

Detailed Basement Construction Plan

Planning Application References: 2020/5647/P (Previous 2018/3647/P)

S106 Obligation Clause numbers: 4.7.1 – 4.7.4

Date: 29 June 2022



Development Description

2018/3647/P – Demolition of existing office buildings (B1) and erection of five storey (plus two storey basement) building comprising mixed office (B1) and hotel (C1) use.

Development address is 7 A, B, C Bayham Street, London, NW1 0EY.

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1. S106 Obligation Clauses

4.7.1 – On or prior to the implementation Date to provide the Council for approval the Detailed Basement Construction Plan.

4.7.2 – Not to implement nor allow implementation of the Development until such time as the Council has approved the Detailed Basement Construction Plan as demonstrated by written notice to that effect.

4.7.3 – The owner acknowledges and agrees that the Council will not approve the Detailed Basement Construction Plan unless it demonstrates by way of certification by the suitably qualified engineers from recognised relevant professional body to the Council's reasonable satisfaction that the Development can be constructed safely in light of the ground and water conditions and will not cause any structural problems with neighbouring properties nor the Development itself.

4.7.4 – To ensure that throughout the Construction Please the Development shall not be carried out otherwise than in strict accordance with the requirements of the Detailed Basement Construction Plan and not to permit the carrying out of any works comprised in building out the Development at any time when the requirements of the Detailed Basement Construction Plan are not being complied with and in the event of non-compliance with this sub-clause the Owner shall upon notice from the Council forthwith take any steps required to remedy such non-compliance.

2. Summary of Documentation

RED Construction Group Ltd, on behalf of the Camden Lifestyle (UK) Ltd, have collated the relevant information in this document for submission to Camden Council for the discharge of the S106 planning obligation clauses 4.7.1 through to 4.7.4. This report is an assembly of contributions from Structural Engineers and Specialist Sub-Contractors.

This Detailed Basement Construction Plan incorporates documentation that has been compiled with the cooperation of suitably qualified Structural Engineers and Specialist Sub-Contractors.

Ground Investigation/Geotechnical Report

Planning Condition number 17 – Details of written programme of contaminated ground investigation required by condition 17 (first part only) of planning permission 2018/3647/P dated 28/08/2020. Condition application reference:2020/4197/P, Decision was approved 18 May 2021.

The RPS reports have been reviewed and considered when Card Geotechnical Ltd (CGL) carried out their ground movement assessment analysis.

Refer to Appendix 2 – for RPS reports and GEA Letter

Ground Movement Assessment

Card Geotechnics Ltd (CGL) were appointed by Camden Lifestyle (UK) Ltd to carry out a WALLAP analysis and PLAXIS analysis 3D model to identify any potential ground movement risk during the proposed excavation and subsequent construction of the basement works.

This Ground Movement Assessment report by CGL has been issued to Camden Council for review, on the 15th of June 2022 via Knight Frank, Camden Lifestyle (UK) Ltd.'s Planning Consultant.

A series of design workshops were held to review the data analysis resulting from the Plaxis 3D model in order to agree the detailed basement construction design and to mitigate risk to the neighbouring buildings during both the excavation and basement construction works. The sequence of programme of the temporary and permanent works was also reviewed together with a monitoring regime to be carried out during the excavation and construction of the basements as identified in the Modebest, Groundworks Sub-Contractor's build sequence report.

In attendance at the design workshops were,

- CGL – Ground Movement Assessment Engineers
- Meinhardt – Structural Engineers for the Structural Design
- BG&E – Structural Engineers for the Temporary Works Design
- GSS – Piling Sub-Contractor for both the Temporary and Permanent Design
- Modebest – Groundworks Sub-Contractor for the Basement Construction
- Conquip – Sub-contractor to Modebest for the Propping System Design
- Meridian – Project Manager for Camden Lifestyle (UK) Ltd
- RED Construction – Main Contractor for Camden Lifestyle (UK) Ltd

CGL's summary from the Ground Movement Assessment, is as noted below, for all three construction sequences the damage Category is 1 or less.

Refer to Appendix 3 – for CGL's full GMA report.

8.6 Summary

Table 10 below summarises the ground movements and corresponding damage category for all critical sections assessed.

Table 10. Building Damage Assessments - Summary

Critical Section Reference	Façade Dimensions L/H ^a	Calculated Maximum Deflection (mm)	Calculated Maximum Horizontal Movement (mm)	Angular Distortion (with jacking)	Deflection Ratio Δ/L^a (%)	Horizontal Strain δ_h/L^b [worst-case] (%)	Damage Category [worst-case]
9B Bayham Street (CS1)	0.52	1 to 2	8 to 9	1/530 (1/780)	0.027	0.027 [0.046]	0 [1]
7 Bayham Street (CS2)	0.46	2	8	1/1140	0.031	0.053	1
Bayham Street (CS3)	N/A	< 15	<15	N/A	N/A	N/A	Acceptable

Notes:

- See Figure 2.18 (a) CIRIA C760 (2017) Guidance on embedded retaining wall design. (L = length of adjacent structure in metres, perpendicular to basement; Δ = relative deflection)
- See Box 2.5 (v) CIRIA C760 (2017) Guidance on embedded retaining wall design. (δ_h = horizontal movement in metres)

Given that the impact for the above critical buildings/highway lies within acceptable limits (Category 1), then the impact on other neighbouring properties located at a greater distance from the proposed basement and/or with less critical heights/widths etc. is also acceptable by inspection.

Detailed Basement Construction Plan

From CGL's Ground Movement Assessment report, June 2022, and the design workshops the Detailed Basement Construction Plan was developed and finalised.

BG&E Structural Engineers were tasked with compiling all the design documentation received from the relevant expert disciplines into the Detailed Basement Construction Plan report which also incorporates a summary of the agreed design method and construction sequence.

Both Structural Engineers Meinhardt and BG&E have reviewed, and quality checked all the design information received from Modebest, GSS and Conquip to ensure the designs submitted align with the CGL Ground Movement Assessment (GMA) maximum loadings and designated build levels as confirmed acceptable in order to mitigate any risk to the neighbouring properties.

Meinhardt also carried out a quality audit of the BG&E Detailed Basement Construction Plan report.

BG&E's conclusion from the Detailed Basement Construction Plan, is as noted below,

CONCLUSION

Based on our review of the documentation we believe the nominated basement design assumptions align with the GMA. We also believe that CGL have undertaken a suitably rigorous GMA. Subject to the approval of the local authority for the nominated movements, this review finds no objection to the proposed construction.

Refer to section 5 – for the full Detailed Basement Construction Plan report compiled by BG&E Engineers.

In Summary

We as a team together with our Client Camden Lifestyle (UK) Ltd believe that the design information submitted, and the resulting summary/conclusions provided by the appointed Structural Engineers and Specialist Sub-Contractors satisfies the requirements of the S106 obligations;

- 4.7.1, 4.7.2, 4.7.3 and 4.7.4

and demonstrates that the development can be constructed safely in light of the ground and water conditions and will not cause any structural problems with neighbouring properties nor the development itself.

3. Programme and Sequence

RED Construction Group Ltd.'s Specialist Groundworks Sub-Contractor Modebest have produced a unique build sequence and a 'Draft' programme for the Camden Lifestyle Project's basement works. The Camden Lifestyle build sequence and method of construction pictorials describe every stage of the basement build stages as;

- 1.1 First Level Underpin
- 1.2 Pile Mat
- 1.3 Tower Crane Erection
- 1.4 Muck Away
- 1.5 Shore Propping
- 1.6 Prop Monitoring
- 1.7 Level B2 Excavation
- 1.8 Capping Beam and Liner Wall Build Sequence

Refer to Appendix 4 – for Modebest full Build Sequence Report and Draft Programme.

4. Structural Monitoring Plan

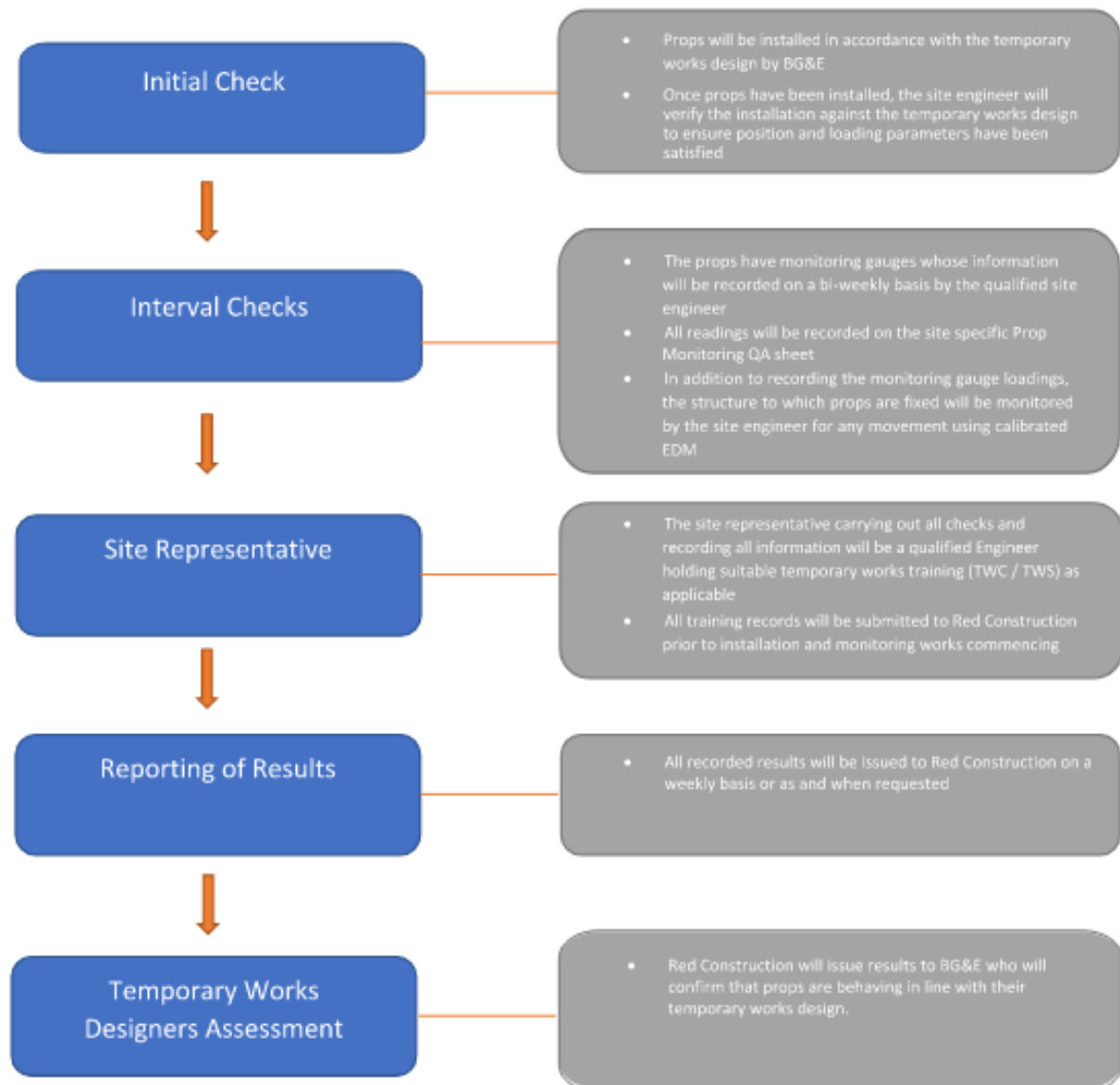
Modebest have noted within their Build Sequence report, item 1.6 Prop Monitoring and the load monitoring gauges fixed to the props, these will be tracked in line with temporary works guidelines and trigger movement values provided by CGL.

The movement findings, will be taken on site at regular agreed intervals for the full duration of the basement works and will be monitored, recorded and submitted to the Temporary Works Engineer BG&E for checking and comment.

This process will continue until the build sequence is complete and sign-off has been achieved.

Refer to Modebest Quality Assurance Procedure – Temporary Prop Monitoring Plan on next page.

Quality Assurance Procedure – Temporary Prop Monitoring Plan



Refer to Appendix 4 – for Modebest QA procedure

CGL have provided a Proposed Movement Monitoring Strategy & Contingency Plan. Which outlines the Trigger Values and Predicted Movements.

Proposed Monitoring Strategy

It is proposed to put in place a monitoring system that will measure the effects and support in managing the risk that the proposed construction activity may have on the surrounding structures and infrastructure.

2.1 Trigger Values

2.2 Predicted Movements

2.3 Piling, Basement Excavation & Construction Trigger Limits

2.4 Monitoring Datum

The following colour code system for the trigger values is proposed:

 **GREEN:** All behaviour is as expected, continue monitoring;

 **AMBER I:** Minor deflection occurring but no clear trends developing;

 **AMBER II:** Increased deflections and movement trends developing;

 **RED:** Movements exceeding predicted/allowable limits.

Trigger limits are selected in relation to expected/predicted movements and the effects the induced movements may have on neighbouring party walls, structures, assets and highways. Consequently, the proposed limits are specific to the design sections, party wall and highways that have been considered.

Typically, green trigger levels are set based on ~70% of the predicted movement, amber 1 and Amber 2 set within the range of the predicted movement with the red trigger up to a maximum deviation of 130% the predicted movement.

In all circumstances, immediate action shall be taken to limit further movement when the acceptable values are exceeded. Trigger limits are summarised for each design section below, based on the potential consequences of the predicted movements for that section.

Proposed Monitoring Methodology

The monitoring of vertical and horizontal displacements will generally consist of the following;

3.1 Monitoring Methodology

3.2 Frequency of Readings

3.3 Reporting Requirements

Refer to Appendix 3 – for the full CGL Proposed Movement Monitoring Strategy & Contingency Plan

5. Detailed Basement Construction Plan

Refer to attached BG&E Detail Basement Construction Plan report attached.

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Revision: 00

Date: 29/06/2022



Camden Lifestyle

DETAILED BASEMENT CONSTRUCTION PLAN

REPORT

CLIENT / RED CONSTRUCTION GROUP

DOCUMENT NO / L21088-CDL-CEG-RPT-001

BG&E PROJECT NO / L21088

REV/ 00

DATE/ 29/06/2022

bgeeng.com—

BENJAMIN DAHLENBURG 29/06/22

1 DESIGN OVERVIEW

1.0 SUMMARY

This report has been prepared for RED Construction for the Camden Lifestyle project, a multi-story development that consists of a multi-story building with a multi-level basement adjacent to several existing properties. The impact assessment that this construction will have on the adjacent properties was modelled and documented by CGL in the Ground Movement Assessment ('GMA'). The construction methodology and design of individual elements has been undertaken by Modebest, GSS, CONQUIP and BG&E as per section 2.1.

This document will provide an overview of the design responsibilities and documentation. It also provides a summary of the agreed design assumptions and construction sequence. As part of this report a comparison of nominated design assumption have been made to ensure compatibility between all parties. Going forward this report is to be used as a basis of design for all relevant parties so that the modelled basement from the GMA is represented in the construction documents.

2.0 DESIGN RESPONSIBILITIES.

Engineering Responsibilities are outlined below.

- **RPS** – Ground investigation/geotechnical report
- **MEINHARDT** – Structural Design
- **CARD GEOTECHNICS LIMITED (CGL)** – Ground Movement Assessment
- **MODEBEST** – Basement Construction Methodology
- **GSS PILING** – Permanent and Temporary Works Pile Design
- **CONQUIP** – Propping System Design
- **BG&E** – Temporary Works Design (also design items listed)
 - o King post
 - o B1 Capping Beam

2.1 DOCUMENT REGISTER

Meinhardt (Appendix 1)

- As per Table 1 Section 3.1
- ST-SPEC-004 – Ref. 2750 Rev. T01 – 22 September 2021

RPS (Appendix 2)

- Phase 1 Preliminary Risk Assessment and Phase 2 Environmental and Geotechnical Site Investigation Report Ref. JER8709 Rev. R2

CGL (Appendix 3)

- CamdenLifestyleHotel_GMA Ref. CG38478 Rev. June22
- CamdenLifestyleHotel_PMM&CP Ref. CG38478 Rev. June22

Modebest (Appendix 4)

- Camden Lifestyle Build Sequence Schematic Ref. rev004
- Camden Lifestyle Build Sequence Ref. rev002
- Camden Lifestyle Draft Programme Ref. 0002
- QAP - Temporary Prop Monitoring Plan Ref. June 2022 Rev. Ver. 01

Conquip (Appendix 5)

- Camden Lifestyle-Temporary Propping Design – Ref. ZP21-0139 Rev. P05
- Temporary Propping Layout Level 1 – Ref. CAM-STT-ZZ-ZZ-DR-TW-1001 Rev. P08
- Temporary Propping Layout Level 2 – Ref. CAM-STT-ZZ-ZZ-DR-TW-1002 Rev. P07
- Temporary Propping Layout Level 3 – Ref. CAM-STT-ZZ-ZZ-DR-TW-1003 Rev. P07
- Temporary Propping Sections – Ref. CAM-STT-ZZ-ZZ-DR-TW-1004 Rev. P08

GSS (Appendix 6)

- Contiguous Piled Wall Design – Ref. 21357 - PD01 Rev. C3
- Pile Layout Ref. 21357 DRG100 Rev. C2
- Contiguous Piled Wall Schedule Ref. 21357 PS01 Rev. C3

BG&E (Appendix 7)

- King Post & B1 Capping Beam Design– Ref. L21088-CDL-CEG-RPT-001- APPENDIX 7 Rev. A

3.0 DESIGN REVIEW

A list of abbreviations used throughout is given in the table below.

Abbreviation	Meaning
GF	Ground Floor
LGF	Lower Ground Floor
B1	Basement Level 1
B2	Basement Level 2 (i.e. lower basement)
mOD	Metres Over Datum
CL	Centre Line
PW	Party Wall

3.1 MEINHARDT – STRUCTURAL DRAWINGS – APPENDIX 1

The GMA undertaken by CGL assumes the permanent structure referenced in table 1 of their report (Appendix 1). The same information is used to inform the construction methodology and additional design elements.

Table 1. Reference documents (Document # CG/38478 page 6)

Type	Document name	Reference
Meinhardt (Structural Information)	BASEMENT -1 LEVEL - PLAN	2750-MHT-ST-XX-B1-DR-04080-T01
	BASEMENT -2 LEVEL - PLAN	2750-MHT-ST-XX-B2-DR-04070-T01
	CONTIGUOUS PILE WALL SETTING OUT	2750-MHT-ST-XX-XX-DR-02001-T01
	UNDEPINNING DRAWING	2750-MHT-ST-XX-XX-DR-02002-T01
	CONTIGUOUS PILE SECTIONS - SHEET 1	2750-MHT-ST-XX-XX-DR-02004-T01
	CONTIGUOUS PILE SECTIONS - SHEET 2	2750-MHT-ST-XX-XX-DR-02005-T01
	CONTIGUOUS PILE SECTIONS - SHEET 3	2750-MHT-ST-XX-XX-DR-02006-T01
	CONTIGUOUS PILE SECTIONS - SHEET 4	2750-MHT-ST-XX-XX-DR-02007-T01
	UNDERPINNING/ADJACENT BUILDINGS DRAWING	2750-MHT-ST-XX-XX-DR-02008-XX
	LOWER GROUND FLOOR LEVEL - PLAN	2750-MHT-XX-LG-DR-ST-04090
	BUILDING SECTIONS - SHEET 1	2750-MHT-XX-XX-DR-ST-08001
	BUILDING SECTIONS - SHEET 2	2750-MHT-XX-XX-DR-ST-08002

3.2 RPS – SITE INVESTIGATION – APPENDIX 2

The GMA undertaken by CGL assumes the site investigation conditions referenced in table 1 of their report (Appendix 2).

Table 1. Reference documents (Document # CG/38478 page 6)

RPS site investigation information	7ABC Bayham Street, Camden, London NW1 0EY - Phase 1 Preliminary Risk Assessment and Phase 2 Environmental and Geotechnical Site Investigation Report JER8709 R2 (2020)
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3.3 CGL – GROUND MOVEMENT ASSESSMENT – APPENDIX 3

The GMA undertook modelling of the basement construction, providing advice on the adjacent building damage assessment. Nominated design assumptions from this document have been used as a reference in our review.

3.4 MODEBEST – Basement Construction Methodology – APPENDIX 4

The basement construction methodology has been provided by Modebest in Appendix 4. BG&E can confirm that the following parameters and methodology are in line with the CGL modelling intent and/or report commentary:

Stage 1 - Existing condition.

- Level 00 +22.970mAD
- Foundation at 1.4m below 00. To be confirmed with trial pits¹.

Stage 2 – Install first underpinning

- Install hit miss underpinning to level +19.800mAD

Stage 3 – Backfill

- Install compacted backfill to natural ground level

Stage 4 – Pile mat

- Pile mat provided must comply with BRE470

Stage 5 – Piles to be installed including contig wall

- Install piles² and reinforcement²
- Install kingpost³ as plunge column

Stage 6 – Propping level 1 installation – for typical underpinning sections

- Sections 2, 3 & 5 (location of sections are as per original Meinhardt drawing 2750-ST-SK029 Rev. P05 (multiple drawings use this number – all should be referred to))
 - o Excavation level +21.000mAD
 - o Temporary propping⁴ installed at +21.500mAD
- Section 6 (Meinhardt drawing 2750-ST-SK029 Rev. P05) – specific levels not given in Modebest drawings, they highlight that section 6 is a variant of the typical underpinned section
 - o Excavation level +19.870mAD
 - o Temporary propping⁴ installed at +20.370mAD

Stage 7 – Propping level 2 installation.

- Sections 1-6 (Meinhardt drawing 2750-ST-SK029 Rev. P05)
 - o Excavation level +16.500mAD
 - o Temporary propping⁴ installed at +17.000mAD

Stage 8 – Excavate to B1 formation

- Excavation levels +13.970mAD

Stage 9 – B1 Capping beam and propping installation.

- Install B1 capping beam^{3,7}
- Once design strength is reached then move to next step
- Excavation levels +12.500mAD
- Temporary propping installed⁴ at +13.000mAD

Stage 10 – Excavate to B2 formation.

- Excavation level +10.500mAD

Stage 11 – B2 and B1 Construction

- B2 and B1 structural element installed⁵

Stage 12 – Propping level 3 removed

- Propping removed once required B2/B1 strength is achieved⁵

Stage 13/14 – Lower ground floor (LGF) installation.

- LGF partially installed
- No restraint to contig. wall is provided

Stage 15 – Ground floor (GF) installation.

- GF slab installed⁵ supported on kingpost⁶

Stage 16/17 – Construction of GF

- Construction above GF can occur as required.
- Required vertical propping system is independent of retention system and movement

Stage 18 – Propping level 1 Removed.

- Propping removed once required GF strength is achieved^{4,5}

Stage 19 – Pile break down (hit and miss)

- Pile break down to 19.800mAD
- Breakdown level to be at or above underpinning soffit
- Next 'hit' only occurs once Stage 20 finger installed

Stage 20 – Install level 1 'finger' prop to underpin face (hit and miss)

- Install prop⁶ at 22.000mAD (20.370mAD @ section 6 i.e. 7 Bayham Street)
- To be installed within 48 hours of underpinning pour
- Repeat Stages 19+20 until all 'hits' complete

Stage 21 – Second underpinning excavation (hit and miss)

- Pile break down to 17.5mAD
- Remove soil to 17.5mAD

Stage 22 – Install Second Underpinning (hit and miss)

- Cast underpinning to 17.5mAD
- Install second level post prop at 19.090mAD⁶
- Repeat Stages 21+22 until all 'hits' complete

Stage 23 – LGF Capping beam and remaining slab installation

- Cast LGF capping beam and remaining slab⁵
- Propping level 2 can be removed once LGL is at full design strength⁴

Stage 24 – Liner wall installation

- Cast Liner wall⁵
- Remove Kingpost and finger as required⁵

Notes

1. Existing conditions to be confirmed as assumed else the relevant design parties are to be informed for review and comment.
2. Design by GSS Piling
3. Design by BG&E
4. Design by Conquip
5. Design by Meinhardt
6. Designed by BG&E to maintain the stiffness assumptions of the GMA
7. The steel waler (@ 13mOD) internally to the B2 area nominated in the GMA has been replaced with a deep capping beam sitting on contiguous piles framing the B2 area internally – 'B1 Capping Beam'. This will not decrease the stiffness required by CGL of the propping system at this level and thus is deemed OK

3.5 CONQUIP – Propping System Design - APPENDIX 5

The propping system has been undertaken by CONQUIP. BG&E can confirm that the following parameters and methodology are in line with the CGL modelling and report:

- Propping levels
 - o Level 1 = 21.5mOD (20.37mOD @ “Section 6” i.e. 7 Bayham Street)
 - o Level 2 = 17mOD
 - o Level 3 = 13mOD
- SLS line load on propping system at each level – as per GSS report rev C3.
- Minimum frame stiffness required is exceed by that provided (see table below)

Level	CGL minimum requirement (kN/m/m)	Conquip minimum provided (kN/m/m)
Level 1	50,000	72,000
Level 2	55,000	110,000
Level 3	50,000	60,000

- Maximum frame SLS deflection limit is not exceeded by the calculated values (see table below)

Level	CGL maximum limit (mm)	Conquip maximum calculated (mm)
Level 1	5	5
Level 2	7	7
Level 3	10	7

3.6 GSS – Permanent and Temporary Works Pile Design – APPENDIX 6

The piling design has been based on work undertaken by GSS. BG&E can confirm that the following parameters and methodology are in line with the CGL modelling and report:

The document has used as reference the RPS ground investigation report and the structural drawings referenced Appendix 1 & 2

- Contiguous pile installation and composition
- Excavation levels (21mOD, 16.5mOD & (local to B2 basement) 12.5mOD)
- Temporary propping CL's
 - o 21.5mOD (20.37mOD @ 7 Bayham Street),
 - o 17mOD
 - o 12.5mOD (local to B2 basement)
- Formation levels
 - o 13.97mOD
 - o 10.5mOD (local to B2 basement)
- Casting of B2 slabs @ 11.3mOD SSL
- Casting of B1 slabs @ 14.77mOD SSL
- Casting liner wall in B2 area
- Removal of temporary waler-prop @ 13mOD
- Casting of GF slab @ 22.97mOD SSL
- Removal of temporary waler-prop
 - o 21.5mOD
 - o 20.37mOD @ 7 Bayham Street
- Break out first height of piles in hit and miss pattern (where underpins present), revealing king posts embedded (where present)
- Cast LGF capping beam
- Removal of temporary waler-prop at @ 17mOD
- Casting B1 & LGF liner walls
- Removal of king posts (where present) and making good concrete surfaces
- Propping Stiffness
- K_0 of 1.5 used
- 2.5m king post embedment (CGL have not specified this as composite nature not utilised)

3.7 BG&E – KING POST AND CAPPING BEAM DESIGN - APPENDIX 7

The ULS king post and B1 capping beam temporary works design has been based on work undertaken by BG&E to meet the requirements of the GMA report (which covers the SLS requirements of these elements), GSS piling and CONQUIP propping design. BG&E can confirm that the following parameters and methodology are in line with the CGL modelling and report:

King Post

- King post member size (254x254x167UC) and stiffness ($I_{y-y}=30000\text{cm}^4$)
- King post length (8m, top extent is 23mOD) and pile cut of level (17.865mOD)
- King post embedment (2.5m – to conform to GSS requirements)
- Finger member size (100x100x10SHS), length (350mm) and stiffness ($A=349\text{mm}^2$)
- Steel properties
 - o Youngs Modulus 210GPa
 - o Poisson's ratio 0.3
 - o Gross unit weight 78kN/m^3
 - o Grade S355 (not required by CGL but required for ULS)

B1 Capping beam

- Capping beam location (TOC = 13.97mOD, 1400mm dp.)
- Capping beam stiffness (Minimum 50,000kN/m/m)
- Capping beam setout with props (as per Conquips Appendix 5)
- Concrete properties
 - o Youngs Modulus 28GPa
 - o Poisson's ratio 0.2
 - o Gross unit weight 25kN/m^3

4 CONCLUSION

Based on our review of the documentation we believe the nominated basement design assumptions align with the GMA. We also believe that CGL have undertaken a suitably rigorous GMA. Subject to the approval of the local authority for the nominated movements this review finds no objection to the proposed construction

6. Appendices

List of all Documents and Drawings as described in the BG&E Detailed Basement Construction Plan