Reef Group c/o the Trustees of the St Pancras Way Block A Unit Trust

Site at the Ugly Brown Building, London

Ground Movement and Building Damage Assessment Report

Project no. 371654-02 (01)

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RSK

RSK GENERAL NOTES

Project No.: 371654-02 (01)

Title: Ground Movement and Building Damage Assessment Report for Ugly Brown Building, London, NW1 0TB

Client: Reef Group c/o the Trustees of the St Pancras Way Block A Unit Trust

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1 INTRODUCTION

On the instructions of GD Partnership, on behalf of Reef Group c/o the Trustees of the St Pancras Way Block A Unit Trust (the client), RSK Environment Ltd has been commissioned to assess the likely ground movements and associated potential impacts to local buildings and adjacent infrastructure assets that will result from the redevelopment of the site through the demolition of the existing UBB building and erection of 6 new buildings ranging in height from 2 storeys to 12 storeys above ground and 2 basement levels, for a mixed use business floorspace, residential, hotel, gym and flexible retail and storage space development and with associated landscaping. RSK has been asked to assess the potential damage that is likely to occur to the following structures for inclusion into a basement impact assessment, which is being completed by GD Partnership Ltd;

- Canal Street Studios immediately to the north;
- Canal Tow Path and retaining wall to the east;
- Beaumont Court to the west;
- Series of three Travis Perkins buildings to the west;
- Series of three St Pancras Hospital Buildings to the south;
- Granary Street to the south;
- St Pancras Way to the west.

The opinions and recommendations expressed in this report are based on the anticipated ground conditions based on preliminary research completed for this assessment. No field work or laboratory testing has been completed at the subject site and this report should be considered as a preliminary assessment, to be reviewed once detailed site investigation information is available.

This report is subject to the RSK service constraints given in **Appendix A**.

2 PROJECT BACKGROUND

The site is located at 2-6 St Pancras Way in the London Borough of Camden and is occupied with a concrete structure known as the Ugly Brown Building (UBB). The northern building is currently vacant (Former Administration Building - Block A), the central building (former Welfare block - Block B) is occupied by Ted Baker Headquarters and the southern building (former sorting office - Block C) is occupied by the Verizon Data Centre, which is very sensitive to noise and vibration. Historically the site was occupied by a five-storey masonry structure called 'St Pancras Ale & Corn store', later became known as the Granary.

The Regent's Canal is located to the Northeast and east of the site. To the southwest/west of the site is St Pancras Way, with Granary Street to the south/southeast beyond which lies St Pancras Hospital. The existing building 'Canal Side Studios', formerly known as 'Atlantic Metals Building', occupies the north/northwest boundary of the site. To the west of the site are a series of three buildings owned by Travis Perkins and a further building known as Beaumont Court.

The client has requested that an assessment be undertaken to estimate the likely magnitude of ground movements and the associated damage that would impact the various sewers and buildings as a result of the proposed development. This information is required to complete a basement impact assessment, which will form part of the planning submission for the proposed development.

From information provided by GD Partnership Ltd it is understood that the Canal Street Studios building comprises a reinforced concrete framed building superstructure supported on strip foundations at a level of approximately 22.00 m AOD. The Beaumont Court Building is 6 storeys plus semi basement level, and the superstructure appears to comprise a mix of either a reinforced concrete (RC) or steel framed and masonry (load bearing) walls. Details on the building foundations have not been provided but are likely to comprise piled foundations with a pile cut off level of approximately 20.00 m AOD. The three Travis Perkins building superstructures appear to comprise a mix RC and masonry (load bearing) wall construction of between 6 or 7 storeys in height. Details on the building foundations have not been provided but are considered likely to comprise piled foundations with a pile cut off level of approximately 20.00 m AOD.

RSK have previously completed a preliminary ground movement assessment report in 2017 and more recently a ground investigation report and Thames Water Sewer Asset Assessment Report, referenced below.

- RSK Environment Limited, Site at the Ugly Brown Building, London NW1 0TB Preliminary Ground Movement Assessment, reference 371654-L01 (01) dated 25th October 2017.
- RSK Environment Limited, Geo-environmental and Geotechnical Assessment: The Ugly Brown Building, reference 371654-01 (01), dated 9th August 2019.

2.1 Proposed development

The proposed redevelopment will involve the demolition of the existing UBB building and erection of 6 new buildings ranging in height from 2 storeys to 12 storeys above ground and 2 basement levels comprising a mixed-use business floorspace, residential, hotel, gym, flexible retail and storage space development with associated landscaping work. The new development comprises three plots A, B & C in which 'Plot A' will be offices, 'Plot B' will be the Ted Baker hotel & headquarters and 'Plot C' will comprise 4 major buildings for mixed-use offices, gym, residential & retail spaces.

The proposed basement level at the site varies from 13.4 m to 19.10 m AOD while the canal water level is at 23.13 m AOD and canal Bed is at average 21.15 m AOD. Plot A will have a single basement at 17.2 m/18.0 m AOD. Plot B will also have a single basement but at two different levels, the south-western portion adjacent to St Pancras Way at a level of 16.30 m AOD, and the northern and eastern portion along the Canal edge, at a level of 19.10 m AOD. Plot C will have two basements with lower basement level at 13.4 m AOD.

None of the existing foundations, which comprise piled foundations, are to be reused as part of the new scheme.

The development of Plots A, B and C will be sequenced as follows:

1. Demolition of Plot A
2. Installation of Plot A contiguous piled wall
3. Excavation of Plot A new basement
4. Construction of Plot A new Building
5. Demolition of Plot B and C
6. Installation of Plot B and C contiguous piled wall
7. Excavation of Plot B and C new basement
8. Construction of Plot B and C new Buildings

Plans showing the existing building layouts, column loads, basement levels, proposed basement levels, difference between existing and proposed levels and proposed new building and foundation layouts are included in **Appendix C**.

3 ASSESSMENT APPROACH

3.1 Scope of Works

The scope of works for the project was defined in our quotation of the 1st December 2018 and is represented below.

1. Updating and revising the preliminary ground movement assessment (GMA) to reflect the actual ground conditions proven by the investigations and final building scheme design/loadings.

The specific scope related to completion of the ground movement and building damage assessment is outlined below.

1. Model the construction sequence on site from demolition through to the proposed development using OASYS PDISP 20.0.0.12 elastic analysis package.

2. Output displacements along line of the existing building and infrastructure assets around the site at the various stages of construction.

3. Estimate the likely ground movements resulting from basement excavations based on the empirical information contained in CIRIA C760 Embedded Retaining Wall using the OASYS XDISP 20.1.1.18 software.

4. Use the program XDISP to combine the ground displacements determined from the numerical analyses PDISP and the CIRIA C760 assessment.

5. From the resulting displacements determine the lateral strain and deflection ratio to determine the potential building damage category in accordance with guidance in CIRIA C760.

6. Report estimated displacements for the various infrastructure assets around the site for the different development stages.

7. Production of report summarising our findings.

3.2 Ground Model Parameters

The distribution of Young's Modulus and other soil parameters with elevation have been based on the results of the site investigations previously completed by RSK, report referenced above.

The undrained Young's Modulus (E_u) has been obtained using a relationship of $E_u = 400c_u$ for the cohesive deposits. The drained Young's Modulus (E') has been obtained using the relationship of $E' = 0.8E_u$.

The resulting distribution of shear strength and drained modulus values are presented in **Figure 4** and **5**.

The parameters adopted for the ground movement assessment in PDISP are summarised below in **Table 1**.

Table 1: Ground Model Parameters

Material	Young's Modulus (kN/m^2)	Young's Modulus – Increase with Depth ($kN/m^2/m$)	Poisson's Ratio
Made Ground - Undrained	15,000	-	0.5
Made Ground - Drained	12,000	-	0.2
London Clay Formation - Undrained	32,000	1,756	0.5
London Clay Formation - Drained	25,600	1,405	0.2
Lambeth Group (Cohesive) - Undrained	72,000	5,200	0.5
Lambeth Group (Cohesive) - Drained	57,600	4,160	0.2
Notes: Uncharacteristically low SPT N Values from dynamic sampling locations have been ignored due to the known overly efficient nature of testing when undertaken in lower strength sensitive soils.			

3.3 Adopted Ground Profile

The ground profile adopted for the ground movement assessment in PDISP is summarised below in **Table 2**.

Table 2: Ground Profile

Material	Top of Stratum (mAOD)	Thickness (m)
Made Ground	22.00	2.00
London Clay Formation	20.00	23.00
Lambeth Group	-3.00	27.00

3.4 PDISP - Ground Model Construction

A settlement / heave analysis has been completed adopting the PDISP software produced by ARUP to assess the likely ground movements to be expected from the demolition and proposed development activities.

The PDISP computer package adopts the Boussinesq method of elastic analysis to calculate the stresses and strains generated within the soil, due to an applied loading and determines the associated displacements by integrating the vertical strains. Settlements are defined as positive movements and heave as negative movements.

The loads applied in the PDISP model are split into two elements; negative loads to represent unloading or demolition and positive loads to represent reloading or construction.

A rigid boundary layer was assumed at -30 m AOD below which no movement is considered to occur.

The loads applied in the PDISP model are split into two elements; negative loads to represent unloading or basement excavation and positive loads to represent reloading or construction. The negative loads have been applied at a level at which they are considered to be acting; at the basement excavation, and for existing or proposed piles using the method discussed by Tomlinson that suggests load is distributed over an area with a load spread of 4 in 1 around the proposed pile at a depth of some two thirds of the length of the pile.

The following PDISP analyses have been undertaken to determine the ground movements at key stages in the constructions process. Both undrained and drained conditions have been considered for the appropriate stages.

- Demolition of existing building (s) – Short Term: This has been carried out by calculating the ground movements that would result from unloading the existing foundations assuming undrained soil parameters. In the absence of detailed information on the existing building foundations, the existing building load take down data provided by GD Partnership has been used to calculate approximate piled foundation dimension based on the pile configurations shown in the appended drawings. To model the unloading, we have used the method discussed by Tomlinson that suggests load is distributed over an area with a load spread of 4 in 1 around the proposed pile at a depth of some two thirds of the length of the pile;

- 2) Basement Excavation(s) – Short Term. This has been calculated by the removal of an overburden pressure for each of the proposed areas of basement extension. For this proposed development, there are three plots to be developed (Plot A, Plot B and Plot C). Plot A will comprise two excavation depths of 4.2 m an 5.0 m below existing level, resulting in an unloading of 84 kN/m2 (4.2 x 20 = 84, where 20 kN/m3 is unit weight of soil) and 100 kN/m2 (5.0 x 20 = 100, where 20 kN/m3 is unit weight of soil). Plot B will comprise two excavation depths of 2.5 m an 5.3 m below existing level, resulting in an unloading of 50 kN/m2 (2.5 x 20 = 50, where 20 kN/m3 is unit weight of soil) and 103 kN/m2 (5.3 x 20 = 106, where 20 kN/m3 is unit weight of soil). Plot C will comprise a single excavation depth of 8.6 m below existing level, resulting in an unloading of 172 kN/m2 (8.6 x 20 = 172, where 20 kN/m3 is unit weight of soil; and

- 3) Loading from the proposed new superstructures on piled foundations –Short Term and Long Term. The loads were modelled as individual piles with a load spread area located at a depth of 2/3 the length of the piles assuming a 1 in 4 load spread. In the absence of a piling scheme the analysis has considered individual piles of varying pile depth, chosen to accommodate the

proposed column load or proportion of column load where pile caps are used, based on the pile layouts shown in the appended design drawings. Loads from core walls have been included in the assessment. This loading case has been considered in both the short term and long term case, using undrained and drained parameters respectively.

The analysis has considered both undrained and drained soil conditions to give an indication of the immediate short term and the maximum expected long term ground movements resulting from the proposed development.

In order to model these conditions two analyses have been carried out, the first considering undrained ground stiffness parameters and a Poisson's ratio of 0.50 and the second considering a drained modulus and a Poisson's ratio of 0.20. The first of these analyses allows an assessment of the immediate elastic heave that would result from demolition of the existing structure and removal of overburden from the lowering of the basement levels. This would typically be expected to occur over of a period of 12 months. The second analysis allows for long term net movements, following construction of the new development, to be determined, which will include the total heave that would develop in the long term and settlement following consolidation of the underlying clay due to the construction of the new building. The fully drained (long term) conditions would typically take many years to develop (10 years or more).

The ground movements have been isolated based on the particular phases of development in addition to the anticipated time frames of which any movements are anticipated to be realised, i.e. short term / long term. These movements have then been used in the building damage assessment, using Oasys Xdisp, as discussed in Section 4. The tabulated results for each modelled construction stage are included in **Appendix C**.

3.5 EMPIRICAL ASSESSMENT OF BUILDING DAMAGE

The approach adopted for the purpose of this assessment, combines both CIRIA C760 and the net long term vertical movements from for the various construction stages, obtained from PDISP.

In this case the results of numerical modelling using PDISP for various construction stages have been imported into the XDISP software and an assessment of potential damage for each stage has been completed using the C760 approach of assessing lateral strain and deflection ratio to determine potential damage category.

The deformations and associated potential damage of the various adjacent buildings have been determined at the end of the stages of construction presented **Table 3**.

Table 3: Stages of Construction at which TW Utilities are Assessed

Section of Development	No.	Construction Stage	Cumulative Effect
PLOT A	1	Demolition of existing structure (short-term)	(A)
PLOT A	2	Basement wall installation (short-term)	(A) + (C)
PLOT A	3	Basement excavation (short-term)	(A) + (C) + (D)
PLOT A	4	New structure (short-term)	(A) + (C) + (D) + (G)
PLOT B + PLOT C	5	Demolition of existing structure (short-term)	PLOT A No.4 + (A)
PLOT B + PLOT C	6	Basement wall installation (short-term)	PLOT A No.4 + (A) + (C)
PLOT B + PLOT C	7	Basement excavation (short-term)	PLOT A No.4 + (A) + (C) + (D)
PLOT B + PLOT C	8	New structure (short-term)	PLOT A No.4 + (A) + (C) + (D) + (G)
FULL DEVELOPMENT	13	New structure (long-term)	{**Plot A** (B) + (C) + (D) + {(F) – (E)} + (H)} + {**Plot B&C** (B) + (C) + (D) + {(F) – (E)} + (H)} – For TW2_1 & TW2_2 only
Notes:			

The various elements of work used to determine the utility deformations at the various stages of construction are given in **Table 4**. This table also defines how the associated movements have been determined and whether they are long or short term.

Table 4: Construction Components

Element	Construction Component	Calculation Method	Short or Long Term
A	Demolition of existing structure	PDISP	Short Term
B	Demolition of existing structure	PDISP	Long Term
C	Basement wall installation	CIRIA C760 (XDISP)	Short Term
D	Basement excavation	CIRIA C760 (XDISP)	Short Term
E	Basement excavation	PDISP	Short Term
F	Basement excavation	PDISP	Long Term
G	Loading of new structure	PDISP	Short Term
H	Loading of new structure	PDISP	Long Term

The ground deformations and building damage categories following each of these stages of construction have been derived by combining the deformations calculated for the various elements of work carried out. For example the short term deformations and building damage category after construction of the proposed building for PLOT A, have been calculated by summing the movements resulting from the short term movements from the demolition of the existing structure (Plot A) (A), installation of the contiguous piled wall, as estimated from CIRIA 760 (C), the short term movements resulting from excavation of the basement, also estimated from CIRIA 760 (D) and the short term settlements resulting from loading of the building of the new Plot A structure, as calculated by PDISP (G). The short term deformations and building damage category after construction of PLOTS B and C have been calculated by summing the full short term net movements from the development sequence of Plot A with the resulting short term movements from the demolition of the existing structure (Plot B & C) (A), installation of the contiguous piled wall, as estimated from CIRIA 760 (C), the short term movements resulting from excavation of the basement, also estimated from CIRIA 760 (D) and the short term settlements resulting from loading of the building of the new Plots B and C structure, as calculated by PDISP (G).

The assessment has been undertaken using XDISP version 20.1.1.18 computer package supplied by OASYS, which uses the empirical approach outlined in CIRIA C760 to assess the vertical and horizontal ground movements resulting from excavation in front of the walls.

The empirical approach is well described in CIRIA C760 “Guidance on Embedded Retaining Wall Design” 2017. This document provides charts of vertical and horizontal ground movements resulting from installation of embedded retaining walls and excavation in front of the walls. These charts have been normalised with wall length and excavation depth to facilitate their use for new development.

The assessment assumes a high stiffness retaining system, considered appropriate on assumption that the excavations will be propped as the excavation is progressed.

4 ASSESSMENT OF DAMAGE TO ADJACENT PROPERTIES

In CIRIA C760 also provides a methodology to assessing the potential damage to properties within the zone of influence of the basement excavation. Figures 6.17 and 6.27 of CIRIA C760 summarise this approach. This methodology uses the relationship between Damage Category, horizontal strain and deflection ratio developed by Boscardin and Cording (1989) and Burland (2001).

The definition of the categories is presented in **Table 5**. The categories assume brick masonry with cement mortar and as such represent a conservative estimate of likely damage that will occur at these properties.

Table 5: Classification of damage category (from Table 2.5, CIRIA C760)

Category of damage		Description of typical damage	Approximate crack width (mm)	Limiting tensile strain □lim (%)
0	Negligible	Hairline cracks of less than about 0.1mm are classed as negligible.	<0.1	0.0- 0.05
1	Very slight	Fine cracks that can easily be treated during normal decoration. Cracks in external brickwork visible on inspection.	<1	0.05–0.075
2	Slight	Cracks easily filled. Redecoration probably required. Cracks are visible externally and some repointing may be required externally to ensure watertightness. Doors and windows may stick slightly.	<5	0.075 – 0.15
3	Moderate	The cracks require some opening up and can be patched by a mason. Repointing of external brickwork and possibly a small amount of brickwork to be replaced. Doors and windows sticking. Service pipes may fracture. Weathertightness often impaired.	5 – 15 or a number of cracks >3	0.15 – 0.3
4	Severe	Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Windows and frames distorted, floor sloping noticeably. Walls leaning or bulging noticeably, some loss of bearing in beams. Service pipes disrupted.	15 – 25 but also depends on number of cracks	>0.3
5	Very severe	This requires a major repair involving partial or complete rebuilding. Beams lose bearings, walls lean badly and require	Usually >25 but depends on number of cracks	

Category of damage	Description of typical damage	Approximate crack width (mm)	Limiting tensile strain □lim (%)
	shoring. Windows broken with distortion. Danger of instability.		

4.1 Buildings to be Assessed

There are a number of buildings which surround the site, however, the properties considered to be potentially most at risk are those to the north comprising Canal Side Studios, to the west, comprising Beaumont Court, and three Travis Perkins Buildings and to the South, comprising three buildings forming part of St Pancras Hospital.

The buildings assessed in this report are presented in Figure 3, which provides a system for identifying the various structures.

From the information provided by GD Partnership we are able to derive a suite of parameters to assist in the completion of this portion of the assessment. Where site specific information is not known then conservative assumptions have been made.

On the basis of the available information, a summary of the specific dimensions and construction details used for these analyses are presented in **Table 6** and **Table 7**.

Table 6: Specific dimensions used for analyses

Adjacent Property	Adopted Piled Wall Depth (m)	Adopted Excavation Depth (m.bbl)	Approximate Distance to Face of Property (m)	Approximate Length of Property Perpendicular to Basement (m)
Canal Side Studios_1 (Southern Elevation)	18.00 m – Basement Retaining wall for Plot-A	5.0 m – Western part basement 4.2 m –eastern part basement	1.50 – north-eastern corner of basement 2.00 – north-western corner of basement	30.00
Canal Side Studios_2 (Eastern Elevation)	18.00 m – Basement Retaining wall for Plot-A	5.0 m – Western part basement 4.2 m –eastern part basement	1.50 – north-eastern corner of basement 2.00 – north-western corner of basement	20.00
Canal Side Studios_3 (Northern Elevation)	18.00 m – Basement Retaining wall for Plot-A	5.0 m – Western part basement	1.50 – north-eastern corner of basement	30.00

Adjacent Property	Adopted Piled Wall Depth (m)	Adopted Excavation Depth (m.bbl)	Approximate Distance to Face of Property (m)	Approximate Length of Property Perpendicular to Basement (m)
		4.2 m –eastern part basement	2.00 – north-western corner of basement	
Canal Side Studios_4 (Western Elevation)	18.00 m – Basement Retaining wall for Plot-A	5.0 m – Western part basement 4.2 m –eastern part basement	1.50 – north-eastern corner of basement 2.00 – north-western corner of basement	20.00
Beaumont Court (Eastern Elevation)	18.00 m – Basement Retaining wall for Plot-A	5.0 m – Western part basement 4.2 m –eastern part basement	15.00	18.00m – Eastern elevation
Beaumont Court (Northern Elevation) NB: Northern elevation comprises two north facing walls)	18.00 m – Basement Retaining wall for Plot-A	5.0 m – Western part basement 4.2 m –eastern part basement	15.00	11.00 – Northern elevation (shortwall) 63.00 – Northern elevation (longwall)
Beaumont Court (Southern Elevation)	18.00 m – Basement Retaining wall for Plot-A	5.0 m – Western part basement 4.2 m –eastern part basement	15.00	74.00 – Southern elevation
Travis Perkins (Building 1) – (Eastern Elevation)	20.00 m – Basement Retaining wall for Plot-B	2.5 m – Eastern and northern part basement 5.3 m – Western and southern part basement	15.00	11.00
Travis Perkins (Building 1) – (Northern Elevation)	20.00 m – Basement Retaining wall for Plot-B	2.5 m – Eastern and northern part basement 5.3 m – Western and southern part basement	15.00	11.00 – Northern & elevation (wall nearest excavation) 12.5 m - Northern elevation (walls furthest from excavation)
Travis Perkins (Building 1) – (Southern Elevation)	20.00 m – Basement Retaining wall for Plot- B	2.5 m – Eastern and northern part basement 5.3 m – Western and southern part basement	15.00	11.00 –Southern elevation (wall nearest excavation) 12.5 m - Southern elevation (wall furthest from excavation)
Travis Perkins (Building 2) – (Northern Elevation)	25.00 m – Basement Retaining wall for Plot- C	8.6 m – Plot C Basement excavation	15.00	10.00 – Northern & Southern elevations

Adjacent Property	Adopted Piled Wall Depth (m)	Adopted Excavation Depth (m.bbl)	Approximate Distance to Face of Property (m)	Approximate Length of Property Perpendicular to Basement (m)
Travis Perkins (Building 2) – (Southern Elevation)	25.00 m – Basement Retaining wall for Plot- C	8.6 m – Plot C Basement excavation	15.00	10.00 – Northern & Southern elevations
Travis Perkins (Building 3) – (Northern Elevation)	25.00 m – Basement Retaining wall for Plot- C	8.6 m – Plot C Basement excavation	15.00	13.00 – Northern & Southern elevations
Travis Perkins (Building 3) – (Southern Elevation)	25.00 m – Basement Retaining wall for Plot- C	8.6 m – Plot C Basement excavation	15.00	13.00 – Northern & Southern elevations
St Pancras Hospital (Building 1) (Northern Elevation)	25.00 m – Basement Retaining wall for Plot- C	8.6 m – Plot C Basement excavation	13.00	12.00
St Pancras Hospital (Building 1) (Western Elevation)	25.00 m – Basement Retaining wall for Plot - C	8.6 m – Plot C Basement excavation	13.00	37.00 – Western Elevation
St Pancras Hospital (Building 1) (Eastern Elevation)	25.00 m – Basement Retaining wall for Plot- C	8.6 m – Plot C Basement excavation	13.00	23.00 – Eastern Elevation (nearest excavation) 14.00 – Eastern Elevation (furthest from excavation)
St Pancras Hospital (Building 2) (Western Elevation)	25.00 m – Basement Retaining wall for Plot- C	8.6 m – Plot C Basement excavation	13.00	36.00 – Eastern & Elevation
St Pancras Hospital (Building 2) (Eastern Elevation)	25.00 m – Basement Retaining wall for Plot- C	8.6 m – Plot C Basement excavation	13.00	36.00 – Western Elevation
St Pancras Hospital (Building 3) (Eastern Elevation)	25.00 m – Basement Retaining wall for Plot- C	8.6 m – Plot C Basement excavation	13.00	41.00 – Eastern Elevation
St Pancras Hospital (Building 3) (Western Elevation)	25.00 m – Basement Retaining wall for Plot- C	8.6 m – Plot C Basement excavation	13.00	9.00 – Western Elevation (nearest Excavation) 24.00 - Western Elevation (furthest Excavation)
Notes: - To model wall installation effects for Stage C outlined in Table 4, half pile length has been considered to provide a realistic estimation of ground movements associated with contiguous bored pile wall installation in London Clay Formation.				

Table 7: Specific construction details

Adjacent Property	Building Material	Assumed Foundation Type	Assumed Foundation Depth (m.bgl)
Canal Side Studios	Concrete / Steel Framed	Strip Foundations	1.00
Beaumont Court	Concrete / Steel Framed	Piled Foundations	2.00 – Pile cut-off level
Travis Perkins Building Nos. 1 - 3	Concrete / Steel Framed	Piled Foundations	2.00 – Pile cut-off level
St Pancras Hospital Building Nos. 1-3	Masonry	Strip / Pad	1.00

These parameters have then been used to determine the displacements and horizontal tensile strains and Deflection Ratios for the adjacent properties.

4.2 Other Assets to be Assessed

The above analysis has also been used to complete a preliminary assessment of the ground movements (horizontal and vertical) at a number of additional assets in close proximity the proposed development. These are listed in **Table 8**. The assessment has been completed using a combination of PDISP and XDISP computer package, where the PDISP analysis results were imported into the XDISP software, as described above.

Table 8: Assets to be Assessed

Asset Name	Adopted Piled Wall Depth (m)	Adopted Excavation Depth (m.bbl)	Approximate Distance to Asset (m)
St Pancras Way	20.00 m – Basement Retaining wall for Plot-A, B and C	4.8 m – Western part basement PLOT A 5.3 m – Western and southern part PLOT B 8.6 m – Plot C	Immediately adjacent western elevation of development
Granary Street	20.00 m – Basement Retaining wall for Plot- C	8.6 m – Plot C	Immediately adjacent southern elevation of development
Canal Tow Path and Retaining Wall	20.00 m – Basement Retaining wall for Plot-A, B and C	4.2 m – Eastern part basement PLOT A 2.5 m – Eastern and northern part basement 8.6 m – Plot C	5.00

The results from the PDISP and XDISP analysis are presented in **Appendix C**.

5 BUILDING DAMAGE ASSESSMENT

5.1 Results of Empirical Assessment of Ground Movements and Building Strains

A summary of estimated ground movements at the front and rear of the adjacent properties for each property during the key stages of construction are presented in **Table 9**. The calculated strains, deflection ratios and building damage category for building elevation where a damage category of 1 or greater, are presented in **Table 10**, for each of the key stages of construction.

The full results of the numerical analysis are included in **Appendix C-2**, which provide movements, strains and deflection ratios for each elevation of every adjacent building assessed, for every development stage through the construction sequence identified in Section 3. The results presented in the tables below are those of the worst case calculated from any stage through the development of Plots A, B and C.

In addition, plots of building damage interaction charts for all cases where the calculated building category is very slight (Category 1) or above are included in **Appendix C-2**.

Table 9: Ground Movements Resulting from Key Stages of Development Sequence

Adjacent Property (Critical Elevations only)	Development Plot (Stage)	DEMOLITION				CONTIGUOUS WALL INSTALLATION				BASEMENT EXCAVATION				NEW LOADING – SHORT TERM				FULL DEVELOPMENT – LONG TERM			
		Ground Movement at Front of Adjacent Property		Ground Movement at Rear of Adjacent Property		Ground Movement at Front of Adjacent Property		Ground Movement at Rear of Adjacent Property		Ground Movement at Front of Adjacent Property		Ground Movement at Rear of Adjacent Property		Ground Movement at Front of Adjacent Property		Ground Movement at Rear of Adjacent Property		Ground Movement at Front of Adjacent Property		Ground Movement at Rear of Adjacent Property	
		Lateral (mm)	Vertical (mm)	Lateral (mm)	Vertical (mm)	Lateral (mm)	Vertical (mm)	Lateral (mm)	Vertical (mm)	Lateral (mm)	Vertical (mm)	Lateral (mm)	Vertical (mm)	Lateral (mm)	Vertical (mm)	Lateral (mm)	Vertical (mm)	Lateral (mm)	Vertical (mm)	Lateral (mm)	Vertical (mm)
Canal Side Studios_1 (Southern Elevation)	PLOT A	0.00	0.20	0.00	0.10	1.86	2.68	1.77	2.49	6.53	5.80	2.20	5.76	6.53	14.65	2.20	14.07	--	--	--	--
	PLOTS B & C	6.53	15.01	2.20	14.43	6.53	15.01	2.20	14.43	6.53	15.01	2.20	14.43	6.53	14.16	2.20	13.58	--	--	--	--
	FULL DEVELOPMENT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.83	17.46	2.20	17.42
Canal Side Studios_4 (Northern Elevation)	PLOT A	0.00	0.04	0.00	-0.01	1.86	2.68	0.00	0.04	6.53	5.80	0.00	0.04	6.53	14.65	0.00	-1.00	--	--	--	--
	PLOTS B & C	6.53	15.01	0.00	-0.76	6.53	15.01	0.00	-0.76	6.53	15.01	0.00	-0.76	6.53	14.16	0.00	-1.22	--	--	--	--
	FULL DEVELOPMENT	--		--		--	--	--	--	--	--	--	--	--	--	--	--	6.53	17.46	0.00	-1.42
Travis Perkins (Building 3_Elevation 2) – (Northern Elevation)	PLOT A	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.09	0.00	0.09	--	--	--	--
	PLOTS B & C	0.00	0.50	0.00	0.51	0.41	2.58	0.00	0.51	3.30	7.33	1.00	0.91	3.30	5.75	1.00	-0.69	--	--	--	--
	FULL DEVELOPMENT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.30	0.90	0.99	-3.52
St Pancras Hospital (Building 1_Elevation 6) (Eastern Elevation)	PLOT A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.05	0.00	-0.03	--	--	--	--
	PLOTS B & C	0.00	0.45	0.00	0.40	1.01	2.82	0.00	0.39	8.34	7.04	0.00	0.40	8.34	5.40	0.00	-0.68	--	--	--	--
	FULL DEVELOPMENT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	8.34	1.48	0.00	-2.36
St Pancras Hospital (Building 2_Elevation 2) (Western Elevation)	PLOT A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.06	0.00	-0.03	--	--	--	--
	PLOTS B & C	0.00	0.25	0.00	0.38	1.05	2.64	0.00	0.38	8.60	6.89	0.00	0.38	8.60	4.93	0.00	-0.55	--	--	--	--
	FULL DEVELOPMENT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	8.60	-0.97	0.00	-2.00
St Pancras Hospital (Building 2_Elevation 4) (Eastern Elevation)	PLOT A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.06	0.00	-0.03	--	--	--	--
	PLOTS B & C	0.00	0.40	0.00	0.30	1.07	2.70	0.00	0.41	6.85	6.99	0.00	0.41	8.65	4.44	0.00	-0.58	--	--	--	--
	FULL DEVELOPMENT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	8.65	-2.80	0.00	-2.14
St Pancras Hospital (Building 3_Elevation 2) (Southern Elevation)	PLOT A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.06	0.00	-0.05	--	--	--	--
	PLOTS B & C	0.00	0.54	0.00	0.29	1.07	2.70	0.00	1.15	8.66	6.99	4.89	3.07	8.66	4.36	4.21	0.10	--	--	--	--
	FULL DEVELOPMENT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-8.66	-2.47	-4.21	-4.19

Adjacent Property (Critical Elevations only)	Development Plot (Stage)	DEMOLITION				CONTIGUOUS WALL INSTALLATION				BASEMENT EXCAVATION				NEW LOADING – SHORT TERM				FULL DEVELOPMENT – LONG TERM			
		Ground Movement at Front of Adjacent Property		Ground Movement at Rear of Adjacent Property		Ground Movement at Front of Adjacent Property		Ground Movement at Rear of Adjacent Property		Ground Movement at Front of Adjacent Property		Ground Movement at Rear of Adjacent Property		Ground Movement at Front of Adjacent Property		Ground Movement at Rear of Adjacent Property		Ground Movement at Front of Adjacent Property		Ground Movement at Rear of Adjacent Property	
		Lateral (mm)	Vertical (mm)	Lateral (mm)	Vertical (mm)	Lateral (mm)	Vertical (mm)	Lateral (mm)	Vertical (mm)	Lateral (mm)	Vertical (mm)	Lateral (mm)	Vertical (mm)	Lateral (mm)	Vertical (mm)	Lateral (mm)	Vertical (mm)	Lateral (mm)	Vertical (mm)	Lateral (mm)	Vertical (mm)
Notes: Elevations presented in table are critical elevations only, where predicted ground movements lead to Damage Category 1 or more at some stage during the development sequence. Quoted value includes cumulative displacements from full construction sequence up to the relevant stage, as detailed at the top of the table. Displacements presented for are largest calculated at any point on relevant displacement line. Lateral displacement recorded as movement along the line for displacement lines that are perpendicular to the excavation elevation and as movement perpendicular to the displacement line for displacement lines parallel to the excavation elevation. Positive lateral displacement values indicate ground movement towards the excavation. Negative vertical displacement values indicate ground heave. Quoted displacements are from the front and rear of the relevant displacement line and do not necessarily represent the largest displacements seen at any calculation point across the displacement line, nor do they represent the change in displacements that may be present between stages at other calculation points in the line.																					

The calculated horizontal strains and deflection ratios are presented in **Table 10**, along with the Building Damage Category.

Table 10: Calculated Horizontal strains and Deflection Ratios

Adjacent Property	Development Plot (Stage)	DEMOLITION				CONTIGUOUS WALL INSTALLATION				BASEMENT EXCAVATION				NEW LOADING – SHORT TERM				FULL DEVELOPMENT – LONG TERM			
		Horizontal Strain (%)	Deflection Ratio (%)	Maximum tensile strain ε_{lim} (%)	Damage Category	Horizontal Strain (%)	Deflection Ratio (%)	Maximum tensile strain ε_{lim} (%)	Damage Category	Horizontal Strain (%)	Deflection Ratio (%)	Maximum tensile strain ε_{lim} (%)	Damage Category	Horizontal Strain (%)	Deflection Ratio (%)	Maximum tensile strain ε_{lim} (%)	Damage Category	Horizontal Strain (%)	Deflection Ratio (%)	Maximum tensile strain ε_{lim} (%)	Damage Category
Canal Side Studios_1 (Southern Elevation)	Plot A	--	--	--	**--**	--	--	--	--	--	--	--	--	0.098	0.076	0.054	**1**	--	--	--	--
	Plot B & C	0.098	0.076	0.054	**1**	0.098	0.076	0.054	**1***	0.098	0.076	0.054	**1***	0.098	0.076	0.054	**1***	--	--	--	--
	FINAL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.098	0.100	0.073	**1**
Canal Side Studios_4 (Northern Elevation)	Plot A	--	--	--	--	--	--	--	--	--	--	--	--	0.033	0.030	0.066	**1**	--	--	--	--
	Plot B & C	0.033	0.030	0.066	**1**	0.033	0.030	0.066	**1***	0.033	0.030	0.066	**1***	0.033	0.030	0.066	**1***	--	--	--	--
	FINAL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.033	0.038	0.075	**1**
Travis Perkins (Building 3_Elevation 2) – (Northern Elevation)	Plot A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Plot B & C	--	--	--	--	--	--	--	--	0.057	0.005	0.057	**1**	0.046	0.006	0.021	**1***	--	--	--	--
	FINAL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.046	0.005	0.050	**0**
St Pancras Hospital (Building 1_Elevation 6) [1] (Eastern Elevation)	Plot A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Plot B & C	--	--	--	--	--	--	--	--	0.036	0.011	0.053	**1**	0.036	0.011	0.053	**1***	--	--	--	--
	FINAL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.054	0.010	0.054	**1**
St Pancras Hospital (Building 2_Elevation 2) [1] (Western Elevation)	Plot A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Plot B & C	--	--	--	--	--	--	--	--	0.057	0.011	0.057	**1**	0.035	0.011	0.054	**1**	--	--	--	--
	FINAL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.057	0.008	0.057	**1**
St Pancras Hospital (Building 2_Elevation 4) [1] (Eastern Elevation)	Plot A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Plot B & C	--	--	--	--	--	--	--	--	0.057	0.011	0.057	**1**	0.036	0.011	0.054	**1**	--	--	--	--
	FINAL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.056	0.007	0.057	**1**
St Pancras Hospital (Building 3_Elevation 2) [1] (Southern Elevation)	Plot A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Plot B & C	--	--	--	--	--	--	--	--	0.057	0.02	0.057	**1**	0.057	0.020	0.057	**1**	--	--	--	--
	FINAL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.056	0.001	0.057	**1**

Notes:

-- = Damage Category 0 (Zero) not exceeded

* Result carried forward from an earlier construction stage. Where no change in values from previous stage, the current stage has no impact on the damage category

All of tabular and graphical results and included within **Appendix D**.

6 EMPIRICAL ASSESSMENT OF GROUND MOVEMENTS ON HOMEFIELD RISE (ROAD) –SHORT TERM

From the analyses described in Section 4, an assessment the ground movements (horizontal and vertical) at a number of other assets listed in Section 4.2, resulting from the various construction stages, has been completed. The assessment has been completed using a combination of PDISP and XDISP computer packages, where the PDISP analysis results were imported into the XDISP software.

Table 11 below provides a summary of the estimated total vertical and horizontal movements for each of the assets, following completion of the full sequence of construction stages. Plots of movements (vertical and horizontal) along the asset for each construction phases are provided in **Appendix C-3**. The value provided in **Table 11** is the worst case at any point along the displacement line.

Table 11: Results of Combined PDISP and XDISP Analysis

Adjacent Property	Stage	FULL DEVELOPMENT – LONG TERM		
		Deformation (mm)		
		Vertical	Horizontal Along Asset	Horizontal Perpendicular to Asset
St Pancras Way	FINAL	15.08	5.52	13.74
Granary Street	FINAL	-11.73	5.20	17.52
Canal Tow Path	FINAL	-5.48	1.09	2.84
Canal Retaining Wall	FINAL	19.71	4.56	11.85

The results of the assessment indicate that the magnitude of resultant movements (settlement and horizontal) due to the proposed construction sequence on the adjacent tow path, canal retaining wall, and two roads (St Pancras Way and Granary Street) are nominal to moderate. Given the flexible nature of road pavement construction and the presence of the sheet piled retaining wall, it is considered that the proposed development is unlikely to cause undue distress to the existing roads or tow path in the short or long term case.

7 CONCLUSIONS

From the assessment above, it is evident that damage categories exhibited for each of the adjacent structures during the various phases of development are confined to Category 1 (Very Slight).

It is important to note that CIRIA C760 is primarily concerned with the effect basement excavations may have on shallow foundations and does not consider the impact on other building foundation types such as concrete framed structures on piles which transfer building loads to depth. Given that it is known that the Travis Perkins buildings are of a RC framed construction and supported on piles it is unlikely that shallow ground movements from the proposed wall installation and basement excavation will impact the structure. As such, if we consider the presence of a deep foundation solution beneath this site then it is likely that the assessed damage Category 1 (Very Slight) will likely be reduced to Category 0 (Negligible). The impact on the nearest building, Canal Side Studios, is limited to Category 1 (Slight)

The Supplementary Planning Document (SPD) for basement development in Westminster states that “The design and construction should aim to limit damage to all buildings to a maximum of Category 2 as set out in CIRIA Report C580”, whilst the associated ‘Residential Basement Report’ produced by Alan Baxter indicates that basements “should be designed and constructed to limit damage to an adjoining building to Category 1, but certainly no more than Category 2”.

On this basis and given that there is no difference between the assessments in CIRIA C580 and CIRIA C760 the damage that has been predicted to occur as a result of the construction of the proposed development falls within the acceptable limits.

It should be stressed that the magnitude of ground movements depends to a great extent upon the quality of workmanship. As such, large local ground movements may occur where construction problems are encountered. Such movements have not been predicted by this work.

7.1 Control of Ground Movements

In order to reduce the potential for any movement over and above that expected, the following methods of safe practice should be considered prior to and during construction:

- Good workmanship will be required to ensure that pile installation induced settlements are kept to a minimum. It will be essential to ensure that the made ground is not allowed to collapse prior to casting of the pile wall. If CFA piling is adopted it should be ensured that flighting does not occur;
- The contiguous piled wall should be installed to a suitable depth and have adequate embedment in stiff strata for satisfactory vertical and lateral stability;
- Any supports should be installed as early as possible in the construction sequence;

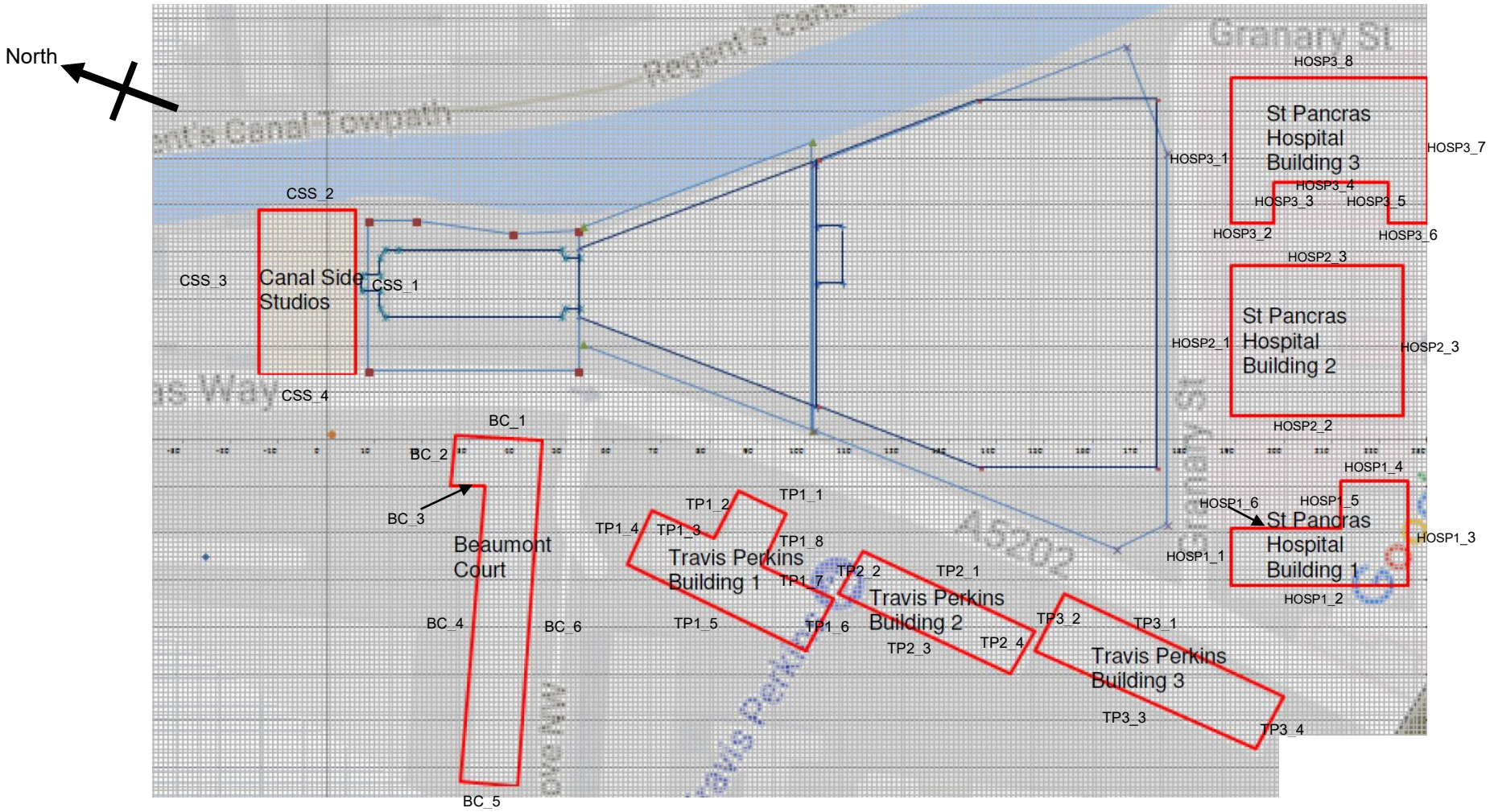
- Ground/basement slabs should be given sufficient time to cure and gain strength prior to removal of the temporary propping, if this is being adopted;
- The first (stiff) support should be installed as early as possible in the construction sequence;
- The construction of the wall and its permanent support systems should not be delayed;
- Over-excavation should be avoided;
- A monitoring strategy should be put in place to ensure that the expected displacements are not exceeded. Limits of lateral and vertical displacement should be set beyond which the method of construction should be re-assessed.

Inadequate workmanship and poor construction control are particularly significant contributory sources of ground movements. Large local ground movements can be expected where construction problems are encountered.

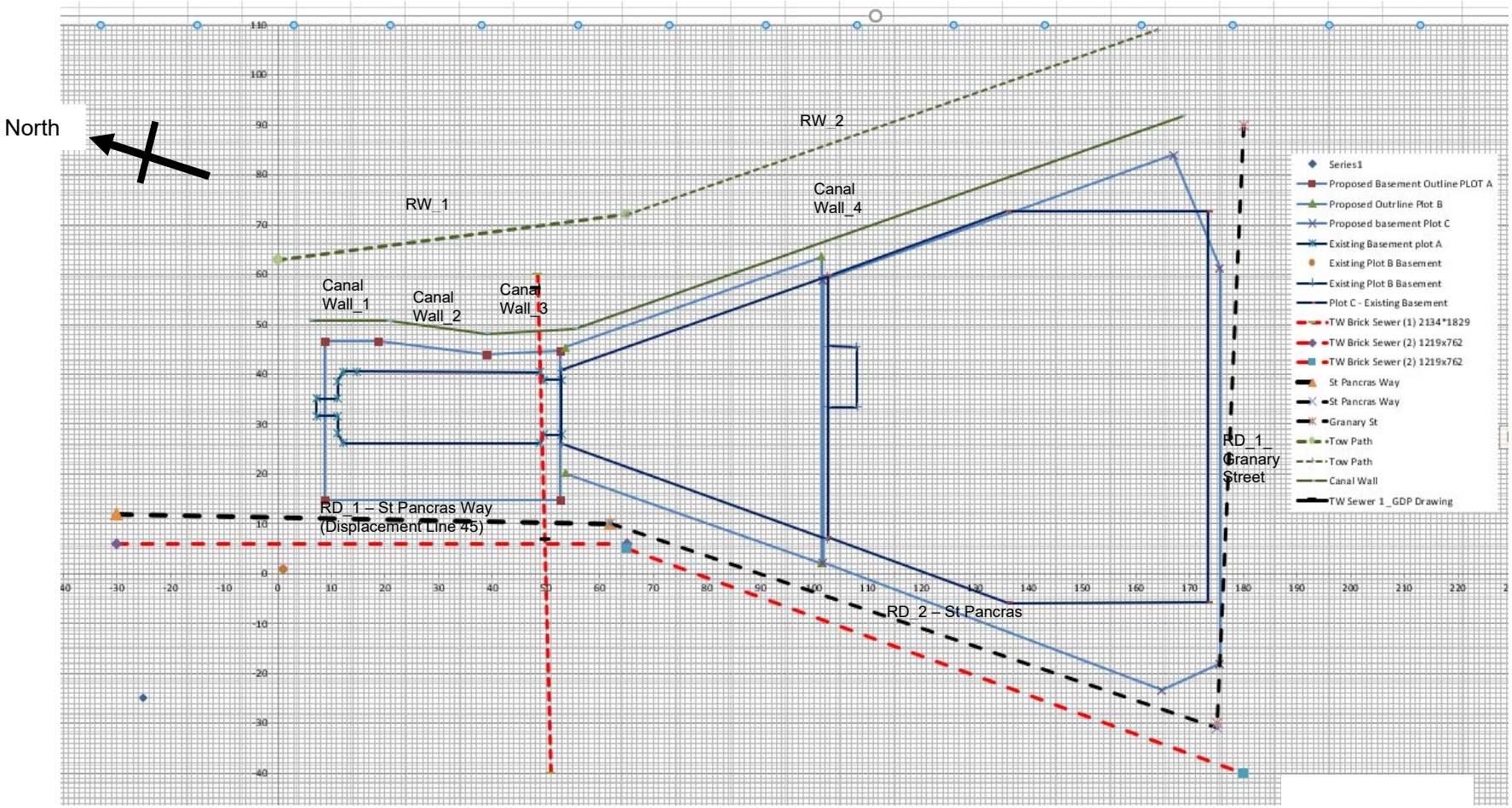
FIGURES

RSK	**SITE LOCATION PLAN**	**Client:** Reef Estates Ltd	**Figure:** 1
		Site: Ugly Brown Building (UBB), St Pancras Way, London	**Job No:** 371654
		Source: Google	**Scale** NTS

RSK	**Plan Showing Proposed Building Configuration**	**Client:**	Reef Estates Ltd	**Figure: 2**	
		Project:	Ugly Brown Building (UBB) Redevelopment	**Job No:**	371654
		Site:	UBB	**Scale:**	NTS



RSK	**Plan Showing Adjacent Buildings Layout and key infrastructure Relative to Development For Building Damage Assessment**	**Client:** The Trustees of St Pancras Way	**Figure: 3**
		Project: Ugly Brown Building Redevelopment	**Job No:** 371654
		Site: Ugly Brown Building	**Scale:** NTS



RSK	**Plan Showing Adjacent Buildings Layout and key infrastructure Relative to Development For Building Damage Assessment**	**Client:** The Trustees of St Pancras Way	**Figure: 3**
		Project: Ugly Brown Building Redevelopment	**Job No:** 371654
		Site: Ugly Brown Building	**Scale:** NTS

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RSK ENVIRONMENT LIMITED

UBB, London
Building Damage & TW Sewer Assessment
PLOT A - Model Geometry

Job No.	Sheet No.	Rev.
371654		

Drg. Ref.

Made by	Date	Checked
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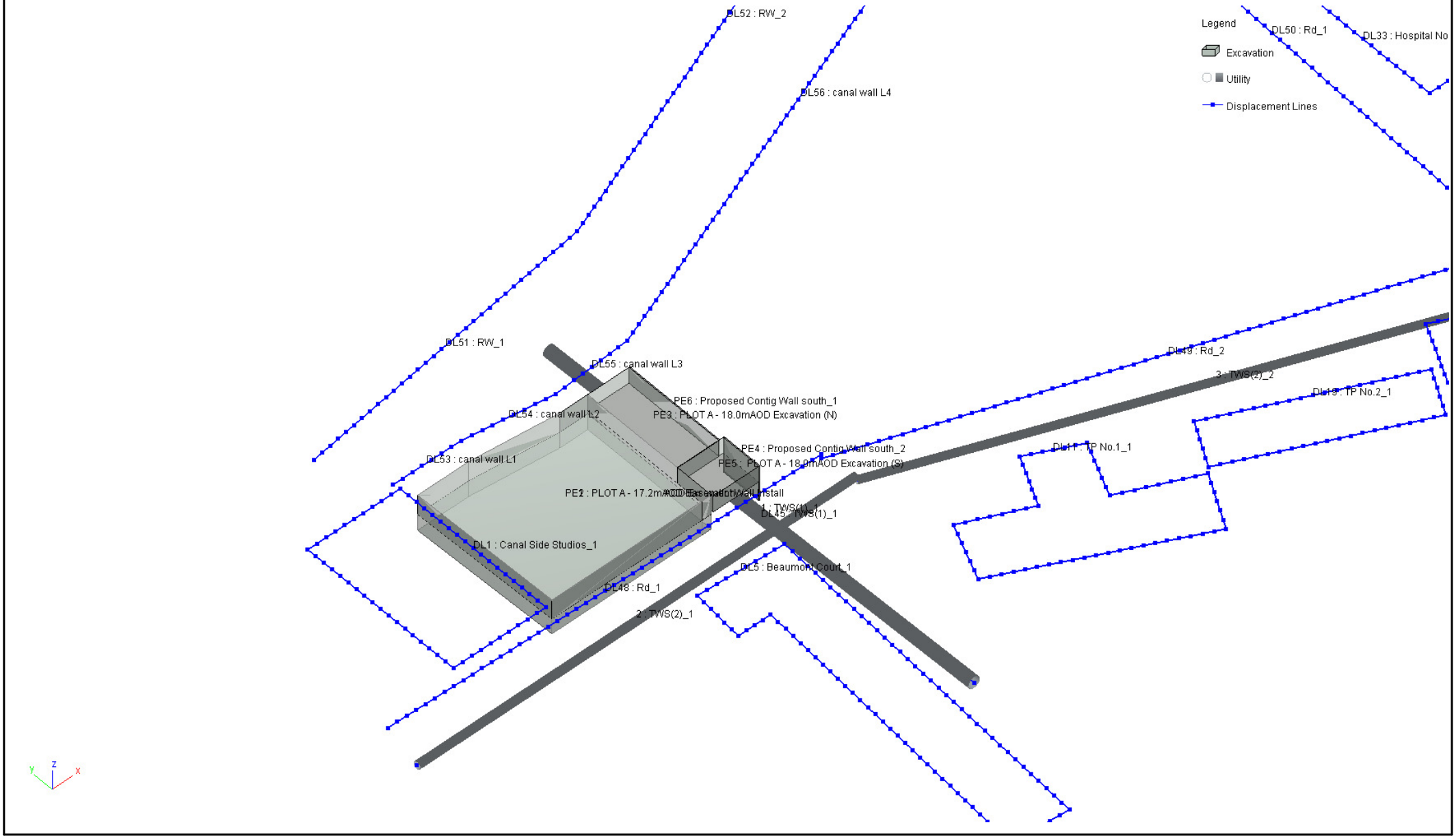

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UBB, London
Building Damage & TW Sewer Assessment
PLOT A - Model Geometry

Job No.	Sheet No.	Rev.
371654		

Drg. Ref.

Made by	Date	Checked
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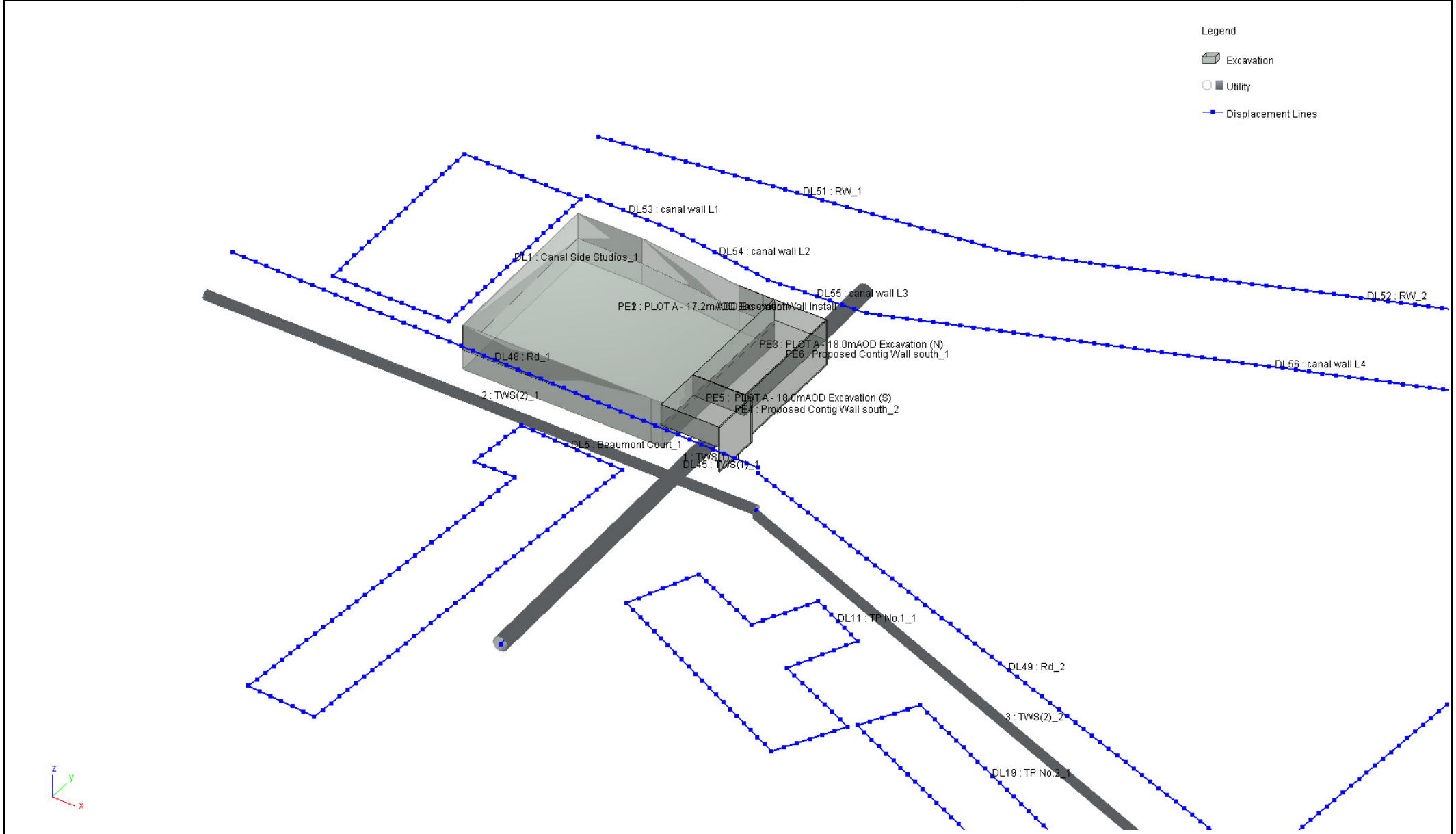

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UBB, London

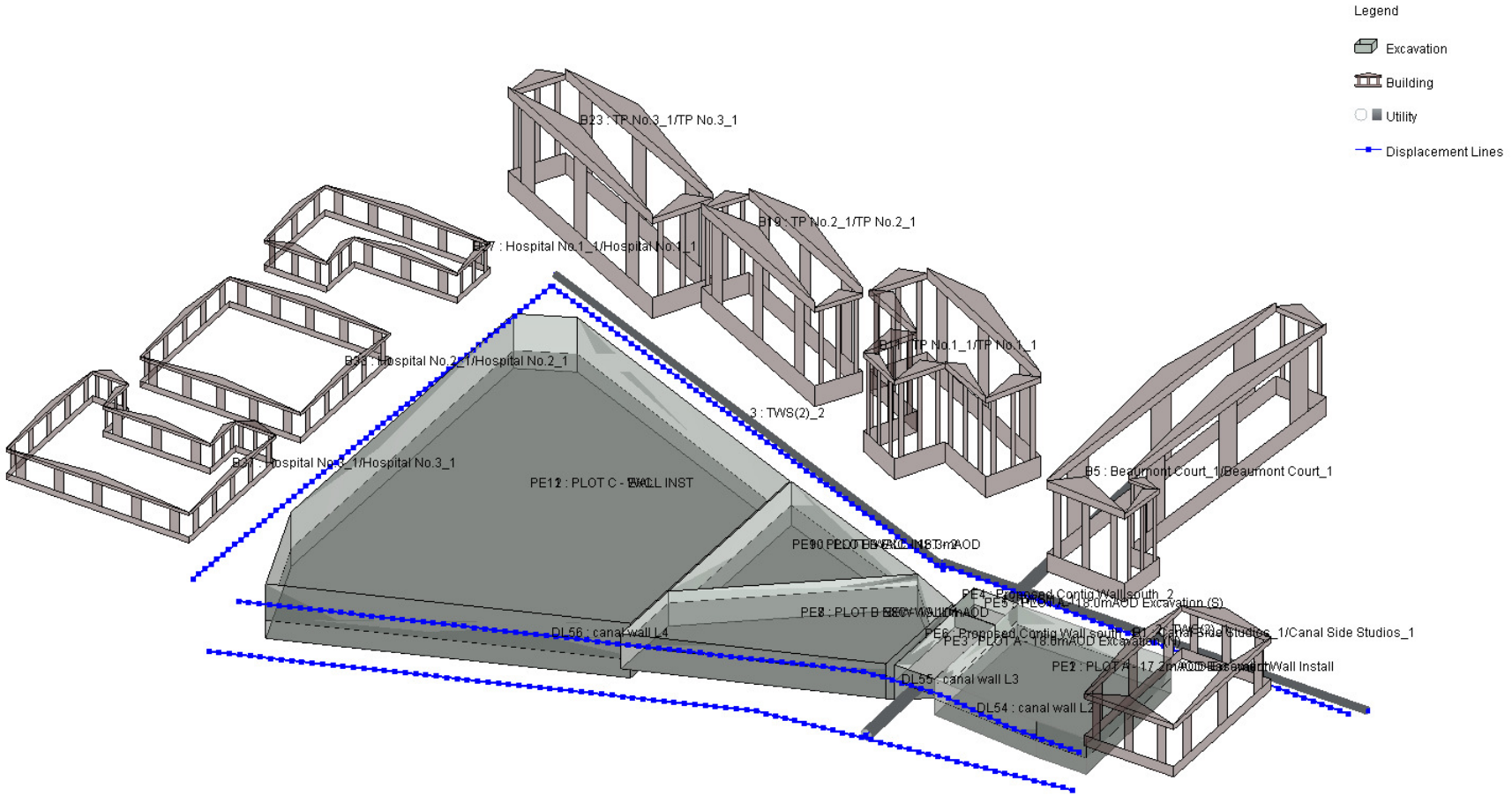
Building Damage & TW Sewer Assessment

FULL DEVELOPMENT GEOMETRY

Job No.	Sheet No.	Rev.
371654		

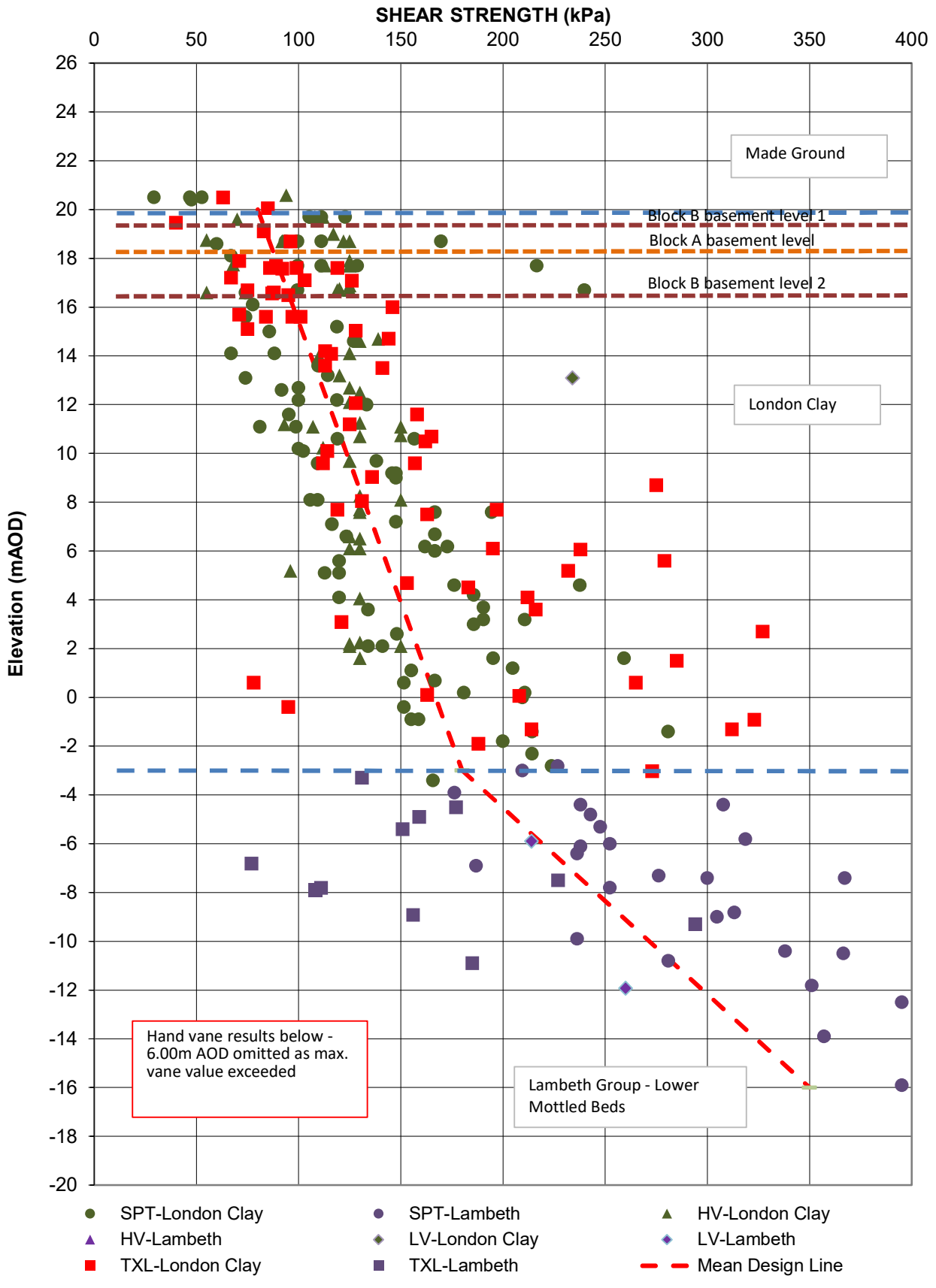
Drg. Ref.

Made by	Date	Checked
MK	30-Jul-2020	



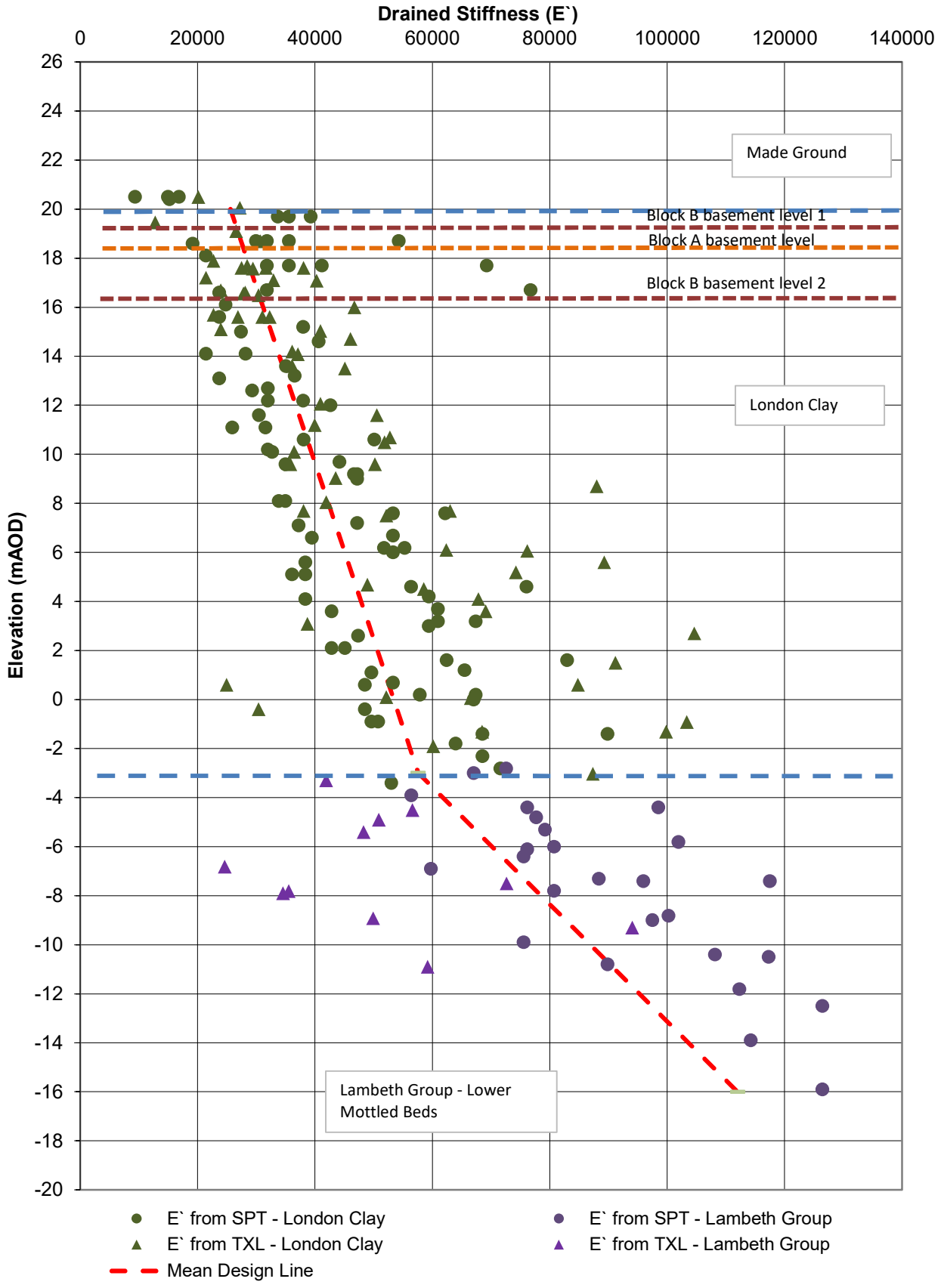
SHEAR STRENGTH vs ELEVATION

Site:	Client:	Job Number:	371654
Ugly Brown Building	The Trustees of The St Pancras Way Block A Unit Trust & Big Lobster	Figure:	4



DRAINED STIFFNESS vs ELEVATION

Site:	Client:	Job Number:	371654
Ugly Brown Building	The Trustees of The St Pancras Way Block A Unit Trust & Big Lobster	Figure:	10



APPENDIX A
SERVICE CONSTRAINTS

1. This report and the site investigation carried out in connection with the report (together the "Services") were compiled and carried out by RSK Environment Limited (RSK) for Reef Group c/o the Trustees of the St Pancras Way Block A Unit Trust (the "client"). The Services were performed by RSK with the skill and care ordinarily exercised by a reasonable environmental consultant at the time the Services were performed. Further, and in particular, the Services were performed by RSK taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between RSK and the client.

2. Other than that, expressly contained in paragraph 1 above, RSK provides no other representation or warranty whether express or implied, in relation to the Services.

3. Unless otherwise agreed in writing, the Services were performed by RSK exclusively for the purposes of the Client. RSK is not aware of any interest of or reliance by any party other than the Client in or on the Services. Unless expressly provided in writing, RSK does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report, or otherwise details of the Services or any part of the Services be made known to any such party, and such party relies thereon that party does so wholly at its own and sole risk and RSK disclaims any liability to such parties. **Any such party would be well advised to seek independent advice from a competent environmental consultant and/or lawyer.**

4. It is RSK's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without RSK 's review and advice shall be at the client's sole and own risk. Should RSK be requested to review the report after the date of this report, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client.

5. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of RSK. In the absence of such written advice of RSK, reliance on the report in the future shall be at the Client's own and sole risk. Should RSK be requested to review the report in the future, RSK shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between RSK and the client.

6. The observations and conclusions described in this report are based solely upon the Services which were provided pursuant to the agreement between the Client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and RSK. RSK is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, RSK did not seek to evaluate the presence on or off the site of asbestos, invasive plants, electromagnetic fields, lead paint, heavy metals, radon gas or other radioactive or hazardous materials, unless specifically identified in the Services.

7. The Services are based upon RSK's observations of existing physical conditions at the Site gained from a visual inspection of the site together with RSK's interpretation of information, including documentation, obtained from third parties and from the Client on the history and usage of the site, unless specifically identified in the Services or accreditation system (such as UKAS ISO 17020:2012 clause 7.1.6):

    a. The Services were based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely.

    b. The Services were limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the visual inspection.

    c. The Services did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services.

    RSK is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to RSK and including the doing of any independent investigation of the information provided to RSK save as otherwise provided in the terms of the contract between the Client and RSK.

8. The intrusive environmental site investigation aspects of the Services are a limited sampling of the site at pre-determined locations based on the known historic / operational configuration of the site. The conclusions given in this report are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around those locations. The extent of the limited area depends on the properties of the materials adjacent and local conditions, together with the position of any current structures and underground utilities and facilities, and natural and other activities on site. In addition, chemical analysis was

carried out for a limited number of parameters (as stipulated in the scope between the client and RSK, based on an understanding of the available operational and historical information) and it should not be inferred that other chemical species are not present.

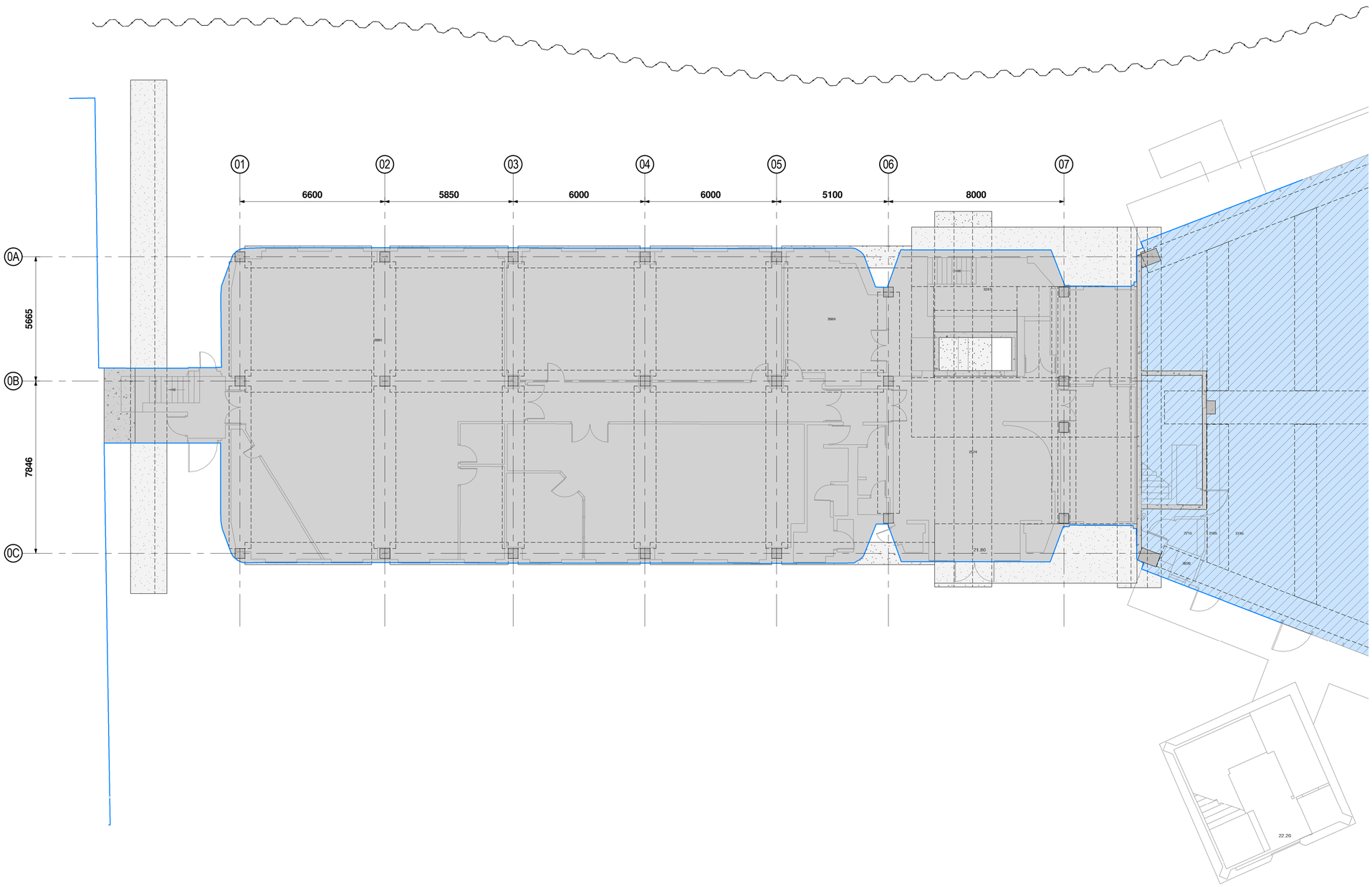
9. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan but is (are) used to present the general relative locations of features on, and surrounding, the site. Features (intrusive and sample locations etc) annotated on site plans are not drawn to scale but are centred over the approximate location. Such features should not be used for setting out and should be considered indicative only.

10. The comments given in this report and the opinions expressed are based on the ground conditions encountered during the site work and on the results of tests made in the field and in the laboratory. However, there may be conditions pertaining to the site that have not been disclosed by the investigation and therefore could not be taken into account. In particular, it should be noted that there may be areas of made ground not detected due to the limited nature of the investigation or the thickness and quality of made ground across the site may be variable. In addition, groundwater levels and ground gas concentrations and flows, may vary from those reported due to seasonal, or other, effects and the limitations stated in the data should be recognised.

11. Asbestos is often observed to be present in soils in discrete areas. Whilst asbestos-containing materials may have been locally encountered during the fieldworks or supporting laboratory analysis, the history of brownfield and demolition sites indicates that asbestos fibres may be present more widely in soils and aggregates, which could be encountered during more extensive ground works.

12. Unless stated otherwise, only preliminary geotechnical recommendations are presented in this report and these should be verified in a Geotechnical Design Report, once proposed construction and structural design proposals are confirmed.

APPENDIX B
DEVELOPMENT INFORMATION & DEVELOPMENT DRAWINGS



E0 PLOT A - EXISTING GROUND FLOOR PLAN
1 : 100

NOTES

1 DO NOT SCALE THIS DRAWING.

2 THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS, ARCHITECTS, AND SERVICES' ENGINEERS DRAWINGS & SPECIFICATIONS.

3 ALL DIMENSIONS ARE IN MILLIMETRES (mm).

4 WORK TO FIGURED DIMENSIONS ONLY.

5 ALL WORK TO COMPLY WITH THE RELEVANT BRITISH STANDARDS, CODES OF PRACTICE AND THE BUILDING REGULATIONS.

Rev	Date	By	Chkd	Description

GD Partnership Ltd.
Consulting Engineers
The Cart Lodge, Lullingstone Lane, Eynsford, Kent, DA4 0HZ
Tel: 01322 868622 Fax: 01322 861050
Email: contact@gdteam.co.uk

Client:
REEF ESTATES

Project:
The Ugly Brown Building

Drawing:
PLOT A - EXISTING GROUND FLOOR PLAN

Scale: 1 : 100 **SCALES INDICATED@A1 (2x SCALE@A3)**
Drawn: MM **Checked:** YG **Date:** OCT. 2017

SKETCH

Job No: 16-017 **Drawing No:** SK(A) - 003 **Rev:**

NOTES

1. DO NOT SCALE THIS DRAWING.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS, ARCHITECTS, AND SERVICES' ENGINEERS DRAWINGS & SPECIFICATIONS.
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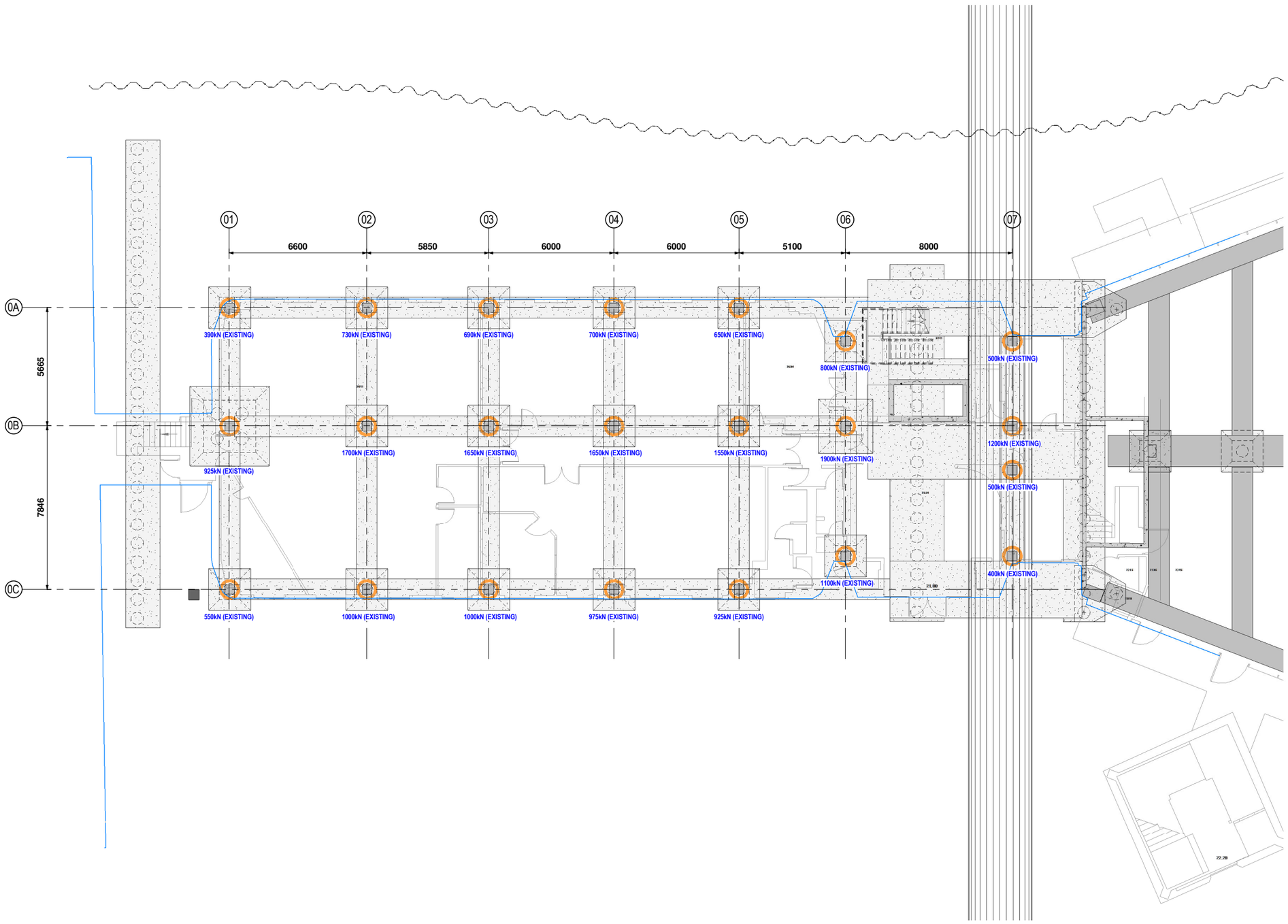

E00 PLOT A - EX. FOUNDATION PLAN - LOADS
1 : 100

Rev	Date	By	Chkd	Description

GD Partnership Ltd.
Consulting Engineers
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Tel: 01322 868622 Fax: 01322 861050
Email: contact@gdteam.co.uk

Client:
REEF ESTATES

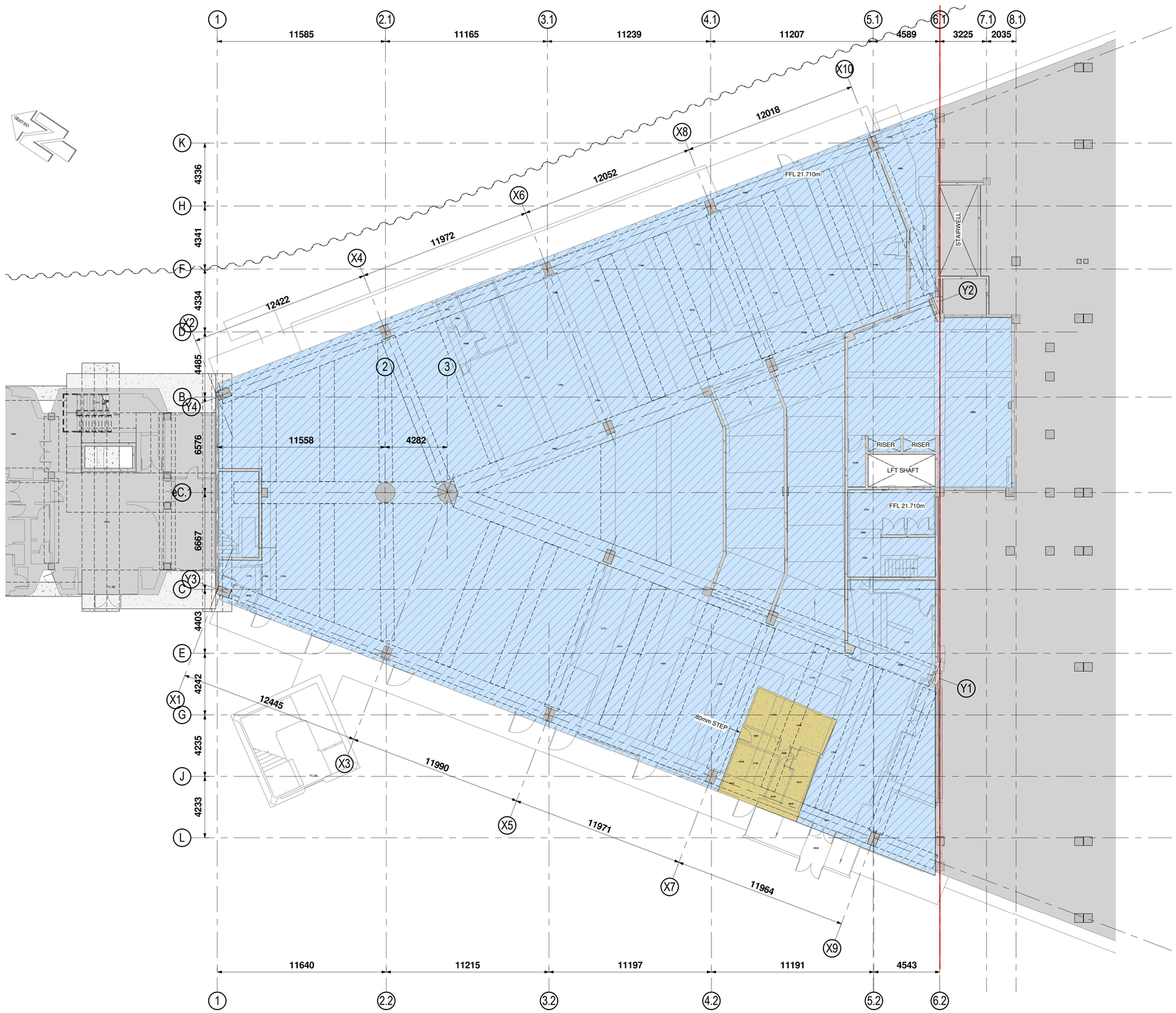
Project:
The Ugly Brown Building

Drawing:
PLOT A - EXISTING FOUNDATION LOADS

Scale: 1 : 100	SCALES INDICATED@A1 (2x SCALE@A3)	
Drawn: MM	Checked: YG	Date: OCT. 2017

SKETCH

Job No:	Drawing No:	Rev:
16-017	SK(A) - 200	



E0 PLOT B - EXISTING GROUND FLOOR PLAN

1 : 150

NOTES

1. DO NOT SCALE THIS DRAWING.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS, ARCHITECTS, AND SERVICES' ENGINEERS DRAWINGS & SPECIFICATIONS.
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Rev	Date	By	Chkd	Description

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Client:

REEF ESTATES

Project:

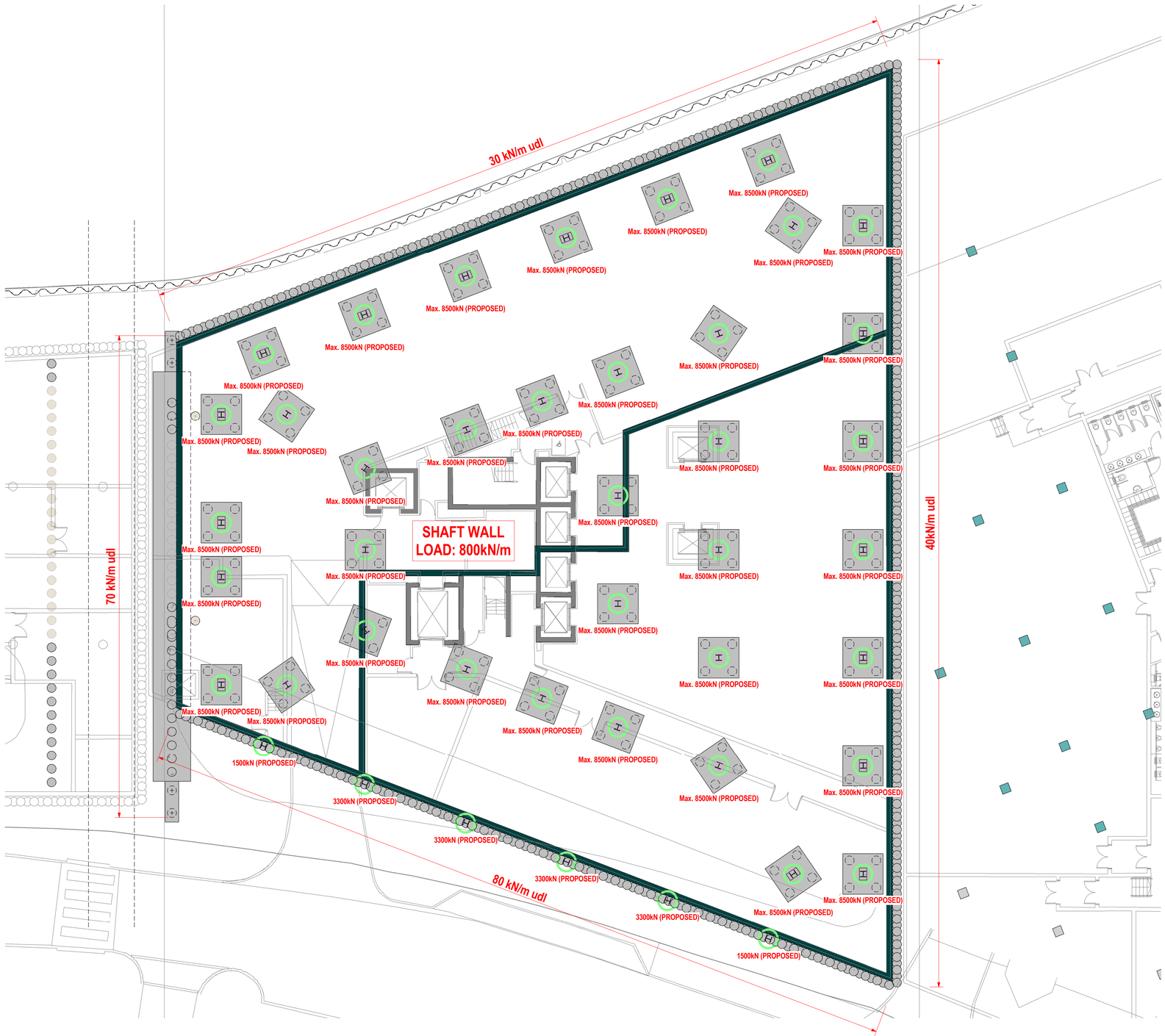
The Ugly Brown Building

Drawing:

PLOT B - EXISTING GROUND FLOOR PLAN

Scale: 1 : 150	**SCALES INDICATED@A1 (2x SCALE@A3)**		
Drawn: MM	**Checked:** YG	**Date:** OCT. 2017	
Job No: 16-017	**Drawing No:** SK(B) - 003	**Rev:**	

SKETCH



P00 PLOT B - PROPOSED BASEMENT PLAN

1 : 150

NOTES

1. DO NOT SCALE THIS DRAWING.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS, ARCHITECTS, AND SERVICES' ENGINEERS DRAWINGS & SPECIFICATIONS.
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Rev	Date	By	Chkd	Description

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Client:

REEF ESTATES

Project:

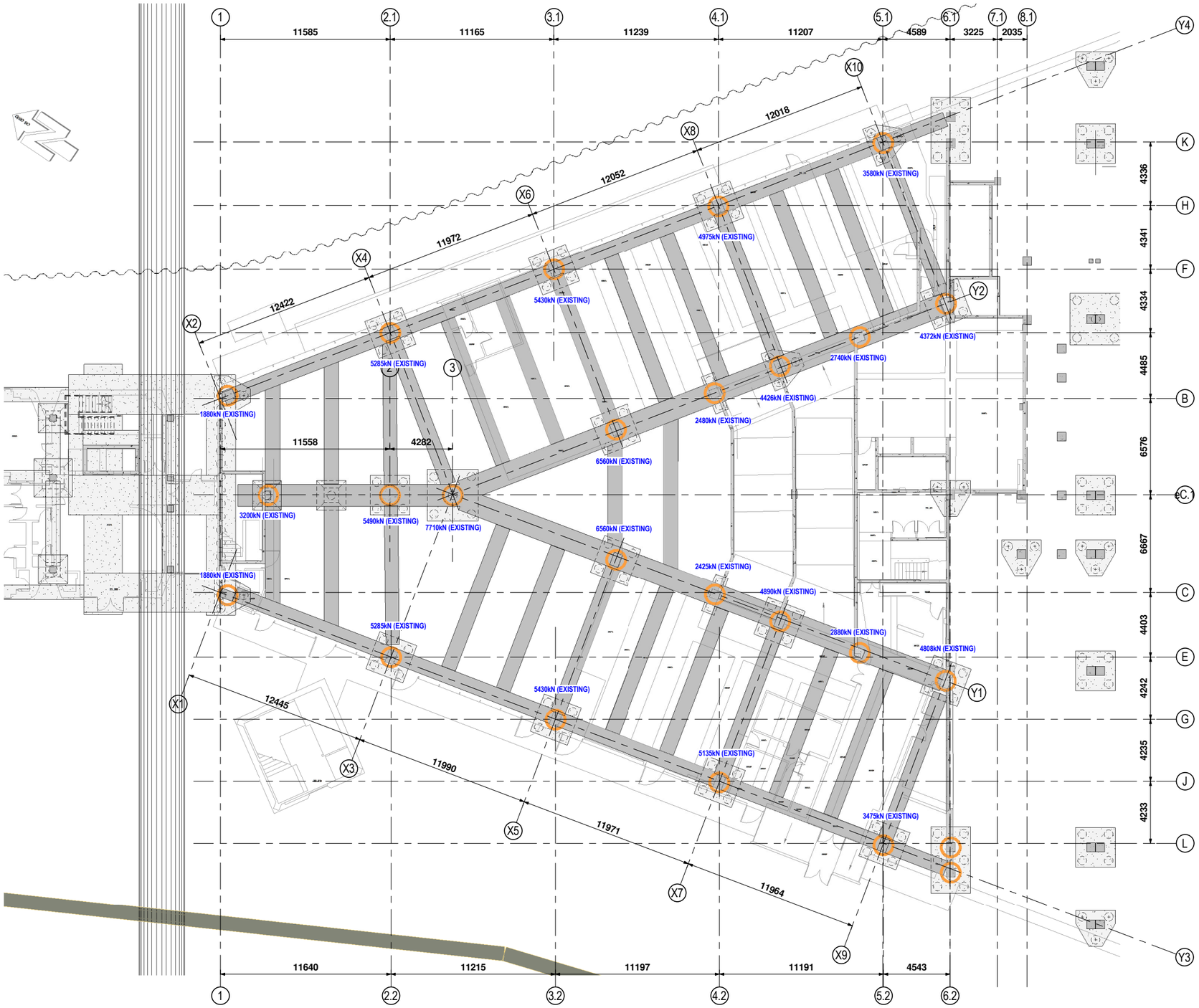
The Ugly Brown Building

Drawing:

PLOT B - PROPOSED FOUNDATION LOADS

Scale: 1 : 150			**SCALES INDICATED@A1 (2x SCALE@A3)**
Drawn: MM	**Checked:** YG	**Date:** OCT. 2017	
Job No: 16-017	**Drawing No:** SK(B) - 250		**Rev:**

SKETCH



E00 PLOT B - EXISTING FOUNDATION PLAN - LOADS

1 : 150

NOTES

1. DO NOT SCALE THIS DRAWING.
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Rev	Date	By	Chkd	Description

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Client:

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Project:

The Ugly Brown Building

Drawing:

PLOT B - EXISTING FOUNDATION LOADS

Scale: 1 : 150 SCALES INDICATED@A1 (2x SCALE@A3)

Drawn: MM | Checked: YG | Date: OCT. 2017

SKETCH

Job No: 16-017 | Drawing No: SK(B) - 200 | Rev: