BASEMENT IMPACT ASSESSMENT

18 PARK SQUARE EAST, LONDON

FOR

THE DIORAMA ESTATE LTD

Giving our all

CONTENTS PAGE No.

FIGURES

TABLES

APPENDICES

APPROVAL & DISTRIBUTION SHEET

PROJECT DETAILS	
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FOREWORD

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1. SUMMARY

The site is located at 18 Parks Square East, NW1 4LH within the jurisdiction of the London Borough of Camden.

The site is occupied by a four/five-storey disused office building with associated rear atrium that occupies the entire footprint of the site.

The proposed development comprises the extension of the existing basement under the site footprint, with a single remote basement to the rear of the rotunda area and lowering of the floor levels in the 'vault' section.

The following assessments are presented in this report:

- Desk Study;
- Screening;
- Scoping;
- Site investigation;
- Ground movement/Damage category assessment; and
- Summary and impact assessment.

A conceptual ground model for the site is summarised as follows:

- **Excavation Level** – Varying from 25.7mAOD and 25.3mAOD for the bulk excavation, 25mAOD for the underpinning and pads for the basement extension and rear basement and 22.1mAOD for the contiguous bored piles. The Vault area will have the floor lowered to 24.8mAOD with the retaining underpinning blocks founded at 24.3mAOD.
- **Site Topography** – Relatively flat at approximately 30mAOD.
- **Surface Water Bodies** – 473m from the site.
- **Flood Risk** – 0.1% annual risk from water courses and High (greater than 3.3%) from surface water.
- **Ground Conditions:**
  - Made Ground penetrated from 30mAOD.
  - Langley Silt Member penetrated from 28.2 to 28.25mAOD.
  - Lynch Hill Gravel Member penetrated from 27 to 25.78mAOD.
  - London Clay Formation proved to 7.65mAOD.
- **Aquifer** – Secondary A Aquifer in the Lynch Hill Gravel Member.
- **Groundwater** – Groundwater level of 23mAOD to 21.65mAOD.

The main conclusions from the screening and scoping assessment are as follows:

- Flooding from surface water is characterised as high for this site indicating that there is a greater than 3.3% annual risk from flooding at the development site. The development must therefore meet the requirements as set out in LBC Core Strategy Camden Development Policy 27, which state that "the scale of the scheme is such that there is no, or minimal, impact on drainage conditions". As presented in the screening stage, the basement construction will not materially affect the flow of surface water on the site.
- The basement excavation is not likely to encounter groundwater during construction based on the data gathered over the short-term groundwater monitoring. However, the piling scheme is likely to encounter groundwater based on a pile founding level of 22.1mAOD. The piling contractor will be required to adopt a technique that has the ability to deal with any water ingress that may occur. As the current scheme calls for contiguous bored pile wall there will be gaps on both sides of each individual pile and as such the effect on the groundwater is likely to be minimal over the short-term and negligible over the long term.
- Construction of the basement and lowering of the vault ground floor will result in lowering of the foundations compared to adjacent sites by an assumed net value of between 2.1m and 0.5m, and excavations of the basement will result in some ground movements. The effect of this has been reviewed in the ground movement and damage category assessment sections of this report. Contour plots of displacement in response to the changes in vertical pressure caused by the excavation and construction of the proposed basement are included. Based upon the maximum displacements predicted by PDISP analyses, Damage Category Assessments were undertaken for the worst-case scenarios in the adjoining properties and these combined with the ground movements alongside the basement in response to the lateral stress release are as predicted by CIRIA publication C760.
- In the assessed cases, the nearest walls have been classified as damage category 1 'very slight' (as given in CIRIA SP200). The damage category results have been plotted graphically in Figure 4. No further Damage Category Assessments have been carried out as other structures in the vicinity are further away and therefore considered lower risk. Parameters for founding depths have been assumed where not data was available, and this will require validation prior to construction. Use of best practice construction methods will be essential to ensure that the ground movements are kept in line with the above predictions. Pre-construction condition surveys of neighbouring properties are also recommended, and a system of monitoring adjoining and adjacent structures should be established before the works start.

2. INTRODUCTION

2.1 GENERAL INTRODUCTION

This report presents a Basement Impact Assessment (BIA), Ground Movement Assessment (GMA) and Damage Category Assessment (DCA) for the proposed basement extensions at 18 Park Square East, NW1 4LH, which is within the London Borough of Camden.

This report has been carried out at the request Quartz Project Services Limited acting on behalf of the client The Diorama Estate Ltd.

This BIA has been produced specifically to meet the requirements of London Borough of Camden (LBC), including Planning Guidance - Basements (Camden Planning Guidance CPG, March 2018) - and the Local Plan (A5 Basements, July 2017). The report structure follows guidance for BIAs set out in the Camden Borough CPG4 (2015). The CPG4 requires desk study, screening and scoping stages, a site investigation and interpretation and ground movement assessment, and impact assessment.

This BIA evaluates the geological, hydrogeological and hydrological conditions and assess the potential detrimental ground stability, groundwater and surface water impacts the proposed development may have on the surrounding area and neighbouring properties.

Attention is drawn to the fact that whilst every effort has been made to ensure the accuracy of the data supplied and any analysis derived from it, there is a potential for variations in ground and groundwater conditions between and beyond the specific locations investigated. No liability can be accepted for any such variations. Furthermore, any recommendations are specific to the client's requirements as detailed herein and no liability will be accepted should these be used by third parties without prior consultation with CET Infrastructure.

2.2 SOURCES OF INFORMATION

The following baseline data have been referenced to complete the BIA in relation to the proposed development:

- Site walkover conducted during a ground investigation in August 2019;
- Current/historical mapping contained in an Envirocheck report;

- The site's geological setting is based on the British Geological Survey (BGS) Geological Map Sheet 270 (South London 1: 50,000 scale solid and drift, 2006), the BGS digital geology maps that utilises most up to date names of geological units (www.bgs.ac.uk/data) and the Geology of London Memoir (Ellison et al., 2004);
- Online flood risk mapping by the Environment Agency;
- LB Camden, Strategic Flood Risk Assessment (produced by URS, 2014);
- LB Camden, Planning Guidance (CPG) – Basements (March 2018);
- LB Camden, Camden Geological, Hydrogeological and Hydrological Study – Guidance for Subterranean Development GHHS (produced by Arup, 2010); and
- LB Camden, Local Plan Policy A5 Basements (2017).

2.3 EXSISTING SITE LOCATION AND LAYOUT

The subject site is located at 18 Park Square East, NW1 4LH at approximate Ordnance Survey grid reference TQ 287822 (see Appendix A1).

The property comprises an existing five storey section with an existing basement and a 4-storey atrium section to the rear with a half basement. The neighbouring properties comprise similarly constructed 4-storey buildings including basements. The footprint of the building is of an irregular polygon shape approximate dimensions of which can be found as Appendix A2.

The property is located roughly within the centre of Park Square East and shares a party wall with No. 17 Park Square East to the north and No. 19 Park Square East to the south.

2.4 TOPOGRAPHY

The topographic map shown on an online topographic map source (http://en-gb.topographic-map.com) shows that the general area of the site is located on at about 30mAOD. The general area of the site is essentially level with no significant slopes noted as shown on Appendix A3. The map indicates a change in slope of approximately 1.5m over Park Square East.

2.5 PROPOSED DEVELOPMENT

Based on the provided drawings (Appendix B), the proposed development at 18 Park Square East includes the excavation and construction a single storey basement extension under the existing rotunda area, a remote basement to the rear of the property and the lowering of the floor level in the vault section. The sides of the

extension walls are to be up to 14m in length, and 11m in length for the remote basement. It has been assumed for purposes of this analysis that the footing width for underpinned walls will be 1m and contiguous bored piles will be of 350mm diameter. The total basement extension area is estimated to be about 84m^2 with the remote basement being 70 m^2.

The proposed finished floor level of the basement extension will be between 25.3mAOD and the rear basement will be 25.7mAOD with a proposed underpinning and pad foundation level of 25mAOD and piles to be to 22.1mAOD, including an allowance for construction of the floor slab. The perimeter walls will comprise reinforced concrete (RC) retaining walls and contiguous bored pile wall with a concrete floor slab.

The Vault section of the site is to have the floor levels lowered by 1.2m below the existing floor level of circa 26mAOD. Underpinning blocks are assumed to extend 0.5m below the proposed floor level.

2.6 NEIGHBOURING PROPERTIES AND STRUCTURES

The subject site is bordered to the north and south by No. 17 and No.19 Park Square East respectively. The east of the site is bordered by Albany Terrace, while the west of the site is bordered by Park Square East.

The neighbouring properties on Park Square East comprise similarly constructed four-storey properties of brick construction. The neighbouring properties were noted as having basements underneath their footprints and do not appear to be additions added after original construction.

Access to the public database (tfl.maps.arcgis.com) provided by TFL asset protection locates the nearest TFL rail asset zone of influence is circa 50m to the south of the site.

3. DESK STUDY

Information in this section has been obtained from the sources outlined in Section 1.2. The background information has been used to undertake a screening and assessment of potential basement impacts.

3.1 SITE HISTORY

Historical maps have been obtained for the area and are presented in the Envirocheck Report in Appendix C. Notable developments are detailed below:

- 1869 to 1880: The earliest map available shows the property and those surrounding were already established. The property at this time was described as occupied by a “Baptist Chapel” up to 1940-1951.
- 1953 – 1954: The maps listed the building as “The Arthur Stanley Institute of Middlesex Hospital”. There were no significant changes to the surrounding structures worth noting.
- 1966 – 1988: The site was shown as being the “Bedford College Annexe of the University of London”. No significant changes to the surrounding structures was noted.
- No specific name for the building is given.

3.2 GEOLOGY

Publications of the British Geological Survey (BGS) indicate that the site is underlain by the London Clay Formation with superficial deposits of Langley Silt Member over Lynch Hill Gravel Member. The online BGS geological map extract displaying the geology is presented in Figure A4.

A BGS borehole located within approximately 70m of the site on St Andrews Place was available for review. The depths of the geology and groundwater levels are summarised in Table 3-1.

Table 3-1: BGS Borehole Data

Borehole Reference	Depth	Geology	Geological Unit	Depth From (m bgl)	Depth To (m bgl)	Groundwater Strike (m)
TQ28SE126	29.81mAOD	Tarmac & Brick	Made Ground	0	0.15	9.1
		Clay & Stones	Made Ground	0.15	0.9	
		Brown Clay	Langley Silt Member	0.9	2.4	
		Gravel and Sand	Lynch Hill Gravel Member	2.4	9.1	
		Firm Brown Clay over Stiff Grey Clay	Weathered and Relatively Unweathered London Clay Formation	9.1	11.2	

The borehole records in Table 3-1 show a typical sequence of London Clay Formation, with superficial deposits of Langley Silt Member overlying Lynch Hill Gravel Member. These deposits will be locally mantled by Made Ground dependant on the current and previous use of the site. Superficial deposits were penetrated to a depth of 9.1m below ground level, with deposits of the London Clay formation being encountered thereafter. These boreholes are located about 70m to the north of the site, but the geology at the site is not expected to vary significantly, only the thicknesses. The actual ground conditions have been assessed by a site specific ground investigation and are discussed later in this report.

3.3 HYDROGEOLOGY

A groundwater strike was noted as being encountered at 9.1m below ground level in the BGS borehole in Table 3-1. It is worth noting that while this may represent the groundwater in this geographic location at the time the borehole was drilled the groundwater table is liable to seasonal and long-term changes. Comments on the groundwater for the subject site is addressed in later chapters.

Hydrogeological information provided by the Envirocheck report is summarised below:

- **Aquifer Category (as defined by the Environment Agency) –** The Superficial Deposits (Lynch Hill Gravel Member) are described as Secondary A Aquifer with a medium vulnerability.

  The bedrock aquifer (London Clay Formation) designation is Unproductive (non-aquifer); rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

The Superficial and Bedrock have a combined Medium vulnerability.

- **Nearest groundwater abstraction licence -** There have been 18 licensed groundwater abstractions within 1km of the site with the closest being 354m to the west for the purpose of production of energy for electricity: heat pump from a ground water source.
- **Source Protection Zone (SPZ) -** None present at the site.
- **Groundwater vulnerability** - Medium; and,
- **Groundwater flooding susceptibility** - Potential for groundwater flooding to occur.

3.4 HYDROLOGY

Hydrological information provided by the Envirocheck report and the Camden Geological, Hydrogeological and Hydrological Study – Guidance for Subterranean Development GHHS is summarised below:

- **Surface water features** – Nearest surface water feature 473m from the subject site.
- **Surface water abstraction licences** – The nearest surface water abstractions are within the Regent's Canal. The Regent's Canal is over 1km from the subject site.
- **River and coastal Zone 2 or 3 flooding** – Site is not a Zone 2 or 3 floodplain and none are identified within 500m.
- **Risk of flooding from rivers and seas** – Less than 0.1% yearly risk.
- **Risk of flooding from surface water** – Yearly flood risk for the site identified as greater than 3.3%.
- **Flood defences** – None identified within 500m.
- **Flood storage areas** – None identified within 500m.

The book 'The Lost Rivers of London' (Barton, 1992) has been consulted and does not identify any former tributaries on the site. The nearest such example has been mapped in excess of 500m from the site.

3.5 FLOODING

The flood risk from rivers and seas from the Environment Agency flood map for planning service is shown on Figure A5 that shows a low risk.

The following risk ratings have been collated from the various references referred to in Section 10 of this report:

- High risk for surface water flooding (greater than 3.3%).
- No historical flood incidents recorded near the site.
- Surface water body was recorded 473m from the site, but environment agency has not identified this as a flood risk to the site.
- No sewer flooding events recorded within 250m of the site.

3.6 CONCEPTUAL SITE MODEL

A conceptual site model for the site has been developed using the information obtained from the desk study for use during the Screening stage.

The conceptual site model can be summarised as follows:-

- **Excavation Level** – Varying from 25.7mAOD and 25.3mAOD for the bulk excavation, 25mAOD for the underpinning and pads for the basement extension and rear basement and 22.1mAOD for the contiguous bored piles. The Vault area will have the floor lowered to 24.8mAOD with the retaining underpinning blocks founded at 24.3mAOD.
- **Site Topography** – Relatively flat at 30mAOD.
- **Surface Water Bodies** – 473m from the site.
- **Flood Risk** – Very low risk (less than 0.1% annual risk) from water courses and high (greater than 3.3%) from surface water.
- **Ground Conditions:**
    - Made Ground to a minimum level of approximately 28.2mAOD.
    - Langley Silt Member to a minimum level of approximately 25.78mAOD.
    - Lynch Hill Gravel Member to a minimum level of approximately 20.6mAOD.
    - Weathered and relatively unweathered London Clay Formation proved to a minimum level of 7.65mAOD.
- **Aquifer** - Superficial Deposits (Lynch Hill Gravel Member) are a Secondary A Aquifer. Bedrock (London Clay Formation) is Unproductive' stratum.
- **Groundwater** – Water strike at approximately 20.7mAOD 70m from the site.

4. CONCEPTUAL SITE MODEL

Screening has been carried out using the criteria outlined in CPG4 to identify any matters of concern relating to slope stability, groundwater flow and surface water flow/flooding that should be carried forward to the Scoping stage. The screening process uses the background site information provided in Section 2 and Section 3 of this report to complete flow charts provided in CPG4. The flow charts are reproduced in the tables below. Items requiring scoping, investigation and impact assessment are highlighted in yellow and are addressed in subsequent sections of this report.

4.1 SLOPE STABILITY

The slope stability screening flowchart from CPG4 is displayed in Table 4-1.

Table 4-1: Screening – Slope Stability

Slope stability screening chart	
1. Does the existing site include slopes, natural or manmade, greater than 7 degrees? (approx. 1 in 8)	No. The site is relatively flat with no sloping land above 7 degrees to the horizontal.
2. Will the proposed re-profiling of landscaping at site change slopes at the property boundary to more than 7 degrees? (approx. 1 in 8)	No. No re-profiling is planned.
3. Does the development neighbouring land, including railway cuttings and the like, with a slope greater than 7 degrees? (approx. 1 in 8)	No. The surrounding area slopes at less than 7 degrees.
4. Is the site within a wider hillside setting in which the general slope is greater than 7 degrees? (approx. 1 in 8)	No. The surrounding area slopes at less than 7 degrees.
5. Is the London Clay the shallowest strata at the site?	No, the shallowest stratum is Langley Silt Member.
6. Will any trees 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?	No, there are no trees on the property.
7. Is there a history of seasonal shrink-swell subsidence in the local area, and/or evidence of such effects at site?	None recorded. Suitable heave protection to be implemented where clay soils are deemed to be desiccated. Kempton Park Gravel Member to be the founding stratum is not liable to seasonal shrink swell.

Slope stability screening chart	
8. Is the site within 100m of a watercourse or a potential spring line?	None recorded.
9. Is the site within an area of previously worked ground?	No. There is no evidence of any previously worked ground on the site.
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?	Yes. The Envirocheck report indicates the Superficial Deposits are a Secondary A Aquifer.
11. Is the site within 50m of the Hampstead Heath Ponds	Not within 50m.
12. Is the site within 5m of a highway or pedestrian right of way?	Yes, the excavation for the rear basement and lowering of the vault section will be within 5m of the Albany Terrace and Park Square East respectively.
13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	No, the neighbouring properties have been constructed with basements to approximately the same depth as the existing basement on this site.
14. Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?	No. The nearest railway tunnel exclusion zone is about 50m from the site boundary.

4.2 SUBTERRANEAN (GROUNDWATER) FLOW

The subterranean (groundwater) flow screening flowchart from CPG4 is displayed in Table 4-2.

Table 4-2: Screening – Subterranean (Groundwater) Flow

Subterranean (groundwater) flow screening chart	
1. a) Is the site located directly above an aquifer?	Yes. The Envirocheck report indicates the Superficial Deposits are a Secondary A Aquifer.
b) Will the proposed basement extend beneath the water table surface?	Based on BGS borehole records the excavation may extend below the groundwater table. However, a ground investigation will be required to assess the longer term conditions of the groundwater beneath the site.
2. Is the site within 100m of a watercourse, well (used/disused) or potential spring line?	No.
3. Is the site within the catchment of the pond chains on Hampstead	No.

Heath?	
4. Will the proposed basement development result in a change in the proportion of hard surfaced/paved external areas?	No. The basements will be constructed in areas which are currently hard surfaced.
5. As part of the site drainage, will more surface water (e.g. rainfall and runoff) than at present be discharged to the ground (e.g. via soakaways and/or SUDS)?	No, there are currently no water discharging to the ground on site or proposed to be constructed. Additionally, the subject site is currently mostly hard landscaped.
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 or spring line?	No. There are no ponds or spring lines identified in the vicinity of the site.

4.3 SURFACE FLOW AND FLOODING

The surface flow and flooding screening flowchart from CPG4 is displayed in Table 4-3.

Table 4-3: Screening – Surface Flow and Flooding

Surface flow and flooding screening chart	
1. Is the site within the catchment of the pond chains on Hampstead Heath?	No.
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. Basements will be constructed in areas which are currently hard surfaced.
3. Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	No. Basements will be constructed in areas which are currently hard surfaced.
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. There are no nearby watercourses.
5. Will the proposed basement result in changes to the quality of surface	No. There are no nearby water courses.

water being received by adjacent properties or downstream watercourses?	
6. Is the site in an area identified to have surface water flood risk or is it at risk from flooding, for example because the proposed basement is below the static water level of nearby surface water feature?	Yes. The site is a high flood risk from surface water flooding. There are no nearby surface water features.

5. SITE INVESTIGATION

A site investigation stage has been undertaken to develop an understanding of the site and its immediate surroundings and for use in assessing matters of concerns identified during the Screening stage. The results have been used to address the matters of concern in the Scoping and Impact Assessment stages.

5.1 INTRUSIVE GROUND INVESTIGATION

A ground investigation (GI) was completed by CET in October 2019 and comprised one 'cut-down' cable percussion borehole (BH01) and two modular windowless sampler boreholes (BH01 & BH02). Details of the GI are outlined in Table 5-1. The boreholes were undertaken within the footprint of the existing property.

Table 5-1: Ground Investigation Details

Type	Reference	Depth mbgl (termination)	Installation Details
'Cut-down' Cable Percussion.	BH01 (Located in rotunda area).	20.45	4m installation with 2m plain pipe and 2m of slotted. Bentonite seal at top and bottom of installation.
Modular Windowless sampler	BH02 (Located in Basement of 17 Park Square East).	18.45	6m installation with 1m plain pipe and 5m of slotted. Bentonite seal at top and bottom of installation.
Modular Windowless sampler	BH03 (Located in Courtyard of 19 Park Square East).	20	10m installation with 2m plain pipe and 5m of slotted. Bentonite seal at top and bottom of installation.

5.2 GROUND AND GROUNDWATER CONDITIONS

A summary of the ground and groundwater conditions encountered in the GI is presented in the table below. The borehole logs are presented in Appendix D.

Table 5-2.1: Summary of Ground Conditions

Strata name	Approximate level to top of strata (mAOD)	Thickness (m)	Description
Made Ground	30	0.25 to 1.9	Very clayey, slightly sandy GRAVEL of angular to rounded, fine to coarse flint and brick. Low cobble content of angular brick.
Langley Silt Member	28.2 to 28.25	1.2 to 1.75m	Firm and firm becoming stiff with depth, brown, slightly gravelly CLAY. Gravel is angular to rounded, fine and medium flint. Or Soft, brown, slightly fine sandy, silty CLAY.
Lynch Hill Gravel Member	27 to 25.78	5.18 to 5.9m	Loose to very dense, brown, very fine to coarse sandy, locally sandy and slightly sandy GRAVEL of sub-angular to rounded, fine to coarse flint.
Weathered and Relatively Unweathered London Clay Formation.	21.3 to 20.6	Not proved.	Stiff, brown mottled grey, becoming brown and grey mottled CLAY with occasional sand size selenite and silt partings. Or Stiff, grey, very closely to closely fissured CLAY with rare fine and medium sand size selenite.

A groundwater seepage was recorded in BH01 at 9.5m below ground level rising to 8m below ground level after 20 minutes of monitoring. Groundwater was likely masked in BH02 and BH03 by the continuous casing of the borehole during the drilling process. Groundwater monitoring standpipes were installed within each of the boreholes to the various depths as described in Table 5-1. Subsequent readings of the standpipes were undertaken and are presented in Table 5-2.2.

Table 5-2.2: Summary of Groundwater Monitoring

Standpipe ID	BH01		BH02		BH03	
Date of Monitoring Visit.	05/12/2019	12/12/2019	05/12/2019	12/12/2019	05/12/2019	12/12/2019
Level (mAOD)	Dry	21.65	21.72	21.74	22.42	23.0

5.3 SITE MODEL

An updated site model for the site has been developed using the information obtained from the site investigation for use during the Scoping and Impact Assessment stages.

The updated site model can be summarised as follows:

- **Excavation Level** – Varying from 25.7mAOD and 25.3mAOD for the bulk excavation, 25mAOD for the underpinning and pads for the basement extension and rear basement and 22.1mAOD for the contiguous bored piles. The Vault area will have the floor lowered to 24.8mAOD with the retaining underpinning blocks founded at 24.3mAOD.
- **Existing Foundation Level for Neighbouring Properties** – Would be anticipated to be at least 25.4mAOD due to the similarly constructed basements.
- **Site Topography** – Relatively flat at 30mAOD
- **Surface Water Bodies** - 473m from the site.
- **Flood Risk** – Less than 0.1% annual risk from water courses and high (greater than 3.3%) from surface water.
- **Ground Conditions**:
    - Made Ground to a minimum level of approximately 28.2mAOD.
    - Langley Silt Member to a minimum level of approximately 25.78mAOD.
    - Lynch Hill Gravel Member to a minimum level of approximately 20.6mAOD.
    - Weathered and relatively unweathered London Clay Formation proved to a minimum level of 7.65mAOD.
- **Aquifer** – Lynch Hill Gravel Member Secondary A Aquifer.
- **Groundwater** – Groundwater level of 23mAOD to 21.65mAOD

6. SCOPING AND IMPACT ASSESSMENT

The Scoping stage identifies the potential impacts of the proposed scheme that were identified by the Screening stage. Items that have been identified as having a potential impact have been taken forward into the Impact Assessment stage.

The following impact assessments are based on concerns identified previously and the CPG4 screening assessments in Section 4.0.

6.1 SLOPE STABILITY

The potential impacts identified in the slope stability CPG4 Stage 1 Screening Assessment, Table 4-1, have been addressed in Table 6-1.

Table 6-1: Scoping- Slope Stability Impact Assessment

Slope stability scoping chart		
Screening Question	**Scoping**	**Impact Assessment**
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?	"Yes. The Envirocheck report indicates the Superficial Deposits are a Secondary A Aquifer." Groundwater level for the site was measured to a level of between 23mAOD and 21.65mAOD. Bulk excavation is to be 25.7mAOD and 25.3mAOD. Excavation is not likely to encounter groundwater.	No impact assessment required. Further consideration given below.

12. Is the site within 5m of a highway or pedestrian right of way?	"Yes, the excavation for the rear basement and lowering of the vault section will be within 5m of the Albany Terrace and Park Square East respectively." Excavation and formation of the basement could cause ground movement affecting the carriageway.	The basement design and construction will need to consider the carriageway in a similar manor to how it addresses the neighbouring properties. The impacts and potential mitigation are discussed in more detail below.

Groundwater has been monitored over a short term period. Taking in to account the water strikes during the investigation and subsequent monitoring readings groundwater has always been encountered at levels exceeding 25mAOD. However this represents the groundwater level over the period of October to December, and further groundwater monitoring may be required to assess the seasonal variations and long term groundwater conditions.

Piling works are however likely to encounter groundwater based on the above stated water levels and based on a founding level of 22.1mAOD. It is the contractors responsibility to ensure that the chosen piling method and equipment are sufficient for dealing with the likely water ingress.

Ground movement associated with forming the basement excavation is a potential hazard. A Damage Category Assessment (DCA) (Sections 7 and 8) has been completed to assess the effects of the excavation and construction of the proposed basement on neighbouring properties.

The excavation and construction of the proposed basement will inevitably cause some ground movement. The magnitude of movements when using underpinning techniques will primarily depend on the geology, the adequacy of temporary support to both the underpinning excavations and the partially complete underpinning prior to installation of full permanent support as well as the quality of workmanship when constructing the permanent structure.

It is crucial therefore that the use of best practice methods of temporary support and high-quality workmanship are used to control ground movements alongside the basement excavations. Prior to excavations for the underpinning works all cracks in load-bearing walls that have weakened structural integrity should be fully repaired in accordance with recommendations from the appointed structural engineer.

Under UK standard practice, the design and implementation of temporary works is the contractor's responsibility, so it is considered essential that the contractor employed for these works has successfully completed similar schemes. Therefore, it is recommended to carefully pre-select the contractors invited to

tender for the works. The contractor's temporary works should be fully detailed in the works method statements.

6.2 SUBTERRANEAN GROUNDWATER FLOW

The potential impacts identified in the subterranean flow CPG4 Stage 1 Screening Assessment, Table 4-2, have been addressed in Table 6-2.

Table 6-2: Scoping and Impact Assessment- Subterranean (Groundwater) Flow Impact Assessment

Subterranean (groundwater) flow scoping chart		
Screening Question	**Scoping**	**Impact Assessment**
1. a) Is the site located directly above an aquifer?	"Yes. The Envirocheck report indicates the Superficial Deposits are a Secondary A Aquifer." The groundwater table has been recorded to a level lower than the lowest proposed excavation level, i.e below a level of 24.3mAOD.	Based on the measured water levels within the boreholes any continuous obstructions are not likely to encounter groundwater. There are currently similarly constructed basements to that proposed on this site existing on adjacent sites. These surround the site in all four cardinal directions. Although, based on measured groundwater levels, groundwater is not likely to rise to the level of the continuous obstructions these existing basements will be forming obstructions to groundwater flow as it stands. Therefore should groundwater level rise groundwater flow is not likely to be significantly impacted by the basement extension in any direction. At the current proposed pile founding depth groundwater is likely to be encountered. Contiguous bored piles are the currently proposed foundation solution. As such water may pass freely between locations where piles are installed. Although this may initiate a short term rise in the groundwater level in the short term this will likely have little impact on the longer term groundwater regime. This hydrogeological regime (i.e. groundwater levels and pressures) will be affected by long-term climatic variations as well as seasonal fluctuations and other man-induced influences, all of which must be considered by the designers when

		selecting a design water level for the permanent works. No long term, multi-seasonal groundwater monitoring data is available, so a conservative approach will be needed, as required by current geotechnical design standards.
b) Will the proposed basement extend beneath the water table surface?	The ground investigation and subsequent monitoring visits encountered groundwater at its shallowest to be 23mAOD. This indicates that the contagious bored piles will likely encounter groundwater.	See above comments, comments on piling works in section 6.1 of this report and comments on piling works in the geotechnical report.

6.3 SURFACE WATER

The potential impacts identified in the subterranean flow CPG4 Stage 1 Screening Assessment, Table 4-3, have been addressed in Table 6-3.

Table 6-3: Scoping and Impact Assessment- Surface Water Flow Impact Assessment

Surface water scoping chart		
Screening Question	**Scoping**	**Impact Assessment**
6. Is the site in an area identified to have surface water flood risk or is it at risk from flooding, for example because the proposed basement is below the static water level of nearby surface water feature?	"Yes. The site is a high flood risk from surface water flooding. There are no nearby surface water features."	The site is currently situated in an area identified as a high surface water flood risk (greater than 3.3% annually) by the Environment Agency and Camden Borough Council. The development must therefore meet the requirements as set out in LBC Core Strategy Camden Development Policy 27, which state that "the scale of the scheme is such that there is no, or minimal, impact on drainage conditions". The current proposed basement construction is located beneath areas which are already covered by hard surfacing. Therefore the construction of the basements is likely to have little effect on the drainage conditions. In addition as stated in section 6.2 of this report subterranean water flow is likely to be little impacted over the long term.

7. GROUND MOVEMENT ASSESSMENT

7.1 INTRODUCTION

Oasys PDISP software has been used to undertake the analyses of heave and settlement ground movements arising from changes in vertical stresses caused by excavation of the basement. The analysis is based on Boussinesq's theory of analysis for calculating stresses and strains in soils due to vertically applied loads with the predicted ground movements being derived by integration of vertical strains derived from Boussinesq's equations. These preliminary analyses have not modelled the horizontal forces on the retaining walls and so have simplified the stress regime significantly. In addition, consistent with Boussinesq theory, the soils are assumed to comprise a semi-infinite isotropically homogeneous elastic medium.

7.2 PROPOSED BASEMENT LAYOUT

The basement layout has been based on drawings provided by Form Structural Design (Figure 1). The proposed basement is to be constructed in three parts nominally the basement extension, rear basement and vault area.

The layout of the extension is to be approximately 6m by 14m and bulk excavation to a level of 25.3mOAD. Line loadings on the contiguous bored pile retaining walls have been determined to be between 32kN/m run and 28kN/m run. Internal pads are proposed to be constructed within the footprint of the extension and within part of the existing basement footprint to a founding level of 25mAOD. It has been assumed for the purposes of this report that pads will be 1.6m by 1.6m founded 1m below slab level. Pressures have been calculated based on provided point loads based on the dimensions above of being between 278kN/m^2 to 61kN/m^2.

The layout of the rear basement is irregular polygon in shape with sides up to 11m in length and bulk excavation to a level of 25.7mAOD. Line loadings for these walls have been advised to be between 88.8kN/m run to 34.3kN/m run.

The vault area is to have the floor level lowered by 1.2m from a current level of approximately 26mAOD. Underpinning blocks will be used to form the retaining structure and has been assumed to be founding 1m below the proposed final floor level and be cast in 1m wide bays.

Gross pressure changes across the development have been based on information provided by the structural engineer. The load zones, positive and negative, used to model the proposed basement in PDISP are displayed in Figure 1. These include the excavation and loads on the retaining walls, excavation of central area from existing ground level and construction of the basement ground bearing floor slab.

It is assumed the retaining walls will be cast in 1m wide bays with a base width of about 1m, and the contiguous bored pile wall will have a diameter of 350mm. A soil berm followed by thrust blocks and props will be used to prop the bored pile walls prior to construction of the ground floor and basement floor slabs which will act as permanent propping for the walls.

Table 7-2 presents the net changes in vertical pressure for each load zone for the four major stages in the sequence of stress changes which will result from excavation and construction of the basement as outlined below:

- Stage 1: Construction of retaining walls – Short-term (undrained) condition;
- Stage 2: Bulk excavation to basement formation level – Short-term (undrained) conditions;
- Stage 3: Construction of the internal pads- Short-term (undrained) conditions;
- Stage 4: Construction of the basement floor slab – Short-term (undrained) conditions; and
- Stage 5: Construction of the basement – Long-term (drained) conditions.

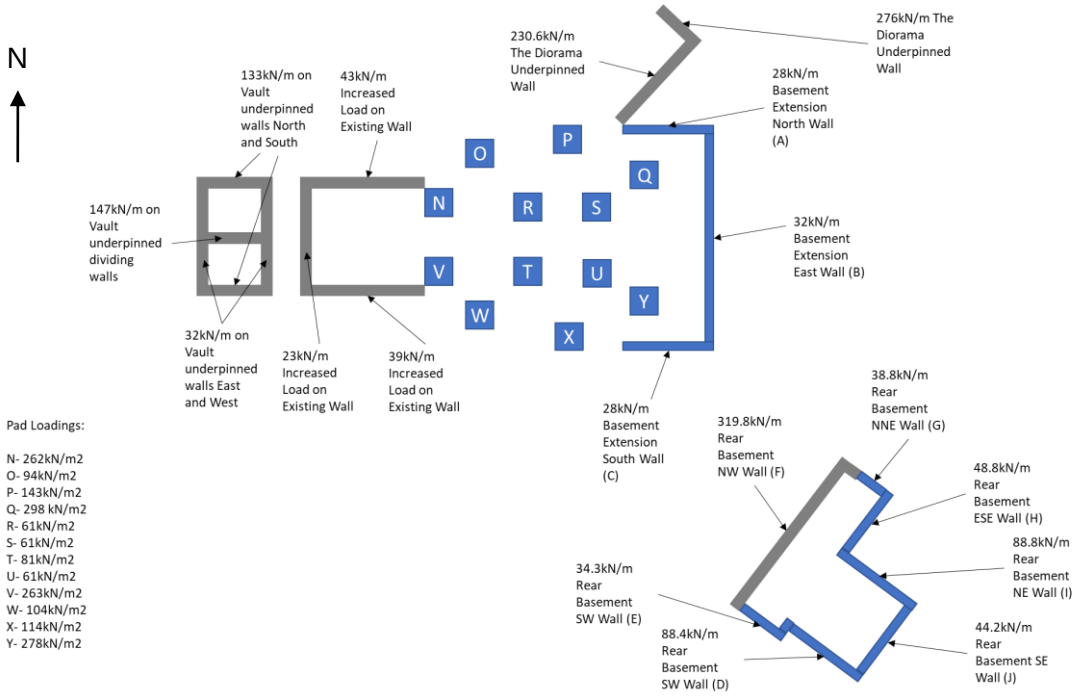


Figure 1: Loaded Zones Introduced to PDISP

Table 7-2: Maximum Net Bearing Pressures for PDISP

Zone		Maximum Net change in vertical pressure (kN/m^2)		
	Stage 1 Retaining wall	Stage 2 Bulk Excavation	Stage 3 Internal Pad Construction	Stages 3 & 4 Basement construction short and long term
Basement walls	319.8	319.8	319.8	319.8
Basement Pads	0	0	278	278
Basement floor slab	0	-54	-54	-43.8

7.3 GROUND CONDITIONS

The ground conditions are based on the CET ground investigation are shown in Table 7-2 and the logs are contained in Appendix D. In light of the ground investigation the proposed basement will be constructed within the Lynch Hill Gravel Member with underpinning blocks and pads founding at 25mAOD, and contiguous bored piles founding at 22.1mAOD.

The short-term and long-term geotechnical properties used in the analysis are summarised in Table 7-3. These were based on the results of the ground investigation. The Young's modulus properties for the Lynch Hill Gravel Member and London Clay Formation have been selected based on average SPT 'N' values at the foundation depth. The derivation of parameters has been done using CIRIA Special Publication 27 and CIRIA Special Publication 200.

All the Made Ground and Langley Silt Member will be excavated and therefore only the change in vertical pressure, due to its excavation, is required for the PDISP analyses. Geotechnical parameters for the Made Ground and Langley Silt Member are not used in the analysis.

A global Poisson's ratio of 0.3 has been adopted for the Lynch Hill Gravel Member and 0.5 for the London Clay Formation over their respective modelled thickness. This has been based on guidance provided in Thomlinson's *Foundation Design and Construction* and Simons and Menzies' *A Short Course In Foundation Engineering*.

Table 7-3: Soil Parameters for PDISP

Strata	Level to Top of Strata (mAOD)	Bulk Density (kN/m^3)	Undrained Young's Modulus, Eu (MPa)	Drained Young's Modulus, E' (MPa)
Made Ground	30	19	Not used	Not used
Langley Silt Member	29.2 to 28.25	18	Not used	Not used
Lynch Hill Gravel Member	27 to 25.78	20	60	60
London Clay Formation	21.3 to 20.6	19	59	35

7.4 PDISP ANALYSIS

Three dimensional analyses of vertical displacements have been undertaken using PDISP software and the basement geometry, loads/stresses and ground conditions outlined above to assess the potential magnitudes of ground movements (heave or settlement) which may result from the vertical stress changes caused by excavation of the basement. PDISP analyses have been carried out as follows:

- Stage 1: Construction of retaining walls – Short-term (undrained) condition;
- Stage 2: Bulk excavation to basement formation level – Short-term (undrained) conditions;
- Stage 3: Construction of the internal pads- Short-term (undrained) conditions;
- Stage 4: Construction of the basement floor slab – Short-term (undrained) conditions; and
- Stage 5: Construction of the basement – Long-term (drained) conditions.

The results of the analyses for Stages 1, 2, 3, 4 and 5 are presented as contour plots in Appendix E.

7.5 HEAVE SETTLEMENT ANALYSIS

Excavation of the basement and construction of the retaining walls will cause immediate elastic heave/settlements in response to the stress changes. The basement will be founded on granular soils that will likely have relatively small immediate effects. In addition the choice of piling method should be such that noise and vibration are limited to avoid damage to nearby structures, services and public carriageways.

The ranges of predicted short-term and long-term movements for each of the main sections of the proposed basement are presented in Table 7-5. Positive values in Table 7-5 represent settlement and negative values represent heave. All values are approximate owing to the simplification of the stress regime and include only displacements caused by stress changes in the ground beneath the basement.

All the short-term elastic displacements would have occurred before the basement slab is cast, so only the post-construction incremental heave/settlements, the difference from Stages 3, short-term, to 4, long-term, are relevant to the slab design.

Table 7-5: Summary of Predicted Ground Movements form PDISP

Location / Building Element	Stage 1 (short term) Retaining walls	Stage 2 (short term) Bulk Excavation	Stage 3 (short term) Internal Pads	Stage 4 (short term) Basement floor slab construction	Stage 5 (long term) Basement construction
17 Park Square East Rear Wall	0.6mm to 0.1mm	0.3mm to 0.1mm	1.5mm to 0.1mm	1.6mm to 0.1mm	2.6mm to 0.2mm
19 Park Square East Rear Wall	Negligible	-0.6mm to -0.1mm	0.7mm to Negligible Heave	0.7mm to Negligible Heave	1.1mm to Negligible Heave
19 Park Square East Courtyard Wall	0.4mm to 0.1mm	-1.1mm to 0mm	0.7mm to Negligible Heave	0.9mm to 0.1mm	1.4mm to 0.1mm
18 Park Square East South West Wall	4.6mm to 0.1mm	4mm to 0mm	4mm to 0mm	4mm to 0mm	5.2mm to 0.1mm
18 Park Square East South East Wall	4.4mm to 0mm	3.8mm to 0mm	3.8mm to 0mm	3.8mm to 0mm	4.8mm to -0.2mm
17 Park Square East Vault Area Rear Wall	1.9mm to 0mm	1.8mm to 0mm	1.8mm to 0mm	1.9mm to 0mm	3.2mm to 0mm
19 Park Square East Vault Area Rear Wall	1.9mm to 0mm	1.8mm to 0mm	1.8mm to 0mm	1.9mm to 0mm	3.2mm to 0mm
Basement Extension Floor Slab Area	1.4mm to 0.2mm	-4.8mm to -1.8mm	-3.2mm to 0mm	1mm to -2.3mm	1.5mm to -2.6mm

Rear Basement Floor Slab Area	4.5mm to 4.1mm	1.8mm to 0.6mm	1.8mm to 0.5mm	2mm to 1.3mm	3.8mm to 3.2mm
Vault Area Floor Slab	3.5mm to 2.2mm	2.6mm to 1.1mm	2.6mm to 1.1mm	3mm to 1.6mm	4mm to 2.9mm

8. DAMAGE CATEGORY ASSESSMENT

8.1 INTRODUCTION

Behaviour of the ground will depend on the quality and methods of construction, so rigorous calculations of predicted ground movements are not practical. However, provided that the temporary support follows best practice, then industry experience has shown that the bulk movements of the ground alongside retaining walls for a single storey basement at a nominal depth 3.5m below ground level should not exceed 5mm horizontally. This figure should be adjusted pro-rata for shallower or deeper basements.

To relate these predicted ground movements to possible damage to adjacent properties, it is necessary to consider the strains and the angular distortion (as a deflection ratio) that may be generated using the method proposed by Burland (2001, in CIRIA Special Publication 200, which developed earlier work by Burland and others).

8.2 CRITICAL DAMAGE CATEGORY LOCATIONS

Evidence from site visits suggest that the neighbouring properties on Park Square East have similarly constructed basements to that which currently exist on site. There are no proposals currently being considered by the London Borough of Camden as confirmed by a search of their planning application portal.

As ground movements reduce with distance away from the proposed basement and the relative founding depths, the worst-case scenarios will be the courtyard wall with No. 19 Park Square East, No. 18 Park Square East South East and South West Walls, No. 17 and No.19 Vault Rear Walls that are located perpendicular and sub-perpendicular to the proposed basement. The locations of the assessed walls are displayed in Figure 2.

Where current foundation details of neighbouring properties have not been available assumed parameters have been used. These values will require validation prior to construction. As a reduction in the values assumed herein will likely result in higher damage category outcomes.

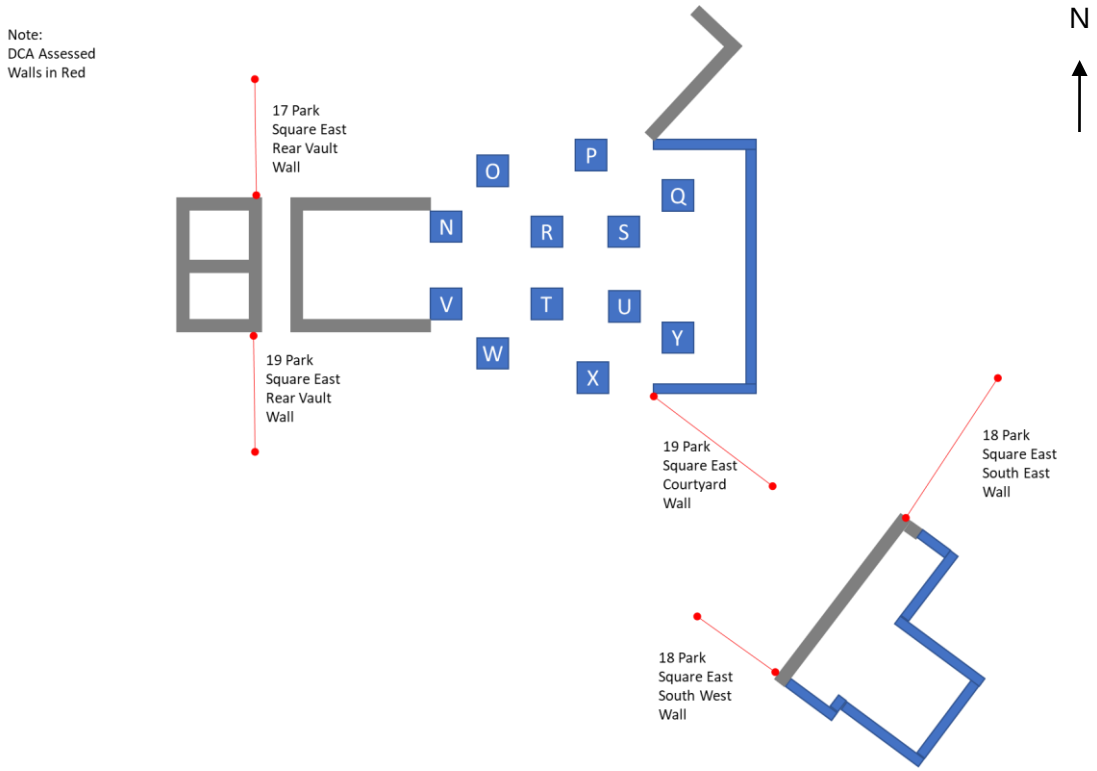


Figure 2: Critical Damage Category Assessment (DCA) Locations

8.3 AFFECTED WIDTHS OF CRITICAL LOCATIONS

The damage category assessments will consider the PDISP analyses of ground movements from vertical stress changes and ground movements alongside the proposed underpinning retaining walls caused by relaxation of the ground in response to the excavations.

CIRIA C760 (Gaba et al., 2017) details that ground movements related to the construction of retaining walls in coarse-grained soil extends up to two times the depth of excavation. A settlement of up to 0.3% of the maximum excavation depth is predicted by CIRIA C760 which is considered appropriate for the development. The relevant geometries of the assessed locations have been obtained from the available drawings or approximated using maps and aerial images. The relevant geometries and affected widths and predicted settlements of the critical locations are detailed in Table 8-3. Where data was not available for foundation depths assumed parameters have been used which will require validation prior to construction.

Table 8-3: Geometries, Affected Widths and Predicted Settlements of Critical Locations

	17 Park Square East Vault Area Rear Wall	19 Park Square East Vault Area Rear Wall	19 Park Square East Courtyard Wall	18 Park Square East South West Wall	18 Park Square East South East Wall
Relative depth of foundations beneath ground floor	0.7m (assumed)	0.7m (assumed)	1.3m (assumed)	0.7m (assumed)	0.7m (assumed)
Level of excavation (below foundation level)	25.3mAOD – 24.8mAOD = 0.5m	25.3mAOD – 25.8mAOD = 0.5m	27.2mAOD – 25.3m AOD = 1.9m	27.8mAOD – 25.7m AOD = 2.1m	27.8mAOD – 25.7m AOD = 2.1m
Zone of influence behind basement wall (settlement)	0.5 x 2 = 1m	0.5 x 2 = 1m	1.9 x 2= 3.8m	2.1 x 2= 4.2m	2.1 x 2= 4.2m
Zone of influence behind basement wall (horizontal)	0.5 x 4 = 2m	0.5 x 4 = 2m	1.9 x 4= 7.6m	2.1 x 4= 8.4m	2.1 x 4= 8.4m
Ground surface movement due to excavation in front of basement wall (CIRIA 760 Figure 6.16)	0.3% of max excavation depth	0.3% of max excavation depth	0.3% of max excavation depth	0.15% of max excavation depth	0.15% of max excavation depth
Distance from proposed excavation	0m	0m	0m	1m	1m
Approximate width of assessed wall	6m	6m	10m	9m	12m
Affected width, L	1m	1m	3.8m	4.2m	4.2m
Height of affected building, H	3m (approximate average height)	3m (approximate average height)	12m (approximate average height)	12m (approximate average height)	12m (approximate average height)
L / H	c. 0.5	c. 0.5	c. 0.5	c. 0.5	c. 0.5
CIRIA predicted settlement	1.5mm	1.5mm	5.7mm	3.15mm	3.15mm

8.4 DISPLACEMENTS ALONG ASSESSED WALLS

The predicted horizontal displacements and the relative theoretical horizontal strains beneath each wall as well as the maximum settlements produced by PDISP beneath the location of the assessed walls are displayed in Table 8-4.1.

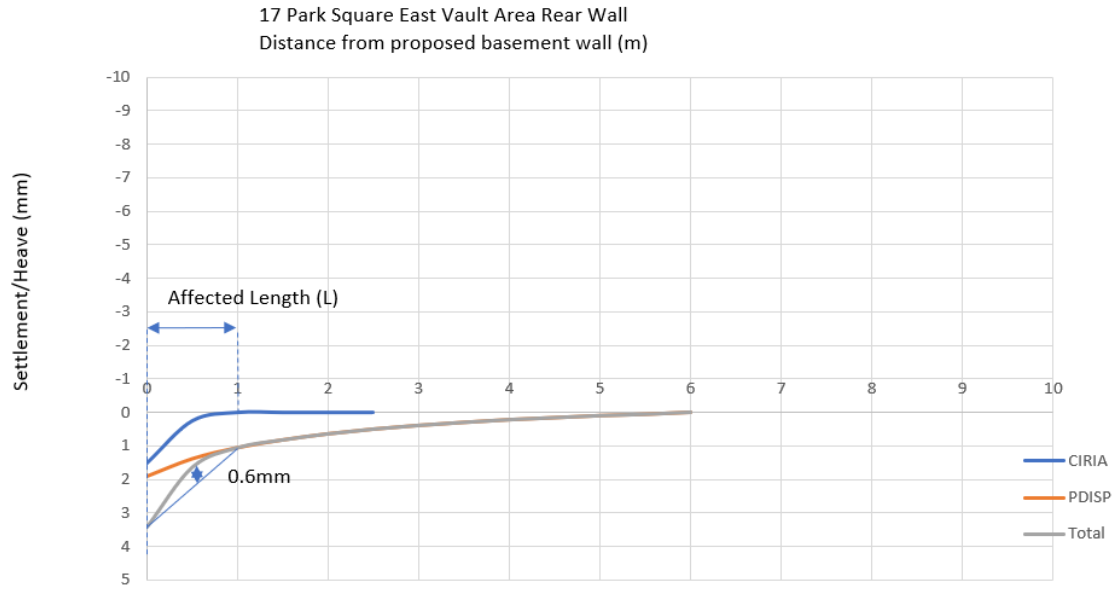
Table 8-4.1: Displacements of Assessed Walls at Closest Point

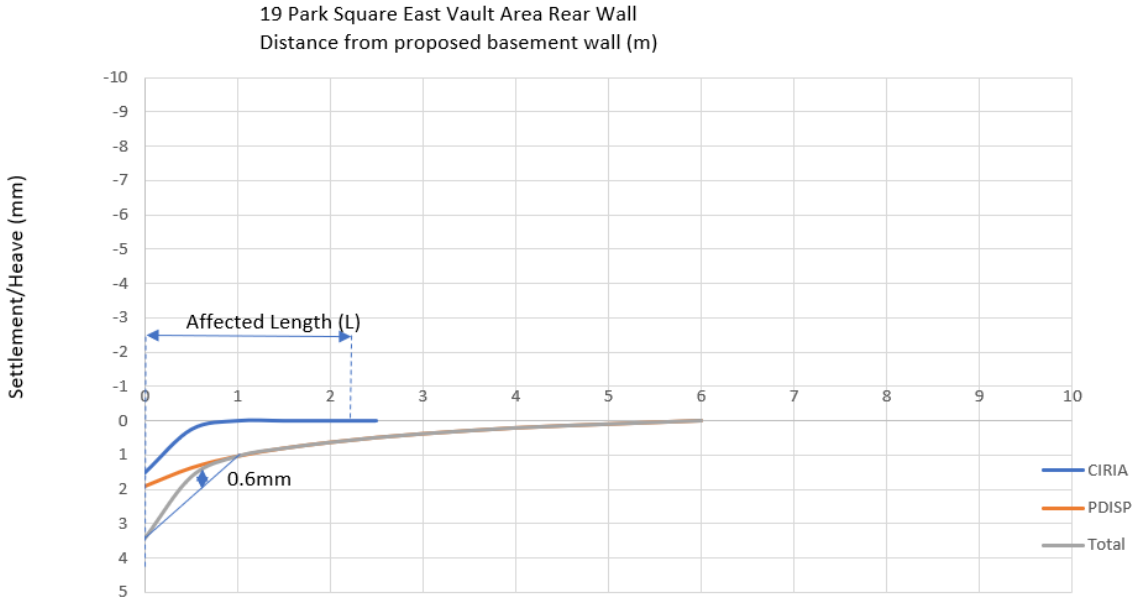
	17 Park Square East Vault Area Rear Wall	19 Park Square East Vault Area Rear Wall	19 Park Square East Courtyard Wall	18 Park Square East South West Wall	18 Park Square East South East Wall
Horizontal displacement	0.7mm	0.7mm	2.7mm	3mm	3mm
Horizontal strain, ε_h	0.036%	0.036%	0.036%	0.036%	0.036%
Maximum PDISP settlement	1.9mm	1.9mm	0.9mm	4.6mm	4.4mm
CIRIA settlement	1.5mm	1.5mm	5.7mm	3.15mm	3.15mm
Combined CIRIA and PDISP settlement	3.4mm	3.4mm	5.6mm	7.75mm	7.55mm

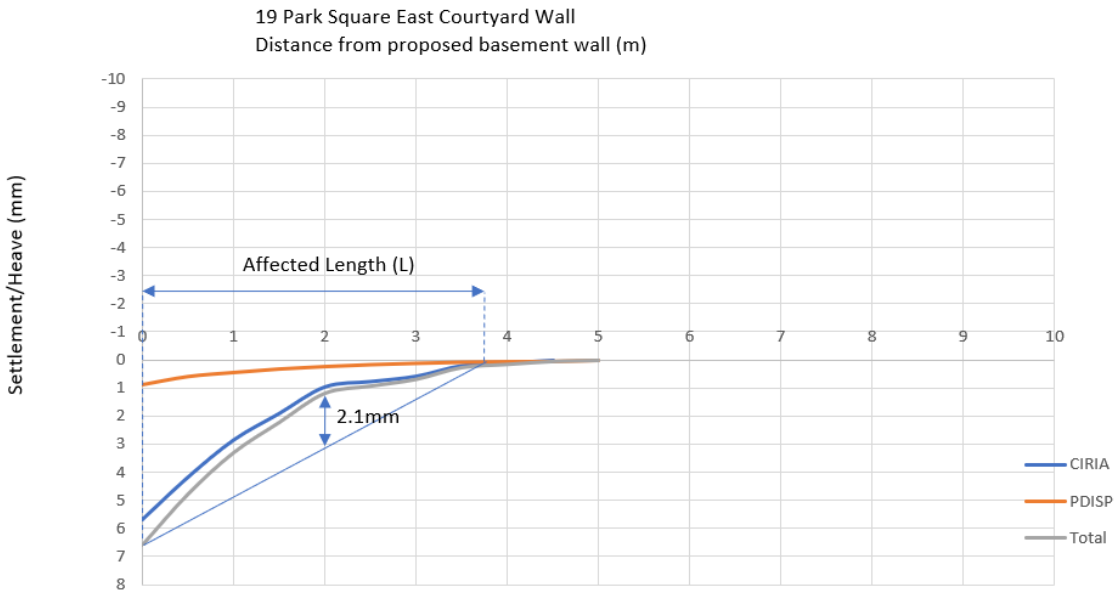
The horizontal strain is the horizontal displacement divided by the affected wall width.

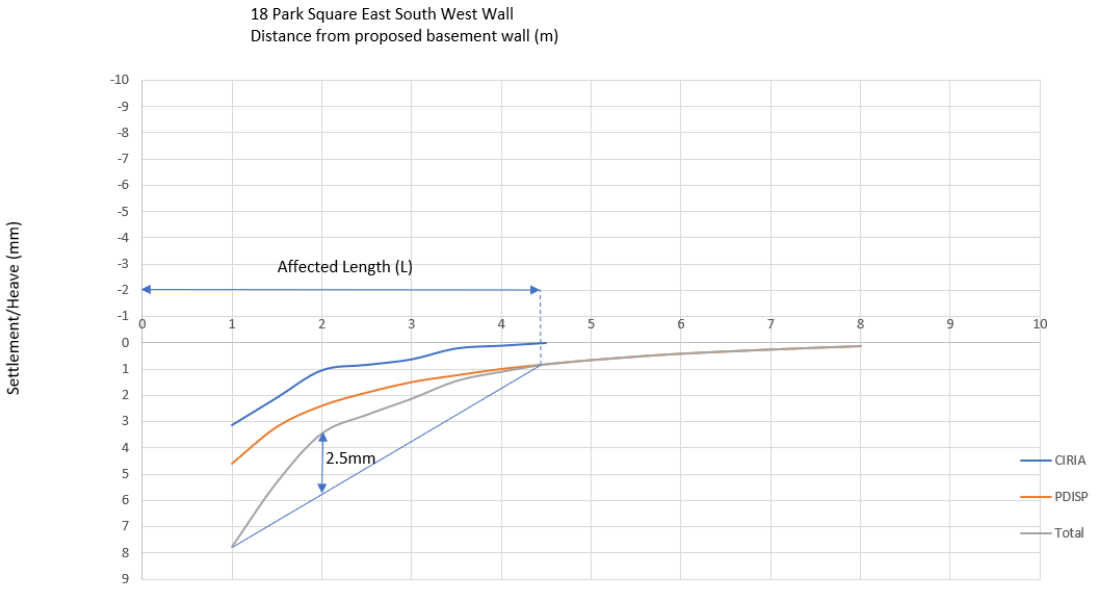
The settlement profile produced by PDISP along the assessed wall locations must be added to the settlement profile presented in Figure 6.16 of CIRIA Report C760, which is appropriate for the proposed construction method. The combined maximum settlements, at the closest point of the assessed walls are displayed in Table 8-2. The CIRIA settlement profiles from the basement wall to the maximum distance of affected ground are predicted to be the same for both walls and this is displayed in Figure 3.

The deflection along the walls is calculated as the difference between the tangent of the relevant width of the affected walls and the total combined predicted ground surface movements curves from the CIRIA C760 and the PDISP analyses.


17 Park Square East Vault Area Rear Wall
Distance from proposed basement wall (m)
Settlement/Heave (mm)
Affected Length (L)
0.6mm
CIRIA
PDISP
Total


19 Park Square East Vault Area Rear Wall
Distance from proposed basement wall (m)
Settlement/Heave (mm)
Affected Length (L)
0.6mm
CIRIA
PDISP
Total


19 Park Square East Courtyard Wall
Distance from proposed basement wall (m)
Settlement/Heave (mm)
Affected Length (L)
2.1mm
CIRIA
PDISP
Total


18 Park Square East South West Wall
Distance from proposed basement wall (m)
Settlement/Heave (mm)
Affected Length (L)
2.5mm
CIRIA
PDISP
Total

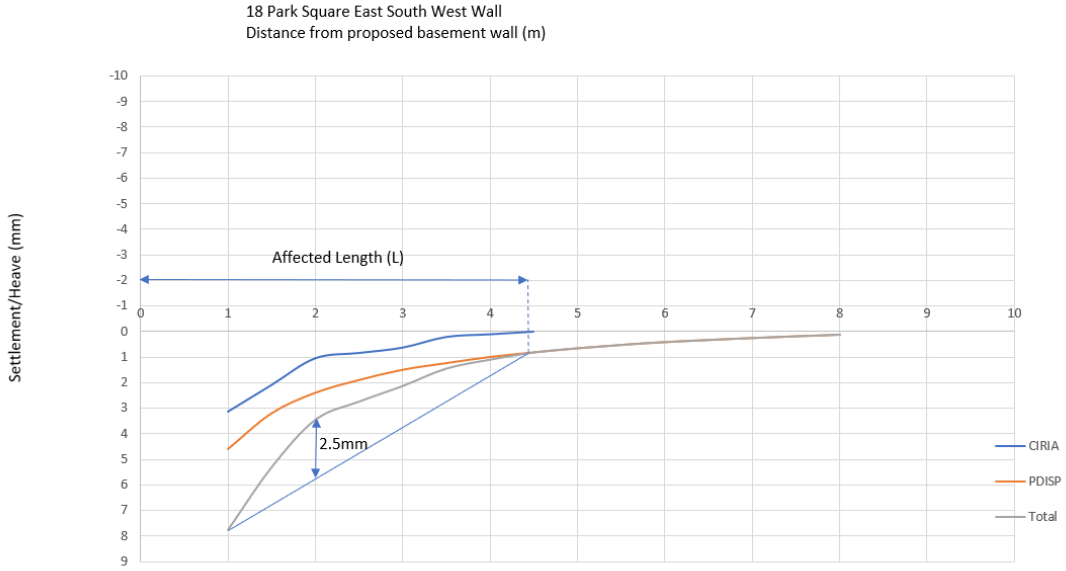


Figure 3: Predicted Displacements for Assessed Walls

The maximum vertical deflections, from the convex settlement curves for the coarse-grained soils support case and the relevant deflection ratios are displayed in Table 8-4.2.

The deflection along the wall is calculated as the difference between the tangent of the relevant width of the affected wall and the total combined predicted ground surface movements curves (from Figure 6.16 of CIRIA C760 and the PDISP analyses). Deflection ratios are measured as the above value divided by the affected width due to settlement.

Table 8-4.2: Vertical Deflections of Assessed Walls

	17 Park Square East Vault Area Rear Wall	19 Park Square East Vault Area Rear Wall	19 Park Square East Courtyard Wall	18 Park Square East South West Wall	18 Park Square East South East Wall
Vertical deflection, Δ	0.6mm	0.6mm	2.1mm	2.5mm	2.5mm
Deflection ratio, Δ/L	0.060%	0.060%	0.055%	0.060%	0.060%

8.5 DAMAGE CATEGOREY RATING

The damage category for the assessed walls are illustrated in Figure 4, using the damage category ratings and graphs given in CIRIA SP200. Figure 5 explains the damage categories.

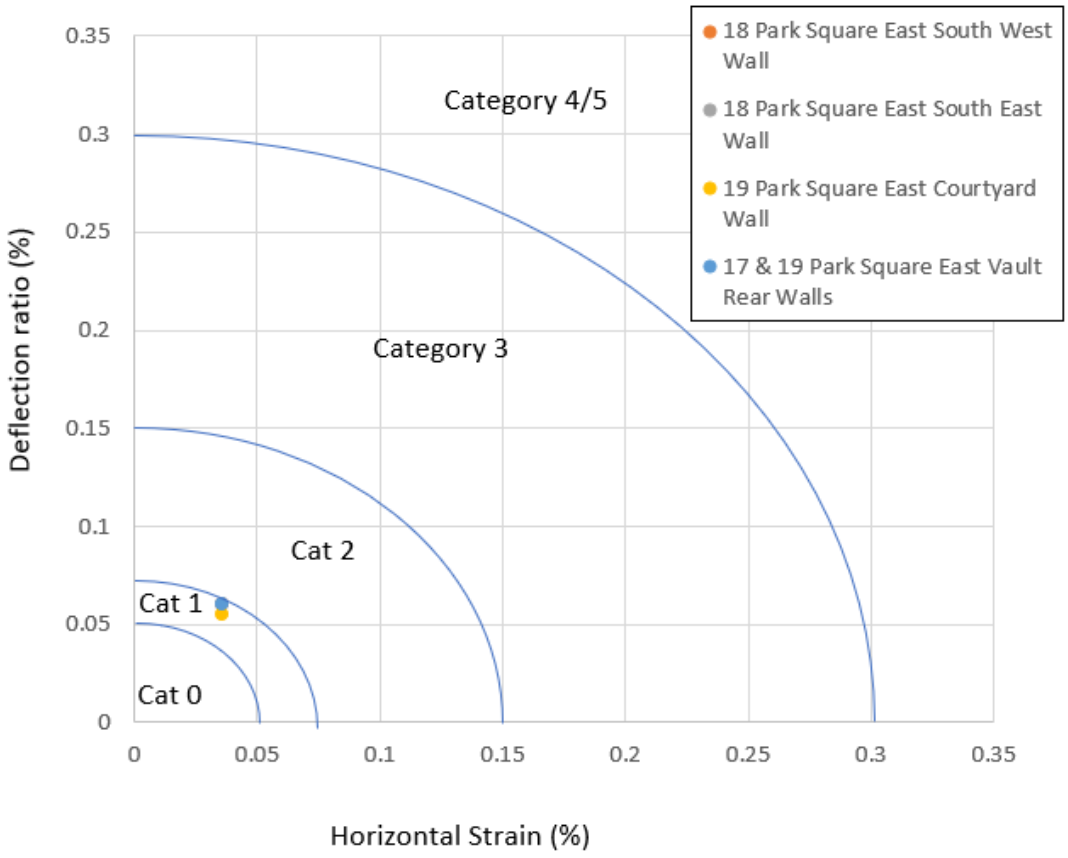


Figure 4: Damage Category Ratings

The results show the affected walls are:

- 18 Park Square East South West Wall
- 18 Park Square East South East Wall
- 19 Park Square East Courtyard Wall
- 17 & 19 Park Square East Vault Rear Walls

Any walls outside of the ones considered above are further away from proposed excavations and as such will have damage categories lower than those presented in figure 4. As such these would be expected to have damage categories of below 2 which is allowable under Camden guidance.

Use of best practice construction methods will be essential to ensure that the ground movements are kept in line with the above predictions. Pre-construction condition surveys of neighbouring properties are also recommended and a system of monitoring adjoining/adjacent structures should be established before the works start.

Category of damage	Description of typical damage (ease of repair is underlined)	Approximate crack width (mm)	Limiting tensile strain, ε_{lim} (%)
0 Negligible	Hairline cracks of less than about 0.1 mm are classed as negligible	<0.1	0.0 to 0.05
1 Very slight	**Fine cracks that can easily be treated during normal decoration.** Perhaps isolated slight fracture in building. Cracks in external brickwork visible on inspection	<1	0.05 to 0.075
2 Slight	**Cracks easily filled. Redecoration probably required.** Several slight fractures showing inside of building. Cracks are visible externally and **some repointing may be required externally** to ensure weathertightness. Doors and windows may stick slightly.	<5	0.075 to 0.15
3 Moderate	**The cracks require some opening up and can be patched by a mason. Recurrent cracks can be masked by suitable lining. 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 to 15 or a number of cracks >3	0.15 to 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. Services pipes disrupted.	15 to 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 shoring. Windows broken with distortion. Danger of instability.	Usually >25, but depends on numbers of cracks	

Notes

1 In assessing the degree of damage, account must be taken of its location in the building or structure.

2 Crack width is only one aspect of damage and should not be used on its own as a direct measure of it.

Figure 5: Classification of Visual Damage to Wall

(after Burland et al, 1977; and Boscardin and Cording, 1989; and Burland, 2001).

9. BASEMENT IMPACT ASSESSMENT AND SUMMARY

This Summary includes the principal aspects and primary findings of this assessment. The whole report should be read to obtain a full understanding of the matters considered.

Location: 17 Park Square East, W8 6JW in the London Borough of Camden.

9.1 STAGE 1: SCREENING

Items identified during a Screening stage as requiring further assessment are outlined below.

Slope Stability:

Slope stability screening chart	
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?	Yes. The Envirocheck report indicates the Superficial Deposits are a Secondary A Aquifer.
12. Is the site within 5m of a highway or pedestrian right of way?	Yes, the excavation for the rear basement and lowering of the vault section will be within 5m of the Albany Terrace and Park Square East respectively.

Subterranean Groundwater Flow:

Subterranean (groundwater) flow screening chart	
1. a) Is the site located directly above an aquifer?	Yes. The Envirocheck report indicates the Superficial Deposits are a Secondary A Aquifer.
b) Will the proposed basement extend beneath the water table surface?	Based on BGS borehole records the excavation may extend below the groundwater table. However, a ground investigation will be required to assess the longer term conditions of the groundwater beneath the site.

Surface Flow and Flooding:

Surface flow and flooding screening chart	
6. Is the site in an area identified to have surface water flood risk or is it at risk from flooding, for example because the proposed basement is below the static water level of nearby surface water feature?	Yes. The site is a high flood risk from surface water flooding. There are no nearby surface water features.

9.2 GROUND INVESTIGATION

A ground investigation (GI) was completed by CET in October 2019 and comprised one 'cut-down' cable percussion borehole (BH01) and two modular windowless sampler boreholes (BH01 & BH02).

Strata name	Approximate level to top of strata (mAOD)	Thickness (m)	Description
Made Ground	30	0.25 to 1.9	Very clayey, slightly sandy GRAVEL of angular to rounded, fine to coarse flint and brick. Low cobble content of angular brick.
Langley Silt Member	28.2 to 28.25	1.2 to 1.75m	Firm and firm becoming stiff with depth, brown, slightly gravelly CLAY. Gravel is angular to rounded, fine and medium flint. Or Soft, brown, slightly fine sandy, silty CLAY.
Lynch Hill Gravel Member	27 to 25.78	5.18 to 5.9m	Loose to very dense, brown, very fine to coarse sandy, locally sandy and slightly sandy GRAVEL of sub-angular to rounded, fine to coarse flint.
Weathered and	21.3 to 20.6	Not proved.	Stiff, brown mottled grey, becoming brown and grey mottled CLAY with

Relatively Unweathered London Clay Formation.			occasional sand size selenite and silt partings. Or Stiff, grey, very closely to closely fissured CLAY with rare fine and medium sand size selenite.

A groundwater seepage was recorded in BH01 at 9.5m below ground level rising to 8m below ground level after 20 minutes of monitoring. Groundwater was likely masked in BH02 and BH03 by the continuous casing of the borehole during the drilling process. Groundwater monitoring standpipes were installed within each of the boreholes to the various depths as described in Table 5-1 of this report. Subsequent readings of the standpipes were undertaken with groundwater level varying between 23mAOD to 21.65mAOD.

9.3 SITE MODEL

A ground model for the site is summarised as follows:

- **Excavation Level** – Varying from 25.7mAOD and 25.3mAOD for the bulk excavation, 25mAOD for the underpinning and pads for the basement extension and rear basement and 22.1mAOD for the contiguous bored piles. The Vault area will have the floor lowered to 24.8mAOD with the retaining underpinning blocks founded at 24.3mAOD.
- **Existing Foundation Level for Neighbouring Properties** – Would be anticipated to be at least 25.4mAOD due to the similarly constructed basements.
- **Site Topography** – Relatively flat at 30mAOD
- **Surface Water Bodies** - 473m from the site.
- **Flood Risk** – Less than 0.1% annual risk from water courses and high (greater than 3.3%) from surface water.
- **Ground Conditions**:
    - Made Ground to a minimum level of approximately 28.2mAOD.
    - Langley Silt Member to a minimum level of approximately 25.78mAOD.
    - Lynch Hill Gravel Member to a minimum level of approximately 20.6mAOD.
    - Weathered and relatively unweathered London Clay Formation proved to a minimum level of 7.65mAOD.
- **Aquifer** – Lynch Hill Gravel Member Secondary A Aquifer.
- **Groundwater** – Groundwater level of 23mAOD to 21.65mAOD

9.4 SCOPING AND IMPACT ASSESSMENT

- Flooding from surface water is characterised as high for this site indicating that there is a greater than 3.3% annual risk from flooding at the development site. The development must therefore meet the requirements as set out in LBC Core Strategy Camden Development Policy 27, which state that "the scale of the scheme is such that there is no, or minimal, impact on drainage conditions". As presented in the screening stage, the basement construction will not materially affect the flow of surface water on the site.
- The basement excavation is not likely to encounter groundwater during construction based on the data gathered over the short-term groundwater monitoring. However, the piling scheme is likely to encounter groundwater based on a pile founding level of 22.1mAOD. The piling contractor will be required to adopt a technique that has the ability to deal with any water ingress that may occur. As the current scheme calls for contiguous bored pile wall there will be gaps on both sides of each individual pile and as such the effect on the groundwater is likely to be minimal over the short-term and negligible over the long term.
- Construction of the basement and lowering of the vault ground floor will result in lowering of the foundations compared to adjacent sites by an assumed net value of between 2.1m and 0.5m, and excavations of the basement will result in some ground movements. The effect of this has been reviewed in the ground movement and damage category assessment sections of this report. Contour plots of displacement in response to the changes in vertical pressure caused by the excavation and construction of the proposed basement are included. Based upon the maximum displacements predicted by PDISP analyses, Damage Category Assessments were undertaken for the worst-case scenarios in the adjoining properties and these combined with the ground movements alongside the basement in response to the lateral stress release are as predicted by CIRIA publication C760.
- In the assessed cases, the nearest walls have been classified as damage category 1 'very slight' (as given in CIRIA SP200). The damage category results have been plotted graphically in Figure 4. No further Damage Category Assessments have been carried out as other structures in the vicinity are further away and therefore considered lower risk. Parameters for founding depths have been assumed where not data was available, and this will require validation prior to construction. Use of best practice construction methods will be essential to ensure that the ground movements are kept in line with the above predictions. Pre-construction condition surveys of neighbouring properties are also recommended, and a system of monitoring adjoining and adjacent structures should be established before the works start.

10. REFFERENCES

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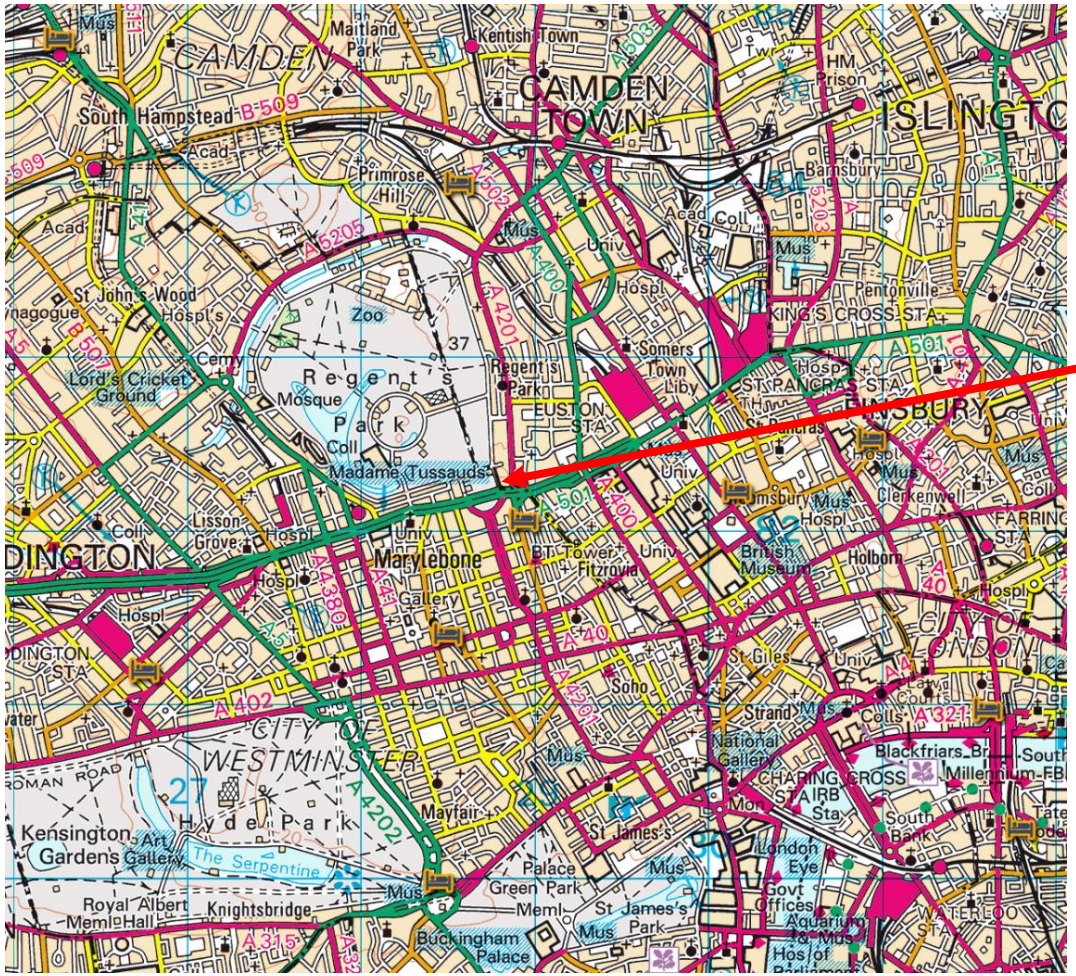
APPENDIX A
CET REPORT FIGURES

CET INFRASTRUCTURE
Giving our all

Northdown House, Ashford Road, Harrietsham, Maidstone
Kent, ME17 1QW
Telephone: 01622 858545 Facsimile: 01622 858544

The Diorama- 17-19 Park Square East

Lead No.			
1038915			
Created By:	Checked:	Approved:	Date:
JM	**PJW**	**PJW**	**November 2019**



Site Location Plan

Scale: 1 square = 1km

FIGURE A1

INFRASTRUCTURE
Giving our all

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The Diorama- 17-19 Park Square East

Lead No.
1038915

Created By:	Checked:	Approved:	Date:
JM	**PJW**	**PJW**	**November 2019**

Transport for London Property Asset Manager

Tunnel Asset Locations

Scale: As shown

FIGURE A2

CET INFRASTRUCTURE
Giving our all

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Telephone: 01622 858545 Facsimile: 01622 858544

The Diorama- 17-19 Park Square East

Lead No.
1038915

Created By:	Checked:	Approved:	Date:
JM	**PJW**	**PJW**	**November 2019**

Topographic Map

Scale: NTS

FIGURE A3

CET INFRASTRUCTURE
Giving our all

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Telephone: 01622 858545 Facsimile: 01622 858544

The Diorama- 17-19 Park Square East

Lead No.			
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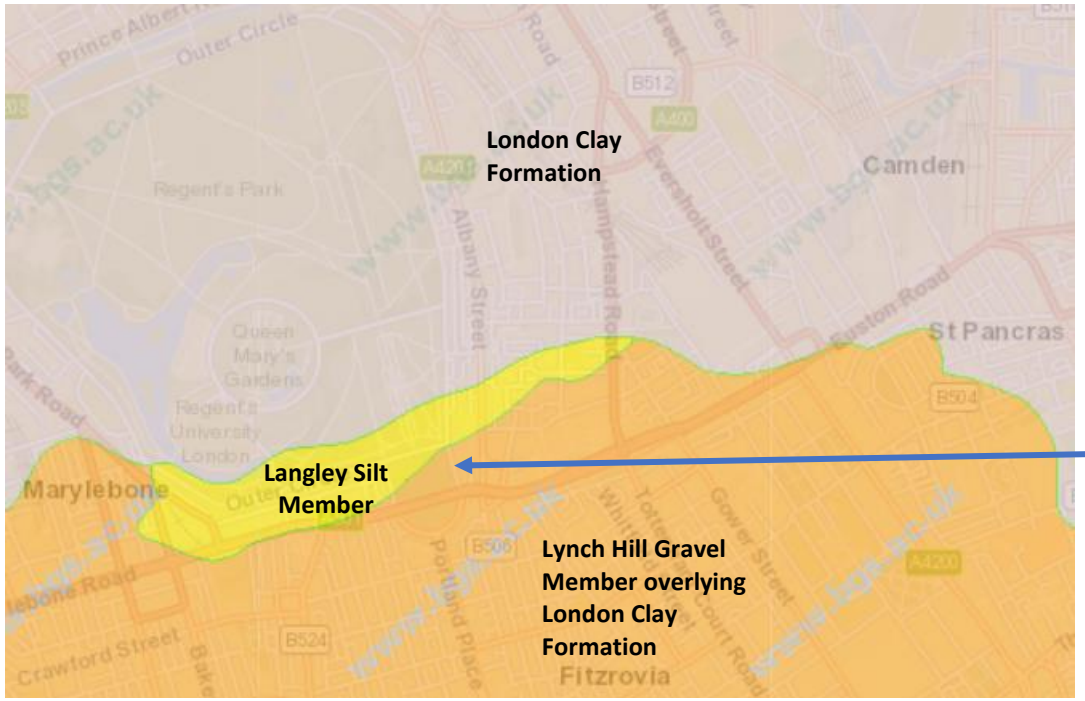
Created By:	Checked:	Approved:	Date:
JM	**PJW**	**PJW**	**November 2019**



Geological Map

Scale: As shown

FIGURE A4

CET INFRASTRUCTURE
Giving our all

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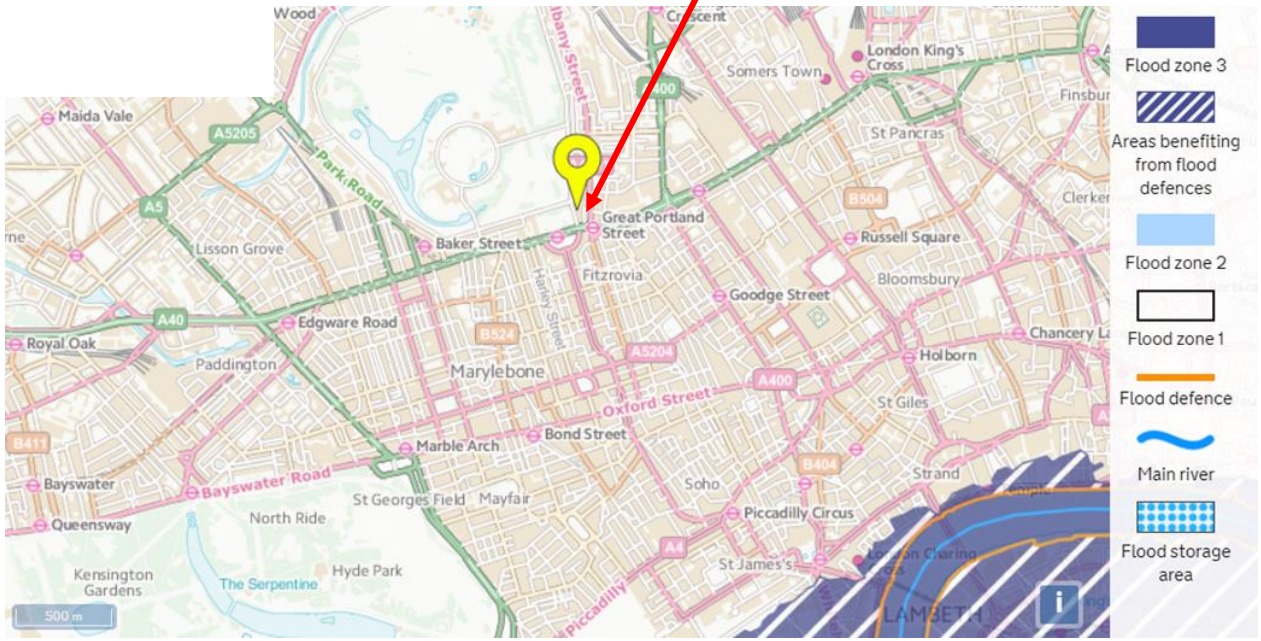
Kent, ME17 1QW
Telephone: 01622 858545 Facsimile: 01622 858544

The Diorama- 17-19 Park Square East			Lead No. 1038915
Created By: JM	Checked: PJW	Approved: PJW	Date: November 2019

FLOOD ZONE 1

Land and property in flood zone 1 have a low probability of flooding

More information about flood zones



Flood Zone Map

Scale: As shown

FIGURE A5

INFRASTRUCTURE
Giving our all

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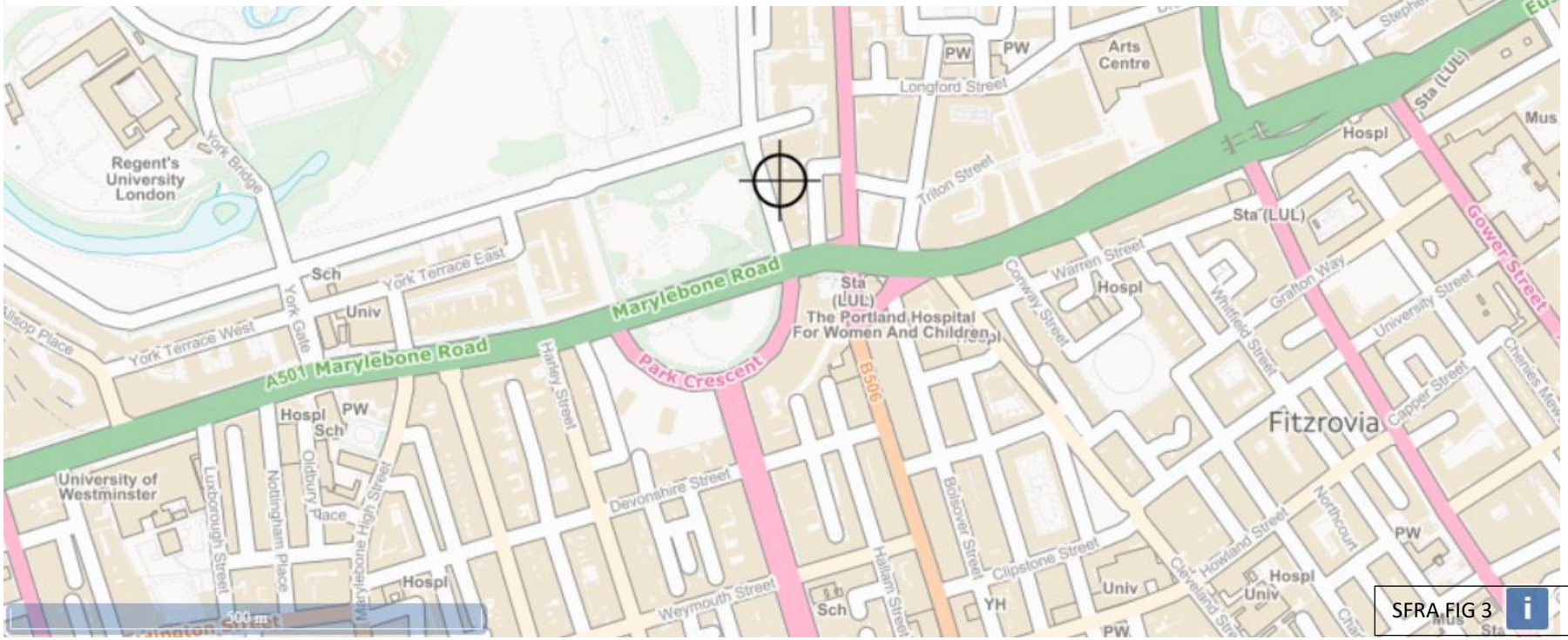
Kent, ME17 1QW
Telephone: 01622 858545 Facsimile: 01622 858544

The Diorama- 17-19 Park Square East

Lead No.			
1038915			
Created By: **JM**	Checked: **PJW**	Approved: **PJW**	Date: **November 2019**

Flood risk from rivers or the sea

Very low risk means that each year this area has a chance of flooding of less than 0.1%. This takes into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped, or fail.



North

Flood Risk (Rivers & Seas)

Scale: NTS

FIGURE A6

CET INFRASTRUCTURE
Giving our all

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Kent, ME17 1QW
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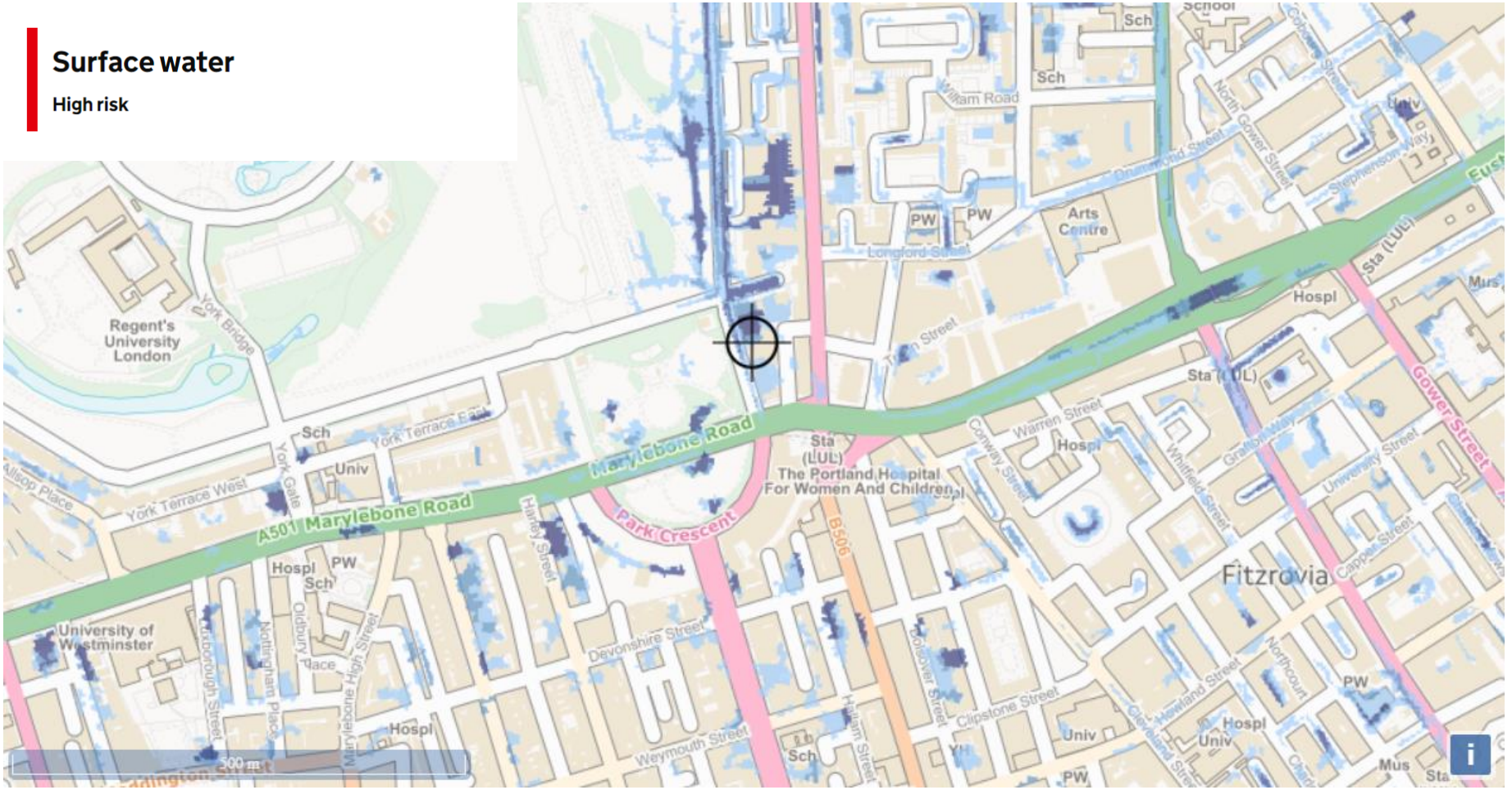
The Diorama- 17-19 Park Square East

Lead No.	Created By:	Checked:	Approved:	Date:
1038915	JM	PJW	PJW	November 2019

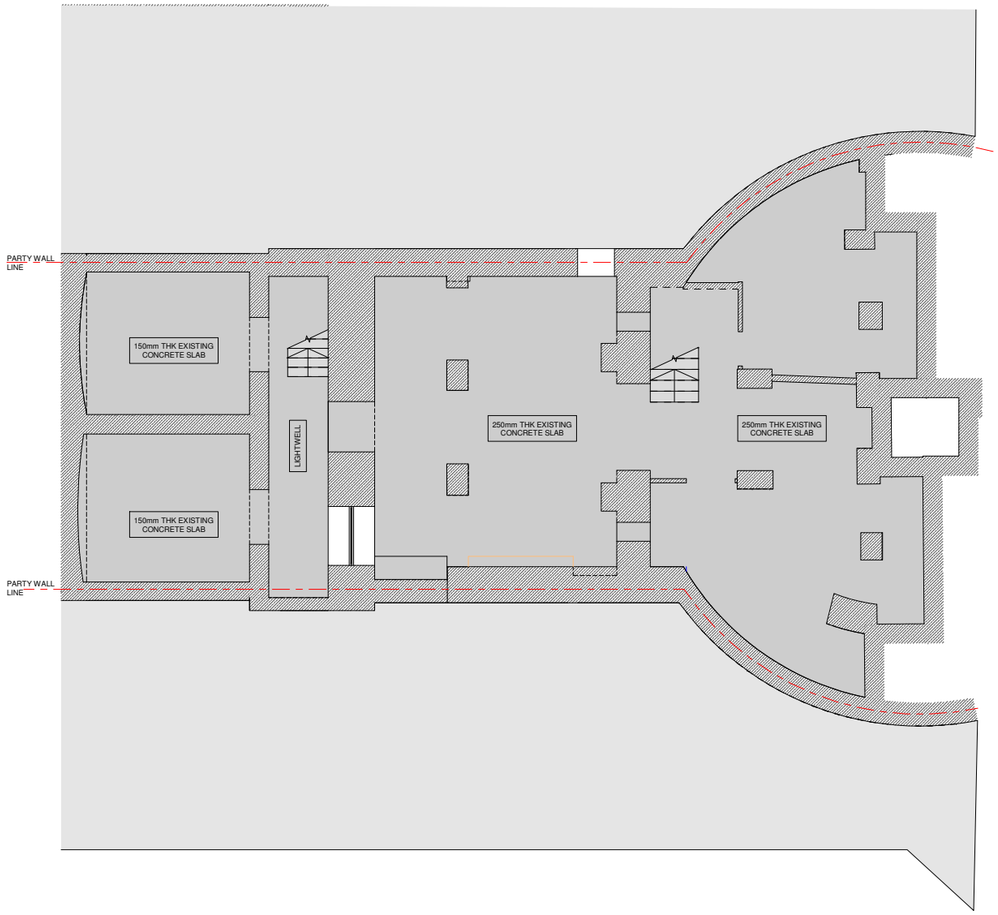


Flood Risk (Surface Water)

Scale: As shown

FIGURE A7

APPENDIX B
PROPOSED DEVELOPMENT PLANS



Rev	Date	Amendment	Drawn / Chkd
P1	11.12.19	ISSUED FOR PLANNING	PE / SD

Drawing Status: PRELIMINARY

Form

Job Title
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Drawing Title
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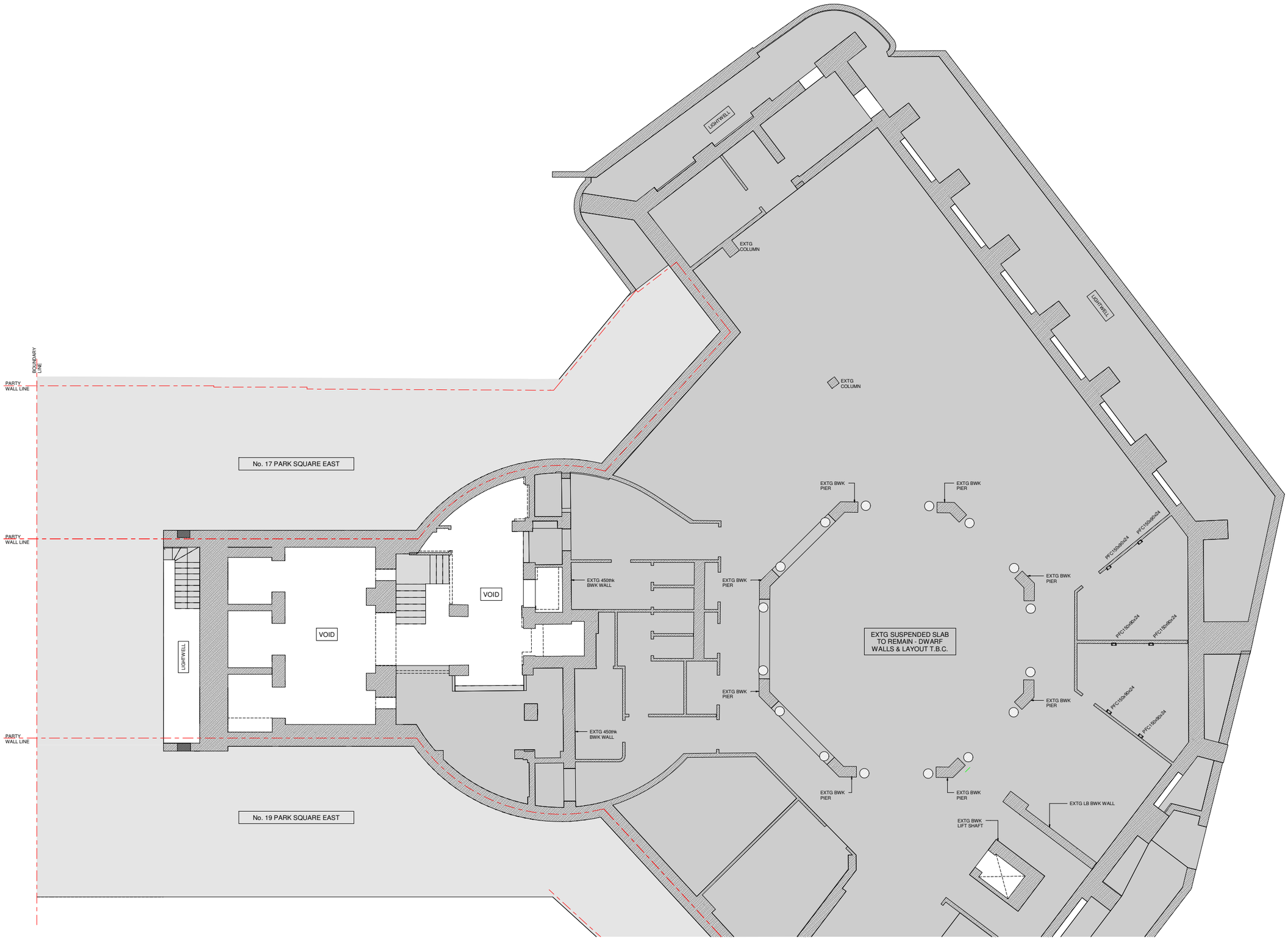

EXISTING LOWER GROUND FLOOR LEVEL - PART 1

1 : 50 @ A0 / 1:100 @ A2

0m 1m 2m 3m 4m 5m

1:50 @ A0 ; 1:100 @ A2

Rev	Date	Amendment	Drawn / Chkd
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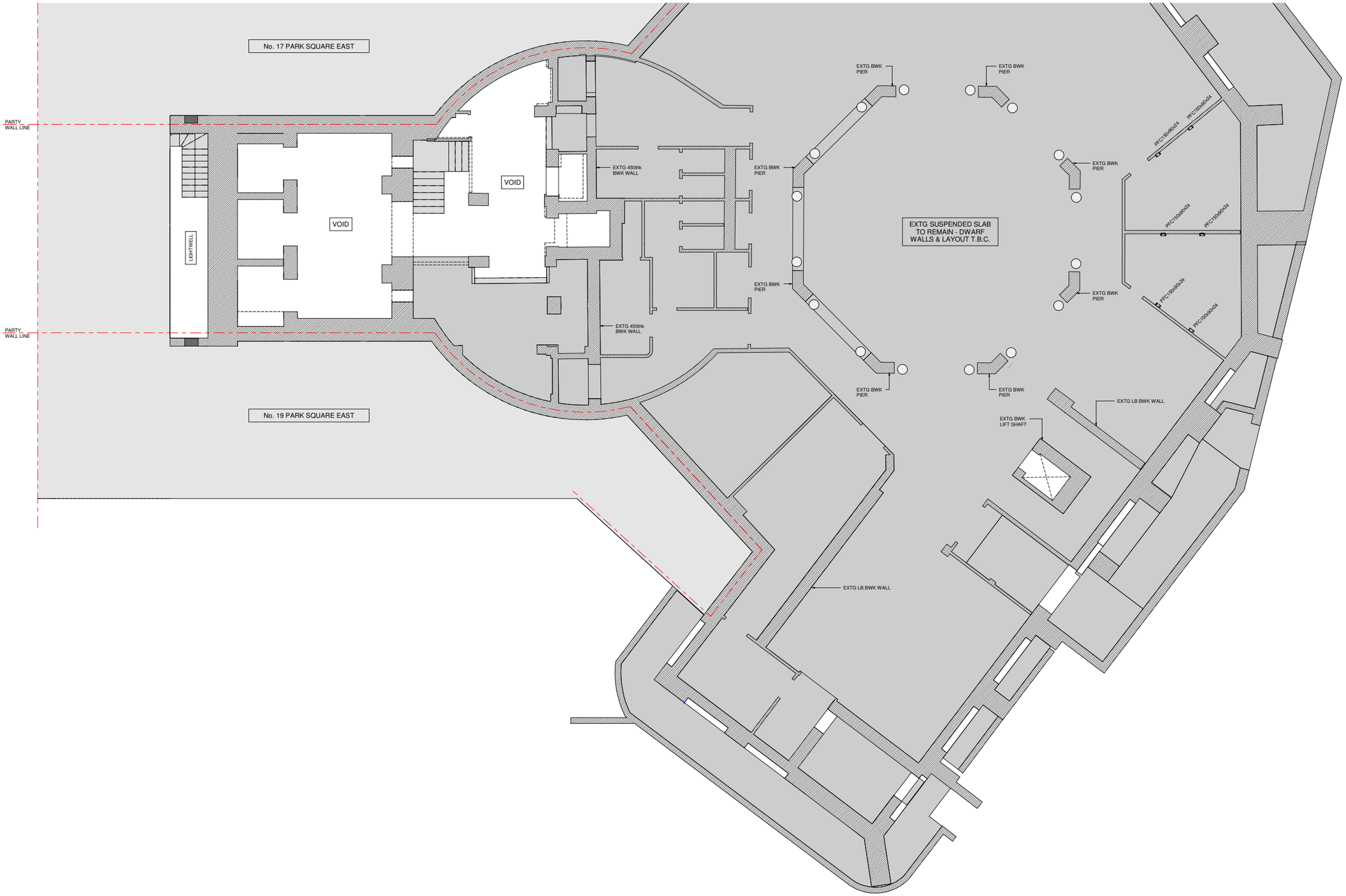

EXISTING LOWER GROUNDF FLOOR LEVEL - PART 2

1 : 50 @ A0 / 1:100 @ A2

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P1	11.12.19	ISSUED FOR PLANNING	PE / SD

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0m 1m 2m 3m 4m 5m

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Date	Scale	Drawn	Checked
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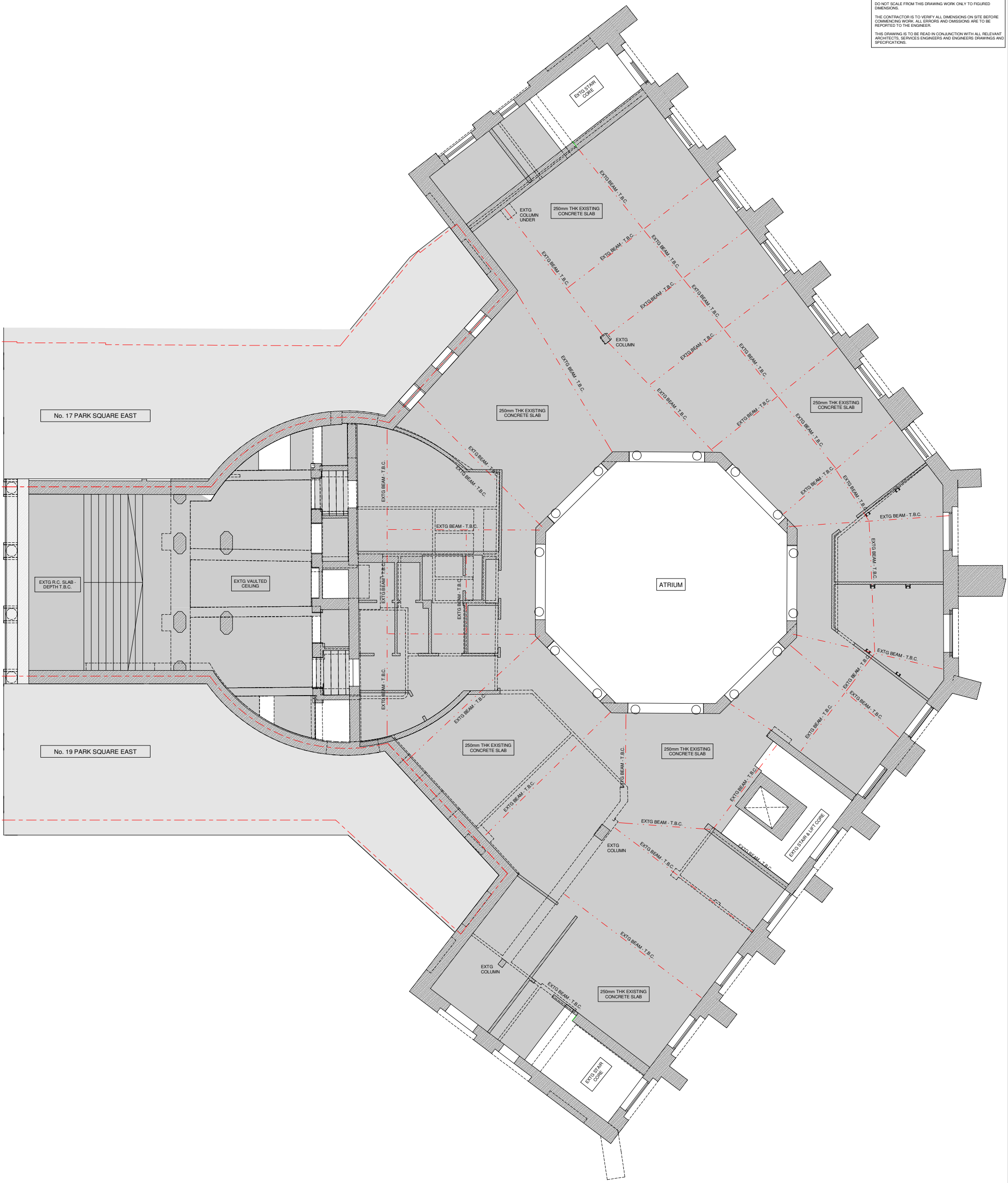

EXISTING UPPER GROUND FLOOR PLAN

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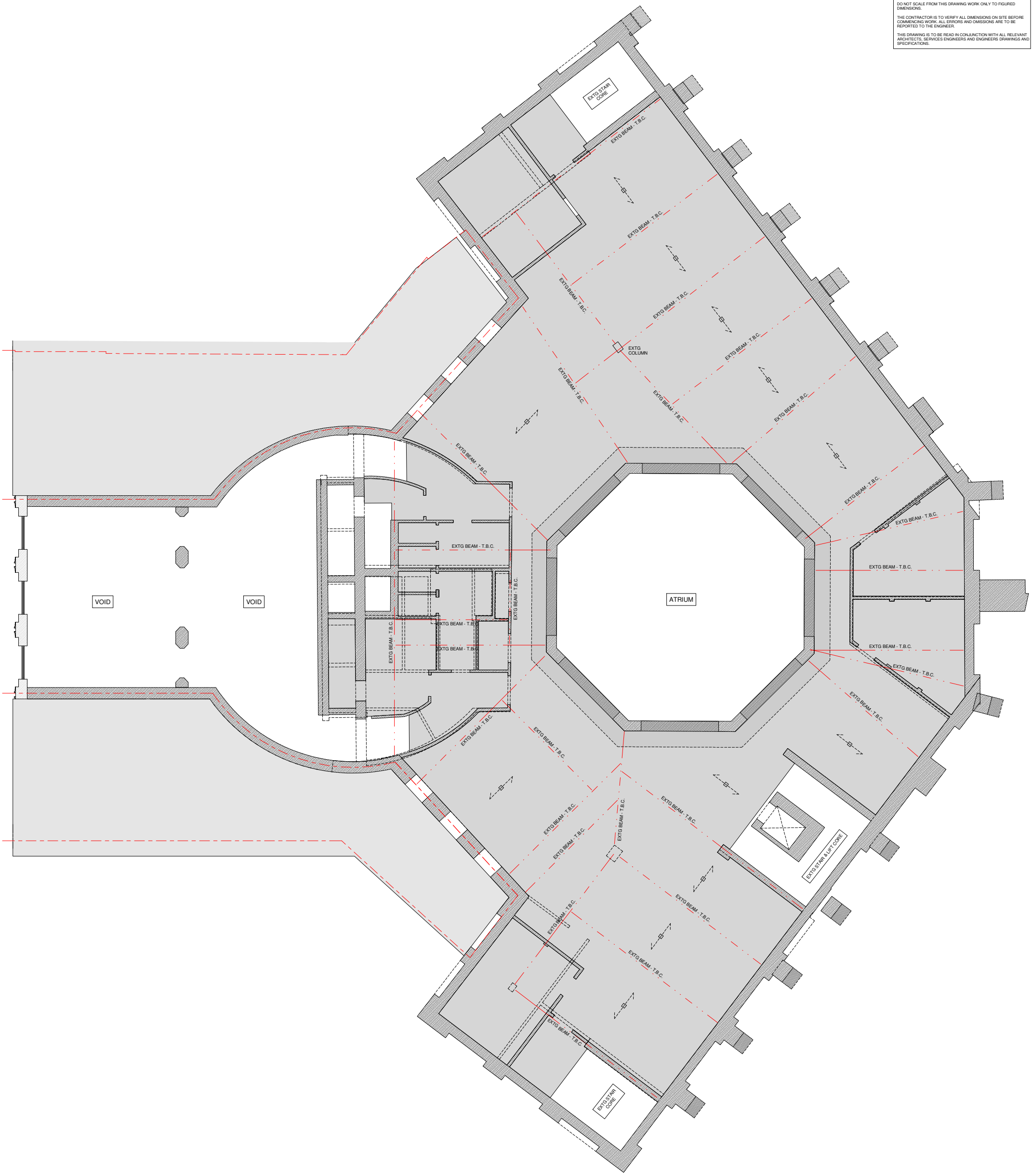

EXISTING FIRST FLOOR PLAN

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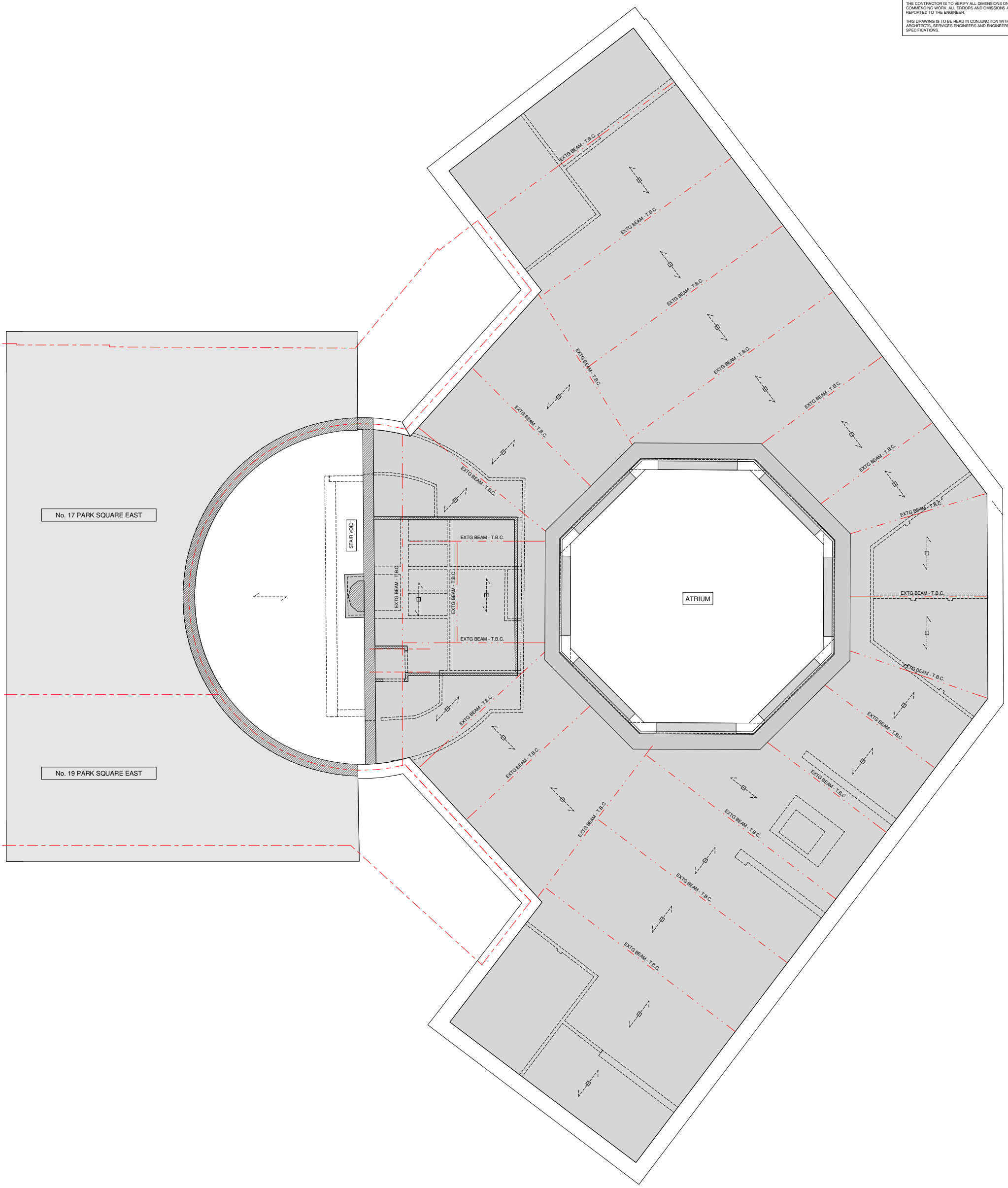

EXISTING MAIN ROOF PLAN

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P1	11.12.19	ISSUED FOR PLANNING	PE / SD

Drawing Status: PRELIMINARY

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LONDON

Drawing Title
EXISTING MAIN ROOF PLAN

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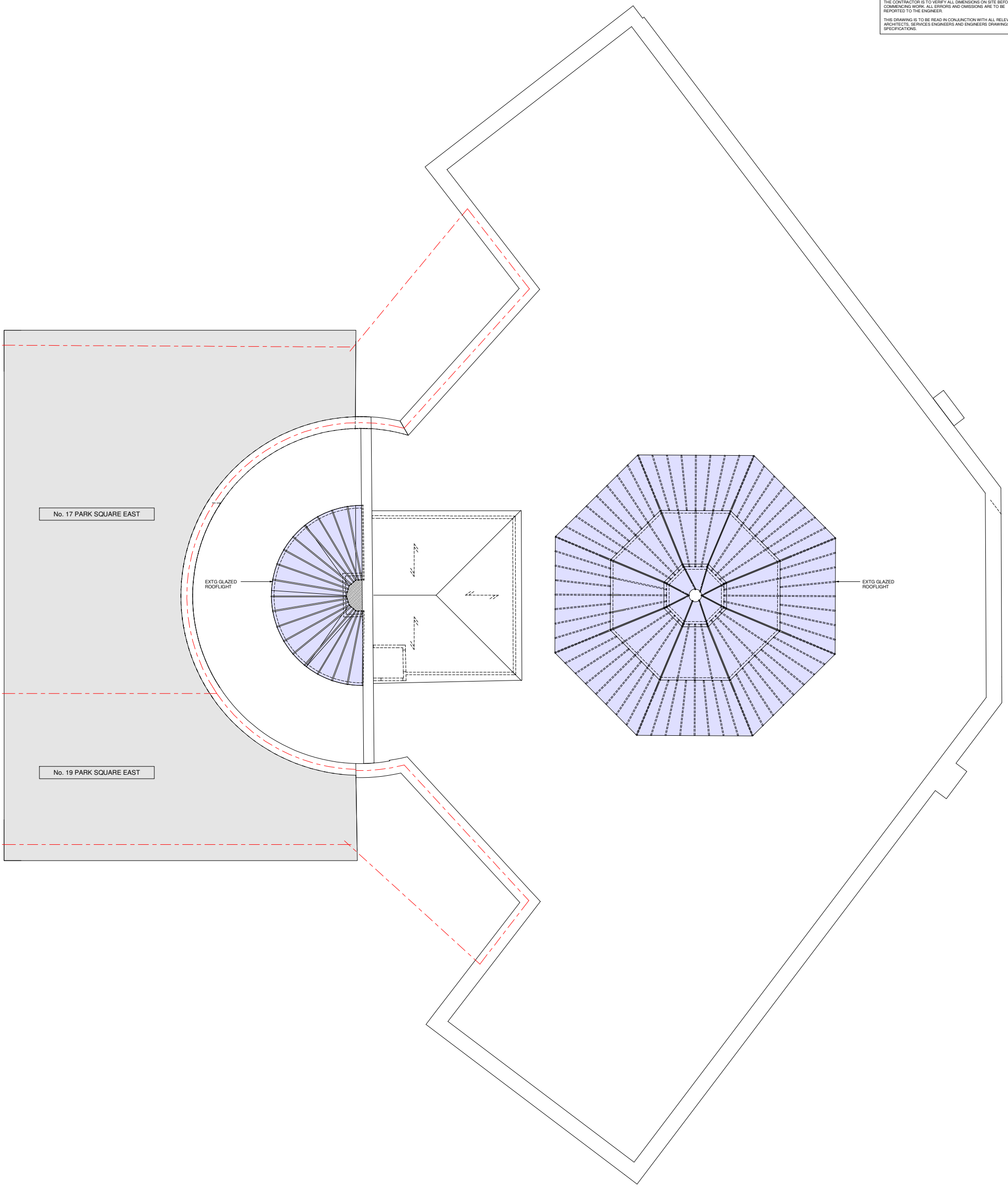

EXISTING UPPER ROOF PLAN

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P1	11.12.19	ISSUED FOR PLANNING	PE / SD

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Drawing Title
EXISTING UPPER ROOF PLAN

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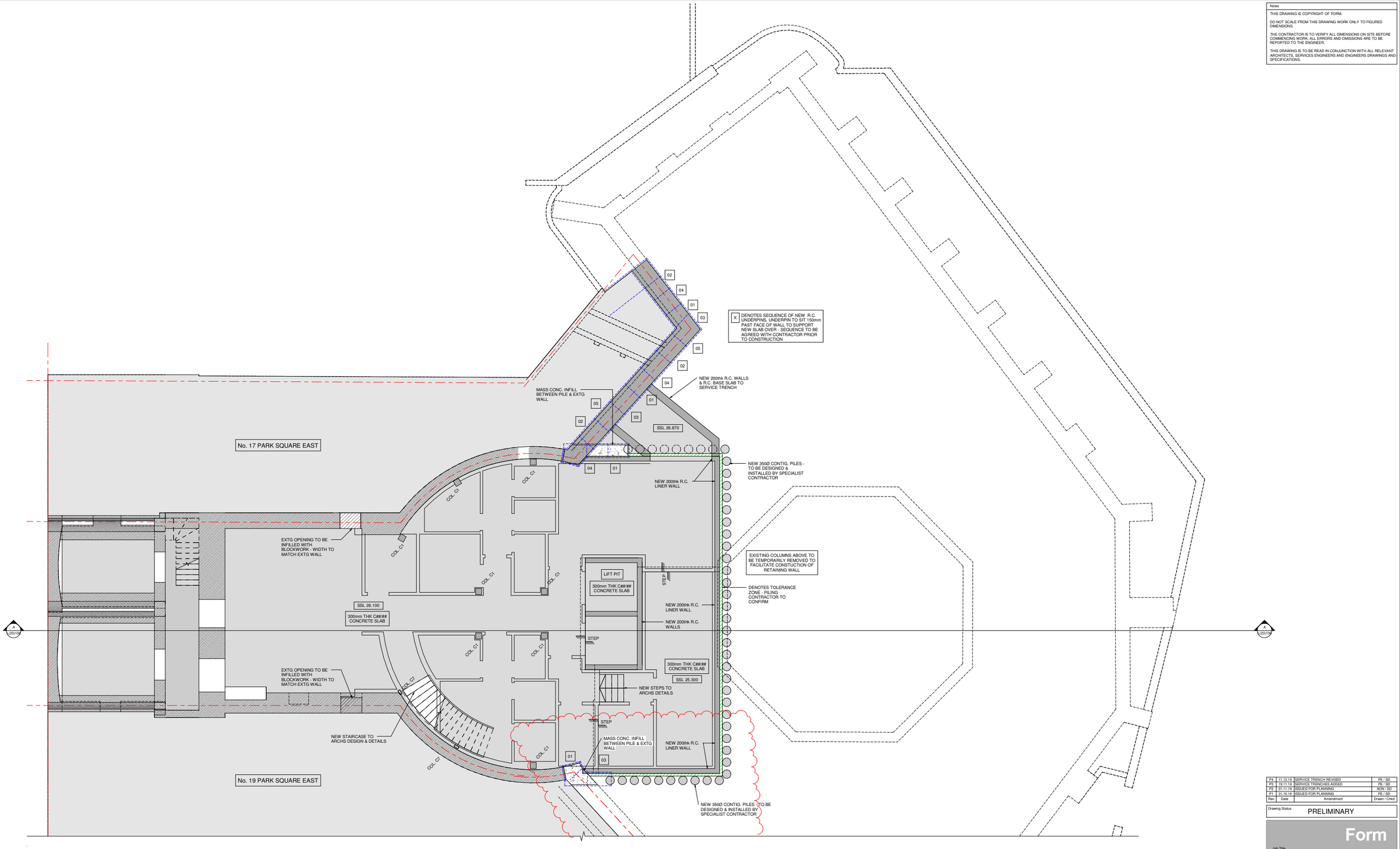

FOR BASEMENT LEVEL - PART 2 REFER TO DRAWING L(17)01b FOR DETAILS

Rev	Date	Amendment	Drawn / Chkd
P4	11.12.19	SERVICE TRENCH REVISED	PE / SD
P3	19.11.19	SERVICE TRENCHES ADDED	PE / SD
P2	01.11.19	ISSUED FOR PLANNING	ADN / SD
P1	31.10.19	ISSUED FOR PLANNING	PE / SD

Drawing Status: PRELIMINARY

Form

Job Title: DIORAMA, PARK SQUARE EAST LONDON

Drawing Title: PROPOSED BASEMENT PLAN - PART 1

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OCT 19	1 : 50	PE	SD

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193206-FSD-	L(17)01a	P4

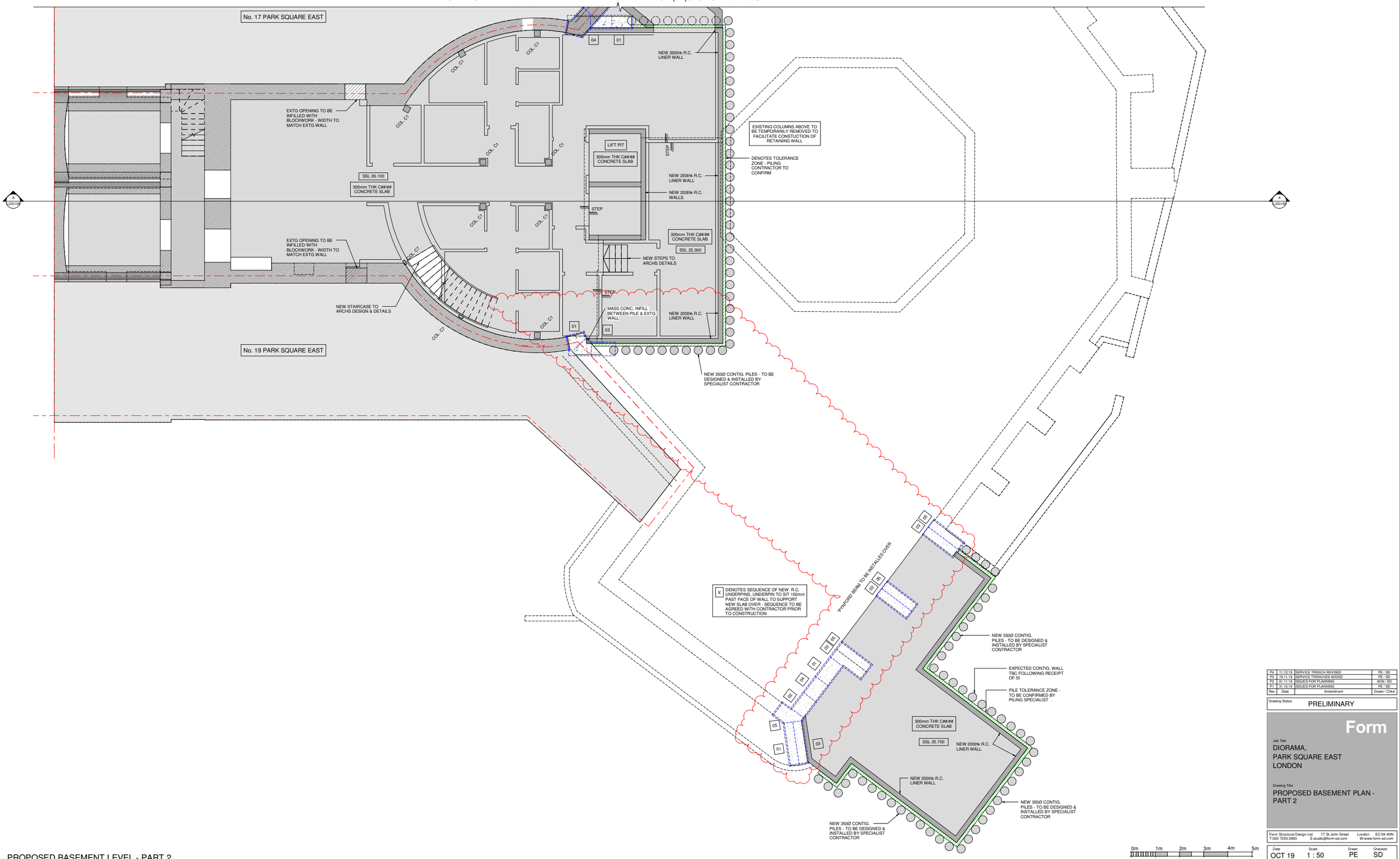
0m 1m 2m 3m 4m 5m

1:50 @ A0 ; 1:100 @ A2

PROPOSED BASEMENT LEVEL - PART 1

1 : 50 @ A0 / 1:100 @ A2

FOR BASEMENT LEVEL - PART 1 REFER TO DRAWING L(17)01a FOR DETAILS



PROPOSED BASEMENT LEVEL - PART 2

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P4	11.12.19	SERVICE TRENCH REVISED	PE / SD
P3	19.11.19	SERVICE TRENCHES ADDED	PE / SD
P2	01.11.19	ISSUED FOR PLANNING	ADN / SD
P1	31.10.19	ISSUED FOR PLANNING	PE / SD

Drawing Status: PRELIMINARY

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Job Title: DIORAMA, PARK SQUARE EAST LONDON

Drawing Title: PROPOSED BASEMENT PLAN - PART 2

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T 020 7253 2893 E studio@form-sd.com W www.form-sd.com

Date	Scale	Drawn	Checked
OCT 19	1 : 50	PE	SD

Job No.	Drawing No.	Revision
193206-FSD-	L(17)01b	P4

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EXTG STAIR CORE TO BE REMOVED - SLAB TO BE MADE GOOD & LEVEL RAISED USING VOID FORMER - NEW SLAB TO BE 150thk R.C. T.B.C.

LIGHTWELL

LIGHTWELL

EXTG COLUMN

NEW 200thk R.C. RETAINING WALLS TO SERVICE TRENCH

SECTION OF EXTG WALL TO BE UNDERPINNED TO FORM NEW BASEMENT RETAINING WALL

NEW 350Ø CONTIG. PILES DESIGNED & INSTALLED BY SPECIALIST CONTRACTOR

No. 17 PARK SQUARE EAST

EXTG SUSPENDED SLAB TO REMAIN - DWARF WALLS & LAYOUT T.B.C.

SSL 28.520

NEW 740w x 700d R.C. CAPPING BEAM

CAPPING BEAM TO STEP 150mm DOWN FOR EXTENT OF SERVICE TRENCH

COL. UNDER

COL. UNDER

COL. C4

COL. C4

150mm THK EXISTING CONCRETE SLAB

STEP

COL. C4

EXTG PIERS TO BE REMOVED & REBUILT FOLLOWING INSTALLATION OF NEW PILED RETAINING WALL - WALL OVER TO BE PROPPED DURING CONSTRUCTION

PADSTONE

BEAM TYPE 2

COL. C6

NEW CONC. STEPS TO ARCHS DESIGN & DETAILS

COL. UNDER

COL. UNDER

COL. C4

600wd x 700dp BEAM D/S R.C. BEAM

LIFT VOID

SSL 28.900

200mm THK C###/## CONCRETE SLAB

PARK SQUARE EAST

BEAM TYPE 2

BEAM TYPE 2

BEAM TYPE 2

BEAM TYPE 2

BEAM TYPE 2

NEW 740w x 700d R.C. CAPPING BEAM

EXTG SUSPENDED SLAB TO REMAIN - DWARF WALLS & LAYOUT T.B.C.

COL. UNDER

COL. UNDER

COL. C4

EXTG PIERS TO BE REMOVED & REBUILT FOLLOWING INSTALLATION OF NEW PILED RETAINING WALL - WALL OVER TO BE PROPPED DURING CONSTRUCTION

PADSTONE

COL. C5

COL. C7

NEW 200thk R.C. WALLS

STEP

COL. C4

COL. C4

COL. C4

COL. C4

COL. C6

CAPPING BEAM TO STEP 1200mm DOWN FOR EXTENT OF SERVICE TRENCH

COL. UNDER

NEW 740w x 700d R.C. CAPPING BEAM LOWERED TO ACCOMODATE SERVICE TRENCH

EXTG SUSPENDED SLAB TO REMAIN - DWARF WALLS & LAYOUT T.B.C.

COL. C6

COLUMN REQUIRED TO SUPPORT STRUCTURE OVER

No. 19 PARK SQUARE EAST

SECTION OF EXTG WALL TO BE UNDERPINNED TO FORM NEW BASEMENT RETAINING WALL

NEW 350Ø CONTIG. PILES DESIGNED & INSTALLED BY SPECIALIST CONTRACTOR

SSL 28.900

COL. C6

STEP

FOR GROUND FLOOR PLAN - PART 2 REFER TO DRAWING L(23)01b FOR DETAILS

Rev	Date	Amendment	Drawn / Chkd
P4	11.12.19	SERVICE TRENCH REVISED	PE / SD
P3	19.11.19	SERVICE TRENCHES ADDED	PE / SD
P2	01.11.19	ISSUED FOR PLANNING	AON / SD
P1	31.10.19	ISSUED FOR PLANNING	PE / SD

Drawing Status: PRELIMINARY

Form

Job Title: DIORAMA, PARK SQUARE EAST LONDON

Drawing Title: PROPOSED GROUND FLOOR PLAN - PART 1

Form Structural Design Ltd 77 St John Street London EC1M 4NN
T 020 7253 2893 E studio@form-sd.com W www.form-sd.com

Date	Scale	Drawn	Checked
OCT 19	1 : 50	PE	SD

Job No.	Drawing No.	Revision
193206-FSD-	L(23)01a	P4

0m 1m 2m 3m 4m 5m

1:50 @ A0 ; 1:100 @ A2

PROPOSED GROUND FLOOR - PART 1

1 : 50 @ A0 / 1:100 @ A2

Notes

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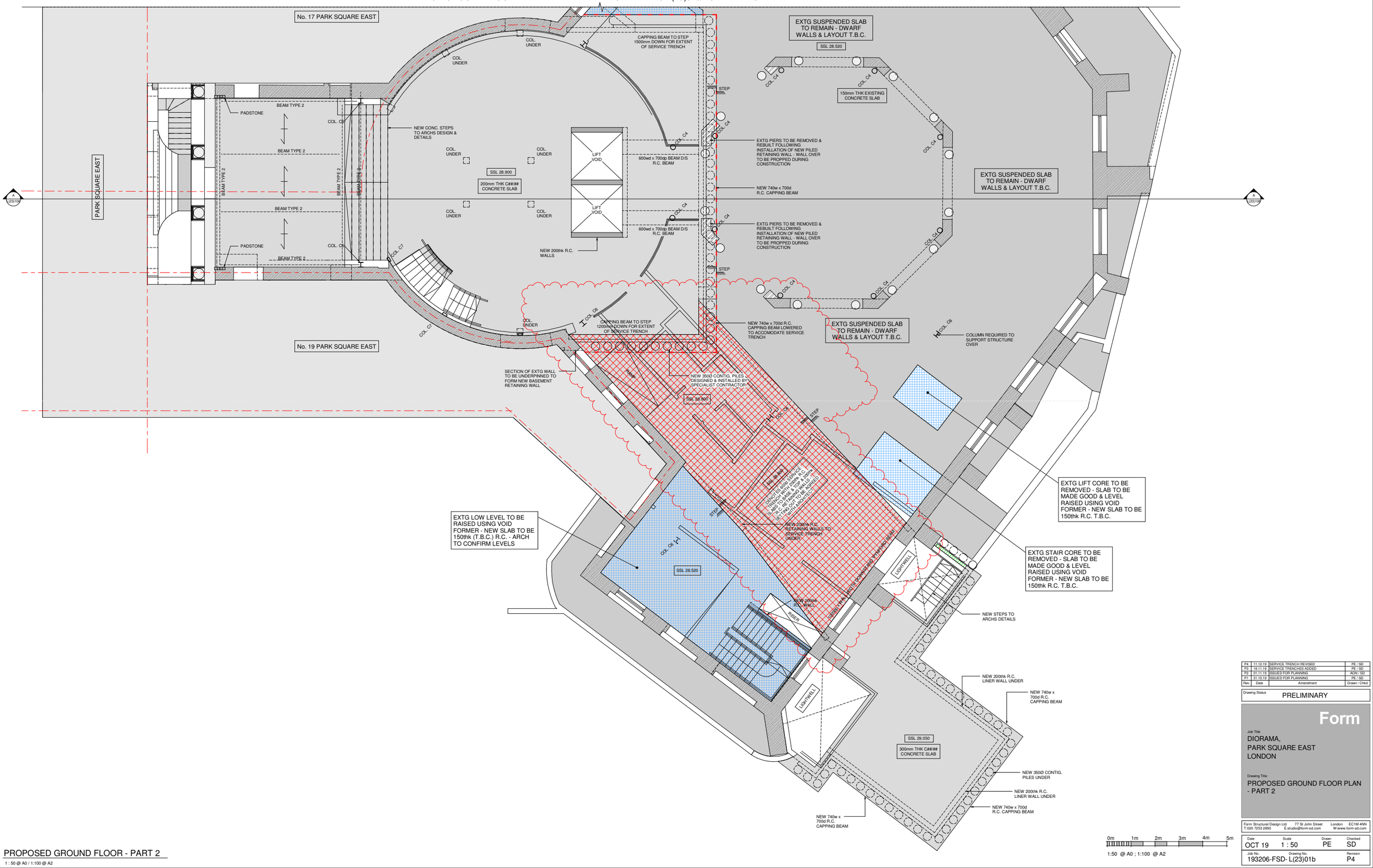
THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, SERVICES ENGINEERS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.

FOR GROUND FLOOR PLAN - PART 1 REFER TO DRAWING L(23)01a FOR DETAILS



PROPOSED GROUND FLOOR - PART 2

1 : 50 @ A0 / 1:100 @ A2

Rev.	Date	Amendment	Drawn / Chkd
P4	11.12.19	SERVICE TRENCH REVISED	PE / SD
P3	19.11.19	SERVICE TRENCHES ADDED	PE / SD
P2	01.11.19	ISSUED FOR PLANNING	AON / SD
P1	31.10.19	ISSUED FOR PLANNING	PE / SD

Drawing Status: PRELIMINARY

Form

Job Title: DIORAMA, PARK SQUARE EAST LONDON

Drawing Title: PROPOSED GROUND FLOOR PLAN - PART 2

Form Structural Design Ltd 77 St John Street London EC1M 4NN
T 020 7253 2893 E studio@form-sd.com W www.form-sd.com

0m 1m 2m 3m 4m 5m

1:50 @ A0 ; 1:100 @ A2

Date	Scale	Drawn	Checked
OCT 19	1 : 50	PE	SD

Job No.	Drawing No.	Revision
193206-FSD-	L(23)01b	P4

STRUCTURAL COLUMN SCHEDULE	
MARK	SIZE
COL. C1	250 x 250 C##/## CONCRETE COLUMN
COL. C2	UC254x254x73
COL. C4	CHS219.1x6.3
COL. C6	UKC203x203x60
COL. C7	RHS200x100x8.0
COL. C8	SHS100x100x8.0
COL. C9	UC203x203x60

STRUCTURAL STEEL BEAM SCHEDULE	
MARK	SIZE
BEAM TYPE 1	UKC356x406x235
BEAM TYPE 2	UC203x203x46
BEAM TYPE 3	2No UKC356x406x235's
BEAM TYPE 4	UC254x254x73
BEAM TYPE 5	UB305x165x54
BEAM TYPE 6	PFC200x90x30
BEAM TYPE 7	UC203x203x46 (PITCHED)
BEAM TYPE 8	
BEAM TYPE 9	UKC203x203x100

Notes

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NEW BEAM & FLOOR CONSTRUCTION TO INFILL EXTG STAIR

No. 17 PARK SQUARE EAST

No. 19 PARK SQUARE EAST

SUPPORT TO SECOND FLOOR LANDING TO BE FINALISED AT STAGE 3

SUPPORT TO SECOND FLOOR LANDING TO BE FINALISED AT STAGE 3

VOID

LIFT VOID

LIFT VOID

NEW 200thk R.C. WALLS

EXTG COL. UNDER

PADSTONE

PADSTONE

- NEW BEAM REQUIRED TO REPLACE LOADBEARING WALL BELOW.

- ADDITIONAL COLUMNS UNDER REQUIRED.

- STRUCTURAL LAYOUT T.B.C. FOLLOWING SOFT STRIP OUT

NEW BEAM & FLOOR CONSTRUCTION TO INFILL EXTG STAIR & LIFT AREA. ADDITIONAL COLUMNS MAY BE REUIQRED TO REPLACE EXISTING LOAD BEARING WALLS. T.B.C.

HATCH DENOTES AREA POTENTIALLY REQUIRING DEMOLITION TO FACILITATE INFILL OF EXISTING STAIR & LIFT CORE. EXTENT T.B.C. POST SOFT STRIP OUT

NEW 200thk R.C. WALL

RISER

PROPOSED FIRST FLOOR - SSL

1 : 50

0m 1m 2m 3m 4m 5m

1:50 @ A0 ; 1:100 @ A2

Rev.	Date	Amendment	Drawn / Chkd
P3	19.11.19	REVISED TO SUIT FURTHER SITE INVESTIGATION	PE / SD
P2	01.11.19	ISSUED FOR PLANNING	AON / SD
P1	31.10.19	ISSUED FOR PLANNING	PE / SD

Drawing Status: PRELIMINARY

Form

Job Title
DIORAMA,
PARK SQUARE EAST
LONDON

Drawing Title
PROPOSED FIRST FLOOR PLAN

Form Structural Design Ltd 77 St John Street London EC1M 4NN
T:020 7253 2893 E:studio@form-sd.com W:www.form-sd.com

Date	Scale	Drawn	Checked
OCT 19	1 : 50	PE	SD

Job No.	Drawing No.	Revision
193206-FSD-	L(23)02	P3

STRUCTURAL COLUMN SCHEDULE	
MARK	SIZE
COL. C1	250 x 250 C##/## CONCRETE COLUMN
COL. C2	UC254x254x73
COL. C4	CHS219.1x6.3
COL. C6	UKC203x203x60
COL. C7	RHS200x100x8.0
COL. C8	SHS100x100x8.0
COL. C9	UC203x203x60

STRUCTURAL STEEL BEAM SCHEDULE	
MARK	SIZE
BEAM TYPE 1	UKC356x406x235
BEAM TYPE 2	UC203x203x46
BEAM TYPE 3	2No UKC356x406x235's
BEAM TYPE 4	UC254x254x73
BEAM TYPE 5	UB305x165x54
BEAM TYPE 6	PFC200x90x30
BEAM TYPE 7	UC203x203x46 (PITCHED)
BEAM TYPE 8	
BEAM TYPE 9	UKC203x203x100

Notes

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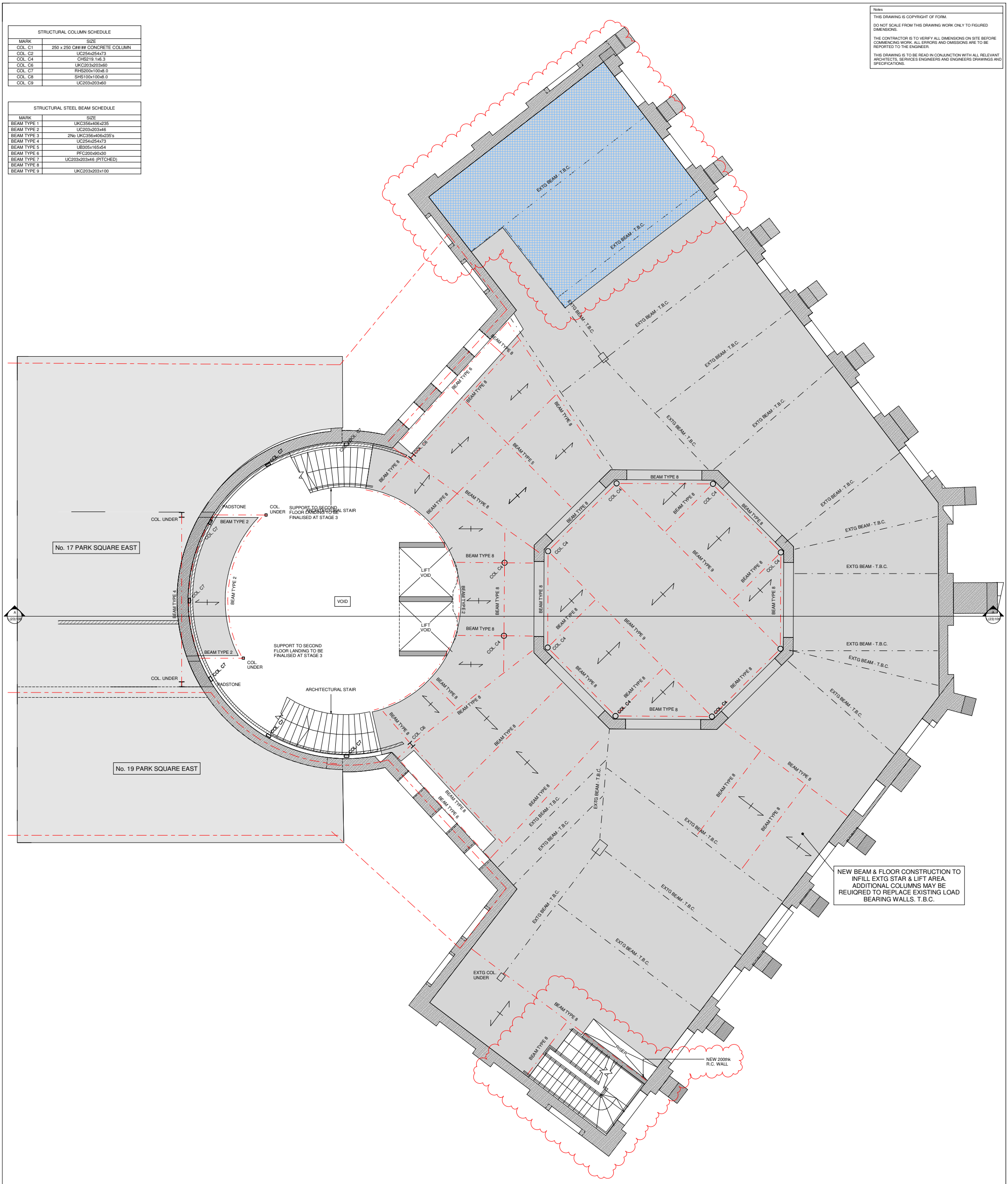

Rev.	Date	Amendment	Drawn / Chkd
P3	19.11.19	REVISED TO SUIT FURTHER SITE INVESTIGATION	PE / SD
P2	01.11.19	ISSUED FOR PLANNING	AON / SD
P1	31.10.19	ISSUED FOR PLANNING	PE / SD

Drawing Status: PRELIMINARY

Form

Job Title
DIORAMA,
PARK SQUARE EAST
LONDON

Drawing Title
PROPOSED SECOND FLOOR PLAN

Form Structural Design Ltd 77 St John Street London EC1M 4NN
T.020 7253 2893 E.studio@form-sd.com W.www.form-sd.com

Date	Scale	Drawn	Checked
OCT 19	1 : 50	PE	SD

Job No.	Drawing No.	Revision
193206-FSD-	L(23)03	P3

0m 1m 2m 3m 4m 5m

1:50 @ A0 ; 1:100 @ A2

PROPOSED SECOND FLOOR PLAN

1 : 50 @ A0 / 1:100 @ A2

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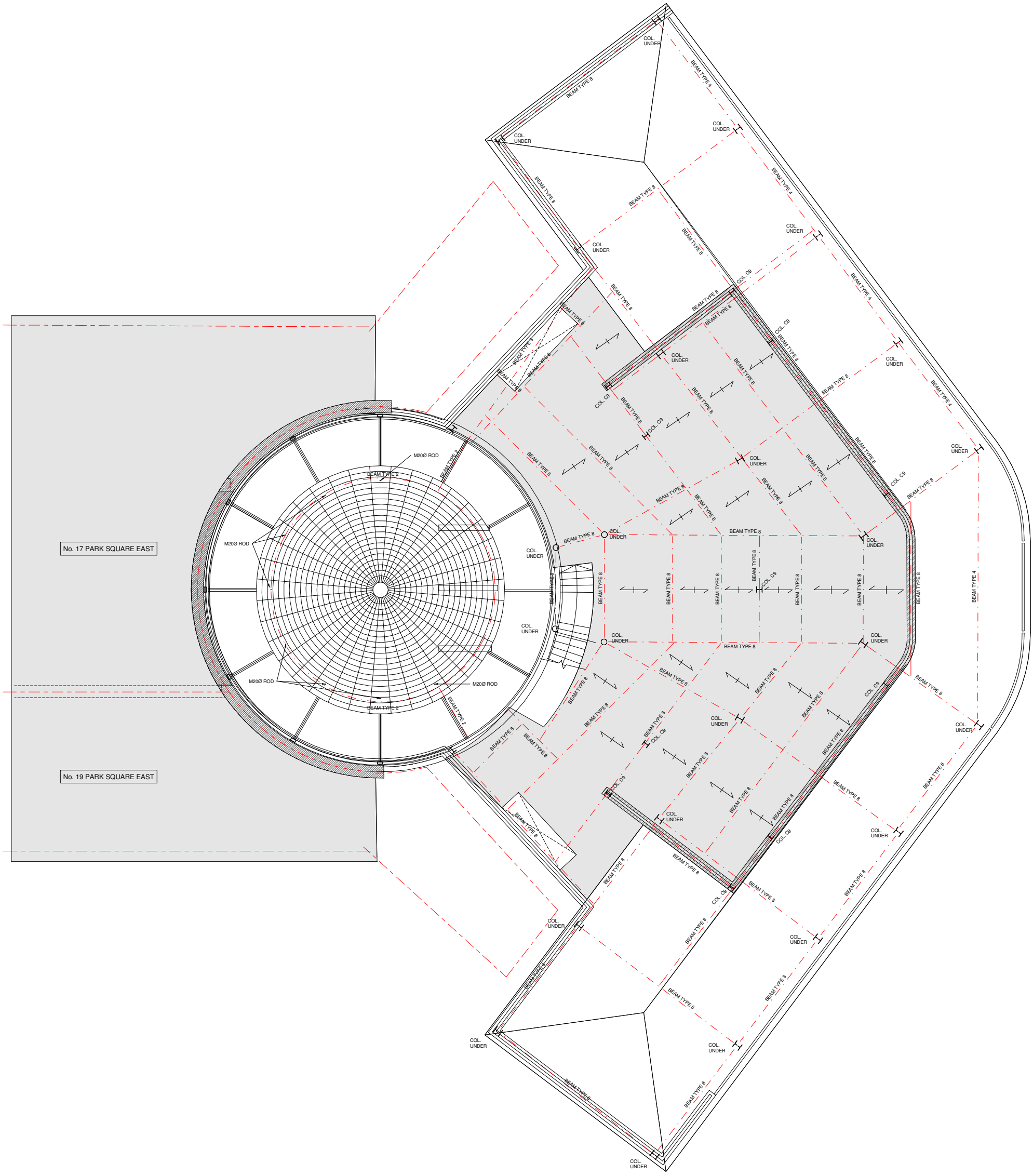
THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, SERVICES ENGINEERS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.



PROPOSED ROOF TERRACE PLAN

1 : 50 @ A0 / 1:100 @ A2

0m 1m 2m 3m 4m 5m

1:50 @ A0 ; 1:100 @ A2

Rev.	Date	Amendment	Drawn / Chkd
P2	01.11.19	ISSUED FOR PLANNING	AON / SD
P1	31.10.19	ISSUED FOR PLANNING	PE / SD

Drawing Status: PRELIMINARY

Form

Job Title
DIRORAMA,
PARK SQUARE EAST
LONDON

Drawing Title
PROPOSED ROOF TERRACE PLAN

Form Structural Design Ltd 77 St John Street London EC1M 4NN
T:020 7253 2893 E:studio@form-sd.com W:www.form-sd.com

Date	Scale	Drawn	Checked
OCT 19	1 : 50	PE	SD

Job No.	Drawing No.	Revision
193206-FSD-	L(23)05	P2

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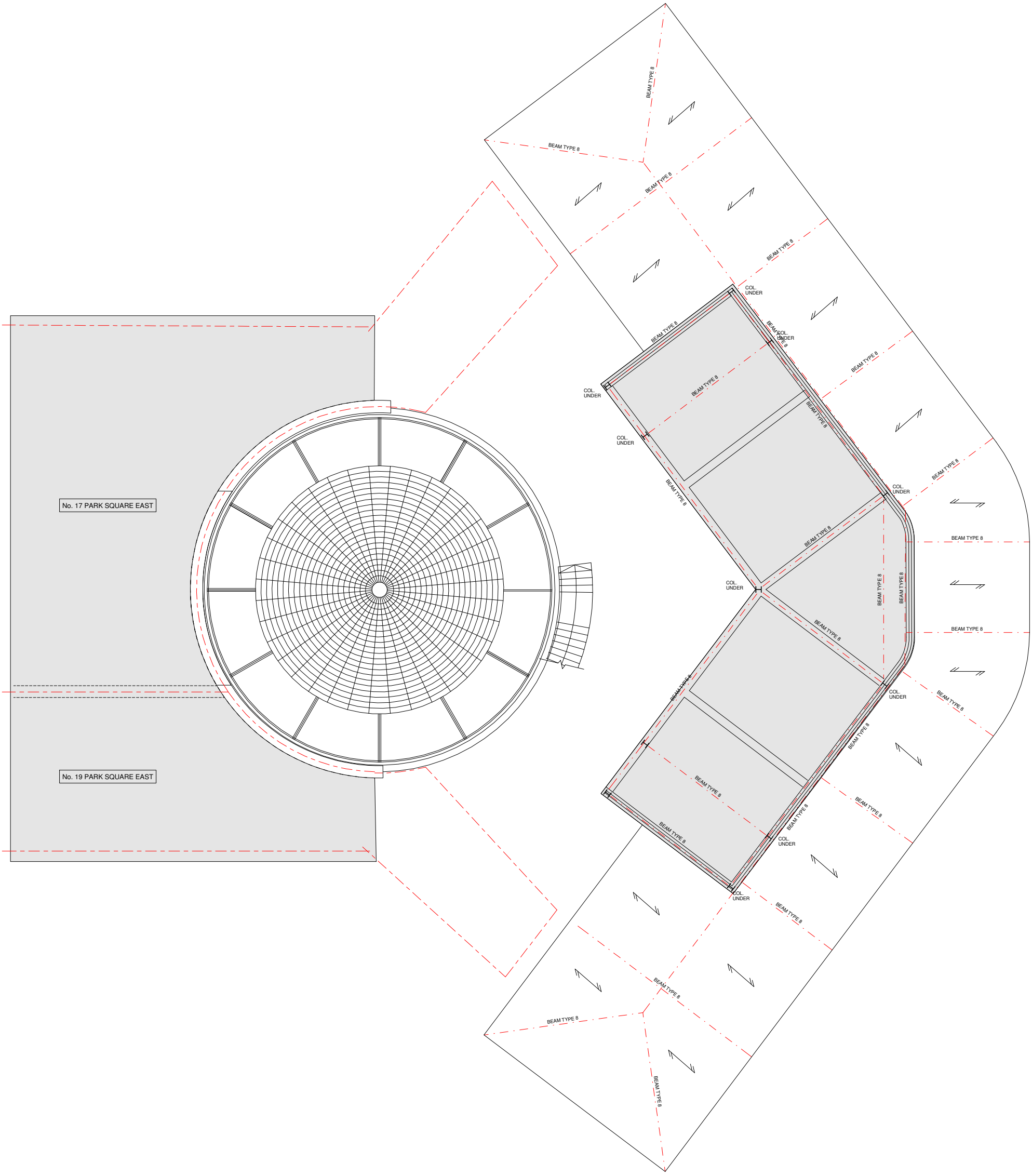
THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, SERVICES ENGINEERS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.



PROPOSED ROOF PLAN

1 : 50 @ A0 / 1:100 @ A2

0m 1m 2m 3m 4m 5m

1:50 @ A0 ; 1:100 @ A2

Rev.	Date	Amendment	Drawn / Chkd
P2	01.11.19	ISSUED FOR PLANNING	AON / SD
P1	31.10.19	ISSUED FOR PLANNING	PE / SD

Drawing Status: PRELIMINARY

Form

Job Title
DIRORAMA,
PARK SQUARE EAST
LONDON

Drawing Title
PROPOSED ROOF PLAN

Form Structural Design Ltd 77 St John Street London EC1M 4NN
T:020 7253 2893 E:studio@form-sd.com W:www.form-sd.com

Date	Scale	Drawn	Checked
OCT 19	1 : 50		

Job No. 193206-FSD- Drawing No. L(23)06 Revision P2

APPENDIX C
ENVIROCHECK REPORT

APPENDIX D
SITE INVESTIGATION LOGS

Client: **17 Park Square East Ltd, 19 Park Square East Ltd, The Diorama Estate Ltd**	Hole Diameter (mm): 100 to 20.45m	BOREHOLE NUMBER **BH01**
Method: Cable Percussion	Casing Dia. (mm): 150 to 7.50m	
Date Started: 14/10/2019 Co-ordinates	Ground Level (m AOD) 28.50 Ref. No: **1038915**	Sheet 1 of 3

Backfill/Well Depth (m)	Backfill/Well Legend	Water Depth (m)	Samples Depth (m)	Samples Type	In Situ Tests Type	In Situ Tests Results	Reduced Level (mAOD)	Depth & (Thickness) (m)	Description of Strata	Legend
			0.00 - 1.00	B			28.50	(0.25)	Concrete.	
0.50			0.50	D			28.25	0.25	Firm, brown, slightly gravelly CLAY. Gravel is angular to rounded, fine and medium flint. (Langley Silt Member)	
			1.20	D	C	N = 4		(1.45)		
			1.70	D			26.80	1.70		
2.00			2.00	D	C	N = 8		(0.30)	Soft, brown slightly fine sandy, silty CLAY. (Langley Silt Member)	
			2.50	D			26.50	2.00	Loose to medium dense, brown, slightly fine sandy, becoming very sandy at 4m below ground level GRAVEL of sub-angular to rounded, fine to course flint. Low cobble content of rounded flint. (Lynch Hill Gravel Member)	
			3.00	D	C	N = 8				
			3.00 - 4.00	B						
			3.50	D						
			4.00	D	C	N = 18				
			4.50	D				(5.20)		
			5.00	D	C	N = 23				
			6.00	D						
			6.00 - 7.00	B						
			6.50	D	C	N = 24				
7.00	W						21.30	7.20	Stiff brown mottled grey, becoming brown and grey mottled at 9m below ground level, CLAY with occasional sand size selenite and silt partings. (Weathered London Clay Formation)	
7.50			7.50	D						
		8.00	8.00	D	C	N = 12		(2.80)		
			9.00	D						
		9.50	9.50	D	C	N = 13				

General Remarks:

1. Water strike at 9.5m rising to 8m below ground level after 20 minutes.

Driller:	LH	**BOREHOLE RECORD** Scale 1:50 See Key Sheet for explanation of symbols, etc.	CET INFRASTRUCTURE Giving our all
Logged:	JM		
Checked:		**The Diorama**	**FIG A1**
Appr'd:			

Client: **17 Park Square East Ltd, 19 Park Square East Ltd, The Diorama Estate Ltd**	Hole Diameter (mm): 100 to 20.45m	BOREHOLE NUMBER **BH01**
Method: Cable Percussion	Casing Dia. (mm): 150 to 7.50m	
Date Started: 14/10/2019 Co-ordinates	Ground Level (m AOD) 28.50 Ref. No: **1038915**	Sheet 2 of 3

Backfill/Well Depth (m)	Backfill/Well Legend	Water Depth (m)	Samples Depth (m)	Samples Type	In Situ Tests Type	In Situ Tests Results	Reduced Level (mAOD)	Depth & (Thickness) (m)	Description of Strata	Legend
			10.50	D			18.50	10.00	Stiff, grey, very closely to closely fissured CLAY with rare fine and medium sand size selenite. (London Clay Formation)	
			11.00	D	C	N = 18				
			11.00 - 12.00	B						
			12.50	D	C	N = 19				
			13.50	D						
					C	N = 19				
								(10.45)		
					C	N = 24				
			16.00 - 17.00	B						
					C	N = 27				
					C	N = 25				

General Remarks:

1. Water strike at 9.5m rising to 8m below ground level after 20 minutes.

Driller:	LH	**BOREHOLE RECORD** Scale 1:50 See Key Sheet for explanation of symbols, etc.	CET INFRASTRUCTURE Giving our all
Logged:	JM		
Checked:		**The Diorama**	**FIG A1**
Appr'd:			

Client: **17 Park Square East Ltd, 19 Park Square East Ltd, The Diorama Estate Ltd**	Hole Diameter (mm): 100 to 20.45m	BOREHOLE NUMBER **BH01**
Method: Cable Percussion	Casing Dia. (mm): 150 to 7.50m	
Date Started: 14/10/2019 Co-ordinates	Ground Level (m AOD) 28.50 Ref. No: **1038915**	Sheet 3 of 3

Backfill/Well		Water	Samples		In Situ Tests		Reduced Level (mAOD)	Depth & (Thickness) (m)	Description of Strata	Legend
Depth (m)	Legend	Depth (m)	Depth (m)	Type	Type	Results				
20.00					C	N = 28	8.05	20.45	End of Borehole at 20.45m	

General Remarks:

1. Water strike at 9.5m rising to 8m below ground level after 20 minutes.

Driller:	LH	**BOREHOLE RECORD** Scale 1:50 See Key Sheet for explanation of symbols, etc.	CET INFRASTRUCTURE Giving our all
Logged:	JM		
Checked:		**The Diorama**	**FIG A1**
Appr'd:			

Client: **17 Park Square East Ltd, 19 Park Square East Ltd, The Diorama Estate Ltd**	Hole Diameter (mm): 75mm tapering with depth to 18.45m		BOREHOLE NUMBER **BH02**
Method: Windowless Sampler			
Date Started: 21/10/2019 Co-ordinates	Ground Level (m AOD) 26.10	Ref. No: **1038915**	Sheet 1 of 3

Backfill/Well Depth (m)	Backfill/Well Legend	Water Depth (m)	Samples Depth (m)	Samples Type	In Situ Tests Type	In Situ Tests Results	Reduced Level (mAOD)	Depth & (Thickness) (m)	Description of Strata	Legend
							26.10	(0.32)	Concrete.	
0.50							25.78	0.32	Dense to very dense, brown, very fine to coarse sandy, locally sandy GRAVEL of sub-rounded to rounded, fine to coarse flint. (Lynch Hill Gravel Member)	
1.00			1.00 - 2.00	B	S	N = 58				
			2.00 - 3.00	B	S	N = 42				
			3.00 - 4.00	B	S	N = 47		(5.18)		
			4.00 - 5.00	B	S	N = 43				
			5.00 - 6.00	B	S	N = 14				
							20.60	5.50	Stiff, brown mottled grey CLAY with rare silty fine sand partings. (Weathered London Clay Formation)	
								(0.40)		
6.00	W		6.00 - 7.00	B	S	N = 25	20.20	5.90	Stiff, grey, very closely to closely fissured CLAY with rare fine and medium sand size selenite. (London Clay Formation)	
6.50										

General Remarks:
1. Gravel transitioning to Clay at 5.0m below ground level, inferred from drop in SPT N value.

Driller:	AR	BOREHOLE RECORD Scale 1:33 See Key Sheet for explanation of symbols, etc.	CET INFRASTRUCTURE Giving our all
Logged:	JM		
Checked:		**The Diorama**	**FIG A2**
Appr'd:			

Client: **17 Park Square East Ltd, 19 Park Square East Ltd, The Diorama Estate Ltd**	Hole Diameter (mm): 75mm tapering with depth to 18.45m	BOREHOLE NUMBER **BH02**
Method: Windowless Sampler		
Date Started: 21/10/2019 Co-ordinates	Ground Level (m AOD) 26.10 Ref. No: **1038915**	Sheet 2 of 3

Backfill/Well		Water	Samples		In Situ Tests		Reduced Level (mAOD)	Depth & (Thickness) (m)	Description of Strata	Legend
Depth (m)	Legend	Depth (m)	Depth (m)	Type	Type	Results				
			7.00 - 8.00	B	S	N = 24				
			8.00 - 9.00	B	S	N = 26				
			9.00 - 10.00	B	S	N = 24				
			10.00 - 11.00	B	S	N = 29				
			11.00 - 12.00	B	S	N = 33				
			12.00 - 13.00	B	C	N = 38		(12.55)		
			13.00 - 14.00	B	S	N = 38				

General Remarks:
1. Gravel transitioning to Clay at 5.0m below ground level, inferred from drop in SPT N value.

Driller:	AR	BOREHOLE RECORD Scale 1:33 See Key Sheet for explanation of symbols, etc.	CET INFRASTRUCTURE Giving our all
Logged:	JM		
Checked:		**The Diorama**	**FIG A2**
Appr'd:			

Client: **17 Park Square East Ltd, 19 Park Square East Ltd, The Diorama Estate Ltd**	Hole Diameter (mm): 75mm tapering with depth to 18.45m	BOREHOLE NUMBER **BH02**
Method: Windowless Sampler		
Date Started: 21/10/2019 Co-ordinates	Ground Level (m AOD) 26.10 Ref. No: **1038915**	Sheet 3 of 3

Backfill/Well		Water	Samples		In Situ Tests		Reduced Level (mAOD)	Depth & (Thickness) (m)	Description of Strata	Legend
Depth (m)	Legend	Depth (m)	Depth (m)	Type	Type	Results				
			14.00 - 15.00	B	S	N = 44				
			15.00 - 16.00	B						
			16.00 - 17.00	B	S	N = 44				
			17.00 - 18.00	B						
					S	N = 52				
							7.65	18.45	End of Borehole at 18.45m	

General Remarks:
1. Gravel transitioning to Clay at 5.0m below ground level, inferred from drop in SPT N value.

Driller:	AR	BOREHOLE RECORD Scale 1:33 See Key Sheet for explanation of symbols, etc.	CET INFRASTRUCTURE Giving our all
Logged:	JM		
Checked:		**The Diorama**	**FIG A2**
Appr'd:			

Client: **17 Park Square East Ltd, 19 Park Square East Ltd, The Diorama Estate Ltd**	Hole Diameter (mm): 75mm tapering with depth to 20m	BOREHOLE NUMBER **BH03**
Method: Windowless Sampler		
Date Started: 25/10/2019 Co-ordinates	Ground Level (m AOD) 30.10 Ref. No: **1038915**	Sheet 1 of 4

Backfill/Well		Water	Samples		In Situ Tests		Reduced Level (mAOD)	Depth & (Thickness) (m)	Description of Strata	Legend
Depth (m)	Legend	Depth (m)	Depth (m)	Type	Type	Results				
			0.00 - 1.00	B			30.10	(0.10)	Decorative gravel.	
							30.00	0.10	Loose, dark brown mottled red, very clayey, slightly fine to coarse sandy GRAVEL of angular to rounded, fine to coarse flint and brick. Low cobble content of angular brick. (Made Ground)	
0.50										
			1.00 - 2.00	B	S	N = 4		(1.80)		
							28.20	1.90	Firm becoming stiff with depth, brown, slightly gravelly CLAY. Gravel is angular to rounded, fine and medium flint. (Langley Silt Member)	
2.00			2.00 - 3.00	B	S	N = 14				
								(1.20)		
			3.00 - 4.00	B	S	N = 51	27.00	3.10	Very dense, brown, very fine to coarse sandy, locally sandy GRAVEL of sub-rounded to rounded, fine to coarse flint. (Lynch Hill Gravel Member)	
			4.00 - 5.00	B	S	N =50/160mm				
			5.00 - 6.00	B	S	N =50/275mm				
			6.00 - 7.00	B	S	N = 50		(5.90)		

General Remarks:

Driller:	MW	BOREHOLE RECORD Scale 1:33 See Key Sheet for explanation of symbols, etc.	CET INFRASTRUCTURE Giving our all
Logged:	JM		
Checked:		**The Diorama**	**FIG A3**
Appr'd:			

Client: **17 Park Square East Ltd, 19 Park Square East Ltd, The Diorama Estate Ltd**	Hole Diameter (mm): 75mm tapering with depth to 20m	BOREHOLE NUMBER **BH03**
Method: Windowless Sampler		
Date Started: 25/10/2019 Co-ordinates	Ground Level (m AOD) 30.10 Ref. No: **1038915**	Sheet 2 of 4

Backfill/Well		Water	Samples		In Situ Tests		Reduced Level (mAOD)	Depth & (Thickness) (m)	Description of Strata	Legend
Depth (m)	Legend	Depth (m)	Depth (m)	Type	Type	Results				
			7.00 - 8.00	B	S	N = 62				
			8.00 - 9.00	B	S	N = 50				
			9.00 - 10.00	B	S	N = 22	21.10	9.00	Stiff, brown mottled grey CLAY with rare silty fine sand partings. (Weathered London Clay Formation)	
								(0.80)		
10.00	W		10.00 - 11.00	B	S	N = 33	20.30	9.80	Stiff, grey, very closely to closely fissured CLAY with rare fine and medium sand size selenite. (London Clay Formation)	
10.50										
			11.00 - 12.00	B	S	N = 25				
			12.00 - 13.00	B	S	N = 28				
			13.00 - 14.00	B	S	N = 35				

General Remarks:

Driller:	MW	BOREHOLE RECORD Scale 1:33 See Key Sheet for explanation of symbols, etc.	CET INFRASTRUCTURE Giving our all
Logged:	JM		
Checked:		**The Diorama**	**FIG A3**
Appr'd:			

Client: **17 Park Square East Ltd, 19 Park Square East Ltd, The Diorama Estate Ltd**	Hole Diameter (mm): 75mm tapering with depth to 20m	BOREHOLE NUMBER **BH03**
Method: Windowless Sampler		
Date Started: 25/10/2019 Co-ordinates	Ground Level (m AOD) 30.10 Ref. No: **1038915**	Sheet 3 of 4

Backfill/Well		Water	Samples		In Situ Tests		Reduced Level (mAOD)	Depth & (Thickness) (m)	Description of Strata	Legend
Depth (m)	Legend	Depth (m)	Depth (m)	Type	Type	Results				
			14.00 - 15.00	B	S	N = 42				
			15.00 - 16.00	B	S	N =50/95mm		(10.20)		
			16.00 - 17.00	B						
			17.00 - 18.00	B	S	N = 21				
			18.00 - 19.00	B						
			19.00 - 20.00	B	S	N = 33				

General Remarks:

Driller:	MW	BOREHOLE RECORD Scale 1:33 See Key Sheet for explanation of symbols, etc.	CET INFRASTRUCTURE Giving our all
Logged:	JM		
Checked:		**The Diorama**	**FIG A3**
Appr'd:			

Client: **17 Park Square East Ltd, 19 Park Square East Ltd, The Diorama Estate Ltd**	Hole Diameter (mm): 75mm tapering with depth to 20m	BOREHOLE NUMBER **BH03**
Method: Windowless Sampler		Sheet 4 of 4
Date Started: 25/10/2019 Co-ordinates	Ground Level (m AOD) 30.10 Ref. No: **1038915**	

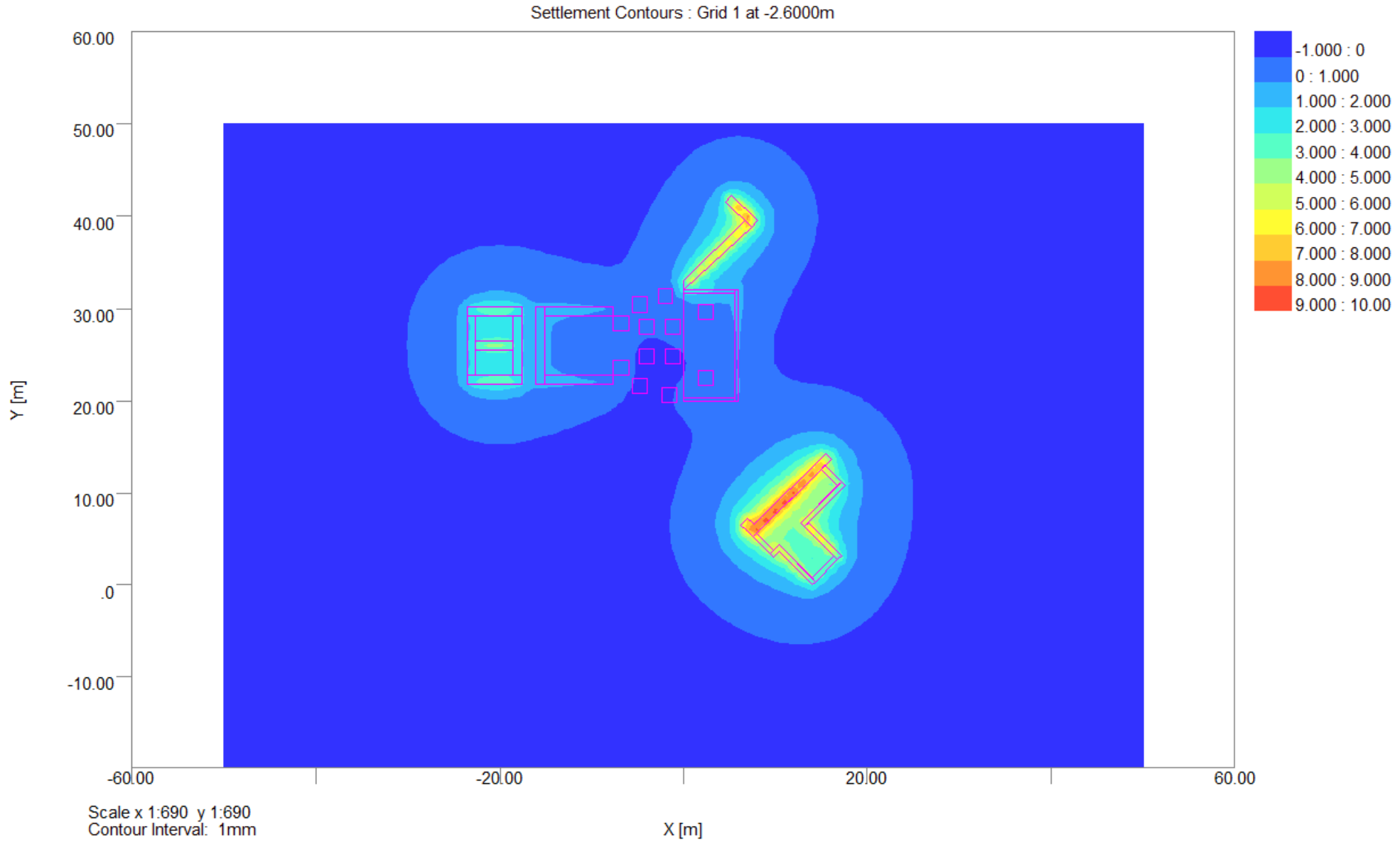
Backfill/Well		Water	Samples		In Situ Tests		Reduced Level (mAOD)	Depth & (Thickness) (m)	Description of Strata	Legend
Depth (m)	Legend	Depth (m)	Depth (m)	Type	Type	Results				
							10.10	20.00	End of Borehole at 20.00m	

General Remarks:

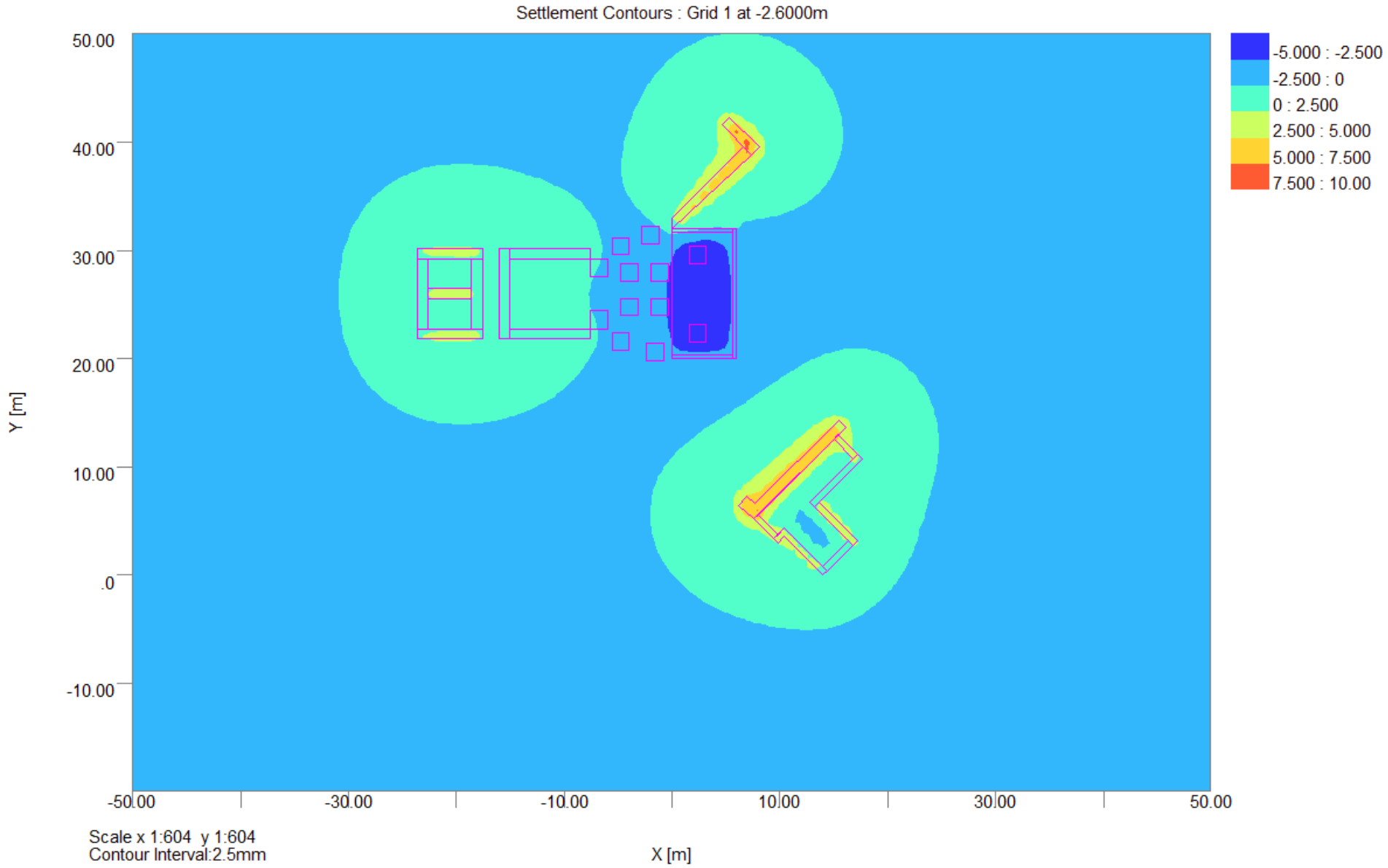
Driller:	MW	BOREHOLE RECORD Scale 1:33 See Key Sheet for explanation of symbols, etc.	CET INFRASTRUCTURE Giving our all
Logged:	JM		
Checked:		**The Diorama**	**FIG A3**
Appr'd:			

APPENDIX E
PDISP EXPORTS

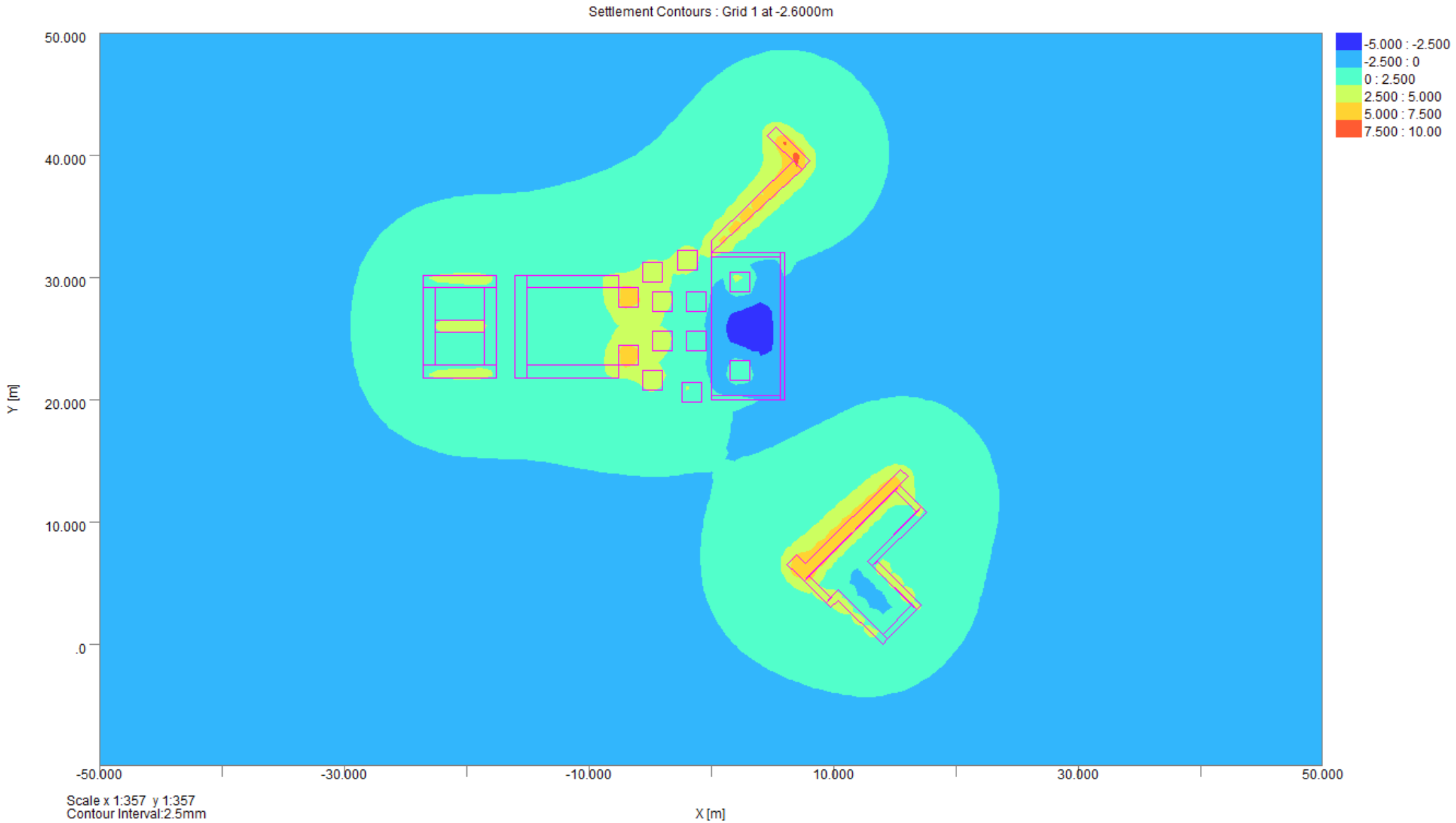
Stage 1


Settlement Contours : Grid 1 at -2.6000m
60.00
50.00
40.00
30.00
20.00
10.00
.0
-10.00
Y [m]
-60.00
-20.00
20.00
60.00
X [m]
-1.000 : 0
0 : 1.000
1.000 : 2.000
2.000 : 3.000
3.000 : 4.000
4.000 : 5.000
5.000 : 6.000
6.000 : 7.000
7.000 : 8.000
8.000 : 9.000
9.000 : 10.00
Scale x 1:690 y 1:690
Contour Interval: 1mm

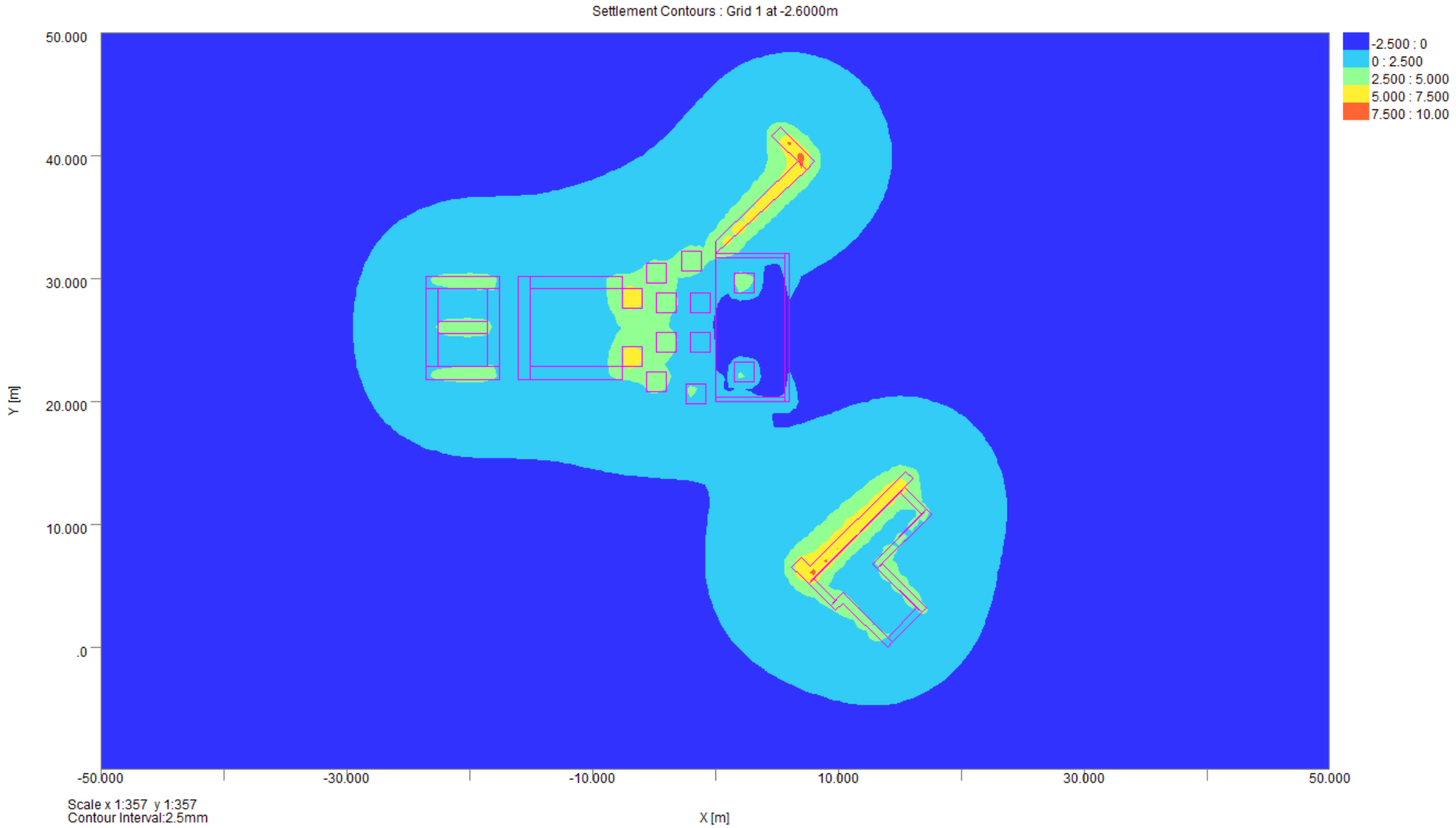
Stage 2


Settlement Contours : Grid 1 at -2.6000m
-5.000 : -2.500
-2.500 : 0
0 : 2.500
2.500 : 5.000
5.000 : 7.500
7.500 : 10.00
50.00
40.00
30.00
20.00
10.00
.0
-10.00
Y [m]
-50.00
-30.00
-10.00
10.00
30.00
50.00
X [m]
Scale x 1:604 y 1:604
Contour Interval:2.5mm

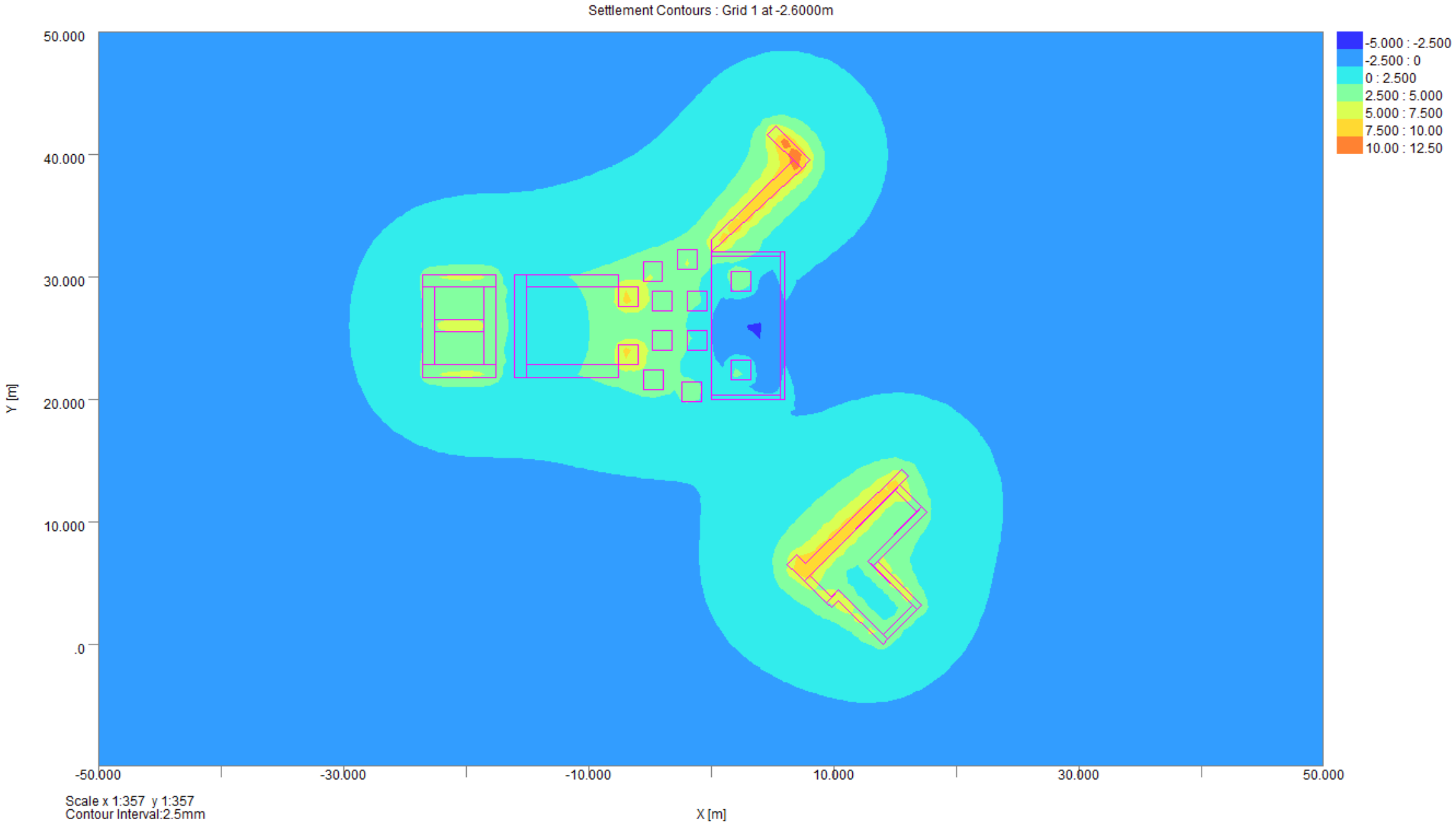
Stage 3


Settlement Contours : Grid 1 at -2.6000m
-5.000 : -2.500
-2.500 : 0
0 : 2.500
2.500 : 5.000
5.000 : 7.500
7.500 : 10.00
50.000
40.000
30.000
20.000
10.000
.0
Y [m]
-50.000
-30.000
-10.000
10.000
30.000
50.000
X [m]
Scale x 1:357 y 1:357
Contour Interval:2.5mm

Stage 4


Settlement Contours : Grid 1 at -2.6000m
-2.500 : 0
0 : 2.500
2.500 : 5.000
5.000 : 7.500
7.500 : 10.00
50.000
40.000
30.000
20.000
10.000
.0
Y [m]
-50.000
-30.000
-10.000
10.000
30.000
50.000
X [m]
Scale x 1:357 y 1:357
Contour Interval:2.5mm

Stage 5


Settlement Contours : Grid 1 at -2.6000m
-5.000 : -2.500
-2.500 : 0
0 : 2.500
2.500 : 5.000
5.000 : 7.500
7.500 : 10.00
10.00 : 12.50
50.000
40.000
30.000
20.000
10.000
.0
Y [m]
-50.000
-30.000
-10.000
10.000
30.000
50.000
X [m]
Scale x 1:357 y 1:357
Contour Interval:2.5mm