Sheet no.	Rev F01
Rev	Date	Details WSP-ST-ST3-SK-0004		Tel / Fax
Part OPTION A - LEVEL 2 PLAN.				

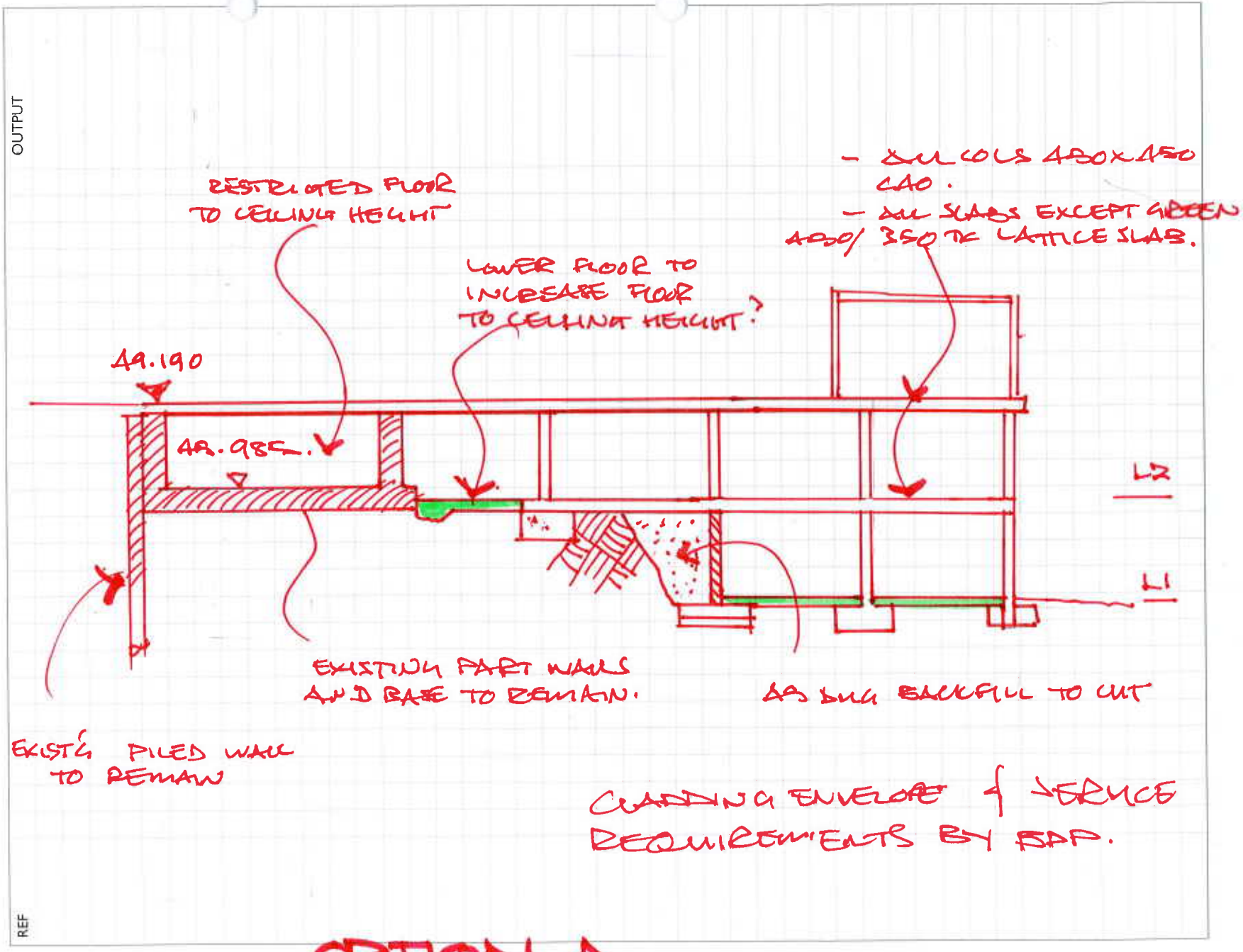
WSP


300TK TWIN WALL ON PRESUMED LINE OF EXISTING WALL AT EXISTING CHANGE of LEVEL.
CORES ASSUME. 16m TOTAL 250TK CAO WALLS. ON 18M LGTH X 2.0 WIDE X 250 TK RC FOUNDS. LOCATION TBC.
STAGE 3
STAGE 1
Sussex cancer centre
SERVICE YARD
3.5WX 500TK CAO BASE STEEL @ 150 kg/m3 WITH 3.5 WIDE X 1000 DEEP THICKENING
CAPPING BEAM AS L2 T.O.C CAPPING BEAM @ 41.500
250TK RC SLAB @ 30kg/m2 STEEL.
600X 1000 B.G.I.
225 TK CAVITE LINING TO WALL.
3.5X3.5X1.75 DEEP GEN 3.
2.5X2.5X1.25 DEEP
SCALE APPROX 1:200 @ A3.
OPTION A
Project
BRIGHTON 3T'S
Status
Date
By
Checked
Job no. 245A 0305.
Section
Sheet no.
Rev
F01
Rev
Date
Details
WSP-ST-ST3-SK-0003
Tel
Fax
Part
OPTION A - LEVEL 1 PLAN.
WSP

WSP

Project	BRUNTON ST'S		Status
Date 16.11.2010	Job no. 24524 0805.	Section	Sheet no.	Rev F01
By AK			
Checked			
Rev	Date	Details	Tel	Fax
Part	OPTION A - SKETCH SECTION - N.T.S.	WSP-ST-ST3-SK-0002		

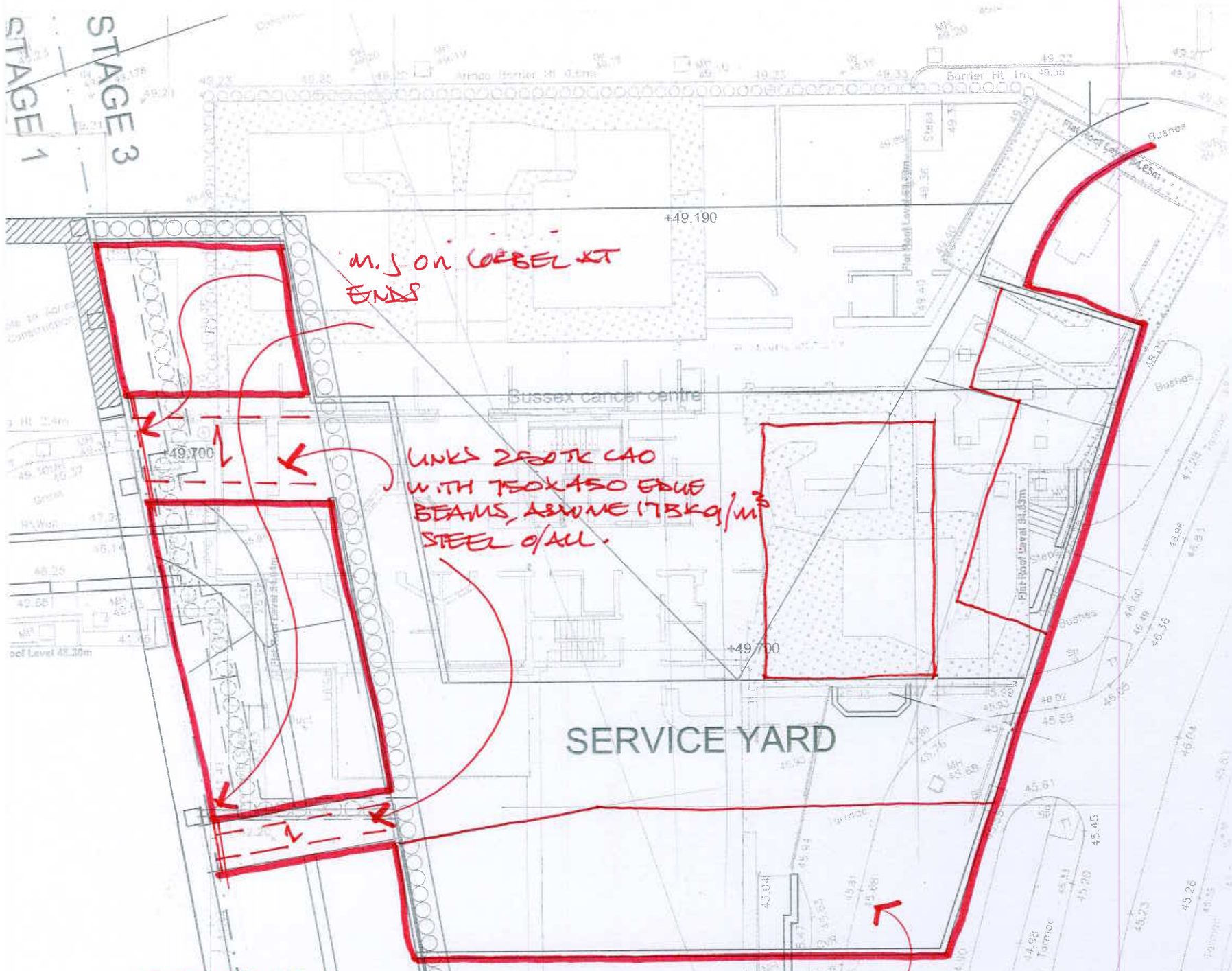
OUTPUT



REF

OPTION A

NORTH - SOUTH SECTION



OPTIONS:

A: REMOVE LIDS AND UPPER WALLS OF EXISTING LINAC BUNKERS AND USE THE REMNANTS AS STRUCTURAL SUPPORT.

B: REMOVE BUNKERS BUT KEEP SPLIT LEVELS BENEATH SERVICE YARD.

C: PROVIDE NEW CONTIGUOUS WALL TO NORTH, AND PROVIDE 2 FULL STOREYS OF ACCOM BENEATH SERVICE YARD.

PLAN COMMON TO ALL OPTIONS.
- 450 TK RCA SLAB 75kg/m² STEEL.

SCALE APPROX 1:200 @ A3.

Project: BRIGHTON STS.			Status	
Date: 16.11.2010. By: DC. Checked	Job no. 24EA 0205.	Section	Sheet no.	Rev: F01
Rev	Date	Details: SERVICE YARD PLAN.		Tel / Fax
Part: WSP-ST-ST3-SK-0001				

WSP

NEW 750 Ø CONTIGUOUS BORED PILED WALL (PILES @ 850 CRS) WITH 600 x 600 RC WALING BEAM @ T.O.C = 44.64, AND 1x ROW OF GROUND ANCHORS.

STAGE 3

STAGE 1

+49.190

Sussex cancer centre

+49.700

SLAB SSL 44.99

+49.700

SERVICE YARD

SLAB 350TK RC 40 LATTICE

PILED WALL AS OPTION B (MAKE LENGTH PILES) CAPPING BEAM AS OPTION A.

APPROX SCALE 1:200 @ A3

OPTION C

Project			Status	
BRIGHTON 3TS.				
Date 16.11.2020. By DC Checked	Job no. 24154 0305	Section	Sheet no.	Rev F01
Rev	Date	Details WSP-ST-ST3-SK-0010		Tel Fax
Part OPTION C - LEVEL 2 PLAN				

WSP