

# The Danish Church

## BASEMENT IMPACT ASSESSMENT & STRUCTURES

ALAN BAXTER LTD.

MAY 2018

C.F. Møller



St Katharine's  
Den Danske Kirke i London

**Danish Church, 4 St. Katharine's  
Precinct, London, NW1**

**Structural Engineering Notes  
including Basement Impact  
Assessment to Support Planning  
Application**

**Prepared for  
The Danish Church  
May 2018**

## 1.0 Introduction

The Danish Church is located on St. Katharine's Precinct on the east side of Regent's Park. The Church building consists of a central Nave with a Church Hall wing along the north side and a Vicarage wing along the south side. The proposals are to carry out refurbishment/alterations to the Nave, Church Hall, and Vicarage. The proposals are aimed at improving the use of the existing spaces. This includes extending the existing basement that is currently under part of the Church Hall wing to the full footprint of the Hall, and also widening the existing lightwell alongside the Vicarage.

Alan Baxter Limited (ABA) have been appointed as consulting structural engineers for the project. This report has been prepared to describe the implication of the proposed basement extension and lightwell widening to support the planning application. This report describes the structural scheme design, sequence of construction/methodology and the impact of the basement extension and lightwell widening on the existing structures. The structure for the basement extension already exists so there will be no change to the support of the building, adjacent properties, or the hydrology of the area. However, a Basement Impact Assessment has also been carried out in accordance with Camden Planning Guidance CPG on Basements.

This report is based on the following information:

- Historical Maps.
- Geological survey maps and records.
- Existing survey drawings by James Brennan Associates, dated March 2017.
- Proposed layout drawings by the architect, C.F. Moller.
- Site investigation trial pits and opening up works carried out during November 2017.
- Site visits during 2017.
- 'Camden Geological, Hydrogeological and Hydrological Study' – Guidance for Subterranean Development by London Borough of Camden.

## 2.0 Site History

St. Katherine's College Chapel (now the Danish Church) was built between 1826-1828, by Ambrose Poynter, for the Royal Hospital of St. Katherine on previously undeveloped land. Victorian extensions were added to the original Georgian north wing (Church Hall) and the original Georgian south wing (Vicarage) in the late 1800's. Since then the Church building has largely remained unchanged since.

WWII bomb damage maps show that the Church suffered general blast damage, but this was not structural. The majority of the surrounding buildings are also shown as suffering minor blast damage.

Drawing No. 1601/210/01 in Appendix A summarises the historical development of the site. For a more detailed account of the historical development of the building refer to the Heritage report by Paul Vonberg Architects.

### **3.0 Site Geology**

Local geology maps and British Geological Survey borehole logs near the site indicate that London Clay underlies the site and surrounding area. There is no record of groundwater in the borehole logs.

A number of trial pits were carried out as part of the site investigation on this site. The trial pits found a thin layer of made ground over London Clay. No groundwater was present in any of the trial pits. The existing foundations generally bear into the London Clay.

Drawing No. 1601/210/02 in Appendix A summarises the geology of the area. Drawings No's 1601/210/S01 & S02 in Appendix B summarise the findings from the trial pits.

### **4.0 Existing Structure**

The Danish Church is a Grade II\* listed building located within the Regent's Park conservation area. The Church building is set within grounds at the east end of St. Katharine's Precinct, which is bounded at the rear by Albany Street, and by houses along the north and south sides. The Church building consists of a central Nave with a 2-3 storey Church Hall wing along the north side, and a 2-3 storey Vicarage wing along the south side.

#### **4.1 The Nave**

The Nave is generally a large single volume space, approximately 3 storey high, comprising external load bearing masonry walls with a reinforced concrete (RC) ground floor slab and a timber roof. The ground floor slab is suspended approximately 1 metre above ground level, spanning between intermediate brick sleeper walls. This appears to be a later alteration replacing the original ground floor structure. Under the chancel/alter to the rear there is a small basement plant room, which is accessed via a staircase from the grounds to the rear of the building.

The masonry walls generally have corbelled bases as foundations bearing into the underlying London Clay.

#### **4.2 The Vicarage (south wing)**

The Vicarage consists of the original Georgian 3 storey section to the front with a Victorian extension to the rear, both with a basement level.

The structure generally comprises load bearing masonry walls with timber floors and timber roofs. The ground floor structure to the Victorian extension has a traditional jack arch construction with steel/cast iron beams spanning between the masonry walls.

The timber roof structure to the Victorian extension is a traditional pitched timber collar braced roof construction spanning between the masonry walls. There is currently a timber ceiling suspended from the roof, which hides the form of the roof.

The masonry walls generally have corbelled bases as foundations bearing into the London Clay.

#### **4.3 The Church Hall (north wing)**

Similar to the Vicarage, the Church Hall consists of the original Georgian 3 storey section to the front with a 2-3 storey Victorian extension to the rear. This includes a basement level which is under the entire footprint of the original front section and only under part of the Victorian extension. The basement under part of the Victorian extension still contains the original coal vault that would have served the original front section before the rear extension was added.

The structure generally comprises load bearing masonry walls supporting timber floors and timber roofs. However, the original timber ground floor structure to the Georgian section has been replaced with a modern RC floor slab spanning between masonry walls and steel beams.

The timber ground floor to the Victorian extension is suspended approximately 1m above the roof of the coal vault and the ground around the vault. The timber floor spans between external masonry walls and intermediate brick sleeper walls.

The walls to the Georgian section generally have corbelled bases as foundations bearing in to the London Clay. Trial pits have found that the external walls to the Victorian extension have much deeper foundations than the rest of the Church building. The foundations extend approximately 4m below existing ground level, which is approximately 2.5m below existing basement level. The foundations bear into the London Clay.

Drawings summarising the existing structure are included in Appendix C.

## **5.0 The Proposed Basement Extension and Lightwell Widening**

Alongside proposals to carry out refurbishment/alterations to the Church building, the existing basement that is currently under part of the Church Hall is proposed to be extended under the full footprint of the Hall. Also, the existing lightwell which runs alongside the Vicarage is proposed to be widened to improve circulation and connectivity with the Church grounds on the south side.

### **5.1 Design of the Basement Extension to the Church Hall**

As part of the site investigation works, trial pits have been carried out to determine the nature and depth of the existing foundations. The trial pits found that the existing foundations to the Victorian extension to the Church Hall extend approximately 4m below external ground level. This is approximately 2.5m below the existing and proposed basement extension level. Trial pits along the Nave wall found that the existing foundations extend approximately 0.8m below the existing and proposed basement extension level. Therefore, the depth of the existing wall foundations mean that the proposed basement extension can be excavated between the existing walls, within the footprint of the Hall, without any underpinning being required to the existing wall foundations.

In order to allow access to carry out the excavation for the basement extension the existing ground floor structure to the Victorian extension is proposed to be removed and replaced. Temporary propping will be installed to provide horizontal restraint to the existing walls prior to the removal of the ground floor, which currently provides restraint to the walls. Following excavation to formation level, a new ground bearing RC basement slab will be cast.

A new RC ground floor slab on profiled metal decking is proposed to replace the existing ground floor structure to the Victorian extension. The new ground floor structure is designed to provide horizontal restraint to the existing walls in the permanent case.

An assessment has been carried out on the ability of the existing external masonry walls to act as the retaining walls to the basement extension, to resist the load from the approximately 1.5m height of retained ground behind the walls, including a surcharge load. The assessment has found that the existing walls can act as gravity retaining walls to resist the load from the ground in the permanent case.

An assessment has also been carried out on the existing walls and foundations due to the increase in load from the new RC ground floor slab on profiled metal decking, which is to replace existing timber floor in the Victorian extension.

The existing loads on the walls/foundations and the relatively small increase in load from the RC ground floor slab means that the load increase on the existing walls/foundations is not significant.

A new external access staircase is proposed to be created for the basement extension from the grounds to the rear of the Church. The excavation to construct the staircase access is to be

formed using a battered slope. The staircase access is then proposed to be constructed using an RC retaining wall cantilevering from an RC base slab/staircase to resist pressure from the retained ground in the permanent case.

## **5.2 Design of the Lightwell Widening alongside the Vicarage**

The existing lightwell alongside the Vicarage provides light and access to the basement level from the Church grounds on the south side via narrow staircases. The existing lightwell is formed with masonry retaining walls. In order to improve connection with the Church grounds the proposal is to widen the lightwell. The lightwell is proposed to be widened by removing the existing brick retaining walls and then creating a stepped terrace down from the Church grounds on the south side. The lightwell widening works can be carried out using a battered slope excavation to allow for the removal of the existing brick retaining walls and then construction of the terrace landscaping forming the new lightwell.

The stepped terrace is to be formed using RC slabs/steps and cantilever RC retaining walls to resist pressure from the retained ground in the permanent case.

Drawings summarising the proposed basement extension and lightwell widening are included in Appendix D.

## **6.0 Construction Method Statement / Sequence of Construction**

The works are reasonably straightforward from a structural point of view. They are not unusual but need consideration by an experienced contractor. We have developed the proposals to suit normal construction techniques. Our thoughts on the main steps to follow for the construction of the basement extension are illustrated on the assumed sequence of construction drawing 1601/210/50 included in Appendix E.

## **7.0 Basement Impact Assessment**

**7.1** The following Basement Impact Assessment has been carried out in order to determine the potential effect of the proposed development on the surrounding area. It has been carried out in accordance with the Camden Planning Guidance CPG on Basement.

**Table 1: Subterranean (ground water) flow screening**

Question		Answer	Evidence/comment
1 a.	Is the site located directly above an aquifer?	No	Camden Geological, Hydrogeological and Hydrological Study 'Aquifer Designation Map' (Figure 8 in Appendix F) shows that the site is in an unproductive strata.
1 b.	Will the proposed basement extend beneath the water table surface?	No	No groundwater was encountered during the site investigations as shown on drawings 1601/210/S01 and 1601/210/S02 in Appendix B. The proposed basement extension depth is to be no lower than the existing basement level, therefore, the proposed basement will not extend below the water table.
2.	Is the site within 100m of a watercourse, well (used/disused) or potentially spring line?	No	Camden Geological, Hydrogeological and Hydrological Study 'Watercourses' and 'Camden Surface Water Feature' maps (Figures 11 and 12 in Appendix F) show that the site is not within 100m of a watercourse or water feature. The closest water feature is approximately 400m away.
3.	Is the site within the catchment of the pond chains on Hampstead Heath?	No	Camden Geological, Hydrogeological and Hydrological Study 'Hampstead Heath Surface Water Catchment and Drainage' Map (Figure 14 in Appendix F) shows that the site is not in the catchment area of the pond chains on Hampstead Heath.
4.	Will the proposed basement development result in change in the proportion of hard surfaced/paved areas?	No	The proposed basement extension is under the existing footprint of the north wing of the Church. There will be a new lightwell access stair down to the basement. Therefore, there will be a very slight increase in paved areas of approximately 3.5m <sup>2</sup> – this is equivalent to less than 1% of the total existing site impermeable area, which is not considered to be a significant change.
5.	As part of the site drainage, will more surface water (e.g rainfall and run-off) than at the present be discharged to the ground (e.g via soakaways and/or SUDS)?	No	Based on the site investigations as shown on drawings 1601/210/S01 and 1601/210/S02 in Appendix B, and surrounding geology (refer to Appendices A & B), soakaways or other SUD's are not considered appropriate for the site. Therefore, no collected surface water will be discharged into the ground.

6.	Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to, or lower than, the mean water level in any local pond (not just the pond chains on Hampstead Heath) or spring line.	No	Camden Geological, Hydrogeological and Hydrological Study 'Watercourses' and 'Camden Surface Water Feature' maps (Figures 11 and 12 in Appendix F) show that the site is not near any local known ponds or spring lines.
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Based on the above there are no items to be carried forward to scoping from the subterranean (ground water) flow screening.



**Table 2: Slope stability screening**

Questions		Answer	Evidence/Comment
1.	Does the existing site include slopes, natural or manmade, greater than 7°?	No	There are no slopes on site greater than 7°. Camden Geological, Hydrogeological and Hydrological Study 'Slope Angle Map' (Figures 16 in Appendix F) shows that the site does not include any slopes greater than 7°.
2.	Will the proposed re-profiling of landscaping at site change slopes, at the property boundary to more than 7°?	No	The proposed development will have no slopes greater than 7° at the property boundary – refer to drawings included in Appendix D.
3.	Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7°?	No	The development does not neighbour land, including railway cuttings and the like, with a slope greater than 7°. Camden Geological, Hydrogeological and Hydrological Study 'Slope Angle Map' (Figure 16 in Appendix F) shows that the land neighbouring the site does not have a slope greater than 7°.
4.	Is the site within a wider hillside setting in which the general slope is greater than 7°?	No	Camden Geological, Hydrogeological and Hydrological Study 'Slope Angle Map' (Figure 16 in Appendix F) shows that the site is not within a wider hillside setting with slopes greater than 7°.
5.	Is the London Clay the shallowest strata at the site?	No	Local geology maps show that the site is underlain by London Clay. The site investigation found that there is a thin layer of made ground over the London Clay strata – refer to drawings included in Appendix B. There is a relatively thick layer, over 30m deep, of London Clay under the site, based on BGS borehole logs near to the site and borehole logs/information from nearby ABA projects.
6.	Will any tree/s be felled as part of the proposed development and/or are any works proposed within any tree protection zones where trees are to be retained? (Note that consent is required from LB Camden to undertake work to any tree/s protected by a Tree Protection Order or to tree/s in a Conservation Area if the tree is over certain dimensions).	No	Some trees are to be removed as part of the overall development, but not as a consequence of the basement works. The trees to be removed are located on the opposite side of the site to the basement. Therefore, the removal of the trees will not have an impact on the proposed basement works or vice versa. Separate approval is being obtained from Camden in relation to the removal of the trees on site.
7.	Is there a history of seasonal shrink-swell subsidence in the local area, and/or evidence of such effects at the site?	No	There is no evidence or records of seasonal shrink-swell subsidence at the site.

8.	Is the site within 100m of a watercourse or a potential spring line?	No	Camden Geological, Hydrogeological and Hydrological Study 'Watercourses' and 'Camden Surface Water Feature' maps (Figures 11 and 12 in Appendix F) show that the site is approximately 400m from both existing surface water features and historical watercourses.
9.	Is the site within an area of previously worked ground?	No	The proposed basement is to be constructed beneath the existing footprint of the north wing of the church. Apart from the existing building construction, there is no evidence or record which suggests there have been previous groundworks carried out in this location.
10.	Is the site within an aquifer? If so, will the proposed basement extend beneath the water table such that dewatering may be required during construction?	No	Camden Geological, Hydrogeological and Hydrological Study 'Aquifer Designation Map' (Figure 8 in Appendix F) shows that the site is in an unproductive strata. The proposed basement development is above the water table.
11.	Is the site within 50m of the Hampstead Heath ponds?	No	Camden Geological, Hydrogeological and Hydrological Study 'Hampstead Heath Surface Water Catchment and Drainage' Map (Figure 14 in Appendix F) shows that the site is over 50m away from the Hampstead Heath ponds.
12.	Is the site within 5m of a highway or pedestrian right of way?	No	The proposed basement is not within 5m of a highway or pedestrian right of way – refer to drawings included in Appendices C & D.
13.	Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	No	The nearest neighbouring property is approximately 9m away to the north of the proposed basement extension. The depths of the neighbouring properties foundations are unknown. However, the proposed basement under the existing footprint of the building is to be at the same depth as the existing basement. Therefore, the proposed basement will not have any significant impact on the neighbouring properties foundations or land stability as it will be no lower than the existing
14	Is the site over (or within the exclusion of) any tunnels, e.g. railway lines?	No	There is no evidence or record that the site is over or within any exclusion zones of any tunnels or railways.

Based on the above there are no items to be carried forward to scoping from slope stability screening.

**Table 3: Surface flow and flooding screening**

	Questions	Answer	Evidence/Comment
1.	Is the site within the catchment of the pond chains on Hampstead Heath?	No	Camden Geological, Hydrogeological and Hydrological Study 'Hampstead Heath Surface Water Catchment and Drainage' map (Figure 14 in Appendix F) shows that the site is not in the catchment area of the pond chains on Hampstead Heath.
2.	As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route?	No	The proposed development includes an extension to the existing basement under the existing footprint of the north wing of the building. There will be a new lightwell access stair down to the basement along the east side of the basement. This increases the non-permeable surface area of the site by approximately 3.5m <sup>2</sup> . This is less than a 1% increase to the total non-permeable surface area of the existing site. This is a minor increase and the resulting increase in surface water runoff will not have a significant impact on the existing drainage system.
3.	Will the proposed basement development result in a change in the proportion of hard surfaced/paved external areas?	No	As per response to 2 above, the increase to the non-permeable surface area of the site is approximately 3.5m <sup>2</sup> . This is less than a 1% increase to the total non-permeable surface area of the existing site, which is not considered to be significant.
4.	Will the proposed basement result in changes to the profile of the inflows (instantaneous and long-term) of surface water being received by adjacent properties or downstream watercourses?	No	The proposed basement will not impact on the profile of inflow of the surface water being received by adjacent properties or downstream watercourses.
5.	Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	No	The proposed basement will not impact on the quality of the surface water being received by adjacent properties or downstream watercourses.
6.	Is the site in the area identified to have surface water flood risk according to either the Local Floor Risk Management Strategy or the Strategic Floor Risk Assessment or is it at risk from flooding, for example because the proposed basement is below the static water level of nearby surface water feature?	No	Camden Geological, Hydrogeological and Hydrological Study 'Flood Map' (Figure 15 in Appendix F) shows that the site is not on a street designated as being at risk from surface water flooding.

Based on the above there are no items to be carried forward to scoping from the Surface flow and flooding screening.

## **8.0 Conclusion**

The engineering rationale and construction issues associated with the proposed basement extension to the Church Hall and widening of the lightwell alongside the Vicarage have been explored and summarised in this report. A structural design has been prepared along with a construction sequence to demonstrate that the proposals can be built safely without significant structural impact on the existing structure or surrounding area.

A Basement Impact Assessment has been carried out in accordance with the Camden Planning Guidance, CPG4, for Basements and Lightwells. The impact of the basement extension has been assessed and key outcomes addressed.

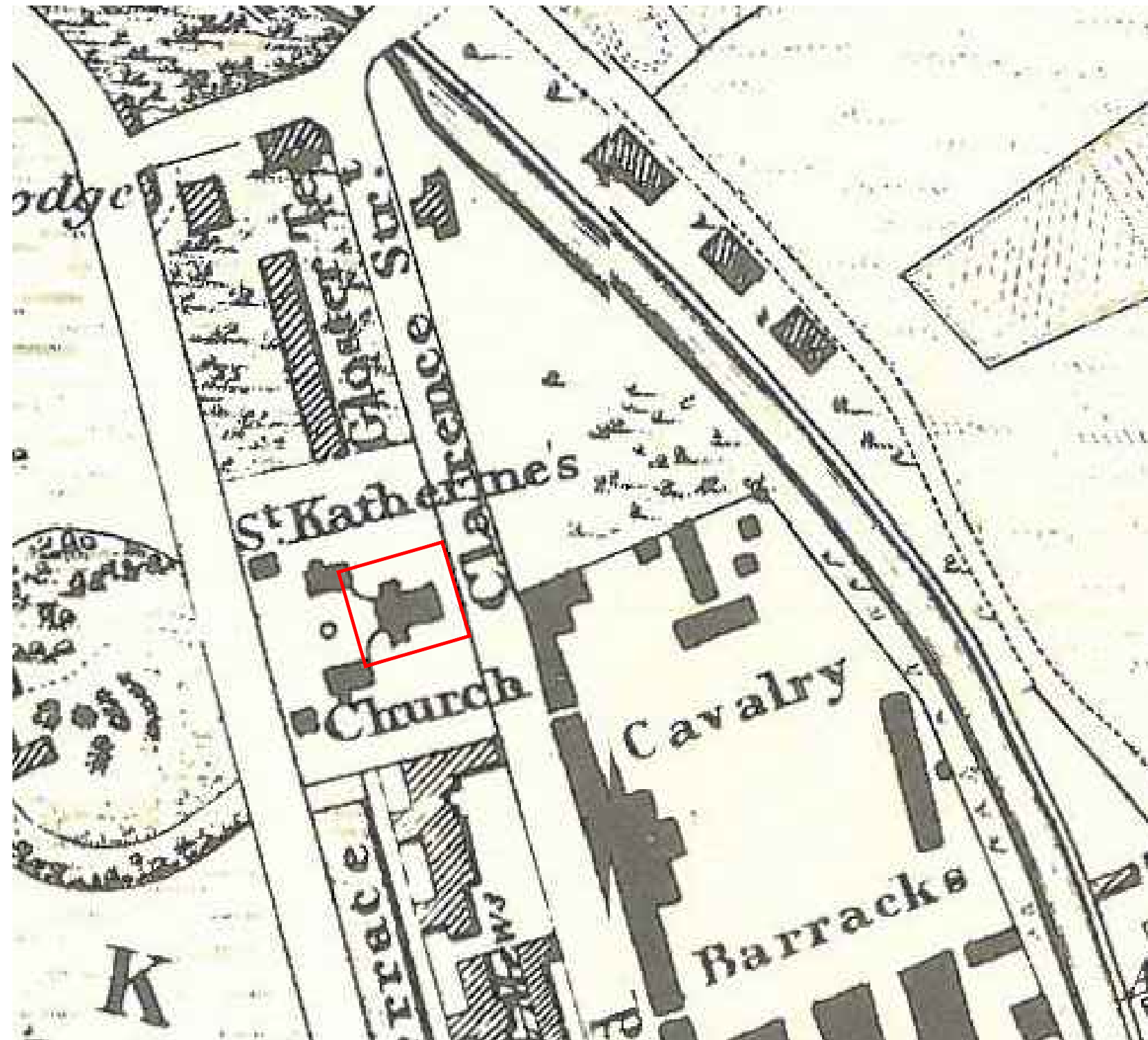
## **Appendix A – Drawings Summarising Existing Site**





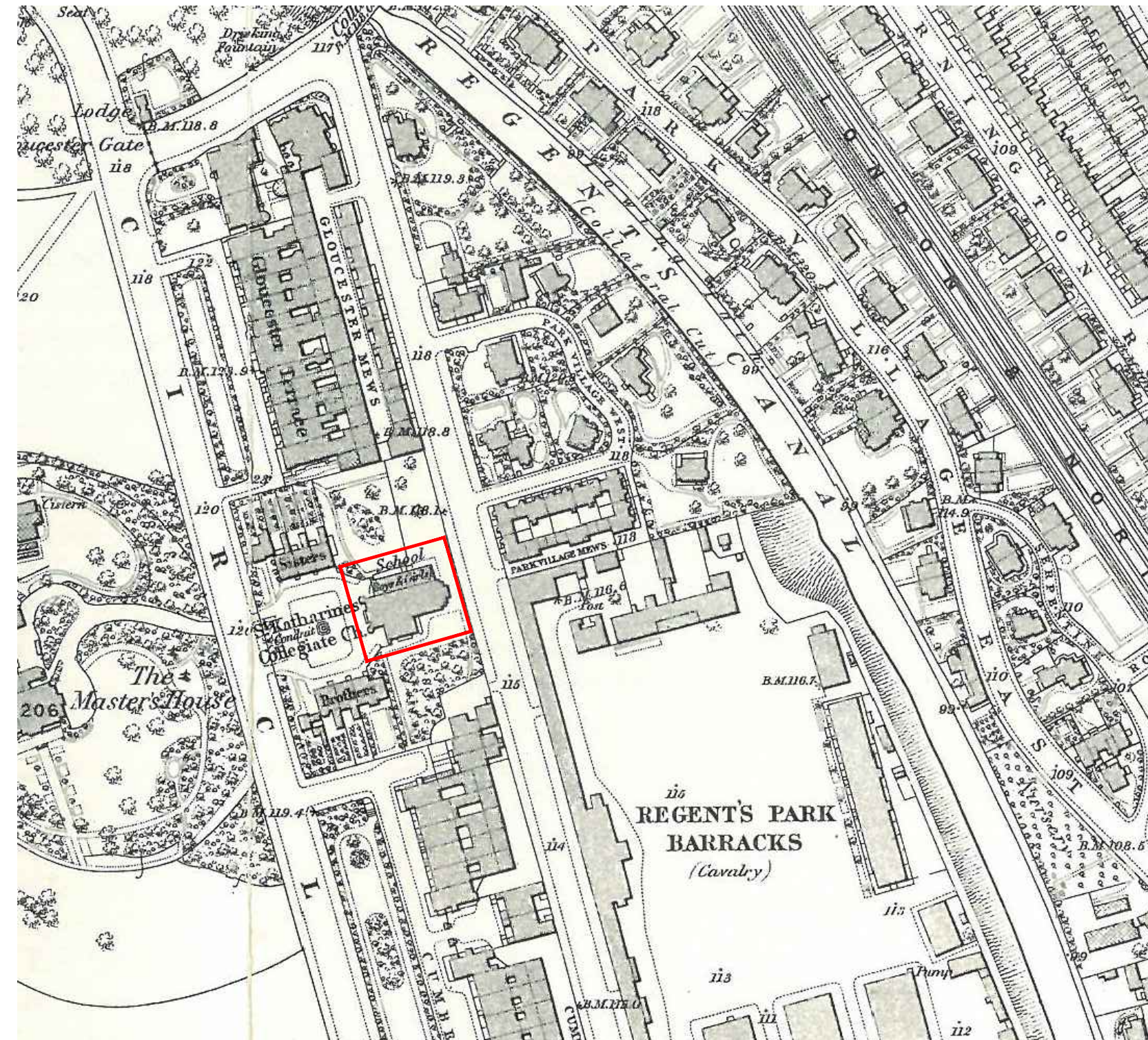
1769

THE SITE IS UNDEVELOPED. TO THE SOUTH, MARYLEBONE AND TOTTENHAM COURT ARE STARTING TO DEVELOP. OXFORD STREET IS ALREADY LAID OUT.



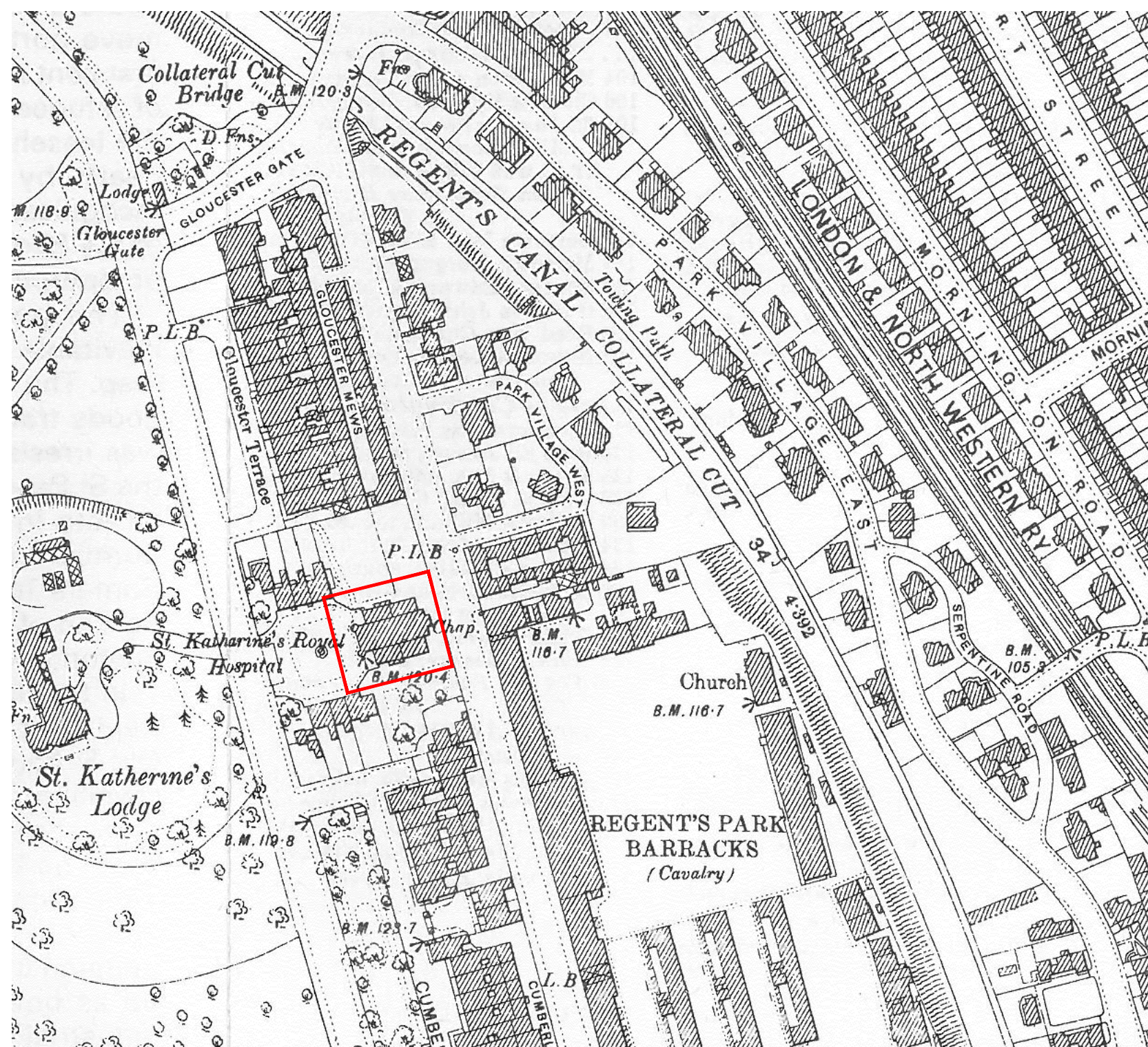
1824-26

ST. KATHARINE'S COLLEGE CHAPEL (NOW THE DANISH CHURCH) WAS BUILT 1826-28 BY AMBROSE POYNTER FOR THE ROYAL HOSPITAL OF ST. KATHARINE. THE AREA BETWEEN OXFORD STREET AND THE SITE HAS NOW BEEN DEVELOPED AND REGENTS PARK HAS BEEN LAID OUT.



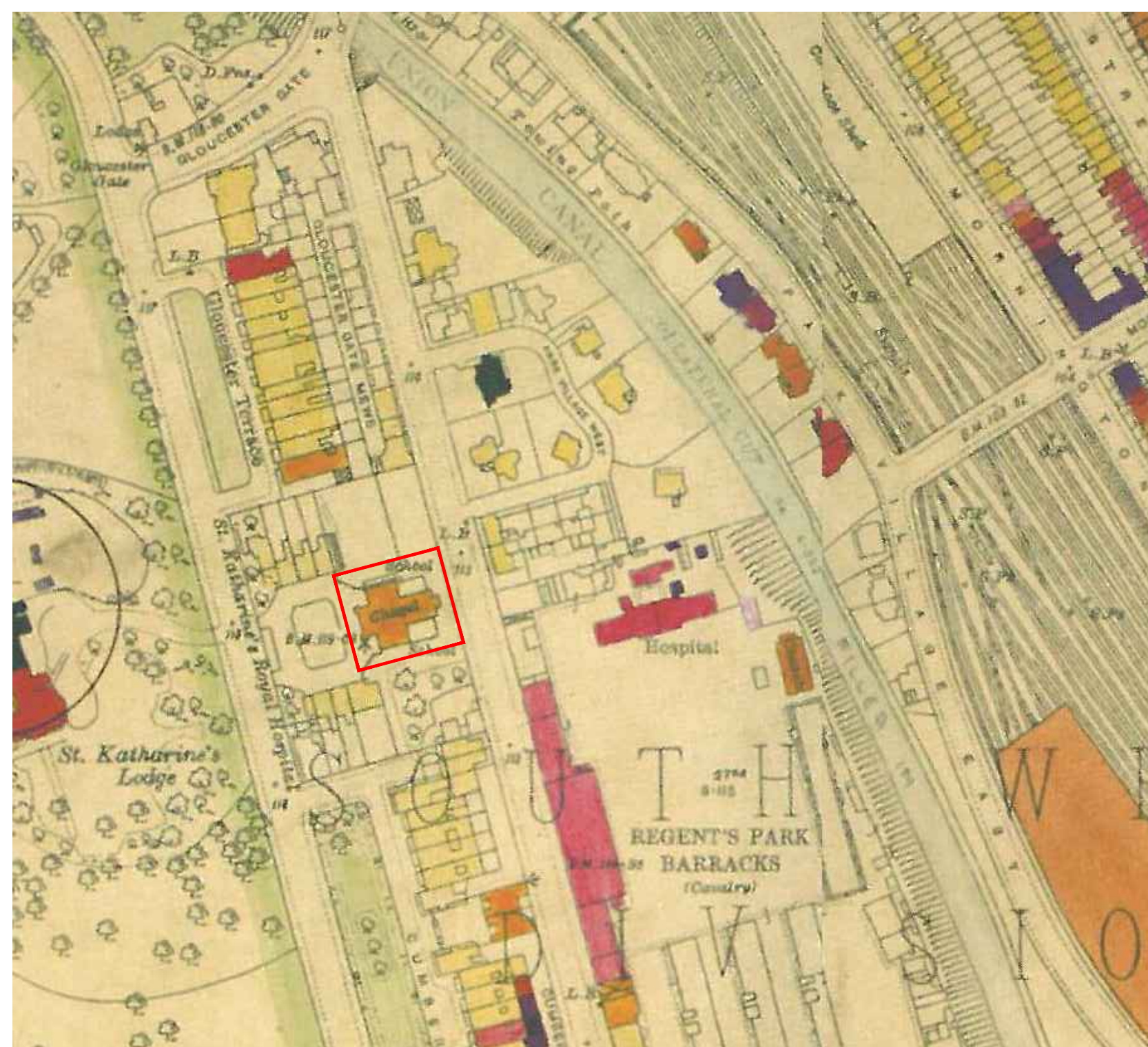
1870

THE AREA TO THE EAST OF THE SITE HAS NOW BEEN DEVELOPED. THE NORTH WING OF THE CHURCH APPEARS TO HAVE BEEN EXTENDED.



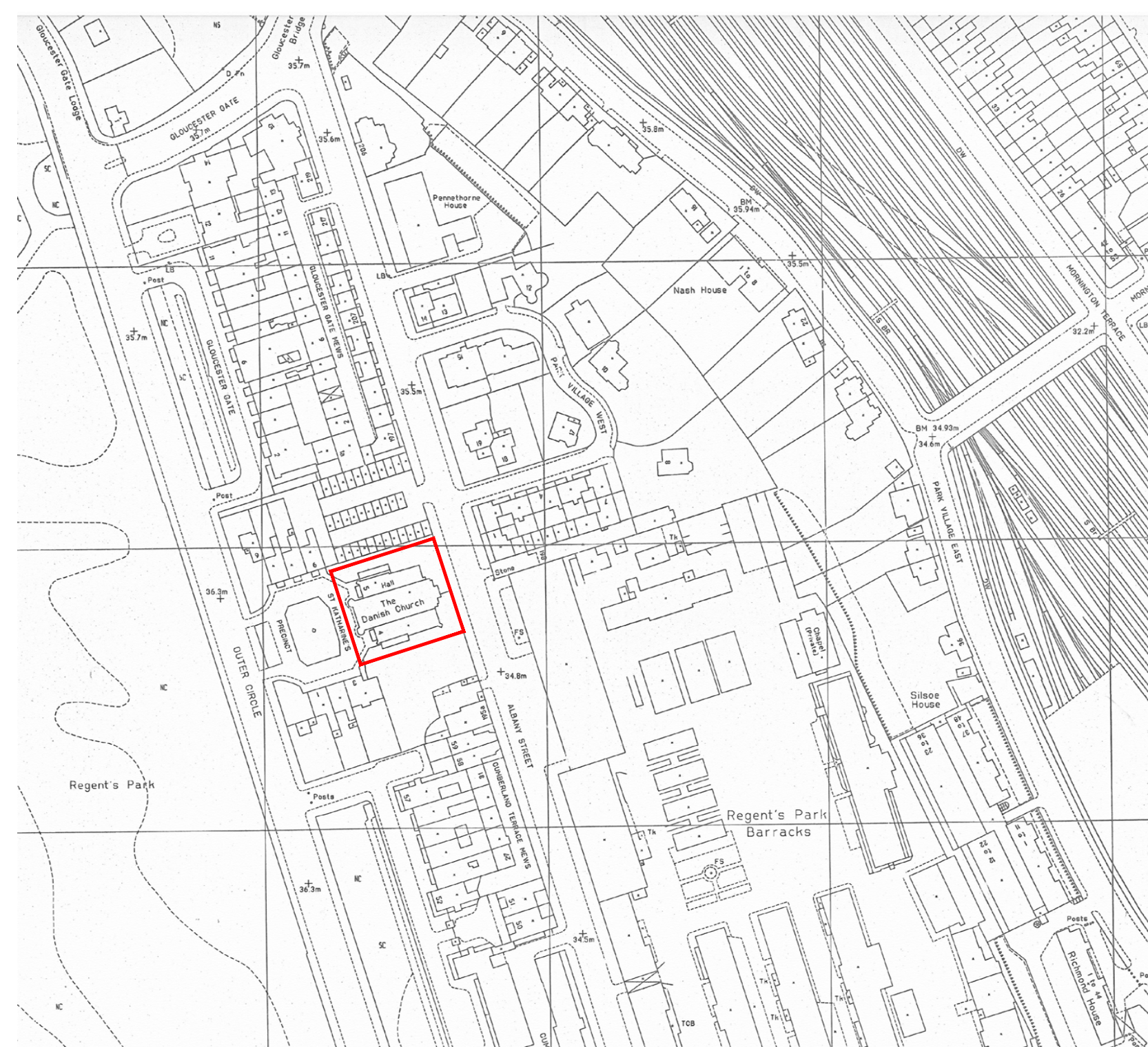
1894

THE SOUTH WING OF THE CHURCH HAS NOW ALSO BEEN EXTENDED. THE SURROUNDING SITE REMAINS SIMILAR.



1939-45 (SHOWING BOMB DAMAGE POST WORLD WAR II)

THE AREA AND SITE GENERALLY REMAIN UNALTERED UNTIL WW2 WHEN IT SUFFERED BOMB DAMAGE. THE CHURCH SUFFERED GENERAL BLAST DAMAGE (NOT STRUCTURAL). ST. KATHARINE'S LODGE TO THE WEST OF THE SITE IN REGENTS PARK WAS SERIOUSLY DAMAGED, WITH PART COMPLETELY DESTROYED. THE MAJORITY OF THE SURROUNDING AREA SUFFERED MINOR BLAST DAMAGE.



1991

THE SITE EXISTS IN ITS PRESENT FORM. THE DANISH CHURCH WAS LISTED GRADE II\* IN 1954 AND IS LOCATED IN THE REGENTS PARK CONSERVATION AREA. THE CHURCH UNDERWENT RESTORATION WORKS IN 1969 AND IS CURRENTLY UNDERGOING FACADE REPAIR WORKS.

This drawing incorporates information from the Ordnance Survey which is © CROWN COPYRIGHT  
ABA Licence Number: AL 1000 17547

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECT'S AND ENGINEER'S DRAWINGS AND THE SPECIFICATION.

2. BOMB DAMAGE KEY

**Colour Key**  
References  
(for guidance only)

**Black**  
Total destruction

**Purple**  
Damaged beyond repair

**Dark Red**  
Seriously damaged; doubtful if repairable

**Light Red**  
Seriously damaged, but repairable at cost

**Orange**  
General blast damage - not structural

**Yellow**  
Blast damage, minor in nature

**Light Blue**  
Clearance areas

**Light Green**  
Clearance areas

○  
V1 flying bomb

○  
V2 long range rocket

3. THIS DRAWING SHOWS EXTRACTS FROM HISTORICAL MAPS FROM THE DATES SHOWN.

4. □ = SITE

FOR INFORMATION ONLY

A 23.05.17 ISSUED FOR INFORMATION. JHI

job DANISH CHURCH

title SUMMARY OF HISTORICAL DEVELOPMENT OF THE AREA

drawn SP checked JHI  
date APR 17 scale (original - A1) N.T.S

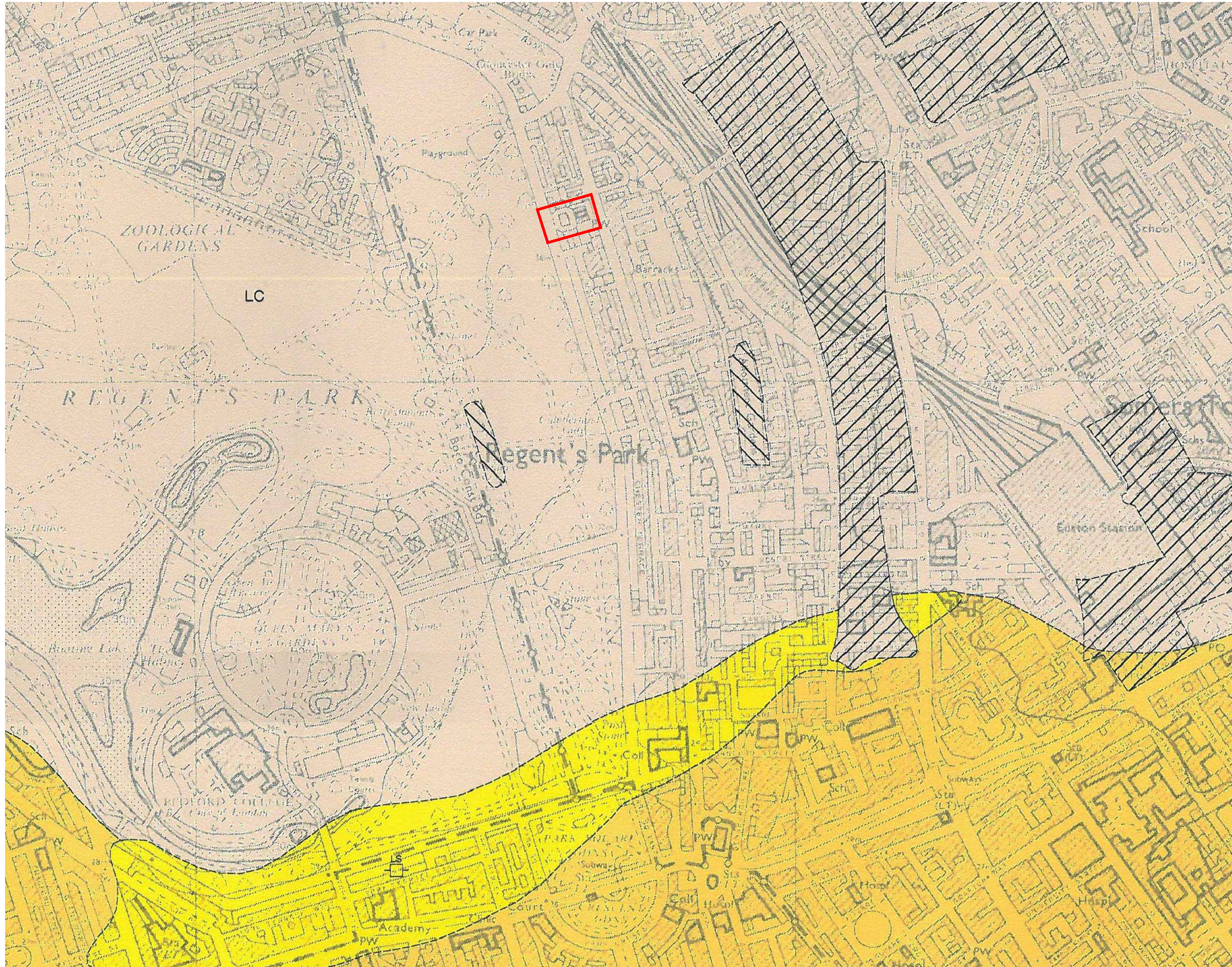
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dig. no. 1601/210/01





- notes
1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECT'S AND ENGINEER'S DRAWINGS AND THE SPECIFICATION.
  2. DO NOT SCALE FROM THIS DRAWING.
  3. GEOLOGY KEY:

KEY	
<b>DRIFT</b>	
<b>ARTIFICIAL DEPOSITS AND WORKED GROUND</b>	
	Worked Ground
	Made Ground
<b>QUATERNARY DEPOSITS</b>	
	Langley Silt
	Alluvium
	Kempton Park Gravel
	Taplow Gravel
	Hackney Gravel
	Lynch Hill Gravel
	Boyn Hill Gravel

4. = SITE

FOR INFORMATION ONLY

23.05.17 ISSUED FOR INFORMATION. JHI

job  
**DANISH CHURCH**

title  
**SUMMARY OF SITE GEOLOGY**

drawn SP	checked JHI
date APR 17	scale (original - A1) N.T.S

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## **Appendix B – Drawings Summarising Site Investigation Works**