## Document Control

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|---|---|---|---|
| **Project title** | 42 Caversham Road, London, NW5 2DS | **Project ref** | J14023A |
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|---|---|---|---|
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## CONTENTS

# 1.0 INTRODUCTION

Geotechnical and Environmental Associates (GEA) has been commissioned by Gurney Consulting Engineers, on behalf of Dexbay Properties Limited, to complete a ground movement assessment for the proposed redevelopment of this site at 42 Caversham Road, London, NW5 2DS.

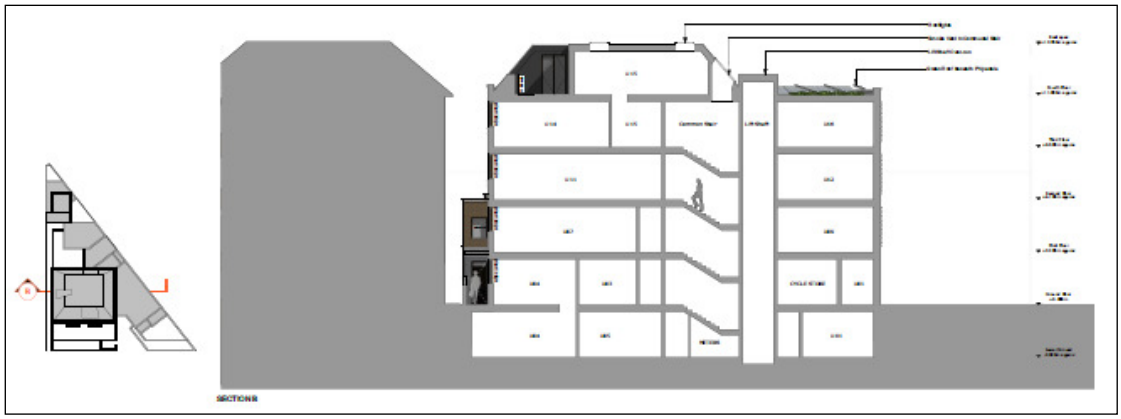
A Desk Study and Basement Impact Assessment (BIA) has also been carried out by GEA (report ref J14004, dated April 2015), the findings of which have been used in the derivation of parameters for use in this assessment. It should, however, be noted that due to the limited nature of the investigation a number of assumptions and a reliance on non-site specific information has been made, such that it would be prudent to carry out additional investigation once access is available to confirm the findings of this assessment.

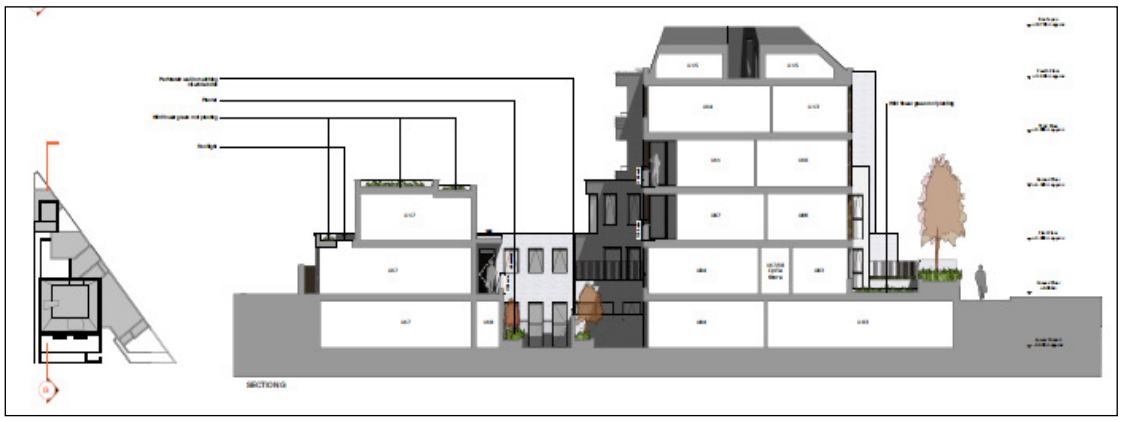
The purpose of this assessment has been to determine the effects of the proposed basement construction upon the neighbouring structures.

## 1.1 Proposed Development

It is understood that consideration is being given to the demolition of the existing building and construction of a new two-storey to five-storey concrete framed building with single level basement to comprise residential flats. It is understood that the maximum column load at foundation level is anticipated to be 800 kN.

The proposed basement, or lower ground floor level, will extend to a depth of approximately 3.0 m below existing site level. A number of sections showing the proposed basement construction are below.





The levels shown on the drawing are understood to be related to an arbitrary datum, the location of which is not known. These levels have not therefore been adopted for the purpose of this report, with all depths given relative to ground level.

This report is specific to the proposed development and the advice herein should be reviewed if the development proposals are amended.

### 1.2 Limitations

The conclusions and recommendations made in this report are limited to those that can be made on the basis of the investigation. The results of the work should be viewed in the context of the range of data sources consulted, the number of locations where the ground was sampled and the number of soil, gas or groundwater samples tested; no liability can be accepted for information in other data sources or conditions not revealed by the sampling or testing. Any comments made on the basis of information obtained from the client or other third parties are given in good faith on the assumption that the information is accurate; no independent validation of such information has been made by GEA.

## 2.0 THE SITE

### 2.1 Site Description

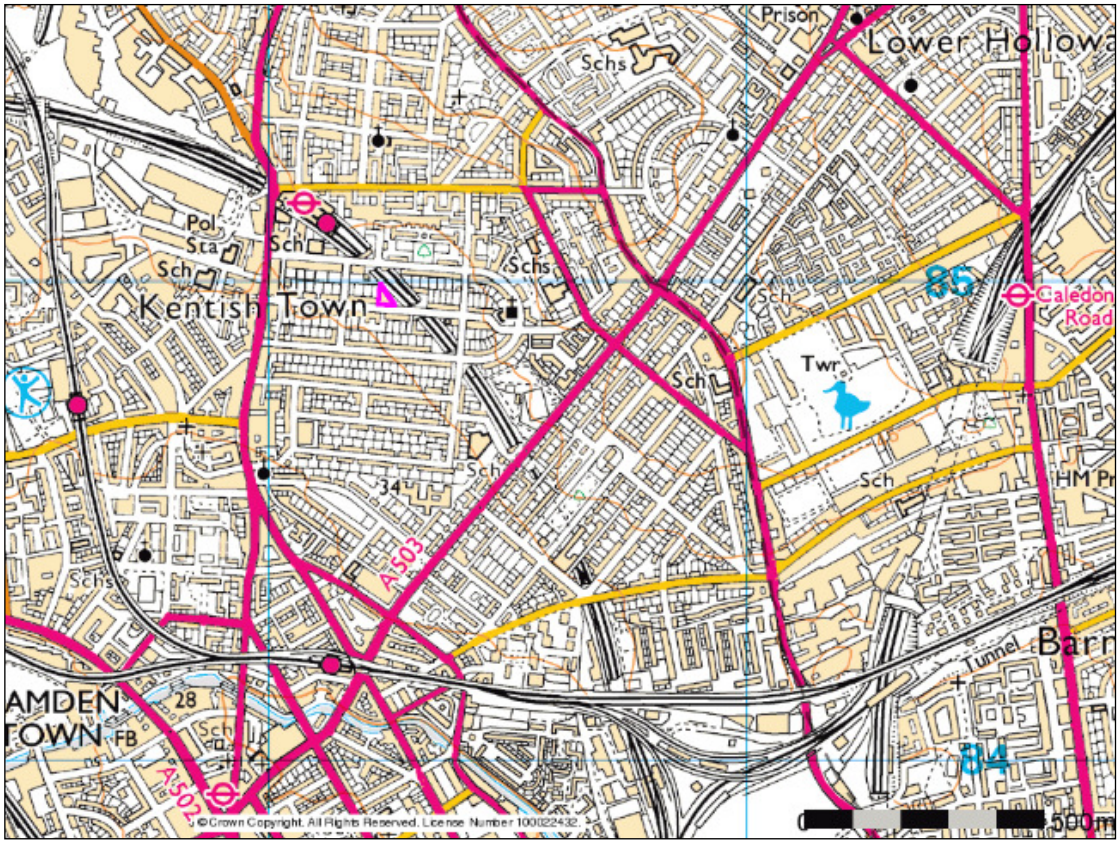
The site is located in Kentish Town within the London Borough of Camden, approximately 235 m to the west of St Lukes Church, 295 m southeast of Kentish Town London Underground station, and 745 m north of Camden Town railway station.

The site forms a triangular shape with maximum dimensions of approximately 35 m east-west by 40 m north-south and is occupied by a mixed use single storey to three-storey building fronting onto Caversham Road to the south. At the time of the site investigation the building was used as a Family Services and Social Work Centre and in view of the continued occupancy of the site the fieldwork was limited to the site frontage only.

The building occupies the majority of the site, with a narrow alleyway along the western boundary, a small garden and areas of hardstanding with delivery bays along the frontage. The garden has maximum dimensions of approximately 7 m by 10 m and is laid to lawn with 3 m tall semi-mature deciduous trees around the perimeter. A ramp leads down to a delivery door approximately 0.50 m below street level.

The site is bordered by three-storey houses with semi-basements to the south and west, a builder's yard to the east and a Network Rail railway line to the north. The site is essentially level and the local topography slopes down towards the west.

The site may be additionally located by National Grid Reference 529249, 184960 and is shown on the map below.




## 3.0 SUMMARY OF GROUND CONDITIONS

The investigation encountered the expected ground conditions in that, below a moderate thickness of made ground, London Clay was encountered and proved to the maximum depth investigated of 5.45 m. The made ground generally comprised dark brown, grey and brown slightly sandy silty clay with gravel of flint, brick, tile, ash and clinker and occasional roots, with horizons of black ash gravel and orange-brown coarse sand, and extended to a depth of 1.40 m. in Borehole No 2 and the maximum depth investigated in Trial Pit No 1 of 1.50 m.

The London Clay comprised firm fissured grey and brown mottled clay with occasional selenite crystals and decomposing roots, frequent black clay pockets and rare black flint gravel, becoming brown mottled blue-grey with depth, and extended to the maximum depth investigated of 5.45 m.

In the western section of the site frontage, beneath a maximum 300 mm thickness of reinforced concrete, Borehole Nos 1 and 1A encountered made ground comprised of dark brown slightly sandy silty clay with gravel of brick, flint and ash was, which extended to depths of 0.50 m and 0.65 m, wherein a concrete slab was encountered. The concrete slab is approximately 0.85 m below street level and it is unknown what this may represent. It was not possible to extend Borehole Nos 1 and 1A beyond this depth.

Groundwater was not encountered during drilling of the boreholes, but subsequent monitoring of a standpipe installed to a depth of 5.00 m recorded groundwater at a depth of 1.15 m four weeks after installation.

### 3.1 British Geological Society (BGS) Archives

A search of borehole records held by the British Geological Survey (BGS) has indicated that the London Clay was found beneath a moderate thickness of made ground, at a distance of 100 m to the southwest of the site. Another borehole, drilled 450 m to the south indicated the base of the London Clay to be at a depth of 52 m, at a level of approximately -22 m OD.

## 4.0 CONSTRUCTION SEQUENCE

The following sequence of operations has been derived to enable analysis of the ground movements around the basement both during and after construction. The exact method of construction is not known at the present stage and it has therefore been assumed that the proposed basement will be formed with a contiguous piled wall, with a minimum embedment equivalent to the retained height of approximately 3.0 m.

Essentially the sequence may be considered as three groups of activities, the first two comprising the short and medium term temporary works whilst the third represents the construction of the permanent works.

The detail of the support provided to adjacent walls is beyond the scope of this report at this stage and the structural engineer will be best placed to agree a methodology with the piling contractor once appointed.

### 4.1 Temporary Support to Piled Walls

Following the installation of the bored pile wall and capping beams at ground floor level, temporary props will be installed and the basement excavation will proceed. The detail of section sizes and spacings will be finalised by the contractor but it is anticipated that the general philosophy adopted will be for diagonal braces to be used across the corners or returns of the basement walls whilst props will be positioned at regular intervals along the long walls of the basement. Where horizontal restraint cannot be provided by other parts of the piled wall the prop forces will be provided by so-called ‘flying shores’ where the reaction to horizontal forces is provided by pile caps, gravity blocks or basement thickenings in the centre of the excavation.

It is anticipated that steel temporary props will be used with strut forces spread along the wall by steel waling beams fixed to the piles. Although the detail of the propping is to be finalised there is the option to use hydraulic ‘active’ props where the propping force is applied prior to excavation in order to minimise movement at critical locations.

Excavation will proceed in stages and in broad terms the order of operations will be install capping beam props, excavate to a suitable depth below the next propping level, install props and then repeat the operation until the final excavation level has been reached.

### 4.2 Permanent Works

When the final excavation depths have been reached the permanent works will be formed, which are likely to comprise reinforced concrete walls with a drained cavity lining the inside of the bored pile wall. Reinforced concrete will be used for floor slabs and it is anticipated that heave protection will be installed beneath the lowest slabs.

It is anticipated that the floor slabs will be constructed lowest level first and when each floor has achieved adequate strength, the temporary props will be removed and the subsequent walls and floors cast until the structure is complete.

# 5.0 GROUND MOVEMENTS

An assessment of ground movements within and surrounding the excavation has been undertaken using the X-Disp and P-Disp computer programs licensed from the OASYS suite of geotechnical modelling software from Arup. These programs are commonly used within the ground engineering industry and are considered to be appropriate tools for this analysis.

The X-Disp program has been used to predict ground movements likely to arise from the construction of the proposed basement. This includes the settlement of the ground (vertical movement) and the lateral movement of soil behind the proposed retaining walls (horizontal movement).

The analysis of potential ground movements within the excavation, as a result of unloading of the underlying soils, has been carried out using the Oasys P-Disp (Version 19.2 – Build 12) software package and is based on the assumption that the soils behave elastically, which provides a reasonable approximation to soil behaviour at small strains.

For the purpose of these analyses, the corners have been defined by x and y coordinates, with the x-direction parallel with the orientation north-south, whilst the y-direction is parallel with the orientation of east-west. Vertical movement is in the z-direction.

The full outputs of all the analyses can be provided on request but samples of the output movement contour plots are included within the appendix. As mentioned previously, due to the limited nature of the investigation, further site work in the form of a number of deep boreholes is likely to be necessary to support the assumptions made with respect to the London Clay beneath the site and confirm the findings of this assessment.

## 5.1 Ground Movements – Surrounding the Basement

### 5.1.1 Model Used

For the X-Disp analysis, the soil movement relationships used for the embedded retaining walls are the default values within CIRIA report C580[1], which were derived from a number of historic case studies.

The ground movement curves for ‘excavations in front of high stiffness wall in stiff clay’ have been adopted as being considered most appropriate for the proposed excavation and its support at this site.

### 5.1.2 Results

An assessment of ground movements surrounding the excavation has been undertaken by GEA using the X-Disp computer program licensed from the OASYS suite of programmes from Arup. The predicted movements are summarised in the table below. The results are presented in the following tables to the degree of accuracy required to allow predicted variations in ground movements around the structure(s) to be illustrated, but may not reflect the anticipated accuracy of the predictions.

[1] Gaba, A, Simpson, B, Powrie, W and Beadman, D (2003) *Embedded retaining walls – guidance for economic design* .CIRIA Report C580.

| Phase of Works | Wall Movement (mm) | |
|---|---|---|
| | Vertical Settlement | Horizontal Movement |
| Pile Installation | 1 to 1.25 | 1 to 1.25 |
| Basement Excavation | 2 to 2.5 | 4 to 5 |
| Combined Movements | 3 to 4 | 5 to 6 |

The analysis has indicated that the maximum vertical and horizontal settlements that will result from pile installation are less than 1.5 mm. The maximum vertical settlement that will take place behind the walls as a result of the basement excavation is unlikely to exceed 2.5 mm with up to 5 mm of maximum horizontal movement.

The movements arising from the combined piling and excavation phases are therefore not likely to exceed 4 mm of vertical settlement, whilst the maximum horizontal movements are anticipated to be between 5 mm to 6 mm.

The movements calculated are considered to represent a worst case scenario, particularly as the movements resulting from basement excavation will be minimised due to control of the propping in the temporary works and a regime of monitoring.

## 5.2 Movements within the Excavation (Heave)

### 5.2.1 Model Used

At this site unloading of the London Clay will take place as a result of the basement excavation and the reduction in vertical stress will cause heave to take place. Undrained soil parameters have been used to estimate the potential short term movements, which include the "immediate" or elastic movements as a result of the basement excavation. Drained parameters have been used to provide an estimate of the total long-term movement.

The elastic analysis requires values of soil stiffness at various levels to calculate displacements. Values of stiffness for the soils at this site are readily available from published data and we have used a well-established method to provide our estimates. This relates values of $E_u$ and E', the drained and undrained stiffness respectively, to values of undrained cohesion, as described by Padfield and Sharrock[2] and Butler[3] and more recently by O'Brien and Sharp[4]. Relationships of $E_u = 500\ C_u$ and $E' = 300\ C_u$ for the cohesive soils and 2000 x SPT 'N' for granular soils have been used to obtain values of Young's modulus. More recent published data[5] indicates stiffness values of 750 x Cu for the London Clay and a ratio of E' to Cu of 0.75, but it is considered that the use of the more conservative values provides a sensible approach for this stage in the design.

The demolition of the existing buildings and proposed construction of the new basement will result in a net unloading of roughly 60 kN/m².

2 Padfield CJ and Sharrock MJ (1983) *Settlement of structures on clay soils.* CIRIA Special Publication 27

3 Butler FG (1974) *Heavily overconsolidated clays: a state of the art review.* Proc Conf Settlement of Structures, Cambridge, 531-578, Pentech Press, Lond

4 O'Brien AS and Sharp P (2001) *Settlement and heave of overconsolidated clays - a simplified non-linear method.* Part Two, Ground Engineering, Nov 2001, 48-53

5 Burland JB, Standing, JR, and Jardine, FM (2001) *Building response to tunnelling, case studies from construction of the Jubilee Line Extension..* CIRIA Special Publication 200

A rigid boundary for the analysis has been set within the London Clay at a depth of about 50 m below existing ground level, where nearby BGS records indicate that the base of this formation is likely to be present. Below this depth the essentially incompressible soils of the Lambeth Group should be present.

### 5.2.2 Results

The P-Disp analysis indicates that, by the time the basement construction is complete, up to 12 mm of heave is likely to have taken place at the centre of the proposed excavations, reducing to approximately 3 mm to 6 mm at the edges.

In the long term, following completion of the basement construction, a further 10mm of heave is estimated as a result of long term swelling of the underlying London Clay.

The results of the P-Disp analysis also indicate the likely impact of the proposed basement construction beyond the site boundaries. On the basis of the analysis, total vertical heave movements outside the proposed basement are unlikely to exceed 5 mm at a distance of approximately 5 m, reducing to less than 1 mm at distances in excess of between 10 m.

The potential movements are summarised in the table below.

| Location | Movement (mm) | | |
|---|---|---|---|
| | Short-term Heave (Excavation Phase) | Long-term Heave (post construction) | Total Heave |
| Centre of excavations | 12 | 10 | 22 |
| Edge of excavations | 3 to 6 | 3 to 6 | 6 to 12 |
| At 5 m from edge of excavations | 2 to 3 | 1 to 2 | 3 to 5 |

In order to mitigate the effects of heave on the new building, the basement could be designed to transmit heave forces into the wall piles or onto tension piles within the basement.

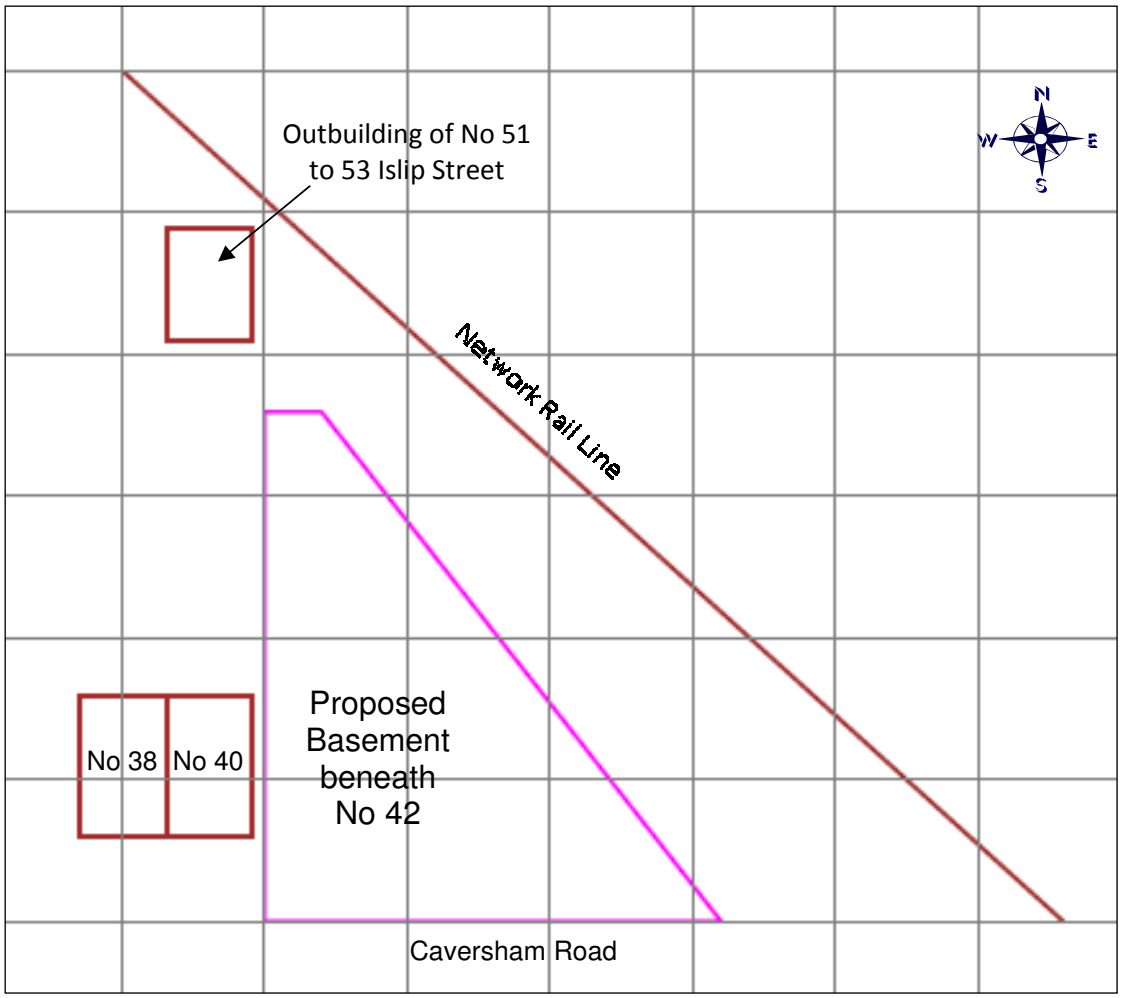
Alternatively, or in any case, a void or layer of compressible material should be incorporated into the design to accommodate these potential long term movements. If a compressible material is used beneath the slab, it will need to be designed to be able to resist the potential uplift forces generated by the ground movements. In this respect potential heave pressures are typically taken to equate to around 50 % to 60 % of the total unloading pressure.

## 6.0 DAMAGE ASSESSMENT

In addition to the above assessment of the likely movements that will result from the proposed development, some of the neighbouring structures have been considered as sensitive structures, requiring Building Damage Assessments, on the basis of the classification given in Table 2.5 of C580[1]. These include:

- The adjoining semi-detached property of 38 to 40 Caversham Road, to the west;
- a single-storey structure, comprising part of the Boma Garden Centre (51 to 53 Islip Street) to the northwest; and
- the network rail line to the northeast of the site.

The sensitive structures outlined above have been modelled as lines in the analysis and are the lines along which the damage assessment has been undertaken. The critical lines for the remaining sensitive structures are shown on the plan below.




Whilst Nos 38 and 40 Caversham Road are known to have lower ground floor levels, it has been assumed that the outbuilding to the northwest does not have an existing basement, such that the average foundation depths can therefore be assumed as being close to existing ground level.

## 6.1 Damage to Neighbouring Structures

The combined movements resulting from both pile installation and basement excavation calculated using the X-Disp modelling software have been used to carry out an assessment of the likely damage to adjacent properties and the results are summarised in the table below.

The potential heave movements predicted by P-Disp have not been included in this assessment, which can therefore be considered as conservative, as these movements are likely to have a mitigating effect on the downward settlement predicted by X-Disp.

| Building Damage Assessment | | |
|---|---|---|
| **Sensitive Structure** | **Elevation** | **Category of Damage*** |
| No 38 to 40 Caversham Road | Northern | Category 0 (Negligible) |
| | Eastern | Category 0 (Negligible) |
| | Southern | Category 0 (Negligible) |
| | Western | Undetectable |
| | Party Wall | Category 0 (Negligible) |
| Outbuilding of No 51 to 53 Islip Road | Northern | Undetectable |
| | Eastern | Category 0 (Negligible) |
| | Southern | Category 0 (Negligible) |
| | Western | Category 0 (Negligible) |
| Network Rail Line | N/A | Category 0 (Negligible) |

**From Table 2.5 of C580[1]: Classification of visible damage to walls.*

The building damage reports for sensitive structures highlighted in the above table predict that the damage to the adjoining and nearby structures would generally be Category 0 (negligible).

On this basis, the damage that would inevitably occur as a result of such an excavation would fall well within the acceptable limits.

## 6.2 Monitoring of Ground Movements

The predictions of ground movement based on the ground movement analysis should be checked by monitoring of adjacent properties and structures. The structures to be monitored during the construction stages should include:

- The adjoining semi-detached property of 38 to 40 Caversham Road, to the west;
- the single-storey structure, comprising part of the Boma Garden Centre (51 to 53 Islip Street) to the northwest; and
- the network rail line to the northeast of the site.

Condition surveys of the above existing structures should be carried out before and after the proposed works.

The precise monitoring strategy will be developed at a later stage and it will be subject to discussions and agreements with the owners of the adjacent properties and structures. Contingency measures will be implemented if movements of the adjacent structures exceed predefined trigger levels. Both contingency measures and trigger levels will need to be developed within a future monitoring specification for the works.

# 7.0 CONCLUSIONS

The analysis has concluded that the predicted damage to the neighbouring properties would be 'Negligible'. On this basis, the damage that would inevitably occur as a result of such an excavation would fall well within the acceptable limits.

The separate phases of work, including formation of the lower ground floor extension, piling and subsequent excavation of the proposed basement, will in practice be separated by a number of weeks during which time construction of capping beams and pile curing will take place. This will provide an opportunity for the ground movements during and immediately after piling to be measured and the data acquired can be fed back into the design and compared with the predicted values. Such a comparison will allow the ground model to be reviewed and the predicted wall movements to be reassessed prior to the main excavation taking place so that propping arrangements can be adjusted if required.

# APPENDICES

**SOIL DISPLACEMENT MODEL RESULTS**

**X-DISP ANALYSIS**

**Pile Installation**

Contour Plots of Vertical Movements and Horizontal Movements

**Basement Excavation**

Contour Plots of Vertical and Horizontal Movements

**Pile Installation and Basement Excavation**

Contour Plots of Combined Vertical Movements and Horizontal Movements

**P-DISP ANALYSIS**

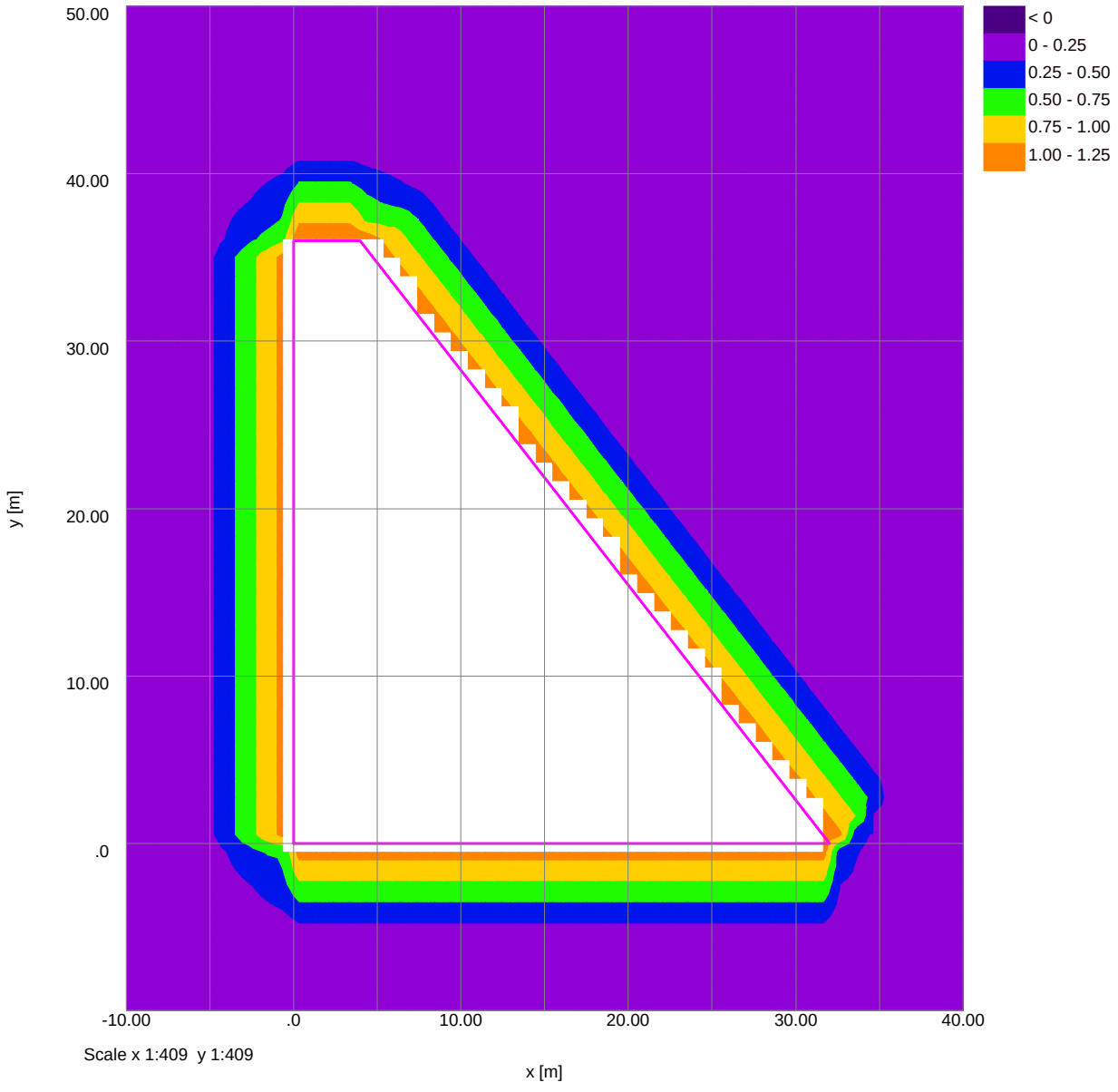
Short Term Movement

Total Movement

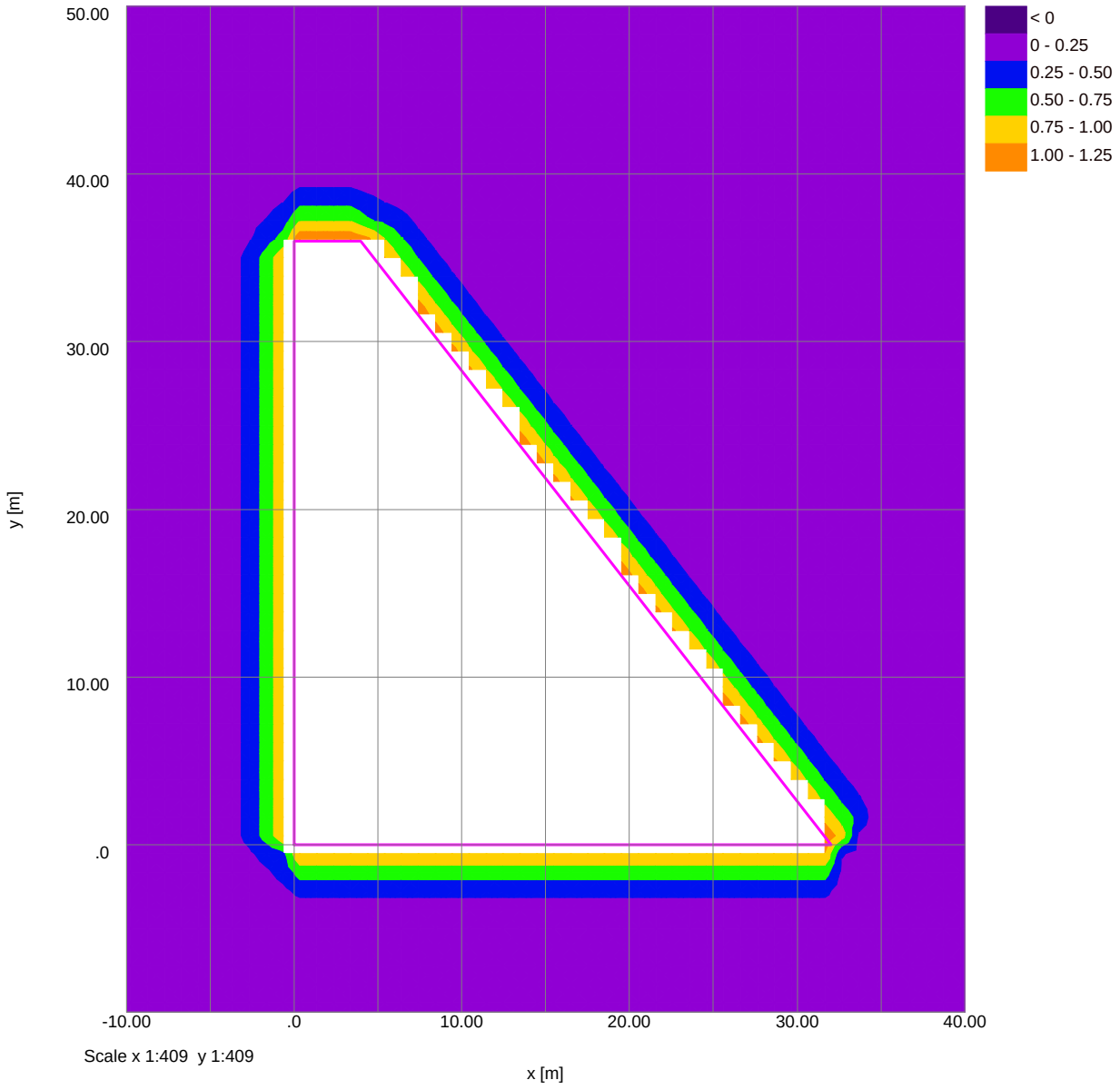
**BUILDING DAMAGE ASSESSMENT (X-DISP)**

Tabular Output of Results

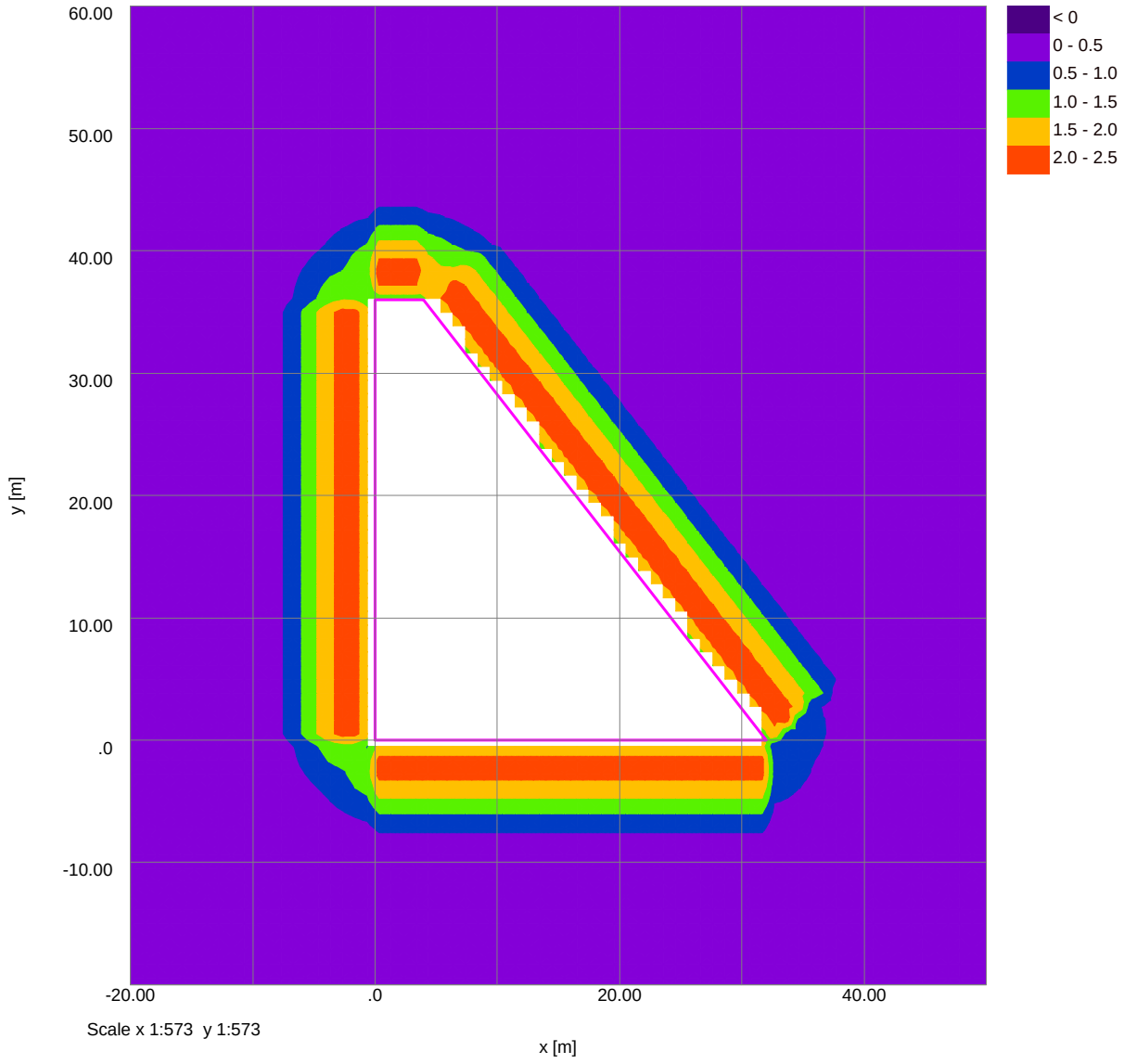
Vertical Settlement Contours: Grid 1 (level 0.000m) (Interval 0.25mm)



Horizontal Displacement Contours: Grid 1 (level 0.000m) Interval 0.25mm

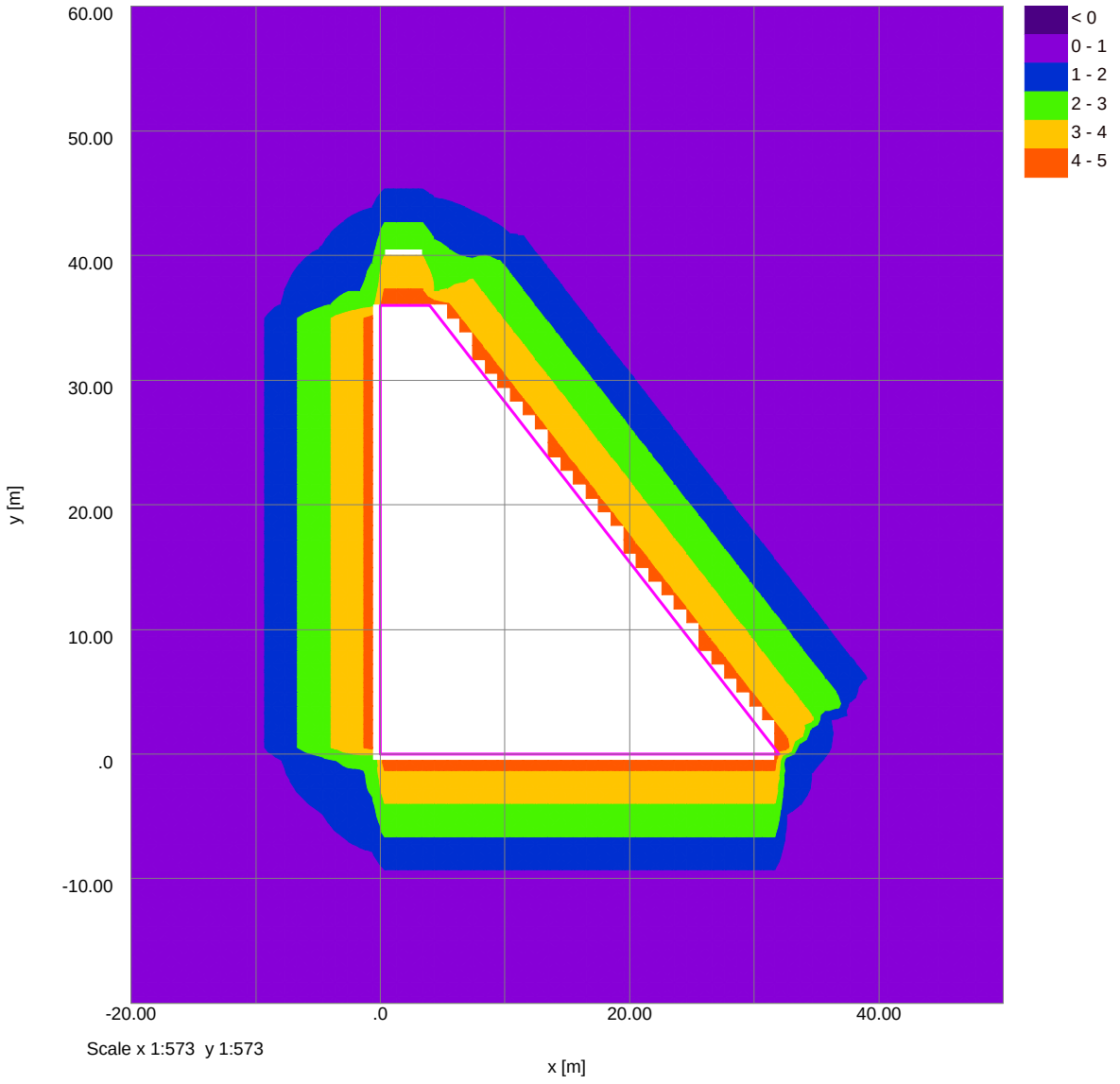


Vertical Settlement Contours: Grid 1 (level 0.000m) (Interval 0.5mm)



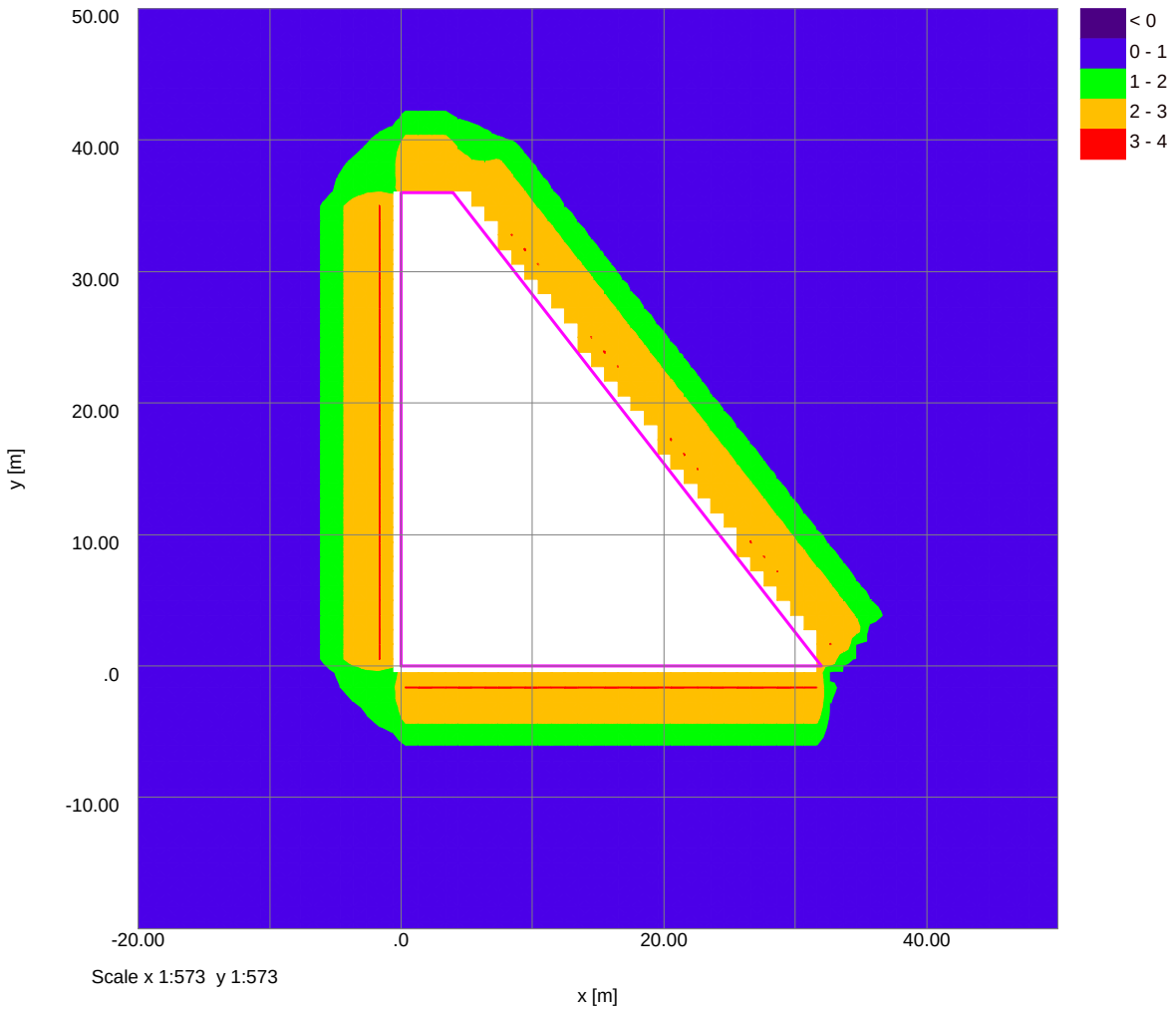

Scale x 1:573 y 1:573

Horizontal Displacement Contours: Grid 1 (level 0.000m) Interval 1mm

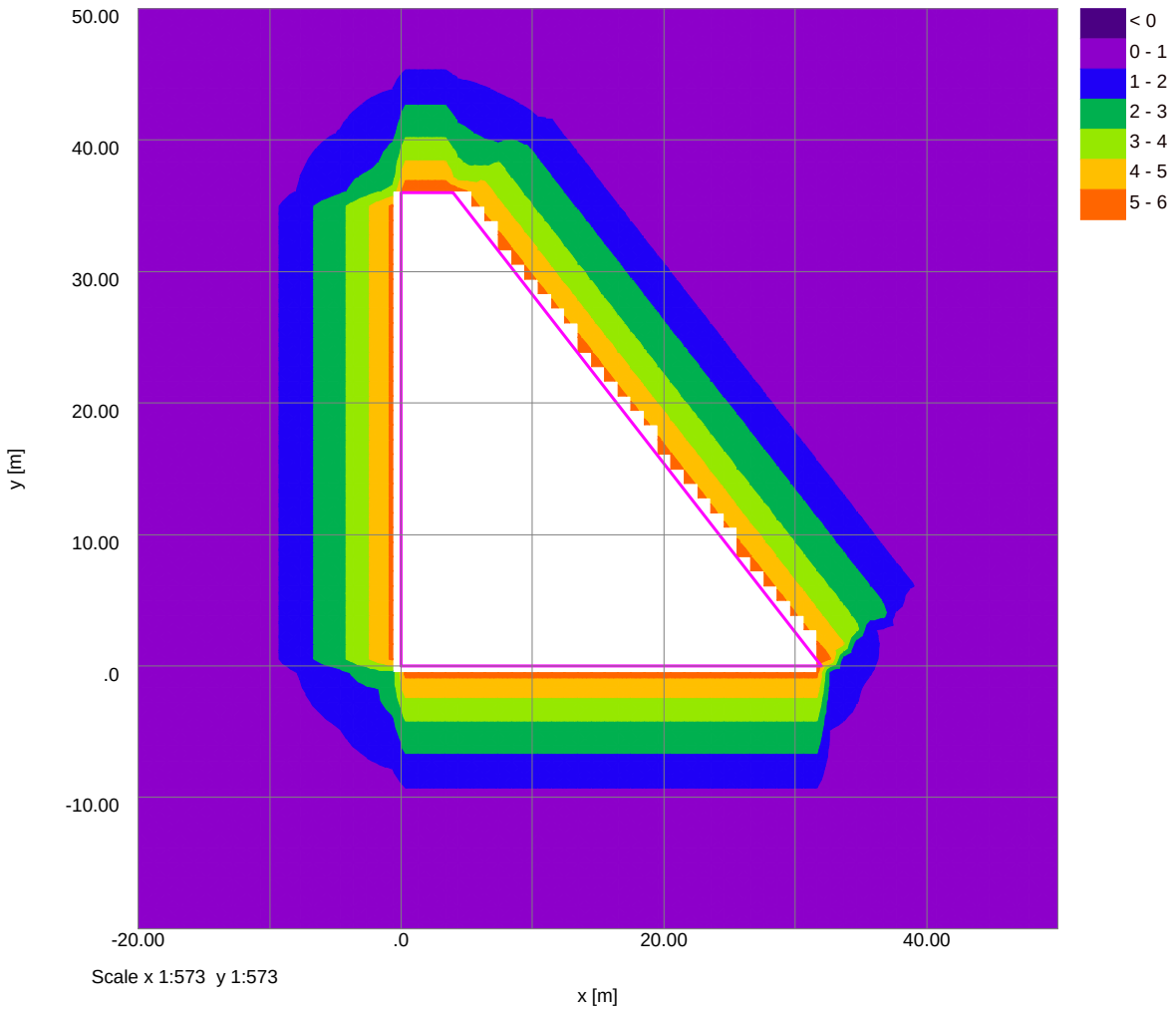


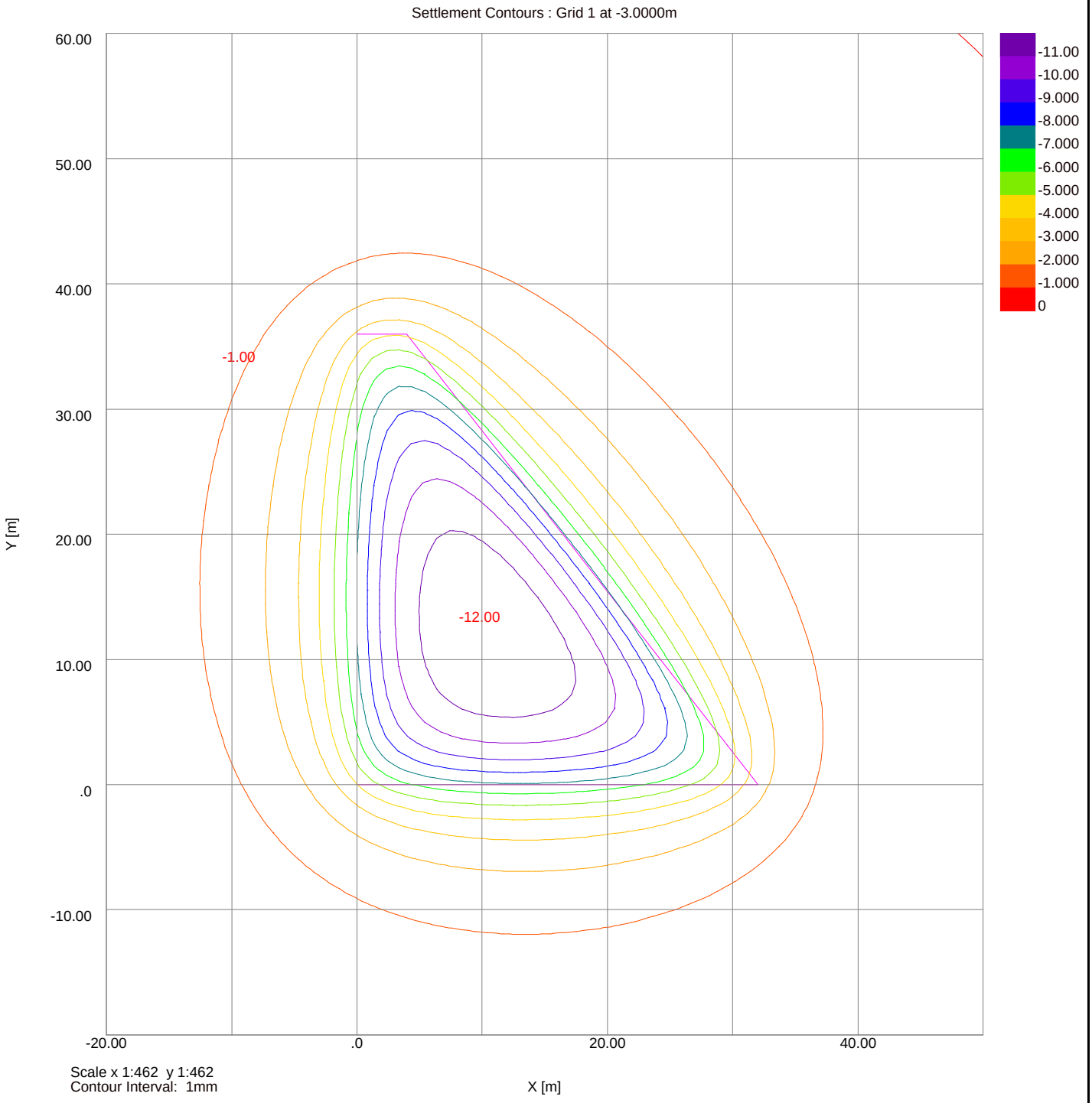

Scale x 1:573 y 1:573

Vertical Settlement Contours: Grid 1 (level 0.000m) (Interval 1mm)



Horizontal Displacement Contours: Grid 1 (level 0.000m) Interval 1mm



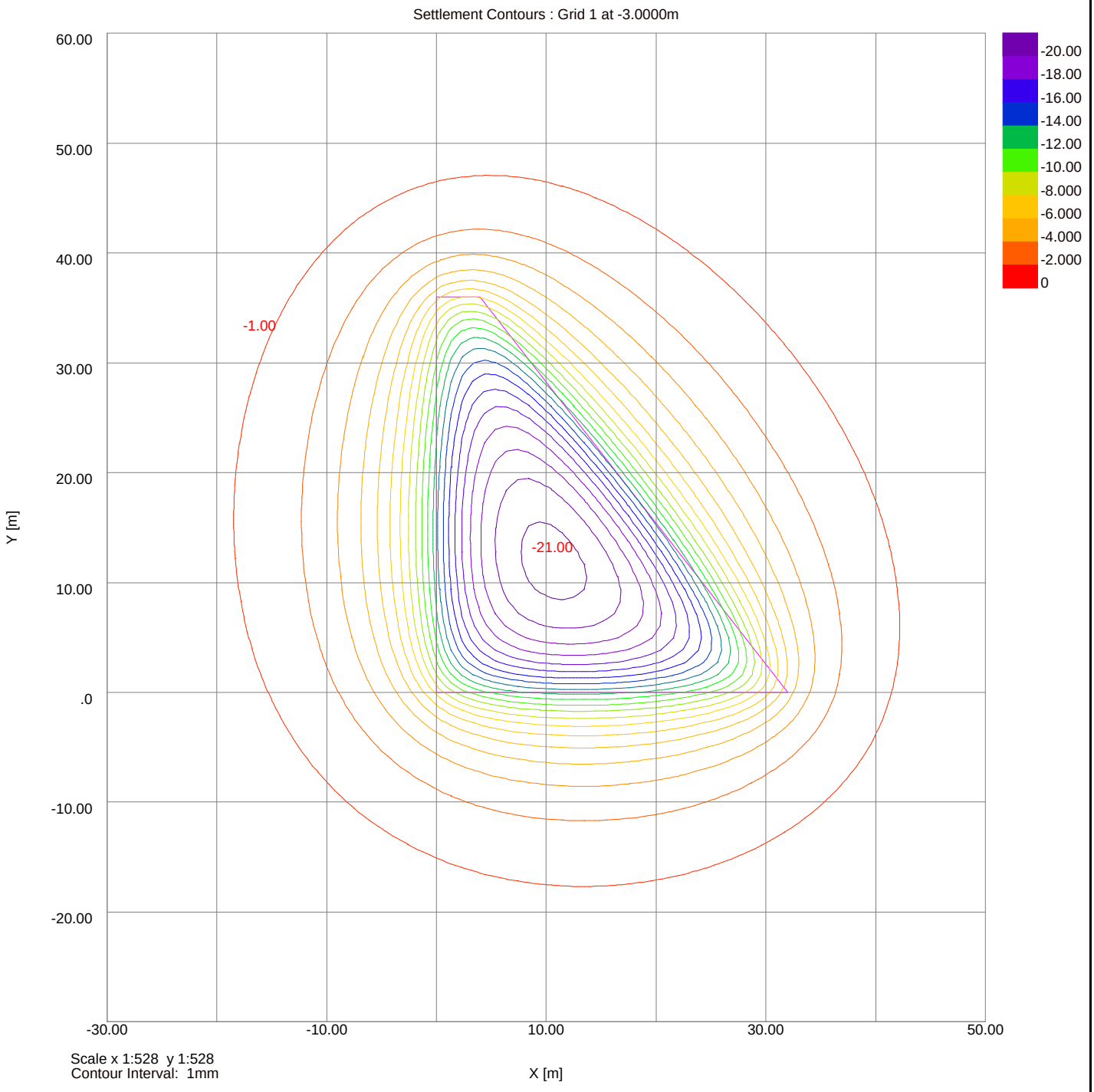

Settlement Contours : Grid 1 at -3.0000m
60.00
50.00
40.00
30.00
20.00
10.00
.0
-10.00
Y [m]
-20.00
.0
20.00
40.00
X [m]
-1.00
-12.00
-11.00
-10.00
-9.000
-8.000
-7.000
-6.000
-5.000
-4.000
-3.000
-2.000
-1.000
0
Scale x 1:462 y 1:462
Contour Interval: 1mm

Oasys

42 Caversham Road

Total Heave

| Job No. | Sheet No. | Rev. |
|---|---|---|
| J14023 | | |
| Drg. Ref. | | |
| Made by MP | Date | Checked |



***Specific Building Damage Results - Horizontal Displacements***

Structure: No 38 to 40 | Sub-structure: Southern Elevation

| Dist. | Coordinates | | | Displacements | | | |
|---|---|---|---|---|---|---|---|
| | x | y | z | x | y | Along the Line | Perpendicular to Line |
| [m] | [m] | [m] | [m] | [mm] | [mm] | [mm] | [mm] |
| 0.0 | -13.00000 | 6.00000 | -2.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1.0000 | -12.00000 | 6.00000 | -2.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2.0000 | -11.00000 | 6.00000 | -2.00000 | 0.37500 | 0.0 | 0.37500 | 0.0 |
| 3.0000 | -10.00000 | 6.00000 | -2.00000 | 0.75000 | 0.0 | 0.75000 | 0.0 |
| 4.0000 | -9.00000 | 6.00000 | -2.00000 | 1.1250 | 0.0 | 1.1250 | 0.0 |
| 5.0000 | -8.00000 | 6.00000 | -2.00000 | 1.5000 | 0.0 | 1.5000 | 0.0 |
| 6.0000 | -7.00000 | 6.00000 | -2.00000 | 1.8750 | 0.0 | 1.8750 | 0.0 |
| 7.0000 | -6.00000 | 6.00000 | -2.00000 | 2.2500 | 0.0 | 2.2500 | 0.0 |
| 8.0000 | -5.00000 | 6.00000 | -2.00000 | 2.6250 | 0.0 | 2.6250 | 0.0 |
| 9.0000 | -4.00000 | 6.00000 | -2.00000 | 3.0000 | 0.0 | 3.0000 | 0.0 |
| 10.000 | -3.00000 | 6.00000 | -2.00000 | 3.3750 | 0.0 | 3.3750 | 0.0 |
| 11.000 | -2.00000 | 6.00000 | -2.00000 | 3.7500 | 0.0 | 3.7500 | 0.0 |
| 12.000 | -1.00000 | 6.00000 | -2.00000 | 4.1250 | 0.0 | 4.1250 | 0.0 |

Structure: No 38 to 40 | Sub-structure: Eastern Elevation

| Dist. | Coordinates | | | Displacements | | | |
|---|---|---|---|---|---|---|---|
| | x | y | z | x | y | Along the Line | Perpendicular to Line |
| [m] | [m] | [m] | [m] | [mm] | [mm] | [mm] | [mm] |
| 0.0 | -1.00000 | 6.00000 | -2.00000 | 4.1250 | 0.0 | 0.0 | -4.1250 |
| 1.0000 | -1.00000 | 7.00000 | -2.00000 | 4.1250 | 0.0 | 0.0 | -4.1250 |
| 2.0000 | -1.00000 | 8.00000 | -2.00000 | 4.1250 | 0.0 | 0.0 | -4.1250 |
| 3.0000 | -1.00000 | 9.00000 | -2.00000 | 4.1250 | 0.0 | 0.0 | -4.1250 |
| 4.0000 | -1.00000 | 10.00000 | -2.00000 | 4.1250 | 0.0 | 0.0 | -4.1250 |
| 5.0000 | -1.00000 | 11.00000 | -2.00000 | 4.1250 | 0.0 | 0.0 | -4.1250 |
| 6.0000 | -1.00000 | 12.00000 | -2.00000 | 4.1250 | 0.0 | 0.0 | -4.1250 |
| 7.0000 | -1.00000 | 13.00000 | -2.00000 | 4.1250 | 0.0 | 0.0 | -4.1250 |
| 8.0000 | -1.00000 | 14.00000 | -2.00000 | 4.1250 | 0.0 | 0.0 | -4.1250 |
| 9.0000 | -1.00000 | 15.00000 | -2.00000 | 4.1250 | 0.0 | 0.0 | -4.1250 |
| 10.000 | -1.00000 | 16.00000 | -2.00000 | 4.1250 | 0.0 | 0.0 | -4.1250 |

Structure: No 38 to 40 | Sub-structure: Northern Elevation

| Dist. | Coordinates | | | Displacements | | | |
|---|---|---|---|---|---|---|---|
| | x | y | z | x | y | Along the Line | Perpendicular to Line |
| [m] | [m] | [m] | [m] | [mm] | [mm] | [mm] | [mm] |
| 0.0 | -1.00000 | 16.00000 | -2.00000 | 4.1250 | 0.0 | -4.1250 | 0.0 |
| 1.0000 | -2.00000 | 16.00000 | -2.00000 | 3.7500 | 0.0 | -3.7500 | 0.0 |
| 2.0000 | -3.00000 | 16.00000 | -2.00000 | 3.3750 | 0.0 | -3.3750 | 0.0 |
| 3.0000 | -4.00000 | 16.00000 | -2.00000 | 3.0000 | 0.0 | -3.0000 | 0.0 |
| 4.0000 | -5.00000 | 16.00000 | -2.00000 | 2.6250 | 0.0 | -2.6250 | 0.0 |
| 5.0000 | -6.00000 | 16.00000 | -2.00000 | 2.2500 | 0.0 | -2.2500 | 0.0 |
| 6.0000 | -7.00000 | 16.00000 | -2.00000 | 1.8750 | 0.0 | -1.8750 | 0.0 |
| 7.0000 | -8.00000 | 16.00000 | -2.00000 | 1.5000 | 0.0 | -1.5000 | 0.0 |
| 8.0000 | -9.00000 | 16.00000 | -2.00000 | 1.1250 | 0.0 | -1.1250 | 0.0 |
| 9.0000 | -10.00000 | 16.00000 | -2.00000 | 0.75000 | 0.0 | -0.75000 | 0.0 |
| 10.000 | -11.00000 | 16.00000 | -2.00000 | 0.37500 | 0.0 | -0.37500 | 0.0 |
| 11.000 | -12.00000 | 16.00000 | -2.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 12.000 | -13.00000 | 16.00000 | -2.00000 | 0.0 | 0.0 | 0.0 | 0.0 |

Structure: No 38 to 40 | Sub-structure: Western Elevation

| Dist. | Coordinates | | | Displacements | | | |
|---|---|---|---|---|---|---|---|
| | x | y | z | x | y | Along the Line | Perpendicular to Line |
| [m] | [m] | [m] | [m] | [mm] | [mm] | [mm] | [mm] |
| 0.0 | -13.00000 | 16.00000 | -2.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1.0000 | -13.00000 | 15.00000 | -2.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2.0000 | -13.00000 | 14.00000 | -2.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3.0000 | -13.00000 | 13.00000 | -2.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4.0000 | -13.00000 | 12.00000 | -2.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 5.0000 | -13.00000 | 11.00000 | -2.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 6.0000 | -13.00000 | 10.00000 | -2.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7.0000 | -13.00000 | 9.00000 | -2.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 8.0000 | -13.00000 | 8.00000 | -2.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 9.0000 | -13.00000 | 7.00000 | -2.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 10.000 | -13.00000 | 6.00000 | -2.00000 | 0.0 | 0.0 | 0.0 | 0.0 |

Structure: No 38 to 40 | Sub-structure: Party Wall

| Dist. | Coordinates | | | Displacements | | | |
|---|---|---|---|---|---|---|---|
| | x | y | z | x | y | Along the Line | Perpendicular to Line |
| [m] | [m] | [m] | [m] | [mm] | [mm] | [mm] | [mm] |
| 0.0 | -7.00000 | 6.00000 | -2.00000 | 1.8750 | 0.0 | 0.0 | -1.8750 |
| 1.0000 | -7.00000 | 7.00000 | -2.00000 | 1.8750 | 0.0 | 0.0 | -1.8750 |
| 2.0000 | -7.00000 | 8.00000 | -2.00000 | 1.8750 | 0.0 | 0.0 | -1.8750 |
| 3.0000 | -7.00000 | 9.00000 | -2.00000 | 1.8750 | 0.0 | 0.0 | -1.8750 |
| 4.0000 | -7.00000 | 10.00000 | -2.00000 | 1.8750 | 0.0 | 0.0 | -1.8750 |
| 5.0000 | -7.00000 | 11.00000 | -2.00000 | 1.8750 | 0.0 | 0.0 | -1.8750 |
| 6.0000 | -7.00000 | 12.00000 | -2.00000 | 1.8750 | 0.0 | 0.0 | -1.8750 |
| 7.0000 | -7.00000 | 13.00000 | -2.00000 | 1.8750 | 0.0 | 0.0 | -1.8750 |
| 8.0000 | -7.00000 | 14.00000 | -2.00000 | 1.8750 | 0.0 | 0.0 | -1.8750 |
| 9.0000 | -7.00000 | 15.00000 | -2.00000 | 1.8750 | 0.0 | 0.0 | -1.8750 |
| 10.000 | -7.00000 | 16.00000 | -2.00000 | 1.8750 | 0.0 | 0.0 | -1.8750 |

Structure: Outbuilding to NW | Sub-structure: Southern Elevation

| Dist. | Coordinates | | | Displacements | | | |
|---|---|---|---|---|---|---|---|
| | x | y | z | x | y | Along the Line | Perpendicular to Line |
| [m] | [m] | [m] | [m] | [mm] | [mm] | [mm] | [mm] |
| 0.0 | -1.00000 | 41.00000 | -0.50000 | 0.31836 | -1.5918 | -0.31836 | 1.5918 |
| 1.0000 | -2.00000 | 41.00000 | -0.50000 | 0.54137 | -1.3534 | -0.54137 | 1.3534 |
| 2.0000 | -3.00000 | 41.00000 | -0.50000 | 0.65823 | -1.0970 | -0.65823 | 1.0970 |
| 3.0000 | -4.00000 | 41.00000 | -0.50000 | 0.68697 | -0.85871 | -0.68697 | 0.85871 |
| 4.0000 | -5.00000 | 41.00000 | -0.50000 | 0.65349 | -0.65349 | -0.65349 | 0.65349 |
| 5.0000 | -6.00000 | 41.00000 | -0.50000 | 0.62718 | -0.52265 | -0.62718 | 0.52265 |
| 6.0000 | -7.00000 | 41.00000 | -0.50000 | 0.55546 | -0.39676 | -0.55546 | 0.39676 |

Structure: Outbuilding to NW | Sub-structure: Eastern Elevation

| Dist. | Coordinates | | | Displacements | | | |
|---|---|---|---|---|---|---|---|
| | x | y | z | x | y | Along the Line | Perpendicular to Line |
| [m] | [m] | [m] | [m] | [mm] | [mm] | [mm] | [mm] |
| 0.0 | -1.00000 | 41.00000 | -0.50000 | 0.31836 | -1.5918 | -1.5918 | -0.31836 |
| 1.0000 | -1.00000 | 42.00000 | -0.50000 | 0.23137 | -1.3882 | -1.3882 | -0.23137 |
| 2.0000 | -1.00000 | 43.00000 | -0.50000 | 0.16711 | -1.1697 | -1.1697 | -0.16711 |
| 3.0000 | -1.00000 | 44.00000 | -0.50000 | 0.11778 | -0.94228 | -0.94228 | -0.11778 |
| 4.0000 | -1.00000 | 45.00000 | -0.50000 | 0.078780 | -0.70902 | -0.70902 | -0.078780 |
| 5.0000 | -1.00000 | 46.00000 | -0.50000 | 0.047184 | -0.47184 | -0.47184 | -0.047184 |
| 6.0000 | -1.00000 | 47.00000 | -0.50000 | 0.021079 | -0.23187 | -0.23187 | -0.021079 |
| 7.0000 | -1.00000 | 48.00000 | -0.50000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 8.0000 | -1.00000 | 49.00000 | -0.50000 | 0.0 | 0.0 | 0.0 | 0.0 |

| Dist. | Coordinates | | | Displacements | | | |
|---|---|---|---|---|---|---|---|
| | x | y | z | x | y | Along the Line | Perpendicular to Line |
| [m] | [m] | [m] | [m] | [mm] | [mm] | [mm] | [mm] |

Structure: Outbuilding to NW | Sub-structure: Northern Elevation

| Dist. | Coordinates | | | Displacements | | | |
|---|---|---|---|---|---|---|---|
| | x | y | z | x | y | Along the Line | Perpendicular to Line |
| [m] | [m] | [m] | [m] | [mm] | [mm] | [mm] | [mm] |
| 0.0 | -1.00000 | 49.00000 | -0.50000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1.0000 | -2.00000 | 49.00000 | -0.50000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2.0000 | -3.00000 | 49.00000 | -0.50000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3.0000 | -4.00000 | 49.00000 | -0.50000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4.0000 | -5.00000 | 49.00000 | -0.50000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 5.0000 | -6.00000 | 49.00000 | -0.50000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 6.0000 | -7.00000 | 49.00000 | -0.50000 | 0.0 | 0.0 | 0.0 | 0.0 |

Structure: Outbuilding to NW | Sub-structure: Western Elevation

| Dist. | Coordinates | | | Displacements | | | |
|---|---|---|---|---|---|---|---|
| | x | y | z | x | y | Along the Line | Perpendicular to Line |
| [m] | [m] | [m] | [m] | [mm] | [mm] | [mm] | [mm] |
| 0.0 | -7.00000 | 49.00000 | -0.50000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1.0000 | -7.00000 | 48.00000 | -0.50000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2.0000 | -7.00000 | 47.00000 | -0.50000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3.0000 | -7.00000 | 46.00000 | -0.50000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4.0000 | -7.00000 | 45.00000 | -0.50000 | 0.072574 | -0.093309 | 0.093309 | 0.072574 |
| 5.0000 | -7.00000 | 44.00000 | -0.50000 | 0.17401 | -0.19887 | 0.19887 | 0.17401 |
| 6.0000 | -7.00000 | 43.00000 | -0.50000 | 0.27849 | -0.27849 | 0.27849 | 0.27849 |
| 7.0000 | -7.00000 | 42.00000 | -0.50000 | 0.40898 | -0.35056 | 0.35056 | 0.40898 |
| 8.0000 | -7.00000 | 41.00000 | -0.50000 | 0.55546 | -0.39676 | 0.39676 | 0.55546 |

Structure: Network Rail Line | Sub-structure: Sub 10

| Dist. | Coordinates | | | Displacements | | | |
|---|---|---|---|---|---|---|---|
| | x | y | z | x | y | Along the Line | Perpendicular to Line |
| [m] | [m] | [m] | [m] | [mm] | [mm] | [mm] | [mm] |
| 0.0 | 56.00000 | 0.00000 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1.0022 | 55.25843 | 0.67416 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2.0044 | 54.51685 | 1.34831 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3.0066 | 53.77528 | 2.02247 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4.0088 | 53.03371 | 2.69663 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 5.0110 | 52.29213 | 3.37079 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 6.0132 | 51.55056 | 4.04494 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7.0154 | 50.80899 | 4.71910 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 8.0177 | 50.06742 | 5.39326 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 9.0199 | 49.32584 | 6.06742 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 10.022 | 48.58427 | 6.74157 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 11.024 | 47.84270 | 7.41573 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 12.026 | 47.10112 | 8.08989 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 13.029 | 46.35955 | 8.76404 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 14.031 | 45.61798 | 9.43820 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 15.033 | 44.87640 | 10.11236 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 16.035 | 44.13483 | 10.78652 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 17.038 | 43.39326 | 11.46067 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 18.040 | 42.65169 | 12.13483 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 19.042 | 41.91011 | 12.80899 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 20.044 | 41.16854 | 13.48315 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 21.046 | 40.42697 | 14.15730 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 22.049 | 39.68539 | 14.83146 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 23.051 | 38.94382 | 15.50562 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 24.053 | 38.20225 | 16.17978 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 25.055 | 37.46067 | 16.85393 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 26.057 | 36.71910 | 17.52809 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 27.060 | 35.97753 | 18.20225 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 28.062 | 35.23596 | 18.87640 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 29.064 | 34.49438 | 19.55056 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 30.066 | 33.75281 | 20.22472 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 31.068 | 33.01124 | 20.89888 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 32.071 | 32.26966 | 21.57303 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 33.073 | 31.52809 | 22.24719 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 34.075 | 30.78652 | 22.92135 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 35.077 | 30.04494 | 23.59551 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 36.079 | 29.30337 | 24.26966 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 37.082 | 28.56180 | 24.94382 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 38.084 | 27.82022 | 25.61798 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 39.086 | 27.07865 | 26.29213 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 40.088 | 26.33708 | 26.96629 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 41.090 | 25.59551 | 27.64045 | 0.00000 | -0.025400 | -0.019755 | 0.0055054 | 0.031703 |
| 42.093 | 24.85393 | 28.31461 | 0.00000 | -0.076156 | -0.059232 | 0.016507 | 0.095056 |
| 43.095 | 24.11236 | 28.98876 | 0.00000 | -0.12691 | -0.098709 | 0.027508 | 0.15841 |
| 44.097 | 23.37079 | 29.66292 | 0.00000 | -0.17767 | -0.13819 | 0.038510 | 0.22176 |
| 45.099 | 22.62921 | 30.33708 | 0.00000 | -0.22842 | -0.17766 | 0.049511 | 0.28512 |
| 46.102 | 21.88764 | 31.01124 | 0.00000 | -0.27918 | -0.21714 | 0.060512 | 0.34847 |
| 47.104 | 21.14607 | 31.68539 | 0.00000 | -0.32994 | -0.25662 | 0.071514 | 0.41182 |
| 48.106 | 20.40449 | 32.35955 | 0.00000 | -0.38069 | -0.29609 | 0.082515 | 0.47517 |
| 49.108 | 19.66292 | 33.03371 | 0.00000 | -0.43145 | -0.33557 | 0.093517 | 0.53853 |
| 50.110 | 18.92135 | 33.70787 | 0.00000 | -0.48221 | -0.37505 | 0.10452 | 0.60188 |
| 51.113 | 18.17978 | 34.38202 | 0.00000 | -0.53296 | -0.41453 | 0.11552 | 0.66523 |
| 52.115 | 17.43820 | 35.05618 | 0.00000 | -0.58372 | -0.45400 | 0.12652 | 0.72859 |
| 53.117 | 16.69663 | 35.73034 | 0.00000 | -0.63447 | -0.49348 | 0.13752 | 0.79194 |
| 54.119 | 15.95506 | 36.40449 | 0.00000 | -0.68523 | -0.53296 | 0.14852 | 0.85529 |
| 55.121 | 15.21348 | 37.07865 | 0.00000 | -0.73599 | -0.57243 | 0.15953 | 0.91865 |
| 56.124 | 14.47191 | 37.75281 | 0.00000 | -0.78674 | -0.61191 | 0.17053 | 0.98200 |
| 57.126 | 13.73034 | 38.42697 | 0.00000 | -0.83750 | -0.65139 | 0.18153 | 1.0454 |
| 58.128 | 12.98876 | 39.10112 | 0.00000 | -0.88826 | -0.69087 | 0.19253 | 1.1087 |
| 59.130 | 12.24719 | 39.77528 | 0.00000 | -0.93901 | -0.73034 | 0.20353 | 1.1721 |
| 60.132 | 11.50562 | 40.44944 | 0.00000 | -0.98977 | -0.76982 | 0.21453 | 1.2354 |
| 61.135 | 10.76404 | 41.12360 | 0.00000 | -1.0405 | -0.80930 | 0.22553 | 1.2988 |
| 62.137 | 10.02247 | 41.79775 | 0.00000 | -0.77307 | -0.74423 | 0.071406 | 1.0707 |
| 63.139 | 9.28090 | 42.47191 | 0.00000 | -0.65719 | -0.80541 | -0.055495 | 1.0380 |
| 64.141 | 8.53933 | 43.14607 | 0.00000 | -0.52190 | -0.82161 | -0.16650 | 0.95901 |
| 65.143 | 7.79775 | 43.82022 | 0.00000 | -0.38512 | -0.79302 | -0.24848 | 0.84585 |
| 66.146 | 7.05618 | 44.49438 | 0.00000 | -0.27704 | -0.77001 | -0.31297 | 0.75612 |
| 67.148 | 6.31461 | 45.16854 | 0.00000 | -0.17637 | -0.69863 | -0.33945 | 0.63559 |
| 68.150 | 5.57303 | 45.84270 | 0.00000 | -0.093164 | -0.58294 | -0.32319 | 0.49401 |
| 69.152 | 4.83146 | 46.51685 | 0.00000 | -0.033940 | -0.42930 | -0.26366 | 0.34049 |
| 70.154 | 4.08989 | 47.19101 | 0.00000 | -0.0019658 | -0.24474 | -0.16318 | 0.18242 |
| 71.157 | 3.34831 | 47.86517 | 0.00000 | 0.0 | -0.050562 | -0.034012 | 0.037413 |
| 72.159 | 2.60674 | 48.53933 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 73.161 | 1.86517 | 49.21348 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 74.163 | 1.12360 | 49.88764 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 75.166 | 0.38202 | 50.56180 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 76.168 | -0.35955 | 51.23596 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 77.170 | -1.10112 | 51.91011 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 78.172 | -1.84270 | 52.58427 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 79.174 | -2.58427 | 53.25843 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 80.177 | -3.32584 | 53.93258 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 81.179 | -4.06742 | 54.60674 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 82.181 | -4.80899 | 55.28090 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 83.183 | -5.55056 | 55.95506 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 84.185 | -6.29213 | 56.62921 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 85.188 | -7.03371 | 57.30337 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 86.190 | -7.77528 | 57.97753 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 87.192 | -8.51685 | 58.65169 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 88.194 | -9.25843 | 59.32584 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |
| 89.196 | -10.00000 | 60.00000 | 0.00000 | 0.0 | 0.0 | 0.0 | 0.0 |

***Specific Building Damage Results - Vertical Displacements***

Structure: No 38 to 40 | Sub-structure: Southern Elevation

| Dist. | Coordinates | | | Displacements |
|---|---|---|---|---|
| | x | y | z | z |
| [m] | [m] | [m] | [m] | [mm] |

| Dist. [m] | Coordinates x [m] | y [m] | z [m] | Displacements z [mm] |
|---|---|---|---|---|
| **Vertical Offset 1** | | | | |
| 0.0 | -13.00000 | 6.00000 | -2.00000 | 0.0 |
| 1.0000 | -12.00000 | 6.00000 | -2.00000 | 0.0025761 |
| 2.0000 | -11.00000 | 6.00000 | -2.00000 | 0.053670 |
| 3.0000 | -10.00000 | 6.00000 | -2.00000 | 0.099704 |
| 4.0000 | -9.00000 | 6.00000 | -2.00000 | 0.19762 |
| 5.0000 | -8.00000 | 6.00000 | -2.00000 | 0.38086 |
| 6.0000 | -7.00000 | 6.00000 | -2.00000 | 0.65933 |
| 7.0000 | -6.00000 | 6.00000 | -2.00000 | 1.0194 |
| 8.0000 | -5.00000 | 6.00000 | -2.00000 | 1.4240 |
| 9.0000 | -4.00000 | 6.00000 | -2.00000 | 1.8125 |
| 10.000 | -3.00000 | 6.00000 | -2.00000 | 2.1008 |
| 11.000 | -2.00000 | 6.00000 | -2.00000 | 2.1811 |
| 12.000 | -1.00000 | 6.00000 | -2.00000 | 1.9223 |

Structure: No 38 to 40 | Sub-structure: Eastern Elevation

| Dist. [m] | Coordinates x [m] | y [m] | z [m] | Displacements z [mm] |
|---|---|---|---|---|
| **Vertical Offset 1** | | | | |
| 0.0 | -1.00000 | 6.00000 | -2.00000 | 1.9223 |
| 1.0000 | -1.00000 | 7.00000 | -2.00000 | 1.9223 |
| 2.0000 | -1.00000 | 8.00000 | -2.00000 | 1.9223 |
| 3.0000 | -1.00000 | 9.00000 | -2.00000 | 1.9223 |
| 4.0000 | -1.00000 | 10.00000 | -2.00000 | 1.9223 |
| 5.0000 | -1.00000 | 11.00000 | -2.00000 | 1.9223 |
| 6.0000 | -1.00000 | 12.00000 | -2.00000 | 1.9223 |
| 7.0000 | -1.00000 | 13.00000 | -2.00000 | 1.9223 |
| 8.0000 | -1.00000 | 14.00000 | -2.00000 | 1.9223 |
| 9.0000 | -1.00000 | 15.00000 | -2.00000 | 1.9223 |
| 10.000 | -1.00000 | 16.00000 | -2.00000 | 1.9223 |

Structure: No 38 to 40 | Sub-structure: Northern Elevation

| Dist. [m] | Coordinates x [m] | y [m] | z [m] | Displacements z [mm] |
|---|---|---|---|---|
| **Vertical Offset 1** | | | | |
| 0.0 | -1.00000 | 16.00000 | -2.00000 | 1.9223 |
| 1.0000 | -2.00000 | 16.00000 | -2.00000 | 2.1811 |
| 2.0000 | -3.00000 | 16.00000 | -2.00000 | 2.1008 |
| 3.0000 | -4.00000 | 16.00000 | -2.00000 | 1.8125 |
| 4.0000 | -5.00000 | 16.00000 | -2.00000 | 1.4240 |
| 5.0000 | -6.00000 | 16.00000 | -2.00000 | 1.0194 |
| 6.0000 | -7.00000 | 16.00000 | -2.00000 | 0.65933 |
| 7.0000 | -8.00000 | 16.00000 | -2.00000 | 0.38086 |
| 8.0000 | -9.00000 | 16.00000 | -2.00000 | 0.19762 |
| 9.0000 | -10.00000 | 16.00000 | -2.00000 | 0.099704 |
| 10.000 | -11.00000 | 16.00000 | -2.00000 | 0.053670 |
| 11.000 | -12.00000 | 16.00000 | -2.00000 | 0.0025761 |
| 12.000 | -13.00000 | 16.00000 | -2.00000 | 0.0 |

Structure: No 38 to 40 | Sub-structure: Western Elevation

| Dist. [m] | Coordinates x [m] | y [m] | z [m] | Displacements z [mm] |
|---|---|---|---|---|
| **Vertical Offset 1** | | | | |
| 0.0 | -13.00000 | 16.00000 | -2.00000 | 0.0 |
| 1.0000 | -13.00000 | 15.00000 | -2.00000 | 0.0 |
| 2.0000 | -13.00000 | 14.00000 | -2.00000 | 0.0 |
| 3.0000 | -13.00000 | 13.00000 | -2.00000 | 0.0 |
| 4.0000 | -13.00000 | 12.00000 | -2.00000 | 0.0 |
| 5.0000 | -13.00000 | 11.00000 | -2.00000 | 0.0 |
| 6.0000 | -13.00000 | 10.00000 | -2.00000 | 0.0 |
| 7.0000 | -13.00000 | 9.00000 | -2.00000 | 0.0 |
| 8.0000 | -13.00000 | 8.00000 | -2.00000 | 0.0 |
| 9.0000 | -13.00000 | 7.00000 | -2.00000 | 0.0 |
| 10.000 | -13.00000 | 6.00000 | -2.00000 | 0.0 |

Structure: No 38 to 40 | Sub-structure: Party Wall

| Dist. [m] | Coordinates x [m] | y [m] | z [m] | Displacements z [mm] |
|---|---|---|---|---|
| **Vertical Offset 1** | | | | |
| 0.0 | -7.00000 | 6.00000 | -2.00000 | 0.65933 |
| 1.0000 | -7.00000 | 7.00000 | -2.00000 | 0.65933 |
| 2.0000 | -7.00000 | 8.00000 | -2.00000 | 0.65933 |
| 3.0000 | -7.00000 | 9.00000 | -2.00000 | 0.65933 |
| 4.0000 | -7.00000 | 10.00000 | -2.00000 | 0.65933 |
| 5.0000 | -7.00000 | 11.00000 | -2.00000 | 0.65933 |
| 6.0000 | -7.00000 | 12.00000 | -2.00000 | 0.65933 |
| 7.0000 | -7.00000 | 13.00000 | -2.00000 | 0.65933 |
| 8.0000 | -7.00000 | 14.00000 | -2.00000 | 0.65933 |
| 9.0000 | -7.00000 | 15.00000 | -2.00000 | 0.65933 |
| 10.000 | -7.00000 | 16.00000 | -2.00000 | 0.65933 |

Structure: Outbuilding to NW | Sub-structure: Southern Elevation

| Dist. [m] | Coordinates x [m] | y [m] | z [m] | Displacements z [mm] |
|---|---|---|---|---|
| **Vertical Offset 1** | | | | |
| 0.0 | -1.00000 | 41.00000 | -0.50000 | 0.86784 |
| 1.0000 | -2.00000 | 41.00000 | -0.50000 | 0.74411 |
| 2.0000 | -3.00000 | 41.00000 | -0.50000 | 0.60062 |
| 3.0000 | -4.00000 | 41.00000 | -0.50000 | 0.45389 |
| 4.0000 | -5.00000 | 41.00000 | -0.50000 | 0.31827 |
| 5.0000 | -6.00000 | 41.00000 | -0.50000 | 0.22160 |
| 6.0000 | -7.00000 | 41.00000 | -0.50000 | 0.13886 |

Structure: Outbuilding to NW | Sub-structure: Eastern Elevation

| Dist. [m] | Coordinates x [m] | y [m] | z [m] | Displacements z [mm] |
|---|---|---|---|---|
| **Vertical Offset 1** | | | | |
| 0.0 | -1.00000 | 41.00000 | -0.50000 | 0.86784 |
| 1.0000 | -1.00000 | 42.00000 | -0.50000 | 0.62618 |
| 2.0000 | -1.00000 | 43.00000 | -0.50000 | 0.40694 |
| 3.0000 | -1.00000 | 44.00000 | -0.50000 | 0.23579 |
| 4.0000 | -1.00000 | 45.00000 | -0.50000 | 0.12286 |
| 5.0000 | -1.00000 | 46.00000 | -0.50000 | 0.062609 |
| 6.0000 | -1.00000 | 47.00000 | -0.50000 | 0.033808 |
| 7.0000 | -1.00000 | 48.00000 | -0.50000 | 0.0 |
| 8.0000 | -1.00000 | 49.00000 | -0.50000 | 0.0 |

Structure: Outbuilding to NW | Sub-structure: Northern Elevation

| Dist. [m] | Coordinates x [m] | y [m] | z [m] | Displacements z [mm] |
|---|---|---|---|---|
| **Vertical Offset 1** | | | | |
| 0.0 | -1.00000 | 49.00000 | -0.50000 | 0.0 |

| Dist. | Coordinates x | y | z | Displacements z |
|---|---|---|---|---|
| [m] | [m] | [m] | [m] | [mm] |
| 1.0000 | -2.00000 | 49.00000 | -0.50000 | 0.0 |
| 2.0000 | -3.00000 | 49.00000 | -0.50000 | 0.0 |
| 3.0000 | -4.00000 | 49.00000 | -0.50000 | 0.0 |
| 4.0000 | -5.00000 | 49.00000 | -0.50000 | 0.0 |
| 5.0000 | -6.00000 | 49.00000 | -0.50000 | 0.0 |
| 6.0000 | -7.00000 | 49.00000 | -0.50000 | 0.0 |

Structure: Outbuilding to NW | Sub-structure: Western Elevation

| Dist. | Coordinates x | y | z | Displacements z |
|---|---|---|---|---|
| [m] | [m] | [m] | [m] | [mm] |
| **Vertical Offset 1** | | | | |
| 0.0 | -7.00000 | 49.00000 | -0.50000 | 0.0 |
| 1.0000 | -7.00000 | 48.00000 | -0.50000 | 0.0 |
| 2.0000 | -7.00000 | 47.00000 | -0.50000 | 0.0 |
| 3.0000 | -7.00000 | 46.00000 | -0.50000 | 0.0 |
| 4.0000 | -7.00000 | 45.00000 | -0.50000 | 0.019886 |
| 5.0000 | -7.00000 | 44.00000 | -0.50000 | 0.034849 |
| 6.0000 | -7.00000 | 43.00000 | -0.50000 | 0.053230 |
| 7.0000 | -7.00000 | 42.00000 | -0.50000 | 0.087627 |
| 8.0000 | -7.00000 | 41.00000 | -0.50000 | 0.13886 |

Structure: Network Rail Line | Sub-structure: Sub 10

| Dist. | Coordinates x | y | z | Displacements z |
|---|---|---|---|---|
| [m] | [m] | [m] | [m] | [mm] |
| **Vertical Offset 1** | | | | |
| 0.0 | 56.00000 | 0.00000 | 0.00000 | 0.0 |
| 1.0022 | 55.25843 | 0.67416 | 0.00000 | 0.0 |
| 2.0044 | 54.51685 | 1.34831 | 0.00000 | 0.0 |
| 3.0066 | 53.77528 | 2.02247 | 0.00000 | 0.0 |
| 4.0088 | 53.03371 | 2.69663 | 0.00000 | 0.0 |
| 5.0110 | 52.29213 | 3.37079 | 0.00000 | 0.0 |
| 6.0132 | 51.55056 | 4.04494 | 0.00000 | 0.0 |
| 7.0154 | 50.80899 | 4.71910 | 0.00000 | 0.0 |
| 8.0177 | 50.06742 | 5.39326 | 0.00000 | 0.0 |
| 9.0199 | 49.32584 | 6.06742 | 0.00000 | 0.0 |
| 10.022 | 48.58427 | 6.74157 | 0.00000 | 0.0 |
| 11.024 | 47.84270 | 7.41573 | 0.00000 | 0.0 |
| 12.026 | 47.10112 | 8.08989 | 0.00000 | 0.0 |
| 13.029 | 46.35955 | 8.76404 | 0.00000 | 0.0 |
| 14.031 | 45.61798 | 9.43820 | 0.00000 | 0.0 |
| 15.033 | 44.87640 | 10.11236 | 0.00000 | 0.0 |
| 16.035 | 44.13483 | 10.78652 | 0.00000 | 0.0 |
| 17.038 | 43.39326 | 11.46067 | 0.00000 | 0.0 |
| 18.040 | 42.65169 | 12.13483 | 0.00000 | 0.0 |
| 19.042 | 41.91011 | 12.80899 | 0.00000 | 0.0 |
| 20.044 | 41.16854 | 13.48315 | 0.00000 | 0.0 |
| 21.046 | 40.42697 | 14.15730 | 0.00000 | 0.0 |
| 22.049 | 39.68539 | 14.83146 | 0.00000 | 0.0 |
| 23.051 | 38.94382 | 15.50562 | 0.00000 | 0.0 |
| 24.053 | 38.20225 | 16.17978 | 0.00000 | 0.0 |
| 25.055 | 37.46067 | 16.85393 | 0.00000 | 0.0 |
| 26.057 | 36.71910 | 17.52809 | 0.00000 | 0.0 |
| 27.060 | 35.97753 | 18.20225 | 0.00000 | 0.0 |
| 28.062 | 35.23596 | 18.87640 | 0.00000 | 0.0 |
| 29.064 | 34.49438 | 19.55056 | 0.00000 | 0.0 |
| 30.066 | 33.75281 | 20.22472 | 0.00000 | 0.0 |
| 31.068 | 33.01124 | 20.89888 | 0.00000 | 0.0 |
| 32.071 | 32.26966 | 21.57303 | 0.00000 | 0.0 |
| 33.073 | 31.52809 | 22.24719 | 0.00000 | 0.0 |
| 34.075 | 30.78652 | 22.92135 | 0.00000 | 0.0 |
| 35.077 | 30.04494 | 23.59551 | 0.00000 | 0.0 |
| 36.079 | 29.30337 | 24.26966 | 0.00000 | 0.0 |
| 37.082 | 28.56180 | 24.94382 | 0.00000 | 0.0 |
| 38.084 | 27.82022 | 25.61798 | 0.00000 | 0.0 |
| 39.086 | 27.07865 | 26.29213 | 0.00000 | 0.0 |
| 40.088 | 26.33708 | 26.96629 | 0.00000 | 0.0 |
| 41.090 | 25.59551 | 27.64045 | 0.00000 | 0.0090126 |
| 42.093 | 24.85393 | 28.31461 | 0.00000 | 0.020260 |
| 43.095 | 24.11236 | 28.98876 | 0.00000 | 0.029724 |
| 44.097 | 23.37079 | 29.66292 | 0.00000 | 0.037828 |
| 45.099 | 22.62921 | 30.33708 | 0.00000 | 0.044977 |
| 46.102 | 21.88764 | 31.01124 | 0.00000 | 0.051553 |
| 47.104 | 21.14607 | 31.68539 | 0.00000 | 0.057921 |
| 48.106 | 20.40449 | 32.35955 | 0.00000 | 0.064422 |
| 49.108 | 19.66292 | 33.03371 | 0.00000 | 0.071381 |
| 50.110 | 18.92135 | 33.70787 | 0.00000 | 0.079099 |
| 51.113 | 18.17978 | 34.38202 | 0.00000 | 0.087858 |
| 52.115 | 17.43820 | 35.05618 | 0.00000 | 0.097919 |
| 53.117 | 16.69663 | 35.73034 | 0.00000 | 0.10952 |
| 54.119 | 15.95506 | 36.40449 | 0.00000 | 0.12289 |
| 55.121 | 15.21348 | 37.07865 | 0.00000 | 0.13823 |
| 56.124 | 14.47191 | 37.75281 | 0.00000 | 0.15571 |
| 57.126 | 13.73034 | 38.42697 | 0.00000 | 0.17550 |
| 58.128 | 12.98876 | 39.10112 | 0.00000 | 0.19773 |
| 59.130 | 12.24719 | 39.77528 | 0.00000 | 0.22253 |
| 60.132 | 11.50562 | 40.44944 | 0.00000 | 0.24999 |
| 61.135 | 10.76404 | 41.12360 | 0.00000 | 0.28020 |
| 62.137 | 10.02247 | 41.79775 | 0.00000 | 0.23897 |
| 63.139 | 9.28090 | 42.47191 | 0.00000 | 0.23206 |
| 64.141 | 8.53933 | 43.14607 | 0.00000 | 0.20836 |
| 65.143 | 7.79775 | 43.82022 | 0.00000 | 0.17333 |
| 66.146 | 7.05618 | 44.49438 | 0.00000 | 0.14234 |
| 67.148 | 6.31461 | 45.16854 | 0.00000 | 0.10865 |
| 68.150 | 5.57303 | 45.84270 | 0.00000 | 0.078867 |
| 69.152 | 4.83146 | 46.51685 | 0.00000 | 0.056276 |
| 70.154 | 4.08989 | 47.19101 | 0.00000 | 0.037474 |
| 71.157 | 3.34831 | 47.86517 | 0.00000 | 0.012436 |
| 72.159 | 2.60674 | 48.53933 | 0.00000 | 0.0 |
| 73.161 | 1.86517 | 49.21348 | 0.00000 | 0.0 |
| 74.163 | 1.12360 | 49.88764 | 0.00000 | 0.0 |
| 75.166 | 0.38202 | 50.56180 | 0.00000 | 0.0 |
| 76.168 | -0.35955 | 51.23596 | 0.00000 | 0.0 |
| 77.170 | -1.10112 | 51.91011 | 0.00000 | 0.0 |
| 78.172 | -1.84270 | 52.58427 | 0.00000 | 0.0 |
| 79.174 | -2.58427 | 53.25843 | 0.00000 | 0.0 |
| 80.177 | -3.32584 | 53.93258 | 0.00000 | 0.0 |
| 81.179 | -4.06742 | 54.60674 | 0.00000 | 0.0 |
| 82.181 | -4.80899 | 55.28090 | 0.00000 | 0.0 |
| 83.183 | -5.55056 | 55.95506 | 0.00000 | 0.0 |
| 84.185 | -6.29213 | 56.62921 | 0.00000 | 0.0 |
| 85.188 | -7.03371 | 57.30337 | 0.00000 | 0.0 |
| 86.190 | -7.77528 | 57.97753 | 0.00000 | 0.0 |
| 87.192 | -8.51685 | 58.65169 | 0.00000 | 0.0 |
| 88.194 | -9.25843 | 59.32584 | 0.00000 | 0.0 |
| 89.196 | -10.00000 | 60.00000 | 0.00000 | 0.0 |

***Specific Building Damage Results - All Segments***

Structure: No 38 to 40 | Sub-structure: Southern Elevation

| Vertical Offset from Line for Vertical Movement Calculations | Segment | Start | Length | Curvature | Deflection Ratio | Average Horizontal Strain | Max. Tensile Strain | Maximum Gradient of Horizontal Displacement Curve | Maximum Gradient of Vertical Displacement Curve | Min. Radius of Curvature | Damage Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [m] | | [m] | [m] | | [%] | [%] | [%] | | | [m] | |
| 0 | 1 | 4.0000 | 3.6372 | Hogging | 0.0036184 | 0.037500 | 0.038131 | -374.86E-6 | -404.46E-6 | 11210. | 0 (Negligible) |
| | 2 | 7.6372 | 4.3628 | Sagging | 0.010838 | 0.037500 | 0.041962 | -374.86E-6 | -404.46E-6 | 2691.0 | 0 (Negligible) |

| Vertical Offset from Line for Vertical Movement Calculations | Segment | Start | Length | Curvature | Deflection Ratio | Average Horizontal Strain | Max. Tensile Strain | Maximum Gradient of Horizontal Displacement Curve | Maximum Gradient of Vertical Displacement Curve | Min. Radius of Curvature | Damage Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [m] | | [m] | [m] | | [%] | [%] | [%] | | | [m] | |
| 0 | 1 | 0.0 | 10.000 | None | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 - | | 0 (Negligible) |

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

Structure: No 38 to 40 | Sub-structure: Eastern Elevation

| Vertical Offset from Line for Vertical Movement Calculations | Segment | Start | Length | Curvature | Deflection Ratio | Average Horizontal Strain | Max. Tensile Strain | Maximum Gradient of Horizontal Displacement Curve | Maximum Gradient of Vertical Displacement Curve | Min. Radius of Curvature | Damage Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [m] | | [m] | [m] | | [%] | [%] | [%] | | | [m] | |
| 0 | 1 | 0.0 | 4.3628 | Sagging | 0.010838 | 0.037500 | 0.041962 | -374.86E-6 | 404.46E-6 | 2691.0 | 0 (Negligible) |
| | 2 | 4.3628 | 3.6372 | Hogging | 0.0036184 | 0.037500 | 0.038131 | -374.86E-6 | 404.46E-6 | 11210. | 0 (Negligible) |

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

Structure: No 38 to 40 | Sub-structure: Northern Elevation

| Vertical Offset from Line for Vertical Movement Calculations | Segment | Start | Length | Curvature | Deflection Ratio | Average Horizontal Strain | Max. Tensile Strain | Maximum Gradient of Horizontal Displacement Curve | Maximum Gradient of Vertical Displacement Curve | Min. Radius of Curvature | Damage Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [m] | | [m] | [m] | | [%] | [%] | [%] | | | [m] | |
| 0 | 1 | 0.0 | 4.3628 | Sagging | 0.010838 | 0.037500 | 0.041962 | -374.86E-6 | 404.46E-6 | 2691.0 | 0 (Negligible) |
| | 2 | 4.3628 | 3.6372 | Hogging | 0.0036184 | 0.037500 | 0.038131 | -374.86E-6 | 404.46E-6 | 11210. | 0 (Negligible) |

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

Structure: No 38 to 40 | Sub-structure: Western Elevation

| Vertical Offset from Line for Vertical Movement Calculations | Segment | Start | Length | Curvature | Deflection Ratio | Average Horizontal Strain | Max. Tensile Strain | Maximum Gradient of Horizontal Displacement Curve | Maximum Gradient of Vertical Displacement Curve | Min. Radius of Curvature | Damage Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [m] | | [m] | [m] | | [%] | [%] | [%] | | | [m] | |
| 0 | All settlements are less than the Settlement Trough Limit Sensitivity. | | | | | | | | | | |

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

Structure: No 38 to 40 | Sub-structure: Party Wall

| Vertical Offset from Line for Vertical Movement Calculations | Segment | Start | Length | Curvature | Deflection Ratio | Average Horizontal Strain | Max. Tensile Strain | Maximum Gradient of Horizontal Displacement Curve | Maximum Gradient of Vertical Displacement Curve | Min. Radius of Curvature | Damage Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [m] | | [m] | [m] | | [%] | [%] | [%] | | | [m] | |
| 0 | 1 | 0.0 | 10.000 | None | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 - | | 0 (Negligible) |

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

Structure: Outbuilding to NW | Sub-structure: Southern Elevation

| Vertical Offset from Line for Vertical Movement Calculations | Segment | Start | Length | Curvature | Deflection Ratio | Average Horizontal Strain | Max. Tensile Strain | Maximum Gradient of Horizontal Displacement Curve | Maximum Gradient of Vertical Displacement Curve | Min. Radius of Curvature | Damage Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [m] | | [m] | [m] | | [%] | [%] | [%] | | | [m] | |
| 0 | 1 | 0.0 | 2.2065 | Sagging | 501.74E-6 | -0.015672 | 0.0031447 | 223.06E-6 | 146.73E-6 | 41882. | 0 (Negligible) |
| | 2 | 2.2065 | 3.7935 | Hogging | 0.0012636 | 0.0028655 | 0.0039804 | -71.716E-6 | 146.73E-6 | 38921. | 0 (Negligible) |

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

Structure: Outbuilding to NW | Sub-structure: Eastern Elevation

| Vertical Offset from Line for Vertical Movement Calculations | Segment | Start | Length | Curvature | Deflection Ratio | Average Horizontal Strain | Max. Tensile Strain | Maximum Gradient of Horizontal Displacement Curve | Maximum Gradient of Vertical Displacement Curve | Min. Radius of Curvature | Damage Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [m] | | [m] | [m] | | [%] | [%] | [%] | | | [m] | |
| 0 | 1 | 0.0 | 4.0000 | Hogging | 0.0022023 | 0.022069 | 0.024097 | -237.13E-6 | 241.62E-6 | 18458. | 0 (Negligible) |

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

Structure: Outbuilding to NW | Sub-structure: Northern Elevation

| Vertical Offset from Line for Vertical Movement Calculations | Segment | Start | Length | Curvature | Deflection Ratio | Average Horizontal Strain | Max. Tensile Strain | Maximum Gradient of Horizontal Displacement Curve | Maximum Gradient of Vertical Displacement Curve | Min. Radius of Curvature | Damage Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [m] | | [m] | [m] | | [%] | [%] | [%] | | | [m] | |
| 0 | All settlements are less than the Settlement Trough Limit Sensitivity. | | | | | | | | | | |

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

Structure: Outbuilding to NW | Sub-structure: Western Elevation

| Vertical Offset from Line for Vertical Movement Calculations | Segment | Start | Length | Curvature | Deflection Ratio | Average Horizontal Strain | Max. Tensile Strain | Maximum Gradient of Horizontal Displacement Curve | Maximum Gradient of Vertical Displacement Curve | Min. Radius of Curvature | Damage Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [m] | | [m] | [m] | | [%] | [%] | [%] | | | [m] | |
| 0 | 1 | 8.0000 | 0.0 | None | 0.0 | 0.0 | 0.0 | -46.200E-6 | -51.234E-6 | 58668. | 0 (Negligible) |

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

Structure: Network Rail Line | Sub-structure: Sub 10

| Vertical Offset from Line for Vertical Movement Calculations | Segment | Start | Length | Curvature | Deflection Ratio | Average Horizontal Strain | Max. Tensile Strain | Maximum Gradient of Horizontal Displacement Curve | Maximum Gradient of Vertical Displacement Curve | Min. Radius of Curvature | Damage Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [m] | | [m] | [m] | | [%] | [%] | [%] | | | [m] | |
| 0 | 1 | 53.117 | 6.1574 | Hogging | 176.87E-6 | 0.0010977 | 0.0013419 | -10.977E-6 | -27.401E-6 | 378380. | 0 (Negligible) |
| | 2 | 59.274 | 6.5715 | Sagging | 0.0011389 | -0.0075903 | 0.0015190 | 153.81E-6 | 41.144E-6 | 37997. | 0 (Negligible) |
| | 3 | 65.846 | 1.3020 | Sagging | 47.733E-6 | -0.0035152 | 703.28E-6 | 64.351E-6 | 33.623E-6 | 326160. | 0 (Negligible) |

Tensile horizontal strains are +ve, compressive horizontal strains are -ve.

***Specific Building Damage Results - Critical Values for All Segments within Each Sub-Structure***

Structure: No 38 to 40 | Sub-structure: Southern Elevation

| Vertical Offset from Line for Vertical Movement Calculations | Deflection Ratio | Average Horizontal Strain | Maximum Slope | Maximum Settlement | Max. Tensile Strain | Maximum Gradient of Horizontal Displacement Curve | Maximum Gradient of Vertical Displacement Curve | Min. Radius of Curvature (Hogging) | Min. Radius of Curvature (Sagging) | Damage Category |
|---|---|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [m] | [%] | [%] | | [mm] | [%] | | | [m] | [m] | | |
| 0 | 0.010838 | 0.037500 | -404.46E-6 | 2.1800 | 0.041962 | -374.86E-6 | -404.46E-6 | 11210. | 2691.0 | 0 | (Negligible) |

Structure: No 38 to 40 | Sub-structure: Eastern Elevation

| Vertical Offset from Line for Vertical Movement Calculations | Deflection Ratio | Average Horizontal Strain | Maximum Slope | Maximum Settlement | Max. Tensile Strain | Maximum Gradient of Horizontal Displacement Curve | Maximum Gradient of Vertical Displacement Curve | Min. Radius of Curvature (Hogging) | Min. Radius of Curvature (Sagging) | Damage Category |
|---|---|---|---|---|---|---|---|---|---|---|
| [m] | [%] | [%] | | [mm] | [%] | | | [m] | [m] | |
| 0 | 0.0 | 0.0 | 0.0 | 1.9223 | 0.0 | 0.0 | 0.0 | - | | - 0 (Negligible) |

Structure: No 38 to 40 | Sub-structure: Northern Elevation

| Vertical Offset from Line for Vertical Movement Calculations | Deflection Ratio | Average Horizontal Strain | Maximum Slope | Maximum Settlement | Max. Tensile Strain | Maximum Gradient of Horizontal Displacement Curve | Maximum Gradient of Vertical Displacement Curve | Min. Radius of Curvature (Hogging) | Min. Radius of Curvature (Sagging) | Damage Category |
|---|---|---|---|---|---|---|---|---|---|---|
| [m] | [%] | [%] | | [mm] | [%] | | | [m] | [m] | |
| 0 | 0.010838 | 0.037500 | 404.46E-6 | 2.1800 | 0.041962 | -374.86E-6 | 404.46E-6 | 11210. | 2691.0 | 0 (Negligible) |

Structure: No 38 to 40 | Sub-structure: Western Elevation

| Vertical Offset from Line for Vertical Movement Calculations | Deflection Ratio | Average Horizontal Strain | Maximum Slope | Maximum Settlement | Max. Tensile Strain | Maximum Gradient of Horizontal Displacement Curve | Maximum Gradient of Vertical Displacement Curve | Min. Radius of Curvature (Hogging) | Min. Radius of Curvature (Sagging) | Damage Category |
|---|---|---|---|---|---|---|---|---|---|---|
| [m] | [%] | [%] | | [mm] | [%] | | | [m] | [m] | |

Structure: No 38 to 40 | Sub-structure: Party Wall

| Vertical Offset from Line for Vertical Movement Calculations | Deflection Ratio | Average Horizontal Strain | Maximum Slope | Maximum Settlement | Max. Tensile Strain | Maximum Gradient of Horizontal Displacement Curve | Maximum Gradient of Vertical Displacement Curve | Min. Radius of Curvature (Hogging) | Min. Radius of Curvature (Sagging) | Damage Category |
|---|---|---|---|---|---|---|---|---|---|---|
| [m] | [%] | [%] | | [mm] | [%] | | | [m] | [m] | |
| 0 | 0.0 | 0.0 | 0.0 | 0.65933 | 0.0 | 0.0 | 0.0 | - | | - 0 (Negligible) |

Structure: Outbuilding to NW | Sub-structure: Southern Elevation

| Vertical Offset from Line for Vertical Movement Calculations | Deflection Ratio | Average Horizontal Strain | Maximum Slope | Maximum Settlement | Max. Tensile Strain | Maximum Gradient of Horizontal Displacement Curve | Maximum Gradient of Vertical Displacement Curve | Min. Radius of Curvature (Hogging) | Min. Radius of Curvature (Sagging) | Damage Category |
|---|---|---|---|---|---|---|---|---|---|---|
| [m] | [%] | [%] | | [mm] | [%] | | | [m] | [m] | |
| 0 | 0.0012636 | -0.015672 | 146.73E-6 | 0.86784 | 0.0039804 | 223.06E-6 | 146.73E-6 | 38921. | 41882. | 0 (Negligible) |

Structure: Outbuilding to NW | Sub-structure: Eastern Elevation

| Vertical Offset from Line for Vertical Movement Calculations | Deflection Ratio | Average Horizontal Strain | Maximum Slope | Maximum Settlement | Max. Tensile Strain | Maximum Gradient of Horizontal Displacement Curve | Maximum Gradient of Vertical Displacement Curve | Min. Radius of Curvature (Hogging) | Min. Radius of Curvature (Sagging) | Damage Category |
|---|---|---|---|---|---|---|---|---|---|---|
| [m] | [%] | [%] | | [mm] | [%] | | | [m] | [m] | |
| 0 | 0.0022023 | 0.022069 | 241.62E-6 | 0.86784 | 0.024097 | -237.13E-6 | 241.62E-6 | 18458. | | - 0 (Negligible) |

Structure: Outbuilding to NW | Sub-structure: Northern Elevation

| Vertical Offset from Line for Vertical Movement Calculations | Deflection Ratio | Average Horizontal Strain | Maximum Slope | Maximum Settlement | Max. Tensile Strain | Maximum Gradient of Horizontal Displacement Curve | Maximum Gradient of Vertical Displacement Curve | Min. Radius of Curvature (Hogging) | Min. Radius of Curvature (Sagging) | Damage Category |
|---|---|---|---|---|---|---|---|---|---|---|
| [m] | [%] | [%] | | [mm] | [%] | | | [m] | [m] | |

Structure: Outbuilding to NW | Sub-structure: Western Elevation

| Vertical Offset from Line for Vertical Movement Calculations | Deflection Ratio | Average Horizontal Strain | Maximum Slope | Maximum Settlement | Max. Tensile Strain | Maximum Gradient of Horizontal Displacement Curve | Maximum Gradient of Vertical Displacement Curve | Min. Radius of Curvature (Hogging) | Min. Radius of Curvature (Sagging) | Damage Category |
|---|---|---|---|---|---|---|---|---|---|---|
| [m] | [%] | [%] | | [mm] | [%] | | | [m] | [m] | |
| 0 | 0.0 | 0.0 | -51.234E-6 | 0.13886 | 0.0 | -46.200E-6 | -51.234E-6 | - | | - 0 (Negligible) |

Structure: Network Rail Line | Sub-structure: Sub 10

| Vertical Offset from Line for Vertical Movement Calculations | Deflection Ratio | Average Horizontal Strain | Maximum Slope | Maximum Settlement | Max. Tensile Strain | Maximum Gradient of Horizontal Displacement Curve | Maximum Gradient of Vertical Displacement Curve | Min. Radius of Curvature (Hogging) | Min. Radius of Curvature (Sagging) | Damage Category |
|---|---|---|---|---|---|---|---|---|---|---|
| [m] | [%] | [%] | | [mm] | [%] | | | [m] | [m] | |
| 0 | 0.0011389 | -0.0075903 | 41.144E-6 | 0.28014 | 0.0015190 | 153.81E-6 | 41.144E-6 | 378380. | 37997. | 0 (Negligible) |

***Specific Building Damage Results - Critical Segments within Each Structure***

| Structure Name | Parameter | Critical Sub-Structure | Critical Segment | Start | End | Curvature | Maximum Slope | Maximum Settlement | Max. Tensile Strain | Min. Radius of Curvature (Hogging) | Min. Radius of Curvature (Sagging) | Damage Category |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | [m] | [m] | | | [mm] | [%] | [m] | [m] | |
| No 38 to 40 | Maximum Slope | Southern Elevation | 1 | 4.0000 | 7.6372 | Hogging | **404.46E-6** | 1.2773 | 0.038131 | 11210. | | - 0 (Negligible) |
| | Maximum Settlement | Northern Elevation | 1 | 0.0 | 4.3628 | Sagging | 404.46E-6 | **2.1800** | 0.041962 | - | 2691.0 | 0 (Negligible) |
| | Max. Tensile Strain | Southern Elevation | 2 | 7.6372 | 12.000 | Sagging | 404.46E-6 | 2.1800 | **0.041962** | - | 2691.0 | 0 (Negligible) |
| | Min. Radius of Curvature (Hogging) | Southern Elevation | 1 | 4.0000 | 7.6372 | Hogging | 404.46E-6 | 1.2773 | 0.038131 | **11210.** | | - 0 (Negligible) |
| | Min. Radius of Curvature (Sagging) | Southern Elevation | 2 | 7.6372 | 12.000 | Sagging | 404.46E-6 | 2.1800 | 0.041962 | - | **2691.0** | 0 (Negligible) |
| Outbuilding to NW | Maximum Slope | Eastern Elevation | 1 | 0.0 | 4.0000 | Hogging | **241.62E-6** | 0.86784 | 0.024097 | 18458. | | - 0 (Negligible) |
| | Maximum Settlement | Southern Elevation | 1 | 0.0 | 2.2065 | Sagging | 146.73E-6 | **0.86784** | 0.0031447 | - | 41882. | 0 (Negligible) |
| | Max. Tensile Strain | Eastern Elevation | 1 | 0.0 | 4.0000 | Hogging | 241.62E-6 | 0.86784 | **0.024097** | 18458. | | - 0 (Negligible) |
| | Min. Radius of Curvature | Eastern Elevation | 1 | 0.0 | 4.0000 | Hogging | 241.62E-6 | 0.86784 | 0.024097 | **18458.** | | - 0 (Negligible) |

| Structure Name | Parameter | Critical Sub-Structure | Critical Segment | Start | End | Curvature | Maximum Slope | Maximum Settlement | Max. Tensile Strain | Min. Radius of Curvature (Hogging) | Min. Radius of Curvature (Sagging) | Damage Category |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (Hogging) | | | | | | | | | | | |
| | Min. Radius of Curvature (Sagging) | Southern Elevation | 1 | 0.0 | 2.2065 | Sagging | 146.73E-6 | 0.86784 | 0.0031447 | - | **41882.** | 0 (Negligible) |
| Network Rail Line | Maximum Slope | Sub 10 | 2 | 59.274 | 65.846 | Sagging | **41.144E-6** | 0.28014 | 0.0015190 | - | 37997. | 0 (Negligible) |
| | Maximum Settlement | Sub 10 | 2 | 59.274 | 65.846 | Sagging | 41.144E-6 | **0.28014** | 0.0015190 | - | 37997. | 0 (Negligible) |
| | Max. Tensile Strain | Sub 10 | 2 | 59.274 | 65.846 | Sagging | 41.144E-6 | 0.28014 | **0.0015190** | - | 37997. | 0 (Negligible) |
| | Min. Radius of Curvature (Hogging) | Sub 10 | 1 | 53.117 | 59.274 | Hogging | 27.401E-6 | 0.22648 | 0.0013419 | **378380.** | - | 0 (Negligible) |
| | Min. Radius of Curvature (Sagging) | Sub 10 | 2 | 59.274 | 65.846 | Sagging | 41.144E-6 | 0.28014 | 0.0015190 | - | **37997.** | 0 (Negligible) |

***Specific Building Damage Results - All Combined Segments***

Structure: No 38 to 40 | Sub-structure: Southern Elevation

| Vertical Offset from Line for Vertical Movement Calculations | Combined Segment | Start | Length | Curvature | Deflection Ratio | Average Horizontal Strain | Max. Tensile Strain | Damage Category |
|---|---|---|---|---|---|---|---|---|
| [m] | | [m] | [m] | | [%] | [%] | [%] | |

No structures have segments combined.

Structure: No 38 to 40 | Sub-structure: Eastern Elevation

| Vertical Offset from Line for Vertical Movement Calculations | Combined Segment | Start | Length | Curvature | Deflection Ratio | Average Horizontal Strain | Max. Tensile Strain | Damage Category |
|---|---|---|---|---|---|---|---|---|
| [m] | | [m] | [m] | | [%] | [%] | [%] | |

No structures have segments combined.

Structure: No 38 to 40 | Sub-structure: Northern Elevation

| Vertical Offset from Line for Vertical Movement Calculations | Combined Segment | Start | Length | Curvature | Deflection Ratio | Average Horizontal Strain | Max. Tensile Strain | Damage Category |
|---|---|---|---|---|---|---|---|---|
| [m] | | [m] | [m] | | [%] | [%] | [%] | |

No structures have segments combined.

Structure: No 38 to 40 | Sub-structure: Western Elevation

| Vertical Offset from Line for Vertical Movement Calculations | Combined Segment | Start | Length | Curvature | Deflection Ratio | Average Horizontal Strain | Max. Tensile Strain | Damage Category |
|---|---|---|---|---|---|---|---|---|
| [m] | | [m] | [m] | | [%] | [%] | [%] | |

No structures have segments combined.

Structure: No 38 to 40 | Sub-structure: Party Wall

| Vertical Offset from Line for Vertical Movement Calculations | Combined Segment | Start | Length | Curvature | Deflection Ratio | Average Horizontal Strain | Max. Tensile Strain | Damage Category |
|---|---|---|---|---|---|---|---|---|
| [m] | | [m] | [m] | | [%] | [%] | [%] | |

No structures have segments combined.

Structure: Outbuilding to NW | Sub-structure: Southern Elevation

| Vertical Offset from Line for Vertical Movement Calculations | Combined Segment | Start | Length | Curvature | Deflection Ratio | Average Horizontal Strain | Max. Tensile Strain | Damage Category |
|---|---|---|---|---|---|---|---|---|
| [m] | | [m] | [m] | | [%] | [%] | [%] | |

No structures have segments combined.

Structure: Outbuilding to NW | Sub-structure: Eastern Elevation

| Vertical Offset from Line for Vertical Movement Calculations | Combined Segment | Start | Length | Curvature | Deflection Ratio | Average Horizontal Strain | Max. Tensile Strain | Damage Category |
|---|---|---|---|---|---|---|---|---|
| [m] | | [m] | [m] | | [%] | [%] | [%] | |

No structures have segments combined.

Structure: Outbuilding to NW | Sub-structure: Northern Elevation

| Vertical Offset from Line for Vertical Movement Calculations | Combined Segment | Start | Length | Curvature | Deflection Ratio | Average Horizontal Strain | Max. Tensile Strain | Damage Category |
|---|---|---|---|---|---|---|---|---|
| [m] | | [m] | [m] | | [%] | [%] | [%] | |

No structures have segments combined.

Structure: Outbuilding to NW | Sub-structure: Western Elevation

| Vertical Offset from Line for Vertical Movement Calculations | Combined Segment | Start | Length | Curvature | Deflection Ratio | Average Horizontal Strain | Max. Tensile Strain | Damage Category |
|---|---|---|---|---|---|---|---|---|
| [m] | | [m] | [m] | | [%] | [%] | [%] | |

No structures have segments combined.

Structure: Network Rail Line | Sub-structure: Sub 10

| Vertical Offset from Line for Vertical Movement Calculations | Combined Segment | Start | Length | Curvature | Deflection Ratio | Average Horizontal Strain | Max. Tensile Strain | Damage Category |
|---|---|---|---|---|---|---|---|---|

[m] [m] [m] [%] [%] [%]
No structures have segments combined.