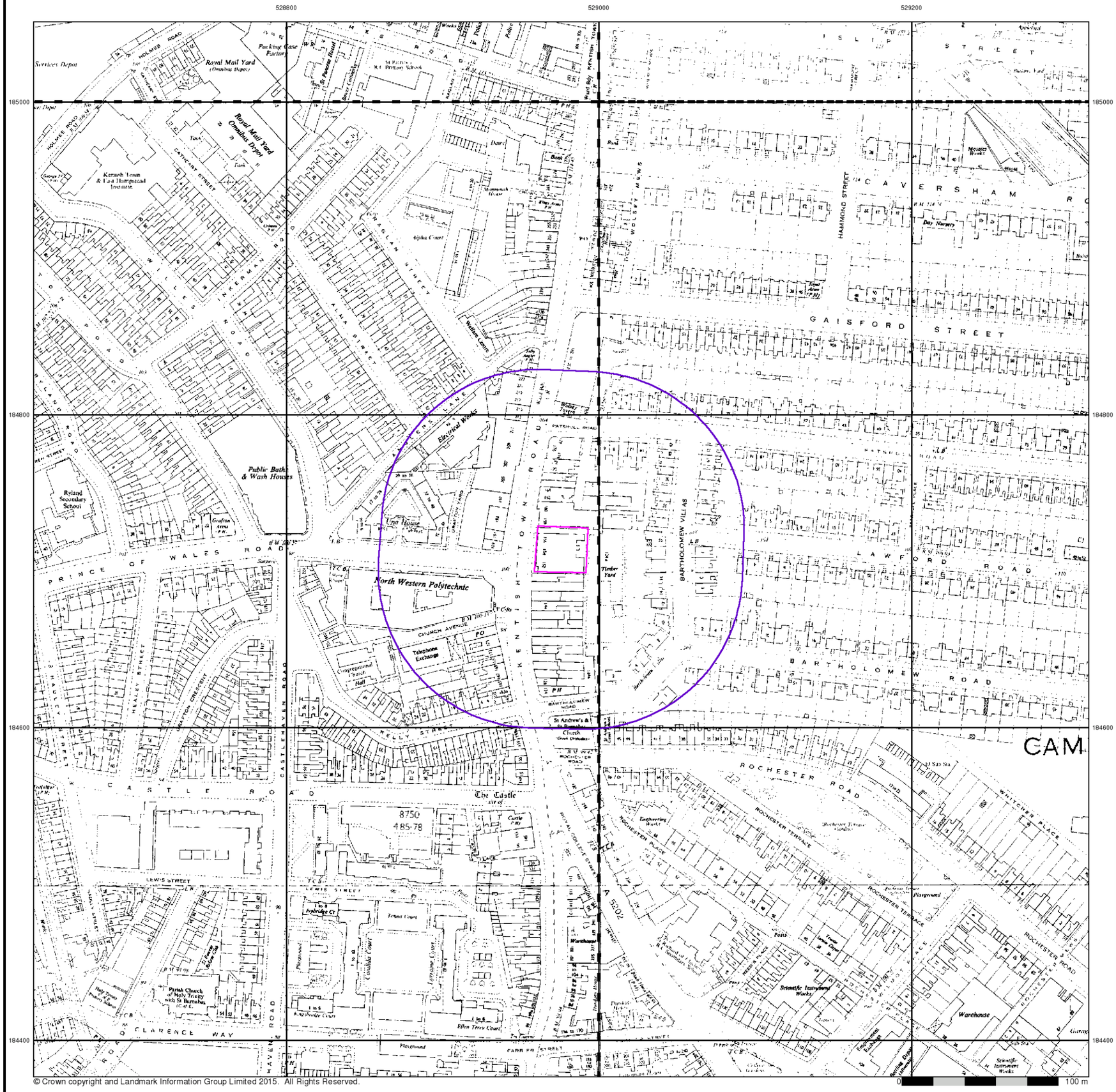

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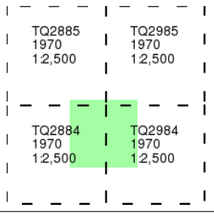
Ordnance Survey Plan

Published 1970

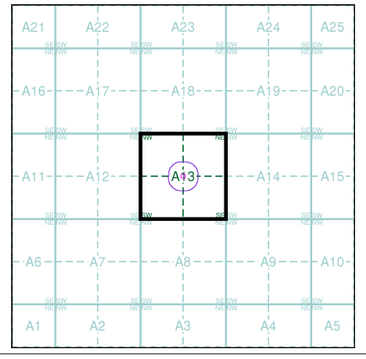
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13

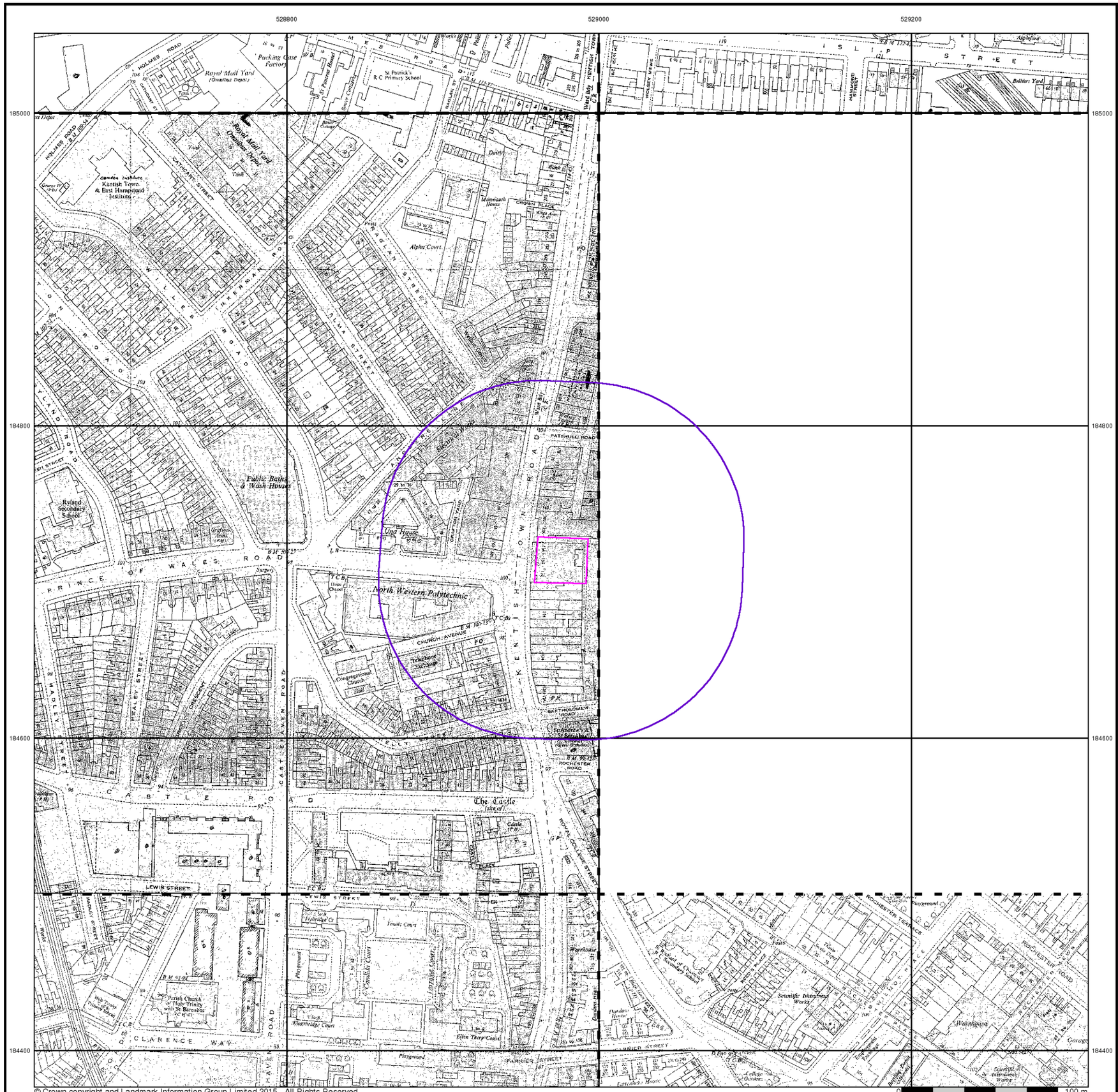


Order Details

Order Number:	77302396_1_1
Customer Ref:	J15359
National Grid Reference:	528980, 184710
Slice:	A
Site Area (Ha):	0.1
Search Buffer (m):	100

Site Details

152-156 Kentish Town Road, LONDON, NW1 9QB



GEA Geotechnical & Environmental Associates

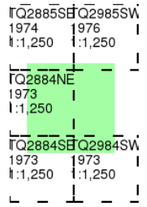
Supply of Unpublished Survey Information

Published 1973 - 1976

Source map scale - 1:1,250

SUSI maps (Supply of Unpublished Survey Information) were produced between 1972 and 1977, mainly for internal use at Ordnance Survey. These were more of a `work-in-progress' plan as they showed updates of individual areas on a map. These maps were unpublished, and they do not represent a single moment in time. They were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



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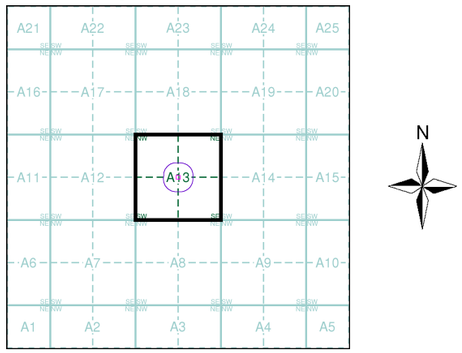

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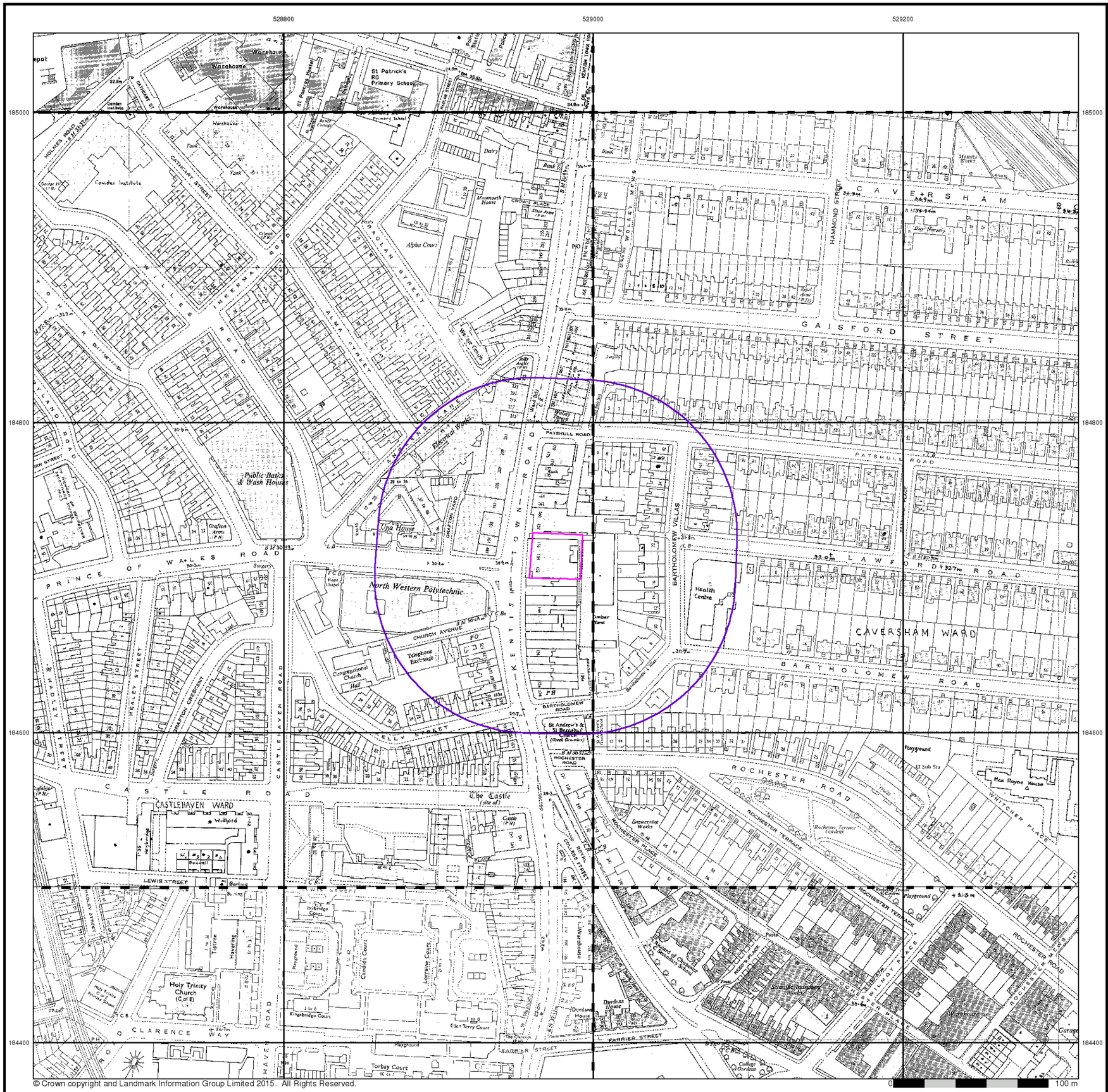
Landmark Information Group

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



GEA Geotechnical & Environmental Associates

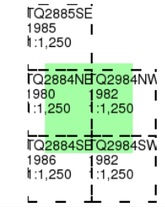
Additional SIMs

Published 1980 - 1986

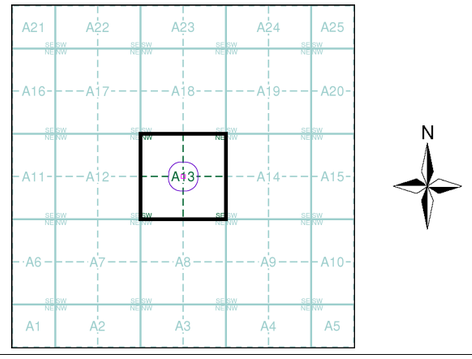
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's `Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



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Additional SIMs

Published 1986 - 1990

Source map scale - 1:1,250

The SIM cards (Ordnance Survey's `Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

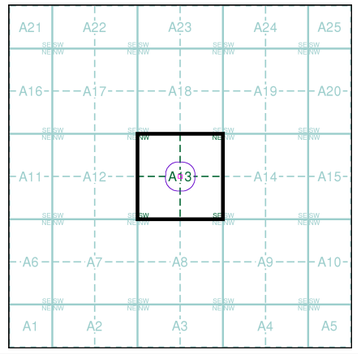
Map Name(s) and Date(s)

TQ2885SE
1990
1:1,250

TQ2884NE
1987
1:1,250

TQ2984SW
1986
1:1,250

Historical Map - Segment A13



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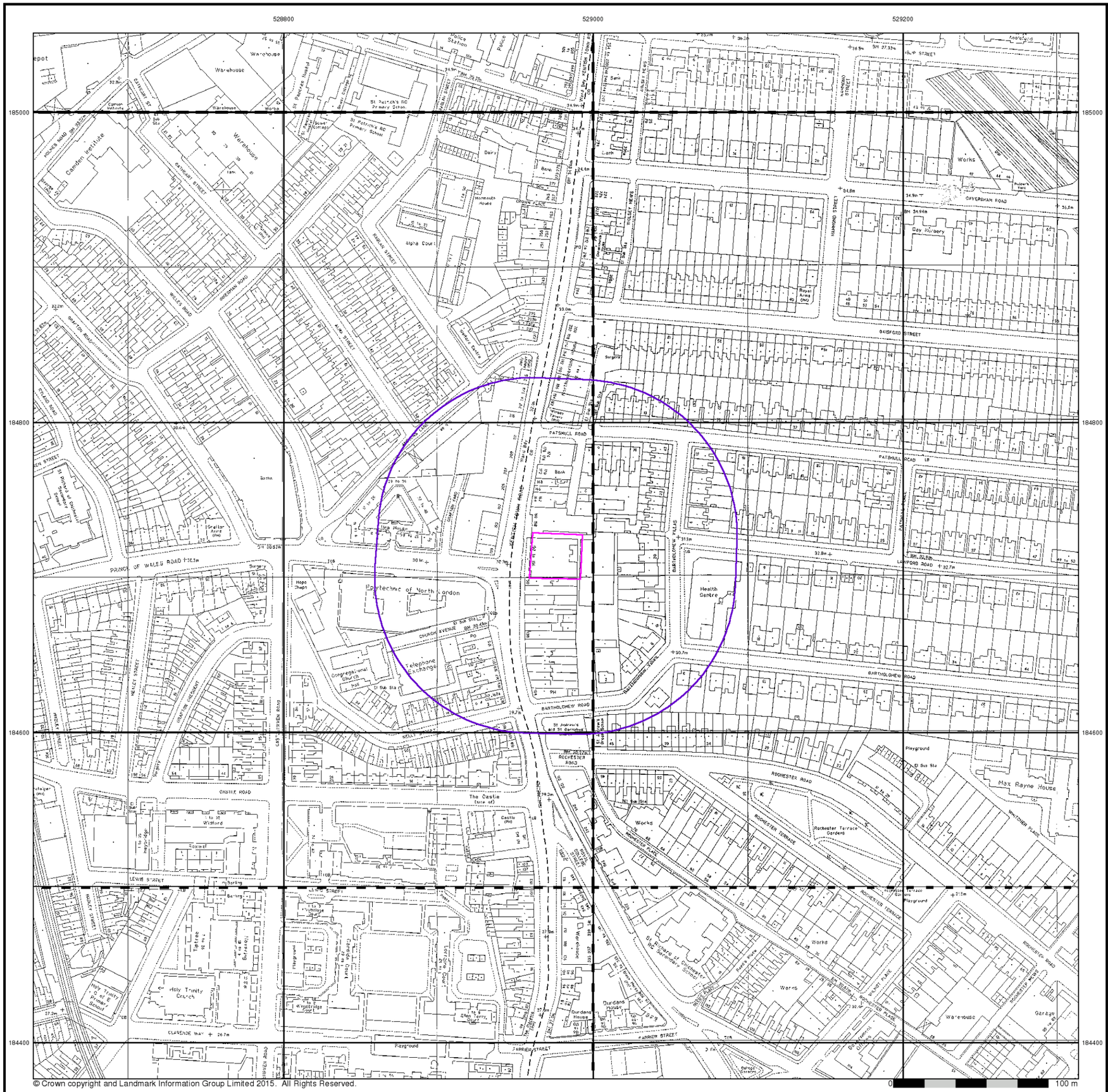

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Large-Scale National Grid Data

Published 1991

Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

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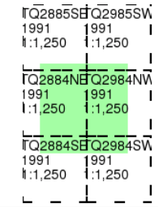

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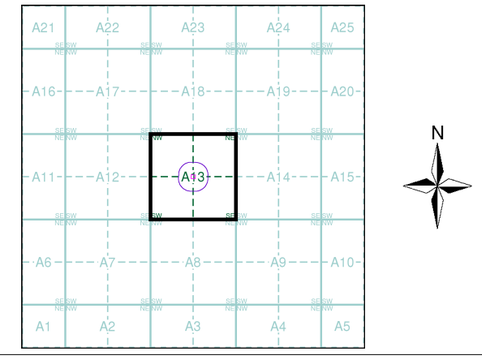

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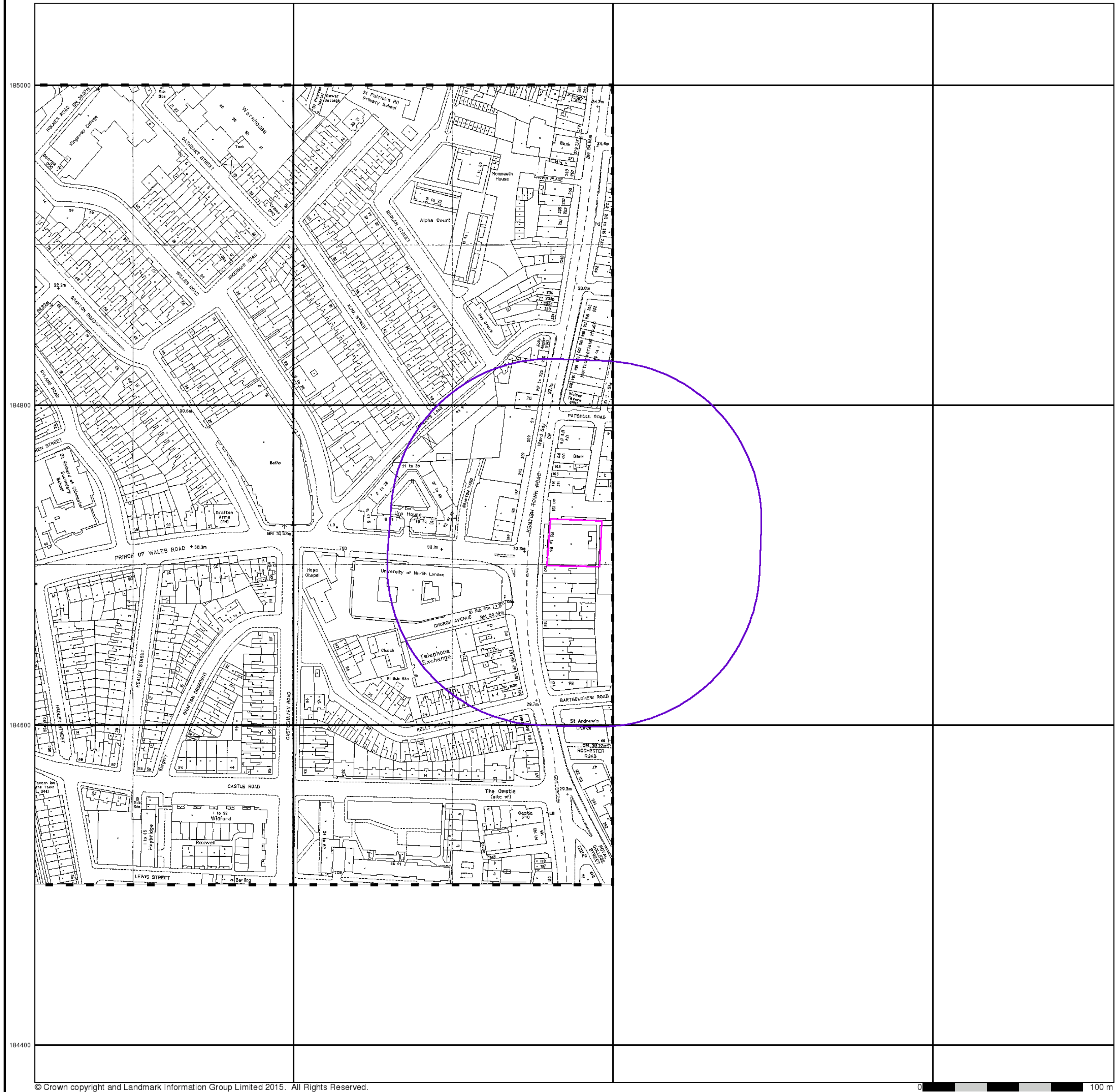

Geotechnical & Environmental Associates

Large-Scale National Grid Data

Published 1996

Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

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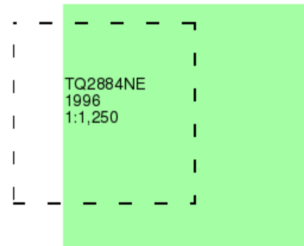

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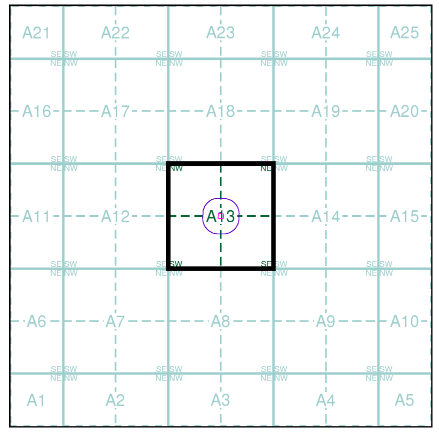

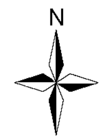

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National Grid Reference: 528980, 184710
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Site Area (Ha): 0.1
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GEA Geotechnical & Environmental Associates

Widbury Barn
Widbury Hill
Ware
Herts SG12 7QE

Site Plan

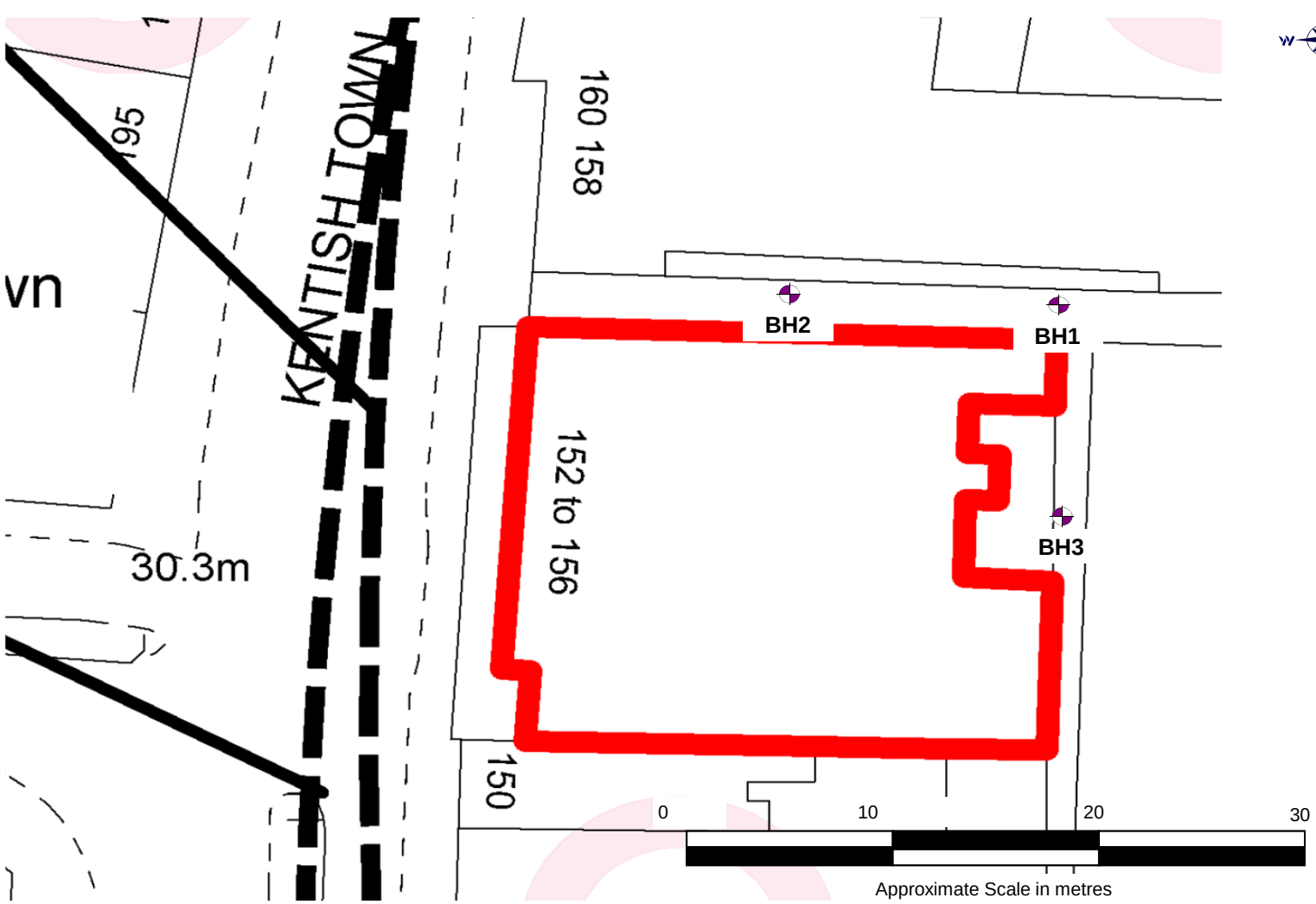
Site 152-156 Kentish Town Road, London NW1 9QB

Client Ahig Limited

Engineer Parmarbrook

Job Number J15359

Sheet 1 / 1



Geotechnical & Environmental Associates (GEA)
is an engineer-led and client-focused independent specialist providing a complete range of geotechnical and contaminated land investigation, analytical and consultancy services to the property and construction industries.

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Enquiries can also be made on-line at

www.gea-ltd.co.uk

where information can be found on all of the services that we offer.

GEA Geotechnical & Environmental Associates

23 Appendix F – GEA Report J15359B

GROUND MOVEMENT ASSESSMENT REPORT

152–156 Kentish Town Road
London
NW1 9QB

Client: Ahig Ltd

Engineer: Parmarbrook

J15359B

June 2016




GEA Geotechnical & Environmental Associates

Document Control

Project title	152–156 Kentish Town Road, London NW1 9QB	**Project ref**	J15359B
Report prepared by	Caroline Anderson MEng AUS FGS		
	Martin Cooper BEng CEng MICE FGS		
Report checked and approved for issue by	Steve Branch BSc MSc CGeol FGS FRGS MIEnvSc		

Issue No	**Status**	**Date**	**Approved for Issue**
1	Final	18 February 2016	
2	Final (revised)	3 March 2016	
3	Final (revised)	1 June 2016	

This report has been issued by the GEA office indicated below. Any enquiries regarding the report should be directed to the office indicated or to Steve Branch in our Herts office.

☑	Hertfordshire	tel 01727 824666	mail@gea-ltd.co.uk
☐	Nottinghamshire	tel 01509 674888	midlands@gea-ltd.co.uk

CONTENTS

1.0 INTRODUCTION

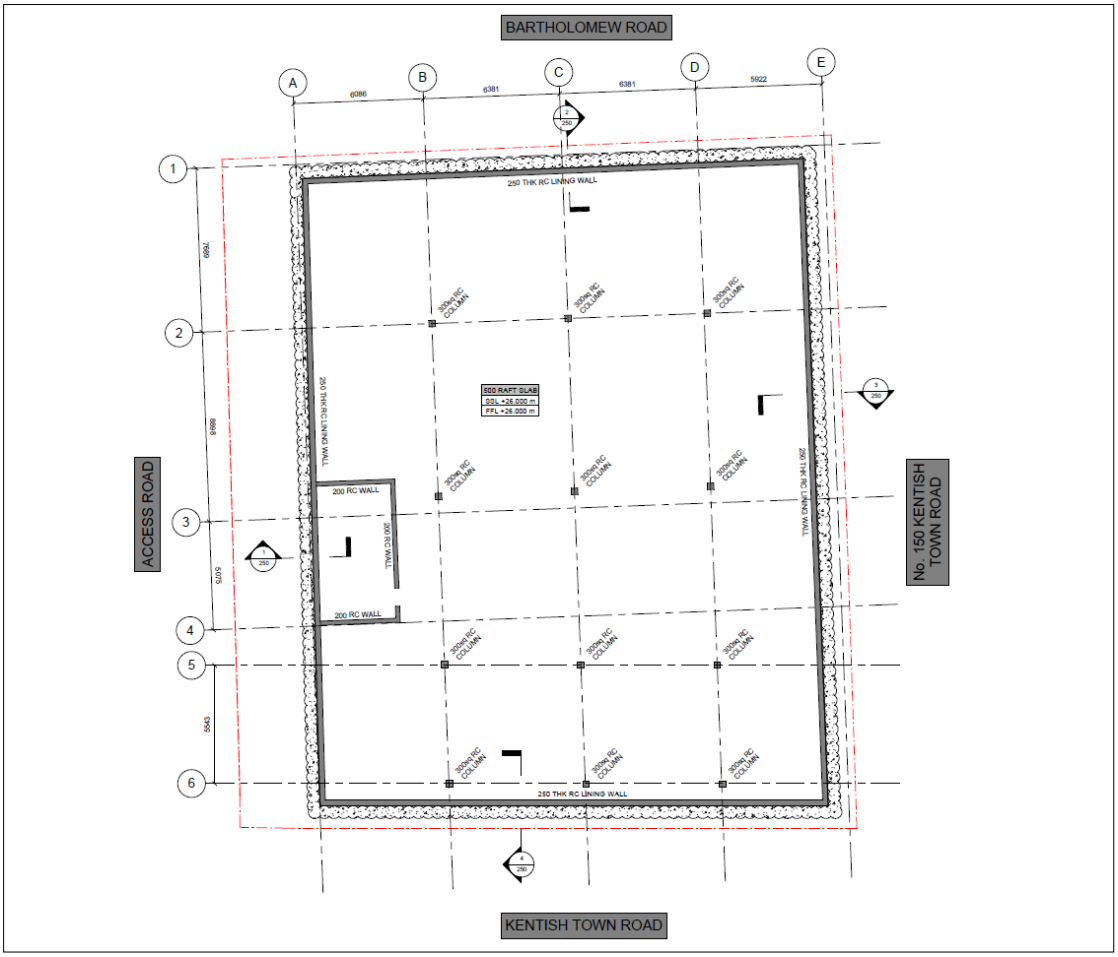
Geotechnical and Environmental Associates (GEA) has been commissioned by Ahig Ltd to complete a ground movement assessment for the proposed demolition of the existing building and subsequent construction of a new apartment block, ranging in height between one storey and four-storeys with a 5.1 m deep basement.

A Ground Investigation and Basement Impact Assessment Report (ref J15359A, dated 9 February 2016) has previously been carried out by GEA and the findings of the report have been used to assist in the derivation of parameters for use in this assessment.

The purpose of this assessment has been to assess any effects of the proposed basement construction upon nearby sensitive structures and an adjacent London Underground tunnel.

1.1 Proposed Development

It is understood that consideration is being given to the demolition of the existing building and construction of a new apartment block, ranging in height between one storey and four-storeys, with a single level basement, which will extend to an approximate depth of 5.1 m, including basement floor slab and finishes.



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

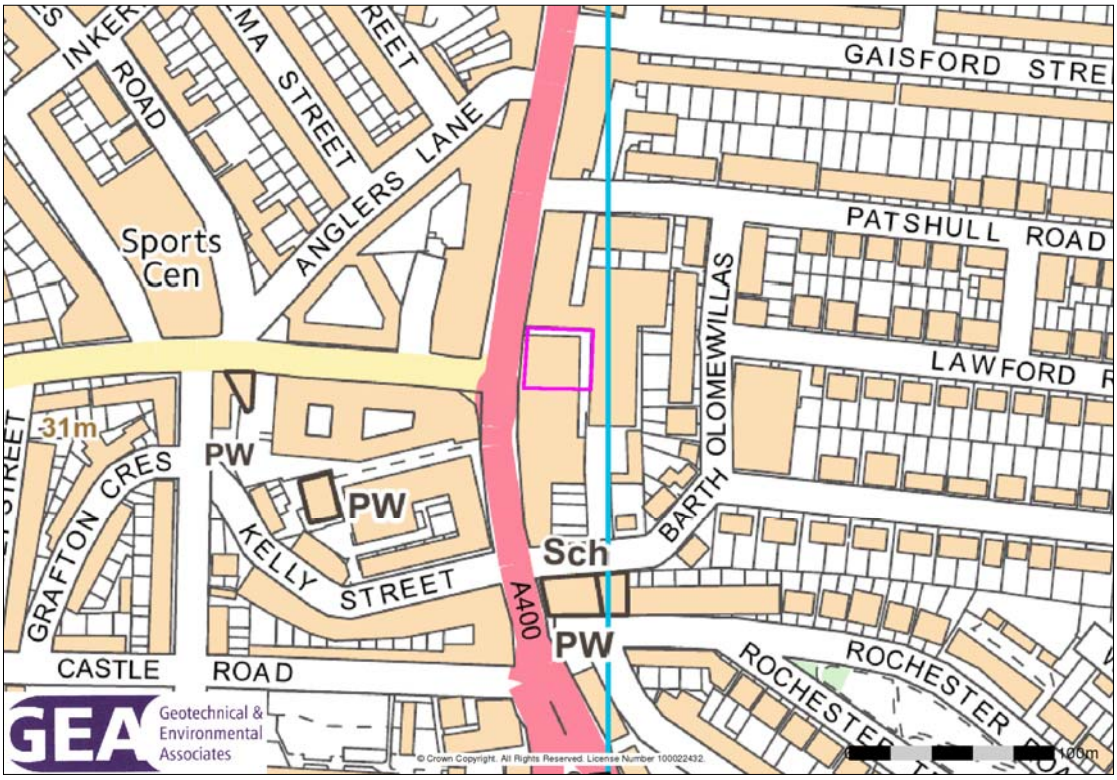
1.2 Limitations

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

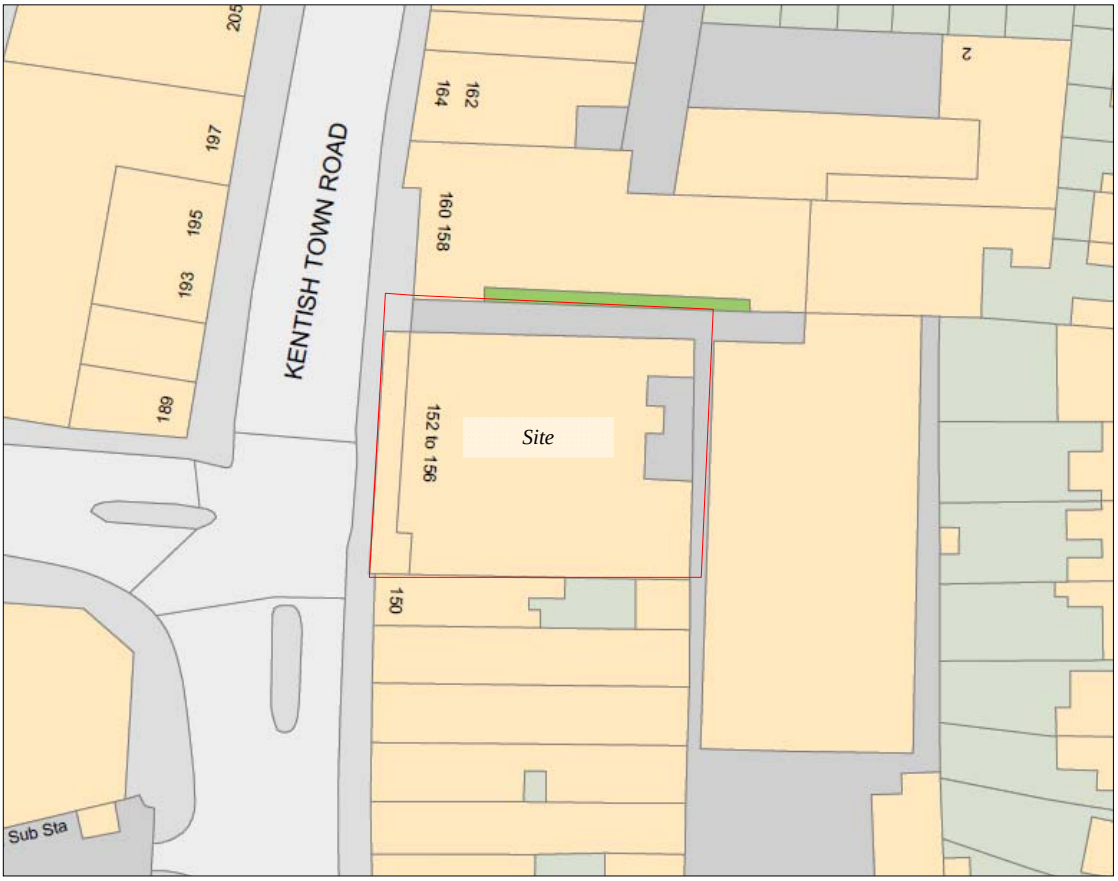
2.1 Site Description

The site is located within the London Borough of Camden (LBC), approximately 350 m east of Kentish Town West London Overground station. It fronts onto Kentish Town Road to the west and is bounded by a dental practice to the north, a shop to the south and a timber merchants to the east. The site may be additionally located by National Grid Reference 528980,184712 and is shown on the map extract below.

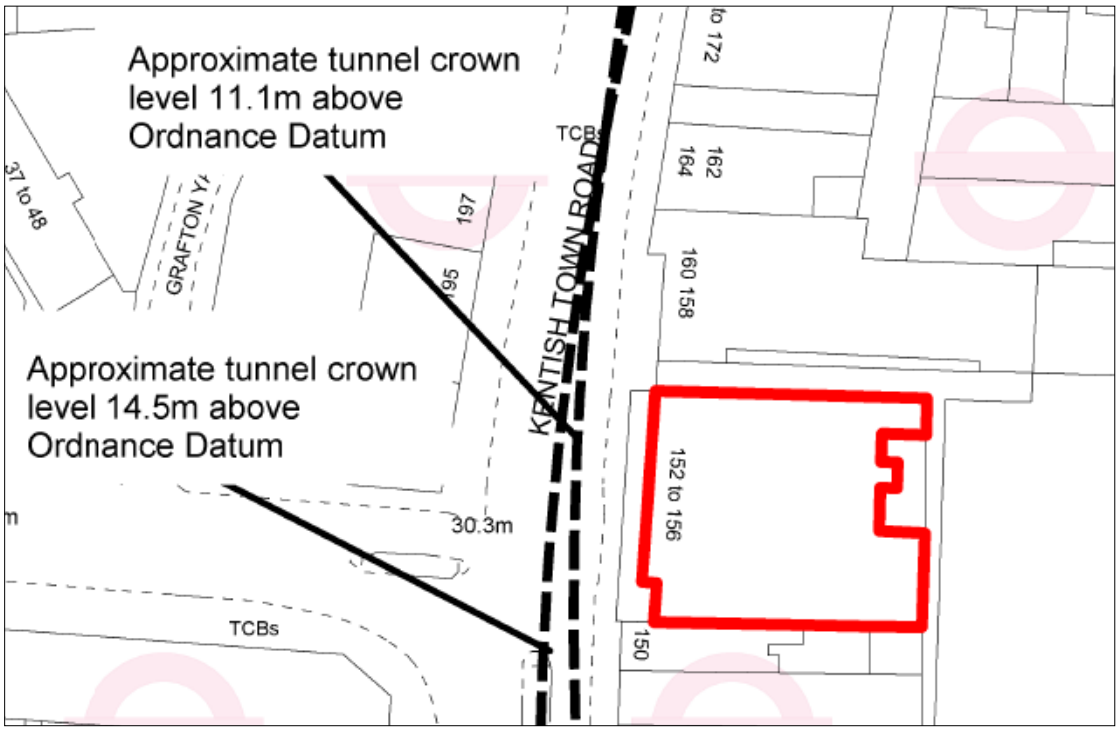


The site is roughly square in shape with side lengths of 30 m. It is occupied by a two-storey brick built mixed residential and commercial building, which occupies nearly the entire footprint of the site, with the exception of a 3 m wide alleyway along the north of the site, which provides access to Kentish Town Road for the businesses on site and also the timber merchant to the east. There is also a small access path that joins halfway along the alleyway in the north and runs along the rear of the building along the entire eastern boundary of site. The building on site is divided in two, with a bookmakers in the northern third of site and a carpet shop occupying the southern two-thirds of the site. The site is sensibly level and is

entirely devoid of vegetation.



The Northern Line of London Underground runs north-south directly under Kentish Town Road at a depth of 19.2 m; it is roughly 5 m from the western boundary of site and is shown on the London Underground (LU) map extract below.



3.0 SUMMARY OF GROUND CONDITIONS

The investigation encountered a significant thickness of made ground over the London Clay Formation which was encountered to the maximum depth of the investigation, of 15.00 m. Beneath a 100 mm to 200 mm thick reinforced concrete slab surface, the made ground generally comprised pale brown and reddish brown very silty very sandy gravelly clay with frequent brick, concrete and occasional coal fragments, whole bricks, ash and tarmac and extended to depths of between 1.00 m and 3.30 m. The London Clay initially comprised a naturally reworked layer of firm brown and dark grey mottled silty very sandy very gravelly clay with partings of dark orange-brown sand and occasional roots and extended to a depth of 3.30 m. Below the initial reworked layer, the London Clay comprised firm to stiff fissured high strength dark brown and grey mottled slightly silty slightly sandy clay with orange-brown clayey silty sand partings, decayed rootlets at 7.0 m depth, fine to coarse selenite crystals, occasional shells and pale grey silty clay partings to a depth of 8.20 m. Below this, the London Clay comprised firm to stiff fissured high strength dark brownish grey silty clay with selenite crystals and pale grey partings of silt to the full depth investigated, of 15.00 m. Groundwater has been monitored at depths of between 0.45 m and 6.10 m.

A record held by the BGS of a borehole drilled on Castlehaven Road, roughly 160 m to the west indicates that made ground was encountered to a depth of 1.5 m over London Clay which comprised stiff brown and greyish blue fissured clay with “mudstone boulders” to a depth of 33.0 m. Below this, the Lambeth Group comprised stiff greyish blue sandy silty clay over fine green silty sand and stiff greyish blue fissured clay and was encountered to the full depth of the borehole, of 40.0 m.

4.0 CONSTRUCTION SEQUENCE

For the purposes of the ground movement assessment, all depths are taken from existing ground level. The proposed basement will be formed by means of a contiguous bored pile wall to a depth of 9.0 m below existing ground level.

The following sequence of operations has been assumed to enable analysis of the ground movements around the proposed basement both during and after construction.

In general, the sequence of works for basement construction will comprise the following stages.

1. Demolish existing building;

2. construct piled retaining walls to perimeter of proposed basement, including capping beam;

3. install propping between capping beam and proposed basement level, including horizontal temporary cross-bracing of proposed excavation corners;

4. excavate the new basement

5. construct and cure new reinforced concrete slabs at basement and ground floor levels;

6. remove temporary propping; and

7. construct new building.

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 temporary works contractor once appointed.

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 walls. Reinforced concrete will be used for floor slabs and it is anticipated that heave protection will be installed beneath the basement slab.

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 19.3 – 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 east-west, whilst the y-direction is parallel with the orientation of north-south. Vertical movement is in the z-direction. Wall lengths of less than 10 m have been modelled as 1 m long structural elements, while greater than 10 m wall lengths have been modelled as 2 m elements to reflect the greater stiffness of the longer walls.

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 analysis has adopted the values for ‘installation of a contiguous bored pile wall in stiff clay’ to represent the installation of the bored pile concrete retaining walls. The ground movement curves for ‘excavations in front of a 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

The predicted movements are based on the worst case of the individually analysed segments of ‘hogging’ and ‘sagging’ and these are summarised in the tables overleaf. It should be noted that the combined effect of segments acting together typically improve the resultant movements and the values below are therefore deemed to be conservative.

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

Displacement Analysis Points:

The founding depths of the surrounding sensitive structures have not been provided and all foundation depths have been taken as a conservative 0.50 m for the purpose of this analysis.

All structures have been modelled with assumed heights, as detailed in the following table.

Sensitive Structure Reference	Assumed Building Height (above existing ground level) (m)
A	3.5
B	3.5
C	12.5
D	12.5
E	3.5
F	3.5
G	3.5
H	6.0
I	6.0
J	6.0
K	7.0
L	7.0
M	7.0

Sensitive Structure Reference	Assumed Building Height (above existing ground level) (m)
N	7.0
O	12.0
P	12.0

The results are presented 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.

Wall Installation Phase:

Sensitive Structure Reference	Vertical Movement (Settlement)(mm)	Horizontal Movement (mm)
A	4	3
B	4	4
C	4	4
D	4	4
E	3	2
F	4	4
G	4	4
H	4	3
I	4	3
J	2	< 1
K	3	3
L	4	3
M	3	3
N	3	3
O	< 1	< 1
P	< 1	< 1

Wall Installation and Excavation Phase Combined:

Sensitive Structure Reference	Vertical Movement (Settlement) (mm)	Horizontal Movement (mm)
A	6	7
B	7	11
C	7	11
D	7	11
E	6	8
F	7	11
G	7	11
H	7	10
I	7	10
J	3	4
K	7	9

Sensitive Structure Reference	Vertical Movement (Settlement) (mm)	Horizontal Movement (mm)
L	7	9
M	7	9
N	7	9
O	< 1	< 1
P	< 1	< 1

The analysis has indicated that the maximum vertical settlements and horizontal movements that will result from the new retaining wall construction are less than 5 mm. Furthermore, the analysis has indicated that the maximum vertical settlements and horizontal movements that will result from the combined effect of the retaining wall installation and excavation are less than 15 mm.

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 proposed building demolition and subsequent excavation and the reduction in vertical stress in the short term 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 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 Eu of 0.75, and it is considered that the use of the more conservative values provides a sensible approach for this stage in the design. The profile of the underlying London Clay has been interpolated from the insitu and laboratory results of the cable percussion borehole carried out of the site as part of the original investigation.

The demolition of the existing building is assumed to result in an unloading of 25 kN/m2 and as a conservative estimated, it is assumed that this unloading occurs at proposed basement level.

The proposed excavation will result in a net unloading of around 100 kN/m^2. At this stage it is assumed that there will be a new uniformly distributed applied loading of 80 kN/m^2 at basement level. Therefore, an estimated net unloading of 125 kN/m^2 is assumed to occur across the basement in the short term, with an estimated total unloading of 45 kN/m^2 acting across the basement following the completion of the proposed development.

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 and clay of the underlying Lambeth Group at a depth of 55 m below existing ground level, where local BGS records indicate these formations are likely to be present.

5.2.2 Results

The P-Disp analysis indicates that, by the time the basement construction is complete and prior to the building completion, around 25 mm to 30 mm of heave is likely to have taken place at the centre of the proposed excavation, reducing to between 10 mm to 15 mm at the edges.

Following completion of the basement and building construction, less than 5 mm of further movement is predicted due to the new building loads.

The results of the P-Disp analysis can be used to indicate the likely impact of the proposed basement construction beyond the site boundaries; about 5 m away from the excavation a total movement of around 5 mm to 10 mm is predicted, reducing to less than 5 mm about 10 m away.

A void or layer of compressible material may need to 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 30 % 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, the neighbouring buildings are considered to be sensitive structures, requiring Building Damage Assessments, on the basis of the classification given in Table 2.5 of C580[1].

All structures are shown on the plan in Section 5.1.2.

6.1 Damage to Neighbouring Structures

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

The potential heave movements predicted by P-Disp have not been included in this assessment.

Sensitive Structure Reference	Damage Category*
A	Category 0 - Negligible
B	Category 0 - Negligible
C	Category 2 - Slight
D	Category 2 - Slight
E	Category 0 - Negligible
F	Category 2 – Slight

Sensitive Structure Reference	Damage Category*
G	Category 0 - Negligible
H	Category 0 - Negligible
I	Category 1 – Very Slight
J	Category 0 - Negligible
K	Category 0 - Negligible
L	Category 1 – Very Slight
M	Category 0 - Negligible
N	Category 1 – Very Slight
O	Category 0 - Negligible
P	Category 0 - Negligible

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

The analysis has predicted that the installation of the new retaining walls and excavation of the proposed basements may generally result in the building damage for sensitive structures of between Category 0 (negligible) and Category 2 (slight). The Camden Planning Guidance for Basements and Lightwells (CPG4; July 2015) states that "The Council … will expect … mitigation measures where any risk of damage is identified of Burland category 1 'very slight' or higher. Following inclusion of mitigation measures into the proposed scheme the changes are to be re-evaluated and new net consequences determined."

It would be prudent to acquire confirmation of the building heights and foundation depths of the buildings assessed to have a 'Slight' damage category in order to reassess the likely movements. The analysis of movements using the Oasys software is based on movement curves produced from a small number of case studies and is considered to be a conservative assessment. If, following confirmation of the adjacent building heights and foundation depths, the movements continue to fall outside the acceptance limits, a more detailed assessment should be carried out using the WALLAP software, whixh can take into consideration the stages of excavation and propping regime.

The potential movement may be reduced by underpinning sensitive structures, although movements may be controlled to a wider extent during construction, through controlled workmanship and particular consideration should be given to the sequence of wall construction, propping and excavation.

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 two-storey part of Nos 146 to 150 Kentish Town Road and the single storey extension at the rear of No 150 Kentish Town Road. 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 TUNNEL MOVEMENTS

The proposed basement extension will be in close proximity to a London Underground tunnel.

It is recommended that the piles that are located close to the London Underground tunnel exclusion zone are permanently sleeved over the upper portion of the pile so that no load can be transferred to the sensitive structures through shedding of shaft friction within the zone of influence of the tunnel. The minimum sleeved length may be determined by a 45° line drawn from the intersection of the outside edge and invert level of the structure and extended until it meets the proposed new piles, roughly 5 m away. The permanent sleeve length required is likely to necessitate the need for the pile length to be increased to take the sleeving into account.

The analysis has been carried out using the Oasys PDisp software. The LU tunnel has been modelled at the crown and invert level. The crown and invert depths have been modelled at 19.2 m and 14.2 below ground level, assuming a tunnel diameter of 5.0 m. The approximate locations of the crown and invert levels described above have been analysed along the length of the tunnel adjacent to the site based on drawings from London Underground and provided by the consulting engineers. The tunnel has been modelled as straight lines at roughly 1.0 m intervals.

The analysis will assess the change in vertical movement of the crown and invert levels in order to demonstrate the differential movement, if any, across the tunnel structure. The analysis will also provide an assessment of the vertical stress and strain along the crown level of the tunnel.

Short term movements:

Tunnel Reference Point	Maximum Vertical Displacement (mm)	Net Change in Vertical Stress (kN/m^2)	Maximum Vertical Strain (%)
Crown	5 mm heave	-20.1	-8.6×10^{-5}
Invert	5 mm heave	-14.5	7.1×10^{-5}

Total movements:

Tunnel Reference Point	Maximum Vertical Displacement (mm)	Net Change in Vertical Stress (kN/m^2)	Maximum Vertical Strain (%)
Crown	3 mm heave	-7.2	-1.2×10^{-4}
Invert	4 mm heave	-5.3	-8.4×10^{-5}

8.0 CONCLUSIONS

The analysis has concluded that the predicted damage to the neighbouring properties from the construction of the secant wall and basement excavation would be 'Negligible' to 'Very Slight', for which the damage that would occur would fall within the acceptable limits. A number of walls have been identified as Category 2 'Slight' and mitigation measures may be required. It is recommended that movement monitoring is carried out on all structures prior to and during the proposed basement construction.

APPENDICES

X-DISP ANALYSIS:

Wall Installation

Contour Plots of Vertical Movements and Horizontal Movements

Wall Installation and Basement Excavation combined

Contour Plots of Vertical Movements and Horizontal Movements

Tabular Output of Results

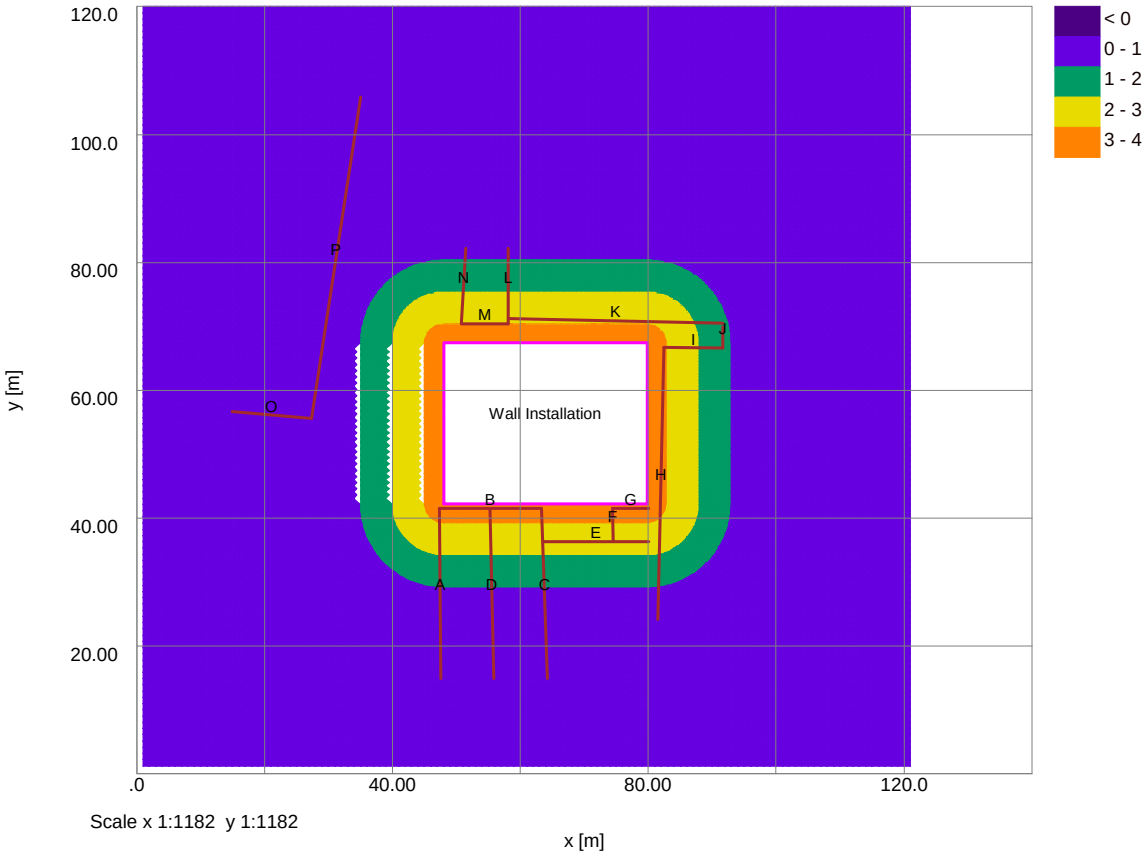
P-DISP ANALYSIS

Short Term Movement Contour Plots

Total Movement Contour Plots

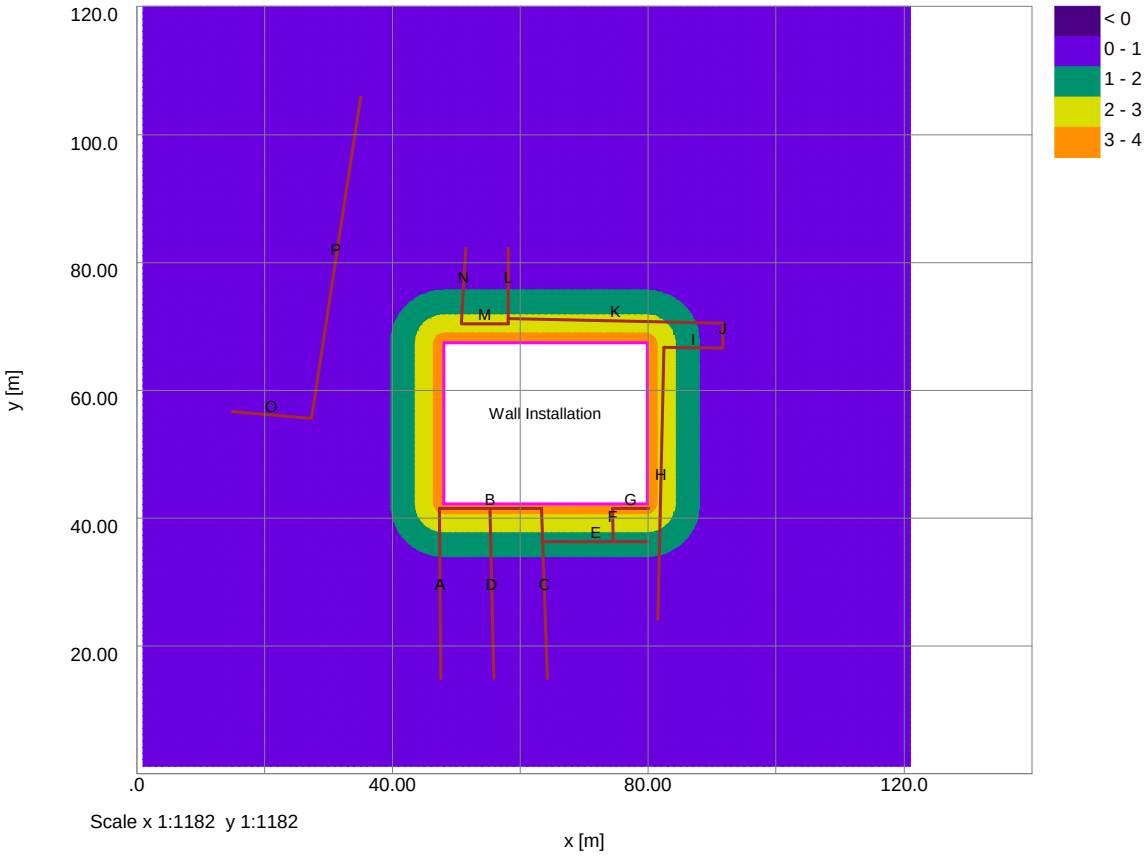
Tunnel Movement/Stress/Strain Plots

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



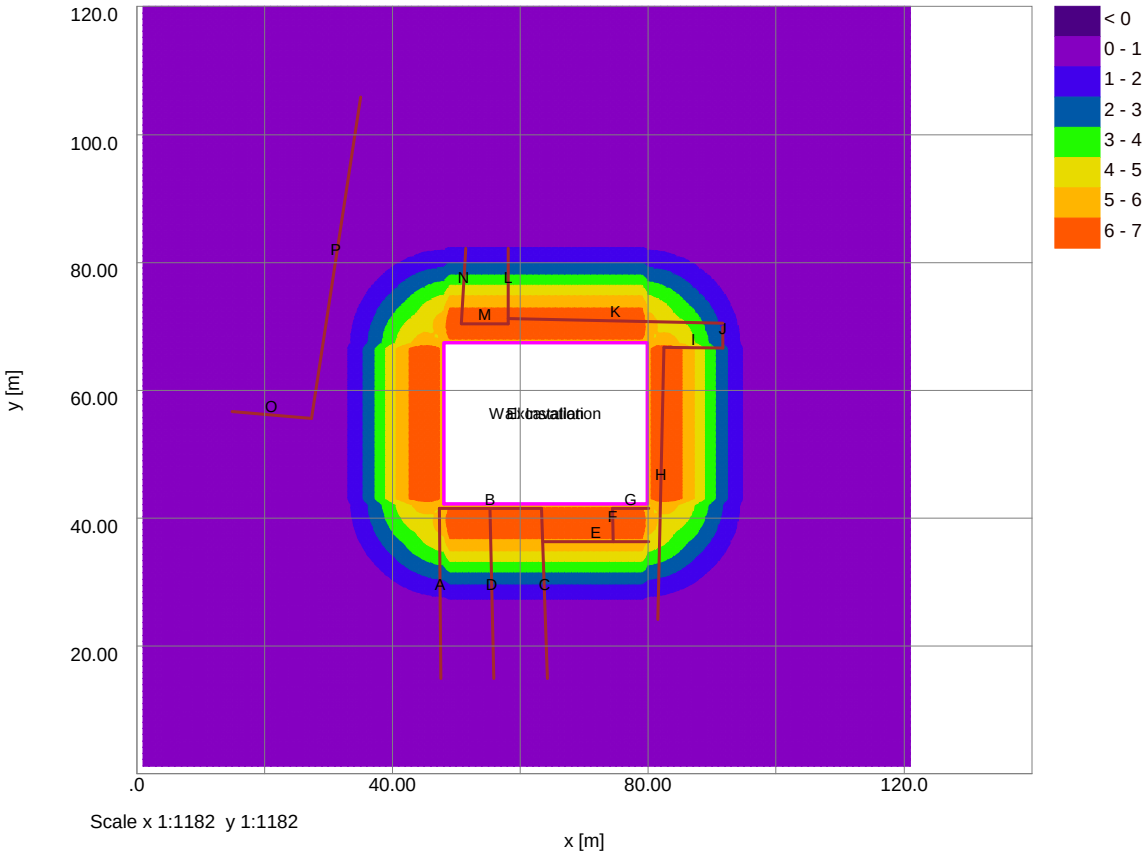
Scale x 1:1182 y 1:1182

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

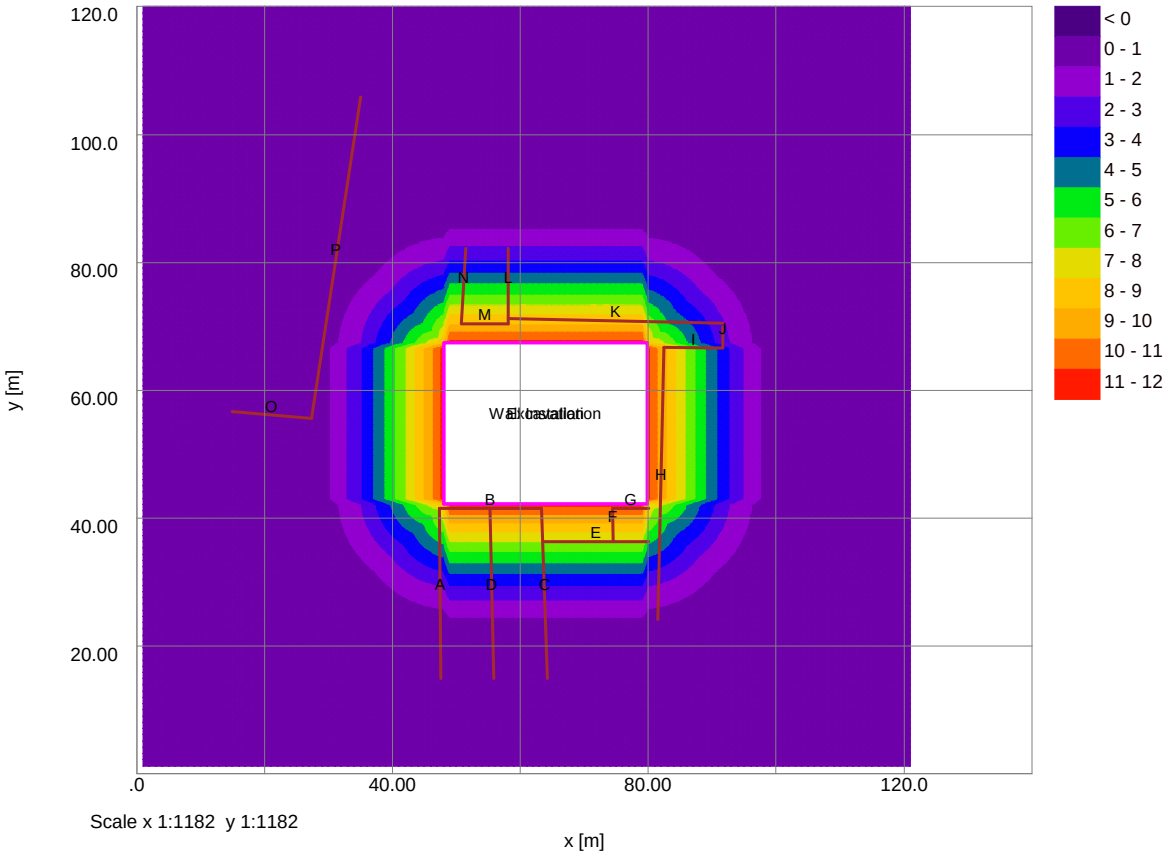


Scale x 1:1182 y 1:1182

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



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



Problem Type

Problem Type : Tunnelling and Embedded Wall Excavations

Displacement Data

Type	Name	Direction of extrusion	Point/Line/Line for extrusion First point X [m]	First point Y [m]	First point Z(level) [m]	Second point X [m]	Second point Y [m]	Second point Z(level) [m]	No. of intervals across extrusion/line	Extrusion depth [m]	No. of intervals along extrusion	Calculate	Surface type for tunnels
Line	A	-	47.30000	41.60000	-0.50000	47.60000	14.90000	-0.50000	14	-	-	Yes	Surface
Line	B	-	47.30000	41.60000	-0.50000	63.30000	41.50000	-0.50000	8	-	-	Yes	Surface
Line	C	-	64.20000	14.90000	-0.50000	63.30000	41.50000	-0.50000	14	-	-	Yes	Surface
Line	D	-	55.30000	41.60000	-0.50000	55.90000	14.90000	-0.50000	14	-	-	Yes	Surface
Line	E	-	63.50000	36.40000	-0.50000	80.10000	36.40000	-0.50000	9	-	-	Yes	Surface
Line	F	-	74.40000	41.60000	-0.50000	74.50000	36.40000	-0.50000	6	-	-	Yes	Surface
Line	G	-	74.40000	41.60000	-0.50000	80.10000	41.60000	-0.50000	6	-	-	Yes	Surface
Line	H	-	82.40000	66.70000	-0.50000	81.50000	24.20000	-0.50000	22	-	-	Yes	Surface
Line	I	-	82.40000	66.70000	-0.50000	91.70000	66.60000	-0.50000	10	-	-	Yes	Surface
Line	J	-	91.70000	66.60000	-0.50000	91.70000	69.90000	-0.50000	4	-	-	Yes	Surface
Line	K	-	58.10000	71.20000	-0.50000	91.70000	70.50000	-0.50000	17	-	-	Yes	Surface
Line	L	-	58.10000	82.20000	-0.50000	58.10000	70.40000	-0.50000	6	-	-	Yes	Surface
Line	M	-	58.10000	70.40000	-0.50000	50.90000	70.40000	-0.50000	8	-	-	Yes	Surface
Line	N	-	50.80000	70.40000	-0.50000	51.50000	82.20000	-0.50000	6	-	-	Yes	Surface
Line	O	-	15.00000	56.70000	-0.50000	27.40000	55.60000	-0.50000	7	-	-	Yes	Surface
Line	P	-	27.40000	55.60000	-0.50000	35.00000	105.80000	-0.50000	26	-	-	Yes	Surface
Grid	Grid 1	Global X	1.00000	1.30000	0.00000	-	120.00000	0.00000	122	120.00000	120	No	Surface

Vertical Ground Movement Curves

Curve Name: **Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(b))**
Coordinates: [Distance from wall / wall depth or max. excavation depth (x), Depth / wall depth or max. excavation depth (y), Settlement / wall depth or max. excavation depth (z)(%)]
[0.000,0.000,0.040][2.000,0.000,0.000]
Curve Fitting Method: Polynomial
x Order: 1
y Order: 0
Polynomial: z = -2.0E-2x + 4.0E-2
Coeff. of Determination: 1.0

Curve Name: **Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(b)**
Coordinates: [Distance from wall / wall depth or max. excavation depth (x), Depth / wall depth or max. excavation depth (y), Settlement / wall depth or max. excavation depth (z)(%)]
[0.000,0.000,0.039][0.100,0.000,0.049][0.200,0.000,0.056][0.300,0.000,0.062]
[0.400,0.000,0.067][0.500,0.000,0.070][0.600,0.000,0.072][0.700,0.000,0.073]
[0.800,0.000,0.073][0.900,0.000,0.072][1.000,0.000,0.070][1.100,0.000,0.068]
[1.200,0.000,0.065][1.300,0.000,0.061][1.400,0.000,0.058][1.500,0.000,0.054]
[1.600,0.000,0.050][1.700,0.000,0.046][1.800,0.000,0.042][1.900,0.000,0.038]
[2.000,0.000,0.034][2.100,0.000,0.030][2.200,0.000,0.027][2.300,0.000,0.023]
[2.400,0.000,0.020][2.500,0.000,0.017][2.600,0.000,0.014][2.700,0.000,0.012]
[2.800,0.000,0.010][2.900,0.000,0.008][3.000,0.000,0.007][3.100,0.000,0.005]
[3.200,0.000,0.004][3.300,0.000,0.004][3.400,0.000,0.003][3.500,0.000,0.002]
[3.600,0.000,0.002][3.700,0.000,0.002][3.800,0.000,0.001][3.900,0.000,0.001]
[4.000,0.000,0.000]
Curve Fitting Method: Polynomial
x Order: 4
y Order: 0
Polynomial: z = $-2.6455E\text{-}3x^4 + 2.8495E\text{-}2x^3 - 1.0051E\text{-}1x^2 + 1.0569E\text{-}1x + 3.8990E\text{-}2$
Coeff. of Determination: 9.9991E-1

Horizontal Ground Movement Curves

Curve Name: **Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(a))**
Coordinates: [Distance from wall / wall depth or max. excavation depth (x), Depth / wall depth or max. excavation depth (y), Horizontal movement / wall depth or max. excavation depth (z)(%)]
[0.000,0.000,0.041][0.050,0.000,0.039][0.100,0.000,0.036][0.150,0.000,0.034]
[0.200,0.000,0.032][0.250,0.000,0.030][0.300,0.000,0.029][0.350,0.000,0.027]
[0.400,0.000,0.025][0.450,0.000,0.023][0.500,0.000,0.022][0.550,0.000,0.020]
[0.600,0.000,0.019][0.650,0.000,0.018][0.700,0.000,0.016][0.750,0.000,0.015]
[0.800,0.000,0.014][0.850,0.000,0.013][0.900,0.000,0.012][0.950,0.000,0.010]
[1.000,0.000,0.009][1.050,0.000,0.008][1.100,0.000,0.007][1.150,0.000,0.006]
[1.200,0.000,0.005][1.250,0.000,0.004][1.300,0.000,0.004][1.350,0.000,0.003]
[1.400,0.000,0.002][1.450,0.000,0.001][1.500,0.000,0.000]
Curve Fitting Method: Polynomial
x Order: 3
y Order: 0
Polynomial: z = $-4.2486E\text{-}3x^3 + 1.9096E\text{-}2x^2 - 4.6221E\text{-}2x + 4.0729E\text{-}2$
Coeff. of Determination: 1.0000

Curve Name: **Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(a))**
Coordinates: [Distance from wall / wall depth or max. excavation depth (x), Depth / wall depth or max. excavation depth (y), Horizontal movement / wall depth or max. excavation depth (z)(%)]
[0.000,0.000,0.150][4.000,0.000,0.000]
Curve Fitting Method: Polynomial
x Order: 1
y Order: 0
Polynomial: z = -3.75E-2x + 1.50E-1
Coeff. of Determination: 1.00

Polygonal Excavations

Excavation Name: **Wall Installation**
Surface level [m]: 0.0
Contribution: Positive
Enabled: Yes
Surface movement curves which are selected are applied between surface and [m]: -9.0000

Corner	x [m]	y [m]	Base Level [m]	Stiffened	Previous Side d [m]	Previous Side p1 [%]	Previous Side p2* [%]	Next Side d [m]	Next Side p1 [%]	Next Side p2* [%]
1	48.000	42.300	-9.0000	No	-	-	-	-	-	-
2	79.800	42.300	-9.0000	No	-	-	-	-	-	-
3	79.800	67.400	-9.0000	No	-	-	-	-	-	-
4	48.000	67.400	-9.0000	No	-	-	-	-	-	-

Side	Corner 1 x [m]	Corner 1 y [m]	Corner 2 x [m]	Corner 2 y [m]	Ground Movement Curve Vertical	Ground Movement Curve Horizontal
1	48.000	42.300	79.800	42.300	Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(b))	Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(a))
2	79.800	42.300	79.800	67.400	Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(b))	Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(a))

Side	Corner 1 x [m]	Corner 1 y [m]	Corner 2 x [m]	Corner 2 y [m]	Ground Movement Curve Vertical	Ground Movement Curve Horizontal
3	79.800	67.400	48.000	67.400	Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(b))	Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(a))
4	48.000	67.400	48.000	42.300	Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(b))	Installation of contiguous bored pile wall in stiff clay (CIRIA 580 Fig. 2.8(a))

Excavation Name:	**Excavation**
Surface level [m]:	0.0
Contribution:	Positive
Enabled:	Yes
Surface movement curves which are selected are applied between surface and [m]:	-5.1000

Corner	x [m]	y [m]	Base Level [m]	Stiffened	Previous Side d [m]	Previous Side p1 [%]	Previous Side p2* [%]	Next Side d [m]	Next Side p1 [%]	Next Side p2* [%]
1	48.000	42.300	-5.1000	Yes	0.0	67.000	25.000	0.0	67.000	25.000
2	79.800	42.300	-5.1000	Yes	0.0	67.000	25.000	0.0	67.000	25.000
3	79.800	67.400	-5.1000	Yes	0.0	67.000	25.000	0.0	67.000	25.000
4	48.000	67.400	-5.1000	Yes	0.0	67.000	25.000	0.0	67.000	25.000

Side	Corner 1 x [m]	Corner 1 y [m]	Corner 2 x [m]	Corner 2 y [m]	Ground Movement Curve Vertical	Ground Movement Curve Horizontal
1	48.000	42.300	79.800	42.300	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(b)	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(a))
2	79.800	42.300	79.800	67.400	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(b)	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(a))
3	79.800	67.400	48.000	67.400	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(b)	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(a))
4	48.000	67.400	48.000	42.300	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(b)	Excavation in front of high stiffness wall in stiff clay (CIRIA 580 Fig. 2.11(a))

Damage Category Strains

Name	0 (Negligible) to 1 (Very Slight)	1 (Very Slight) to 2 (Slight)	2 (Slight) to 3 (Moderate)	3 (Moderate) to 4 (Severe)
Burland Strain Limits	0.0	500.00E-6	750.00E-6	0.0015000

Specific Structures - Geometry

Structure Name	Sub-Structure Name	Displacement Line	Start Distance Along Line [m]	End Distance Along Line [m]	Vertical Offsets from Line for Vertical Movement Calculations [m]	Vertical Displacement Limit Sensitivity [mm]	Damage Category Strains	Poisson's Ratio	E/G
A		A	0.00000	26.70069	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
B	Sub #	B	0.00000	15.99931	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
C	Sub #	C	0.00000	26.61422	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
D	Sub #	D	0.00000	26.70574	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
E	Sub #	E	0.00000	16.59900	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
F	Sub #	F	0.00000	5.19996	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
G	Sub #	G	0.00000	5.69900	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
H	Sub #	H	0.00000	42.50853	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
I	Sub #	I	0.00000	9.29954	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
J	Sub #	J	0.00000	3.29900	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
K	Sub #	K	0.00000	33.60629	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
L	Sub #	L	0.00000	11.79900	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
M	Sub #	M	0.00000	7.19900	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
N	Sub #	N	0.00000	11.81974	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
O	Sub #	O	0.00000	12.44769	0.0	0.10000	Burland Strain Limits	0.20000	2.6000
P	Sub #	P	0.00000	50.77104	0.0	0.10000	Burland Strain Limits	0.20000	2.6000

Specific Structures - Bending Parameters

Structure Name	Sub-Structure Name	Height [m]	Default Properties	Hogging 2nd Moment of Area (per unit width) [m³]	Hogging Distance of Bending Strain from N.A. [m]	Hogging Distance of N.A. from Edge of Beam in Tension [m]	Sagging 2nd Moment of Area (per unit width) [m³]	Sagging Distance of Bending Strain from N.A. [m]	Sagging Distance of N.A. from Edge of Beam in Tension [m]
A		4.0000	Yes	21.333	4.0000	4.0000	5.3333	2.0000	2.0000
B	Sub #	4.0000	Yes	21.333	4.0000	4.0000	5.3333	2.0000	2.0000
C	Sub #	13.000	Yes	732.33	13.000	13.000	183.08	6.5000	6.5000
D	Sub #	13.000	Yes	732.33	13.000	13.000	183.08	6.5000	6.5000
E	Sub #	4.0000	Yes	21.333	4.0000	4.0000	5.3333	2.0000	2.0000
F	Sub #	4.0000	Yes	21.333	4.0000	4.0000	5.3333	2.0000	2.0000
G	Sub #	4.0000	Yes	21.333	4.0000	4.0000	5.3333	2.0000	2.0000
H	Sub #	6.5000	Yes	91.542	6.5000	6.5000	22.885	3.2500	3.2500
I	Sub #	6.5000	Yes	91.542	6.5000	6.5000	22.885	3.2500	3.2500
J	Sub #	6.5000	Yes	91.542	6.5000	6.5000	22.885	3.2500	3.2500
K	Sub #	7.5000	Yes	140.63	7.5000	7.5000	35.156	3.7500	3.7500
L	Sub #	7.5000	Yes	140.63	7.5000	7.5000	35.156	3.7500	3.7500
M	Sub #	7.5000	Yes	140.63	7.5000	7.5000	35.156	3.7500	3.7500
N	Sub #	7.5000	Yes	140.63	7.5000	7.5000	35.156	3.7500	3.7500
O	Sub #	12.500	Yes	651.04	12.500	12.500	162.76	6.2500	6.2500
P	Sub #	12.500	Yes	651.04	12.500	12.500	162.76	6.2500	6.2500

Building Segment Combinations

Structure Name	Sub-Structure Name	Vertical Offset from Line for Vertical Movement Calculations [m]	Segment Start [m]	Length [m]	Curvature	Combined Segment

No structures have segments combined.

Displacement and Strain Results

Type/No.	Name	Dist. [m]	Coordinates x [m]	y [m]	z [m]	Displacements x [mm]	y [mm]	z [mm]	Horizontal dispalcement along the Line [mm]	Horizontal displacement perpendicular to Line [mm]	Angle of Line to x Axis [°]
A	Line 1	47.30000	41.60000	-0.50000	4.8562	4.8562	4.8281	-4.8013	4.9104	270.64
		1.9073	47.32143	39.69286	-0.50000	1.6742	6.4325	5.2805	-6.4133	1.7464	270.64
		3.8145	47.34286	37.78571	-0.50000	0.82719	5.6824	5.0269	-5.6728	0.89098	270.64
		5.7218	47.36429	35.87857	-0.50000	0.47467	4.7947	4.3855	-4.7890	0.52851	270.64
		7.6291	47.38571	33.97143	-0.50000	0.28945	3.9245	3.5529	-3.9210	0.33353	270.64
		9.5363	47.40714	32.06429	-0.50000	0.17888	3.0883	2.6753	-3.0861	0.21357	270.64
		11.444	47.42857	30.15714	-0.50000	0.10717	2.2773	1.8547	-2.2759	0.13274	270.64
		13.351	47.45000	28.25000	-0.50000	0.061514	1.5714	1.1497	-1.5706	0.079165	270.64
		15.258	47.47143	26.34286	-0.50000	0.036488	1.1015	0.57633	-1.1011	0.048862	270.64
		17.165	47.49286	24.43571	-0.50000	0.017862	0.62921	0.10770	-0.62897	0.024931	270.64
		19.073	47.51429	22.52857	-0.50000	0.0038113	0.15514	0.029891	-0.15509	0.0055541	270.64
		20.980	47.53571	20.62143	-0.50000	0.0	0.0	0.0	0.0	0.0	270.64
		22.887	47.55714	18.71429	-0.50000	0.0	0.0	0.0	0.0	0.0	270.64

Name	Type/No. Dist.	Coordinates x	y	z	Displacements x	y	z	Horizontal displacement	Horizontal displacement	Angle of Line to x Axis
	24.794	47.57857	16.80714	-0.50000	0.0	0.0	0.0	0.0	0.0	270.64
	26.702	47.60000	14.90000	-0.50000	0.0	0.0	0.0	0.0	0.0	270.64
B	Line 2	47.30000	41.60000	-0.50000	4.8562	4.8562	4.8281	4.8257	4.8864	359.64
	2.0000	49.30000	41.58750	-0.50000	0.0	10.730	6.1029	-0.067059	10.729	359.64
	4.0001	51.30000	41.57500	-0.50000	0.0	10.720	6.1103	-0.066996	10.719	359.64
	6.0001	53.30000	41.56250	-0.50000	0.0	10.709	6.1176	-0.066933	10.709	359.64
	8.0002	55.30000	41.55000	-0.50000	0.0	10.699	6.1249	-0.066870	10.699	359.64
	10.000	57.30000	41.53750	-0.50000	0.0	10.689	6.1321	-0.066807	10.689	359.64
	12.000	59.30000	41.52500	-0.50000	0.0	10.679	6.1393	-0.066744	10.679	359.64
	14.000	61.30000	41.51250	-0.50000	0.0	10.669	6.1464	-0.066681	10.669	359.64
	16.000	63.30000	41.50000	-0.50000	0.0	10.659	6.1534	-0.066618	10.659	359.64
C	Line 3	64.20000	14.90000	-0.50000	0.0	0.0	0.0	0.0	0.0	91.938
	1.9011	64.13571	16.80000	-0.50000	0.0	0.0	0.0	0.0	0.0	91.938
	3.8022	64.07143	18.70000	-0.50000	0.0	0.0	0.0	0.0	0.0	91.938
	5.7033	64.00714	20.60000	-0.50000	0.0	0.0	0.0	0.0	0.0	91.938
	7.6043	63.94286	22.50000	-0.50000	0.0	0.22500	0.043745	0.22487	-0.0076084	91.938
	9.5054	63.87857	24.40000	-0.50000	0.0	0.93750	0.14229	0.93696	-0.031702	91.938
	11.407	63.81429	26.30000	-0.50000	0.0	1.6500	0.65219	1.6491	-0.055795	91.938
	13.308	63.75000	28.20000	-0.50000	0.0	2.3625	1.3190	2.3611	-0.079888	91.938
	15.209	63.68571	30.10000	-0.50000	0.0	3.3072	2.1861	3.3053	-0.11183	91.938
	17.110	63.62143	32.00000	-0.50000	0.0	4.3701	3.2341	4.3676	-0.14778	91.938
	19.011	63.55714	33.90000	-0.50000	0.0	5.4693	4.3817	5.4661	-0.18494	91.938
	20.912	63.49286	35.80000	-0.50000	0.0	6.6261	5.4849	6.6223	-0.22406	91.938
	22.813	63.42857	37.70000	-0.50000	0.0	7.8623	6.3374	7.8578	-0.26587	91.938
	24.714	63.36429	39.60000	-0.50000	0.0	9.1995	6.6706	9.1942	-0.31108	91.938
	26.615	63.30000	41.50000	-0.50000	0.0	10.659	6.1534	10.653	-0.36044	91.938
D	Line 4	55.30000	41.60000	-0.50000	0.0	10.740	6.0955	-10.737	0.24128	271.29
	1.9076	55.34286	39.69286	-0.50000	0.0	9.2678	6.6680	-9.2655	0.20821	271.29
	3.8152	55.38571	37.78571	-0.50000	0.0	7.9203	6.3658	-7.9183	0.17794	271.29
	5.7229	55.42857	35.87857	-0.50000	0.0	6.6755	5.5267	-6.6738	0.14997	271.29
	7.6305	55.47143	33.97143	-0.50000	0.0	5.5116	4.4251	-5.5102	0.12382	271.29
	9.5381	55.51429	32.06429	-0.50000	0.0	4.4066	3.2719	-4.4055	0.099000	271.29
	11.446	55.55714	30.15714	-0.50000	0.0	3.3389	2.2152	-3.3380	0.075011	271.29
	13.353	55.60000	28.25000	-0.50000	0.0	2.3813	1.3392	-2.3806	0.053498	271.29
	15.261	55.64286	26.34286	-0.50000	0.0	1.6661	0.66522	-1.6657	0.037430	271.29
	17.169	55.68571	24.43571	-0.50000	0.0	0.95089	0.15098	-0.95065	0.021363	271.29
	19.076	55.72857	22.52857	-0.50000	0.0	0.23571	0.045292	-0.23565	0.0052956	271.29
	20.984	55.77143	20.62143	-0.50000	0.0	0.0	0.0	0.0	0.0	271.29
	22.891	55.81429	18.71429	-0.50000	0.0	0.0	0.0	0.0	0.0	271.29
	24.799	55.85714	16.80714	-0.50000	0.0	0.0	0.0	0.0	0.0	271.29
	26.707	55.90000	14.90000	-0.50000	0.0	0.0	0.0	0.0	0.0	271.29
E	Line 5	63.50000	36.40000	-0.50000	0.0	7.0069	5.7926	0.0	7.0069	0.0
	1.8444	65.34444	36.40000	-0.50000	0.0	7.0069	5.7926	0.0	7.0069	0.0
	3.6889	67.18889	36.40000	-0.50000	0.0	7.0069	5.7926	0.0	7.0069	0.0
	5.5333	69.03333	36.40000	-0.50000	0.0	7.0069	5.7926	0.0	7.0069	0.0
	7.3778	70.87778	36.40000	-0.50000	0.0	7.0069	5.7926	0.0	7.0069	0.0
	9.2222	72.72222	36.40000	-0.50000	0.0	7.0069	5.7926	0.0	7.0069	0.0
	11.067	74.56667	36.40000	-0.50000	0.0	7.0069	5.7926	0.0	7.0069	0.0
	12.911	76.41111	36.40000	-0.50000	0.0	7.0069	5.7926	0.0	7.0069	0.0
	14.756	78.25556	36.40000	-0.50000	0.0	7.0069	5.7926	0.0	7.0069	0.0
	16.600	80.10000	36.40000	-0.50000	-0.26147	5.1422	4.6396	-0.26147	5.1422	0.0
F	Line 6	74.40000	41.60000	-0.50000	0.0	10.740	6.0955	-10.738	0.20650	271.10
	0.86683	74.41667	40.73333	-0.50000	0.0	10.054	6.4882	-10.052	0.19331	271.10
	1.7337	74.43333	39.86667	-0.50000	0.0	9.3965	6.6576	-9.3947	0.18067	271.10
	2.6005	74.45000	39.00000	-0.50000	0.0	8.7650	6.6403	-8.7634	0.16853	271.10
	3.4673	74.46667	38.13333	-0.50000	0.0	8.1576	6.4700	-8.1561	0.15685	271.10
	4.3341	74.48333	37.26667	-0.50000	0.0	7.5723	6.1780	-7.5709	0.14559	271.10
	5.2010	74.50000	36.40000	-0.50000	0.0	7.0069	5.7926	-7.0056	0.13472	271.10
G	Line 7	74.40000	41.60000	-0.50000	0.0	10.740	6.0955	0.0	10.740	0.0
	0.95000	75.35000	41.60000	-0.50000	0.0	10.740	6.0955	0.0	10.740	0.0
	1.9000	76.30000	41.60000	-0.50000	0.0	10.740	6.0955	0.0	10.740	0.0
	2.8500	77.25000	41.60000	-0.50000	0.0	10.740	6.0955	0.0	10.740	0.0
	3.8000	78.20000	41.60000	-0.50000	0.0	10.740	6.0955	0.0	10.740	0.0
	4.7500	79.15000	41.60000	-0.50000	0.0	10.740	6.0955	0.0	10.740	0.0
	5.7000	80.10000	41.60000	-0.50000	-2.9995	6.9987	5.0107	-2.9995	6.9987	0.0
H	Line 8	82.40000	66.70000	-0.50000	-9.2731	0.0	6.6677	0.19633	-9.2710	268.79
	1.9323	82.35909	64.76818	-0.50000	-9.3033	0.0	6.6659	0.19697	-9.3012	268.79
	3.8645	82.31818	62.83636	-0.50000	-9.3335	0.0	6.6636	0.19761	-9.3314	268.79
	5.7968	82.27727	60.90455	-0.50000	-9.3638	0.0	6.6610	0.19825	-9.3617	268.79
	7.7290	82.23636	58.97273	-0.50000	-9.3942	0.0	6.6579	0.19889	-9.3921	268.79
	9.6613	82.19545	57.04091	-0.50000	-9.4246	0.0	6.6544	0.19954	-9.4225	268.79
	11.594	82.15455	55.10909	-0.50000	-9.4551	0.0	6.6505	0.20018	-9.4530	268.79
	13.526	82.11364	53.17727	-0.50000	-9.4857	0.0	6.6462	0.20083	-9.4835	268.79
	15.458	82.07273	51.24545	-0.50000	-9.5163	0.0	6.6414	0.20148	-9.5141	268.79
	17.390	82.03182	49.31364	-0.50000	-9.5469	0.0	6.6362	0.20213	-9.5448	268.79
	19.323	81.99091	47.38182	-0.50000	-9.5777	0.0	6.6306	0.20278	-9.5755	268.79
	21.255	81.95000	45.45000	-0.50000	-9.6085	0.0	6.6245	0.20343	-9.6063	268.79
	23.187	81.90909	43.51818	-0.50000	-9.6393	0.0	6.6180	0.20408	-9.6371	268.79
	25.119	81.86818	41.58636	-0.50000	-6.4612	2.2295	5.2364	-2.0922	-6.5070	268.79
	27.052	81.82727	39.65455	-0.50000	-3.4815	4.5431	4.8903	-4.4684	-3.5769	268.79
	28.984	81.78636	37.72273	-0.50000	-2.0630	4.7538	4.6910	-4.7090	-2.1631	268.79
	30.916	81.74545	35.79091	-0.50000	-1.2709	4.2523	4.1134	-4.2244	-1.3607	268.79
	32.848	81.70455	33.85909	-0.50000	-0.80440	3.5651	3.3361	-3.5473	-0.87970	268.79
	34.781	81.66364	31.92727	-0.50000	-0.50794	2.8271	2.5042	-2.8157	-0.56768	268.79
	36.713	81.62273	29.99545	-0.50000	-0.30697	2.0722	1.7210	-2.0653	-0.35077	268.79
	38.645	81.58182	28.06364	-0.50000	-0.18126	1.4482	1.0460	-1.4441	-0.21188	268.79
	40.577	81.54091	26.13182	-0.50000	-0.10746	0.99797	0.49430	-0.99547	-0.12856	268.79
	42.510	81.50000	24.20000	-0.50000	-0.050588	0.53861	0.072021	-0.53742	-0.061980	268.79
I	Line 9	82.40000	66.70000	-0.50000	-9.2731	0.0	6.6677	-9.2725	-0.099705	359.38
	0.93005	83.33000	66.69000	-0.50000	-8.6016	0.0	6.6087	-8.6011	-0.092485	359.38
	1.8601	84.26000	66.68000	-0.50000	-7.9572	0.0	6.3833	-7.9567	-0.085556	359.38
	2.7902	85.19000	66.67000	-0.50000	-7.3373	0.0	6.0292	-7.3369	-0.078891	359.38
	3.7202	86.12000	66.66000	-0.50000	-6.7395	0.0	5.5801	-6.7391	-0.072464	359.38
	4.6503	87.05000	66.65000	-0.50000	-6.1612	0.0	5.0665	-6.1608	-0.066245	359.38
	5.5803	87.98000	66.64000	-0.50000	-5.5998	0.0	4.5151	-5.5995	-0.060210	359.38
	6.5104	88.91000	66.63000	-0.50000	-5.0529	0.0	3.9490	-5.0526	-0.054329	359.38
	7.4404	89.84000	66.62000	-0.50000	-4.5179	0.0	3.3878	-4.5177	-0.048577	359.38
	8.3705	90.77000	66.61000	-0.50000	-3.9923	0.0	2.8477	-3.9921	-0.042925	359.38
	9.3005	91.70000	66.60000	-0.50000	-3.4735	0.0	2.3409	-3.4733	-0.037347	359.38
J	Line 10	91.70000	66.60000	-0.50000	-3.4735	0.0	2.3409	0.0	3.4735	90.000
	0.82500	91.70000	67.42500	-0.50000	-2.4202	-0.0050844	1.9705	-0.0050844	2.4202	90.000
	1.6500	91.70000	68.25000	-0.50000	-2.3535	-0.16811	1.9412	-0.16811	2.3535	90.000
	2.4750	91.70000	69.07500	-0.50000	-2.2537	-0.31722	1.8895	-0.31722	2.2537	90.000
	3.3000	91.70000	69.90000	-0.50000	-2.1249	-0.44640	1.8173	-0.44640	2.1249	90.000
K	Line 11	58.10000	71.20000	-0.50000	0.0	-8.4118	6.5587	0.17521	-8.4100	358.81
	1.9769	60.07647	71.15882	-0.50000	0.0	-8.4406	6.5671	0.17581	-8.4388	358.81
	3.9538	62.05294	71.11765	-0.50000	0.0	-8.4694	6.5753	0.17641	-8.4676	358.81
	5.9307	64.02941	71.07647	-0.50000	0.0	-8.4983	6.5832	0.17701	-8.4965	358.81
	7.9076	66.00588	71.03529	-0.50000	0.0	-8.5273	6.5908	0.17761	-8.5254	358.81
	9.8845	67.98235	70.99412	-0.50000	0.0	-8.5563	6.5980	0.17822	-8.5544	358.81
	11.861	69.95882	70.95294	-0.50000	0.0	-8.5853	6.6050	0.17882	-8.5835	358.81
	13.838	71.93529	70.91176	-0.50000	0.0	-8.6145	6.6116	0.17943	-8.6126	358.81
	15.815	73.91176	70.87059	-0.50000	0.0	-8.6436	6.6178	0.18004	-8.6417	358.81
	17.792	75.88824	70.82941	-0.50000	0.0	-8.6728	6.6238	0.18064	-8.6710	358.81
	19.769	77.86471	70.78824	-0.50000	0.0	-8.7021	6.6294	0.18125	-8.7002	358.81
	21.746	79.84118	70.74706	-0.50000	-0.081238	-6.6035	5.4024	0.056322	-6.6037	358.81
	23.723	81.81765	70.70588	-0.50000	-2.9073	-4.7635	4.8752	-2.8074	-4.8230	358.81
	25.700	83.79412	70.66471	-0.50000	-3.6820	-3.0096	4.4250	-3.6185	-3.0856	358.81
	27.677	85.77059	70.62353	-0.50000	-3.7098	-2.0030	3.9802	-3.6673	-2.0798	358.81
	29.653	87.74706	70.58235	-0.50000	-3.2894	-1.3172	3.2957	-3.2612	-1.3854	358.81
	31.630	89.72353	70.54118	-0.50000	-2.6918	-0.85207	2.5155	-2.6735	-0.90795	358.81
	33.607	91.70000	70.50000	-0.50000	-2.0158	-0.52513	1.7532	-2.0044	-0.56700	358.81
L	Line 12	58.10000	82.20000	-0.50000	0.0	-2.1000	1.0510	2.1000	0.0	270.00
	1.9667	58.10000	80.23333	-0.50000	0.0	-2.9572	1.8747	2.9572	0.0	270.00
	3.9333	58.10000	78.26667	-0.50000	0.0	-4.0503	2.9062	4.0503	0.0	270.00
	5.9000	58.10000	76.30000	-0.50000	0.0	-5.1753	4.0770	5.1753	0.0	270.00
	7.8667	58.10000	74.33333	-0.50000	0.0	-6.3561	5.2469	6.3561	0.0	270.00
	9.8333	58.10000	72.36667	-0.50000	0.0	-7.6166	6.2041	7.6166	0.0	270.00
	11.800	58.10000	70.40000	-0.50000	0.0	-8.9808	6.6653	8.9808	0.0	270.00
M	Line 13	58.10000	70.40000	-0.50000	0.0	-8.9808	6.6653	0.0	8.9808	180.00
	0.90000	57.20000	70.40000	-0.50000	0.0	-8.9808	6.6653	0.0	8.9808	180.00
	1.8000	56.30000	70.40000	-0.50000	0.0	-8.9808	6.6653	0.0	8.9808	180.00
	2.7000	55.40000	70.40000	-0.50000	0.0	-8.9808	6.6653	0.0	8.9808	180.00
	3.6000	54.50000	70.40000	-0.50000	0.0	-8.9808	6.6653	0.0	8.9808	180.00
	4.5000	53.60000	70.40000	-0.50000	0.0	-8.9808	6.6653	0.0	8.9808	180.00
	5.4000	52.70000	70.40000	-0.50000	0.0	-8.9808	6.6653	0.0	8.9808	180.00
	6.3000	51.80000	70.40000	-0.50000	0.0	-8.9808	6.6653	0.0	8.9808	180.00
	7.2000	50.90000	70.40000	-0.50000	0.0	-8.9808	6.6653	0.0	8.9808	180.00
N	Line 14	50.80000	70.40000	-0.50000	0.0	-8.9808	6.6653	-8.9650	-0.53182	86.605
	1.9701	50.91667	72.36667	-0.50000	0.0	-7.6166	6.2041	-7.6032	-0.45104	86.605
	3.9402	51.03333	74.33333	-0.50000	0.0	-6.3561	5.2469	-6.3449	-0.37639	86.605

Type/No.	Name	Dist.	Coordinates x	y	z	Displacements x	y	z	Horizontal displacement	Horizontal displacement	Angle of Line to x Axis
		5.9104	51.15000	76.30000	-0.50000	0.0	-5.1753	4.0770	-5.1662	-0.30647	86.605
		7.8805	51.26667	78.26667	-0.50000	0.0	-4.0503	2.9062	-4.0432	-0.23985	86.605
		9.8506	51.38333	80.23333	-0.50000	0.0	-2.9572	1.8747	-2.9520	-0.17512	86.605
		11.821	51.50000	82.20000	-0.50000	0.0	-2.1000	1.0510	-2.0963	-0.12436	86.605
O	Line 15		15.00000	56.70000	-0.50000	0.0	0.0	0.0	0.0	0.0	354.93
		1.7784	16.77143	56.54286	-0.50000	0.0	0.0	0.0	0.0	0.0	354.93
		3.5568	18.54286	56.38571	-0.50000	0.0	0.0	0.0	0.0	0.0	354.93
		5.3352	20.31429	56.22857	-0.50000	0.0	0.0	0.0	0.0	0.0	354.93
		7.1135	22.08571	56.07143	-0.50000	0.0	0.0	0.0	0.0	0.0	354.93
		8.8919	23.85714	55.91429	-0.50000	0.0	0.0	0.0	0.0	0.0	354.93
		10.670	25.62857	55.75714	-0.50000	0.0	0.0	0.0	0.0	0.0	354.93
		12.449	27.40000	55.60000	-0.50000	0.0	0.0	0.0	0.0	0.0	354.93
P	Line 16		27.40000	55.60000	-0.50000	0.0	0.0	0.0	0.0	0.0	81.391
		1.9528	27.69231	57.53077	-0.50000	0.034615	0.0	0.011419	0.0051815	-0.034225	81.391
		3.9055	27.98462	59.46154	-0.50000	0.14423	0.0	0.031228	0.021590	-0.14261	81.391
		5.8583	28.27692	61.39231	-0.50000	0.25385	0.0	0.047853	0.037998	-0.25099	81.391
		7.8111	28.56923	63.32308	-0.50000	0.36346	0.0	0.062027	0.054406	-0.35937	81.391
		9.7639	28.86154	65.25385	-0.50000	0.47308	0.0	0.074449	0.070814	-0.46775	81.391
		11.717	29.15385	67.18462	-0.50000	0.58269	0.0	0.085782	0.087222	-0.57613	81.391
		13.669	29.44615	69.11538	-0.50000	0.42891	-0.039655	0.060924	0.024995	-0.43002	81.391
		15.622	29.73846	71.04615	-0.50000	0.41019	-0.081900	0.059052	-0.019576	-0.41783	81.391
		17.575	30.03077	72.97692	-0.50000	0.34341	-0.10658	0.052600	-0.053975	-0.35549	81.391
		19.528	30.32308	74.90769	-0.50000	0.24046	-0.10213	0.041825	-0.064982	-0.25304	81.391
		21.480	30.61538	76.83846	-0.50000	0.11462	-0.062227	0.025163	-0.044369	-0.12264	81.391
		23.433	30.90769	78.76923	-0.50000	0.0	0.0	0.0	0.0	0.0	81.391
		25.386	31.20000	80.70000	-0.50000	0.0	0.0	0.0	0.0	0.0	81.391
		27.339	31.49231	82.63077	-0.50000	0.0	0.0	0.0	0.0	0.0	81.391
		29.292	31.78462	84.56154	-0.50000	0.0	0.0	0.0	0.0	0.0	81.391
		31.244	32.07692	86.49231	-0.50000	0.0	0.0	0.0	0.0	0.0	81.391
		33.197	32.36923	88.42308	-0.50000	0.0	0.0	0.0	0.0	0.0	81.391
		35.150	32.66154	90.35385	-0.50000	0.0	0.0	0.0	0.0	0.0	81.391
		37.103	32.95385	92.28462	-0.50000	0.0	0.0	0.0	0.0	0.0	81.391
		39.055	33.24615	94.21538	-0.50000	0.0	0.0	0.0	0.0	0.0	81.391
		41.008	33.53846	96.14615	-0.50000	0.0	0.0	0.0	0.0	0.0	81.391
		42.961	33.83077	98.07692	-0.50000	0.0	0.0	0.0	0.0	0.0	81.391
		44.914	34.12308	100.00769	-0.50000	0.0	0.0	0.0	0.0	0.0	81.391
		46.866	34.41538	101.93846	-0.50000	0.0	0.0	0.0	0.0	0.0	81.391
		48.819	34.70769	103.86923	-0.50000	0.0	0.0	0.0	0.0	0.0	81.391
		50.772	35.00000	105.80000	-0.50000	0.0	0.0	0.0	0.0	0.0	81.391

Specific Building Damage Results - Horizontal Displacements

Structure: A | Sub-structure:

Dist.	Coordinates x	y	z	Displacements x	y	Horizontal displacement along the Line	Horizontal displacement perpendicular to Line
[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]
0.0	47.30000	41.60000	-0.50000	4.8562	4.8562	-4.8013	4.9104
1.9073	47.32143	39.69286	-0.50000	1.6742	6.4325	-6.4133	1.7464
3.8145	47.34286	37.78571	-0.50000	0.82719	5.6824	-5.6728	0.89098
5.7218	47.36429	35.87857	-0.50000	0.47467	4.7947	-4.7890	0.52851
7.6291	47.38571	33.97143	-0.50000	0.28945	3.9245	-3.9210	0.33353
9.5363	47.40714	32.06429	-0.50000	0.17888	3.0883	-3.0861	0.21357
11.444	47.42857	30.15714	-0.50000	0.10717	2.2773	-2.2759	0.13274
13.351	47.45000	28.25000	-0.50000	0.061514	1.5714	-1.5706	0.079165
15.258	47.47143	26.34286	-0.50000	0.036488	1.1015	-1.1011	0.048862
17.165	47.49286	24.43571	-0.50000	0.017862	0.62921	-0.62897	0.024931
19.073	47.51429	22.52857	-0.50000	0.0038113	0.15514	-0.15509	0.0055541
20.980	47.53571	20.62143	-0.50000	0.0	0.0	0.0	0.0
22.887	47.55714	18.71429	-0.50000	0.0	0.0	0.0	0.0
24.794	47.57857	16.80714	-0.50000	0.0	0.0	0.0	0.0
26.702	47.60000	14.90000	-0.50000	0.0	0.0	0.0	0.0

Structure: B | Sub-structure: Sub #

Dist.	Coordinates x	y	z	Displacements x	y	Horizontal displacement along the Line	Horizontal displacement perpendicular to Line
[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]
0.0	47.30000	41.60000	-0.50000	4.8562	4.8562	4.8257	4.8864
2.0000	49.30000	41.58750	-0.50000	0.0	10.730	-0.066959	10.729
4.0001	51.30000	41.57500	-0.50000	0.0	10.720	-0.066996	10.719
6.0001	53.30000	41.56250	-0.50000	0.0	10.709	-0.066933	10.709
8.0002	55.30000	41.55000	-0.50000	0.0	10.699	-0.066870	10.699
10.000	57.30000	41.53750	-0.50000	0.0	10.689	-0.066807	10.689
12.000	59.30000	41.52500	-0.50000	0.0	10.679	-0.066744	10.679
14.000	61.30000	41.51250	-0.50000	0.0	10.669	-0.066681	10.669
16.000	63.30000	41.50000	-0.50000	0.0	10.659	-0.066618	10.659

Structure: C | Sub-structure: Sub #

Dist.	Coordinates x	y	z	Displacements x	y	Horizontal displacement along the Line	Horizontal displacement perpendicular to Line
[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]
0.0	64.20000	14.90000	-0.50000	0.0	0.0	0.0	0.0
1.9011	64.13571	16.80000	-0.50000	0.0	0.0	0.0	0.0
3.8022	64.07143	18.70000	-0.50000	0.0	0.0	0.0	0.0
5.7033	64.00714	20.60000	-0.50000	0.0	0.0	0.0	0.0
7.6043	63.94286	22.50000	-0.50000	0.0	0.22500	0.22487	-0.0076084
9.5054	63.87857	24.40000	-0.50000	0.0	0.93750	0.93696	-0.031702
11.407	63.81429	26.30000	-0.50000	0.0	1.6500	1.6491	-0.055795
13.308	63.75000	28.20000	-0.50000	0.0	2.3625	2.3611	-0.079888
15.209	63.68571	30.10000	-0.50000	0.0	3.3072	3.3053	-0.11183
17.110	63.62143	32.00000	-0.50000	0.0	4.3701	4.3676	-0.14778
19.011	63.55714	33.90000	-0.50000	0.0	5.4693	5.4661	-0.18494
20.912	63.49286	35.80000	-0.50000	0.0	6.6261	6.6223	-0.22406
22.813	63.42857	37.70000	-0.50000	0.0	7.8623	7.8578	-0.26587
24.714	63.36429	39.60000	-0.50000	0.0	9.1995	9.1942	-0.31108
26.615	63.30000	41.50000	-0.50000	0.0	10.659	10.653	-0.36044

Structure: D | Sub-structure: Sub #

Dist.	Coordinates x	y	z	Displacements x	y	Horizontal displacement along the Line	Horizontal displacement perpendicular to Line
[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]
0.0	55.30000	41.60000	-0.50000	0.0	10.740	-10.737	0.24128
1.9076	55.34286	39.69286	-0.50000	0.0	9.2678	-9.2655	0.20821
3.8152	55.38571	37.78571	-0.50000	0.0	7.9203	-7.9183	0.17794
5.7229	55.42857	35.87857	-0.50000	0.0	6.6755	-6.6738	0.14997
7.6305	55.47143	33.97143	-0.50000	0.0	5.5116	-5.5102	0.12382
9.5381	55.51429	32.06429	-0.50000	0.0	4.4066	-4.4055	0.099000
11.446	55.55714	30.15714	-0.50000	0.0	3.3389	-3.3380	0.075011
13.353	55.60000	28.25000	-0.50000	0.0	2.3813	-2.3806	0.053498
15.261	55.64286	26.34286	-0.50000	0.0	1.6661	-1.6657	0.037430
17.169	55.68571	24.43571	-0.50000	0.0	0.95089	-0.95065	0.021363
19.076	55.72857	22.52857	-0.50000	0.0	0.23571	-0.23565	0.0052956
20.984	55.77143	20.62143	-0.50000	0.0	0.0	0.0	0.0
22.891	55.81429	18.71429	-0.50000	0.0	0.0	0.0	0.0
24.799	55.85714	16.80714	-0.50000	0.0	0.0	0.0	0.0
26.707	55.90000	14.90000	-0.50000	0.0	0.0	0.0	0.0

Structure: E | Sub-structure: Sub #

Dist.	Coordinates			Displacements			
	x	y	z	x	y	Horizontal displacement along the Line	Horizontal displacement perpendicular to Line
[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]
0.0	63.50000	36.40000	-0.50000	0.0	7.0069	0.0	7.0069
1.8444	65.34444	36.40000	-0.50000	0.0	7.0069	0.0	7.0069
3.6889	67.18889	36.40000	-0.50000	0.0	7.0069	0.0	7.0069
5.5333	69.03333	36.40000	-0.50000	0.0	7.0069	0.0	7.0069
7.3778	70.87778	36.40000	-0.50000	0.0	7.0069	0.0	7.0069
9.2222	72.72222	36.40000	-0.50000	0.0	7.0069	0.0	7.0069
11.067	74.56667	36.40000	-0.50000	0.0	7.0069	0.0	7.0069
12.911	76.41111	36.40000	-0.50000	0.0	7.0069	0.0	7.0069
14.756	78.25556	36.40000	-0.50000	0.0	7.0069	0.0	7.0069
16.600	80.10000	36.40000	-0.50000	-0.26147	5.1422	-0.26147	5.1422

Structure: F | Sub-structure: Sub #

Dist.	Coordinates			Displacements			
	x	y	z	x	y	Horizontal displacement along the Line	Horizontal displacement perpendicular to Line
[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]
0.0	74.40000	41.60000	-0.50000	0.0	10.740	-10.738	0.20650
0.86683	74.41667	40.73333	-0.50000	0.0	10.054	-10.052	0.19331
1.7337	74.43333	39.86667	-0.50000	0.0	9.3965	-9.3947	0.18067
2.6005	74.45000	39.00000	-0.50000	0.0	8.7650	-8.7634	0.16853
3.4673	74.46667	38.13333	-0.50000	0.0	8.1576	-8.1561	0.15685
4.3341	74.48333	37.26667	-0.50000	0.0	7.5723	-7.5709	0.14559
5.2010	74.50000	36.40000	-0.50000	0.0	7.0069	-7.0056	0.13472

Structure: G | Sub-structure: Sub #

Dist.	Coordinates			Displacements			
	x	y	z	x	y	Horizontal displacement along the Line	Horizontal displacement perpendicular to Line
[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]
0.0	74.40000	41.60000	-0.50000	0.0	10.740	0.0	10.740
0.95000	75.35000	41.60000	-0.50000	0.0	10.740	0.0	10.740
1.9000	76.30000	41.60000	-0.50000	0.0	10.740	0.0	10.740
2.8500	77.25000	41.60000	-0.50000	0.0	10.740	0.0	10.740
3.8000	78.20000	41.60000	-0.50000	0.0	10.740	0.0	10.740
4.7500	79.15000	41.60000	-0.50000	0.0	10.740	0.0	10.740
5.7000	80.10000	41.60000	-0.50000	-2.9995	6.9987	-2.9995	6.9987

Structure: H | Sub-structure: Sub #

Dist.	Coordinates			Displacements			
	x	y	z	x	y	Horizontal displacement along the Line	Horizontal displacement perpendicular to Line
[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]
0.0	82.40000	66.70000	-0.50000	-9.2731	0.0	0.19633	-9.2710
1.9323	82.35909	64.76818	-0.50000	-9.3033	0.0	0.19697	-9.3012
3.8645	82.31818	62.83636	-0.50000	-9.3335	0.0	0.19761	-9.3314
5.7968	82.27727	60.90455	-0.50000	-9.3638	0.0	0.19825	-9.3617
7.7290	82.23636	58.97273	-0.50000	-9.3942	0.0	0.19889	-9.3921
9.6613	82.19545	57.04091	-0.50000	-9.4246	0.0	0.19954	-9.4225
11.594	82.15455	55.10909	-0.50000	-9.4551	0.0	0.20018	-9.4530
13.526	82.11364	53.17727	-0.50000	-9.4857	0.0	0.20083	-9.4835
15.458	82.07273	51.24545	-0.50000	-9.5163	0.0	0.20148	-9.5141
17.390	82.03182	49.31364	-0.50000	-9.5469	0.0	0.20213	-9.5448
19.323	81.99091	47.38182	-0.50000	-9.5777	0.0	0.20278	-9.5755
21.255	81.95000	45.45000	-0.50000	-9.6085	0.0	0.20343	-9.6063
23.187	81.90909	43.51818	-0.50000	-9.6393	0.0	0.20408	-9.6371
25.119	81.86818	41.58636	-0.50000	-6.4612	2.2295	-2.0922	-6.5070
27.052	81.82727	39.65455	-0.50000	-3.4815	4.5431	-4.4684	-3.5769
28.984	81.78636	37.72273	-0.50000	-2.0630	4.7538	-4.7090	-2.1631
30.916	81.74545	35.79091	-0.50000	-1.2709	4.2523	-4.2244	-1.3607
32.848	81.70455	33.85909	-0.50000	-0.80440	3.5651	-3.5473	-0.87970
34.781	81.66364	31.92727	-0.50000	-0.50794	2.8271	-2.8157	-0.56768
36.713	81.62273	29.99545	-0.50000	-0.30697	2.0722	-2.0653	-0.35077
38.645	81.58182	28.06364	-0.50000	-0.18126	1.4482	-1.4441	-0.21188
40.577	81.54091	26.13182	-0.50000	-0.10746	0.99797	-0.99547	-0.12856
42.510	81.50000	24.20000	-0.50000	-0.050588	0.53861	-0.53742	-0.061980

Structure: I | Sub-structure: Sub #

Dist.	Coordinates			Displacements			
	x	y	z	x	y	Horizontal displacement along the Line	Horizontal displacement perpendicular to Line
[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]
0.0	82.40000	66.70000	-0.50000	-9.2731	0.0	-9.2725	-0.099705
0.93005	83.33000	66.69000	-0.50000	-8.6016	0.0	-8.6011	-0.092485
1.8601	84.26000	66.68000	-0.50000	-7.9572	0.0	-7.9567	-0.085556
2.7902	85.19000	66.67000	-0.50000	-7.3373	0.0	-7.3369	-0.078891
3.7202	86.12000	66.66000	-0.50000	-6.7395	0.0	-6.7391	-0.072464
4.6503	87.05000	66.65000	-0.50000	-6.1612	0.0	-6.1608	-0.066245
5.5803	87.98000	66.64000	-0.50000	-5.5998	0.0	-5.5995	-0.060210
6.5104	88.91000	66.63000	-0.50000	-5.0529	0.0	-5.0526	-0.054329
7.4404	89.84000	66.62000	-0.50000	-4.5179	0.0	-4.5177	-0.048577
8.3705	90.77000	66.61000	-0.50000	-3.9923	0.0	-3.9921	-0.042925
9.3005	91.70000	66.60000	-0.50000	-3.4735	0.0	-3.4733	-0.037347

Structure: J | Sub-structure: Sub #

Dist.	Coordinates			Displacements			
	x	y	z	x	y	Horizontal displacement along the Line	Horizontal displacement perpendicular to Line
[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]
0.0	91.70000	66.60000	-0.50000	-3.4735	0.0	0.0	3.4735
0.82500	91.70000	67.42500	-0.50000	-2.4202	-0.0050844	-0.0050844	2.4202
1.6500	91.70000	68.25000	-0.50000	-2.3535	-0.16811	-0.16811	2.3535
2.4750	91.70000	69.07500	-0.50000	-2.2537	-0.31722	-0.31722	2.2537
3.3000	91.70000	69.90000	-0.50000	-2.1249	-0.44640	-0.44640	2.1249

Structure: K | Sub-structure: Sub #

Dist.	Coordinates			Displacements			
	x	y	z	x	y	Horizontal displacement along the Line	Horizontal displacement perpendicular to Line
[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]
0.0	58.10000	71.20000	-0.50000	0.0	-8.4118	0.17521	-8.4100
1.9769	60.07647	71.15882	-0.50000	0.0	-8.4406	0.17581	-8.4388
3.9538	62.05294	71.11765	-0.50000	0.0	-8.4694	0.17641	-8.4676
5.9307	64.02941	71.07647	-0.50000	0.0	-8.4983	0.17701	-8.4965
7.9076	66.00588	71.03529	-0.50000	0.0	-8.5273	0.17761	-8.5254
9.8845	67.98235	70.99412	-0.50000	0.0	-8.5563	0.17822	-8.5544
11.861	69.95882	70.95294	-0.50000	0.0	-8.5853	0.17882	-8.5835
13.838	71.93529	70.91176	-0.50000	0.0	-8.6145	0.17943	-8.6126

Dist.	Coordinates			Displacements			
	x	y	z	x	y	Horizontal displacement along the Line	Horizontal displacement perpendicular to Line
15.815	73.91176	70.87059	-0.50000	0.0	-8.6436	0.18004	-8.6417
17.792	75.88824	70.82941	-0.50000	0.0	-8.6728	0.18064	-8.6710
19.769	77.86471	70.78824	-0.50000	0.0	-8.7021	0.18125	-8.7002
21.746	79.84118	70.74706	-0.50000	-0.081238	-6.6035	0.056322	-6.6037
23.723	81.81765	70.70588	-0.50000	-2.9073	-4.7635	-2.8074	-4.8230
25.700	83.79412	70.66471	-0.50000	-3.6820	-3.0096	-3.6185	-3.0856
27.677	85.77059	70.62353	-0.50000	-3.7098	-2.0030	-3.6673	-2.0798
29.653	87.74706	70.58235	-0.50000	-3.2894	-1.3172	-3.2612	-1.3854
31.630	89.72353	70.54118	-0.50000	-2.6918	-0.85207	-2.6735	-0.90795
33.607	91.70000	70.50000	-0.50000	-2.0158	-0.52513	-2.0044	-0.56700

Structure: L | Sub-structure: Sub #

Dist.	Coordinates			Displacements			
	x	y	z	x	y	Horizontal displacement along the Line	Horizontal displacement perpendicular to Line
[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]
0.0	58.10000	82.20000	-0.50000	0.0	-2.1000	2.1000	0.0
1.9667	58.10000	80.23333	-0.50000	0.0	-2.9572	2.9572	0.0
3.9333	58.10000	78.26667	-0.50000	0.0	-4.0503	4.0503	0.0
5.9000	58.10000	76.30000	-0.50000	0.0	-5.1753	5.1753	0.0
7.8667	58.10000	74.33333	-0.50000	0.0	-6.3561	6.3561	0.0
9.8333	58.10000	72.36667	-0.50000	0.0	-7.6166	7.6166	0.0
11.800	58.10000	70.40000	-0.50000	0.0	-8.9808	8.9808	0.0

Structure: M | Sub-structure: Sub #

Dist.	Coordinates			Displacements			
	x	y	z	x	y	Horizontal displacement along the Line	Horizontal displacement perpendicular to Line
[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]
0.0	58.10000	70.40000	-0.50000	0.0	-8.9808	0.0	8.9808
0.90000	57.20000	70.40000	-0.50000	0.0	-8.9808	0.0	8.9808
1.8000	56.30000	70.40000	-0.50000	0.0	-8.9808	0.0	8.9808
2.7000	55.40000	70.40000	-0.50000	0.0	-8.9808	0.0	8.9808
3.6000	54.50000	70.40000	-0.50000	0.0	-8.9808	0.0	8.9808
4.5000	53.60000	70.40000	-0.50000	0.0	-8.9808	0.0	8.9808
5.4000	52.70000	70.40000	-0.50000	0.0	-8.9808	0.0	8.9808
6.3000	51.80000	70.40000	-0.50000	0.0	-8.9808	0.0	8.9808
7.2000	50.90000	70.40000	-0.50000	0.0	-8.9808	0.0	8.9808

Structure: N | Sub-structure: Sub #

Dist.	Coordinates			Displacements			
	x	y	z	x	y	Horizontal displacement along the Line	Horizontal displacement perpendicular to Line
[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]
0.0	50.80000	70.40000	-0.50000	0.0	-8.9808	-8.9650	-0.53182
1.9701	50.91667	72.36667	-0.50000	0.0	-7.6166	-7.6032	-0.45104
3.9402	51.03333	74.33333	-0.50000	0.0	-6.3561	-6.3449	-0.37639
5.9104	51.15000	76.30000	-0.50000	0.0	-5.1753	-5.1662	-0.30647
7.8805	51.26667	78.26667	-0.50000	0.0	-4.0503	-4.0432	-0.23985
9.8506	51.38333	80.23333	-0.50000	0.0	-2.9572	-2.9520	-0.17512
11.821	51.50000	82.20000	-0.50000	0.0	-2.1000	-2.0963	-0.12436

Structure: O | Sub-structure: Sub #

Dist.	Coordinates			Displacements			
	x	y	z	x	y	Horizontal displacement along the Line	Horizontal displacement perpendicular to Line
[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]
0.0	15.00000	56.70000	-0.50000	0.0	0.0	0.0	0.0
1.7784	16.77143	56.54286	-0.50000	0.0	0.0	0.0	0.0
3.5568	18.54286	56.38571	-0.50000	0.0	0.0	0.0	0.0
5.3352	20.31429	56.22857	-0.50000	0.0	0.0	0.0	0.0
7.1135	22.08571	56.07143	-0.50000	0.0	0.0	0.0	0.0
8.8919	23.85714	55.91429	-0.50000	0.0	0.0	0.0	0.0
10.670	25.62857	55.75714	-0.50000	0.0	0.0	0.0	0.0
12.449	27.40000	55.60000	-0.50000	0.0	0.0	0.0	0.0

Structure: P | Sub-structure: Sub #

Dist.	Coordinates			Displacements			
	x	y	z	x	y	Horizontal displacement along the Line	Horizontal displacement perpendicular to Line
[m]	[m]	[m]	[m]	[mm]	[mm]	[mm]	[mm]
0.0	27.40000	55.60000	-0.50000	0.0	0.0	0.0	0.0
1.9528	27.69231	57.53077	-0.50000	0.034615	0.0	0.0051815	-0.034225
3.9055	27.98462	59.46154	-0.50000	0.14423	0.0	0.021590	-0.14261
5.8583	28.27692	61.39231	-0.50000	0.25385	0.0	0.037998	-0.25099
7.8111	28.56923	63.32308	-0.50000	0.36346	0.0	0.054406	-0.35937
9.7639	28.86154	65.25385	-0.50000	0.47308	0.0	0.070814	-0.46775
11.717	29.15385	67.18462	-0.50000	0.58269	0.0	0.087222	-0.57613
13.669	29.44615	69.11538	-0.50000	0.42891	-0.039655	0.024995	-0.43002
15.622	29.73846	71.04615	-0.50000	0.41019	-0.081900	-0.019576	-0.41783
17.575	30.03077	72.97692	-0.50000	0.34341	-0.10658	-0.053975	-0.35549
19.528	30.32308	74.90769	-0.50000	0.24046	-0.10213	-0.064982	-0.25304
21.480	30.61538	76.83846	-0.50000	0.11462	-0.062227	-0.044369	-0.12264
23.433	30.90769	78.76923	-0.50000	0.0	0.0	0.0	0.0
25.386	31.20000	80.70000	-0.50000	0.0	0.0	0.0	0.0
27.339	31.49231	82.63077	-0.50000	0.0	0.0	0.0	0.0
29.292	31.78462	84.56154	-0.50000	0.0	0.0	0.0	0.0
31.244	32.07692	86.49231	-0.50000	0.0	0.0	0.0	0.0
33.197	32.36923	88.42308	-0.50000	0.0	0.0	0.0	0.0
35.150	32.66154	90.35385	-0.50000	0.0	0.0	0.0	0.0
37.103	32.95385	92.28462	-0.50000	0.0	0.0	0.0	0.0
39.055	33.24615	94.21538	-0.50000	0.0	0.0	0.0	0.0
41.008	33.53846	96.14615	-0.50000	0.0	0.0	0.0	0.0
42.961	33.83077	98.07692	-0.50000	0.0	0.0	0.0	0.0
44.914	34.12308	100.00769	-0.50000	0.0	0.0	0.0	0.0
46.866	34.41538	101.93846	-0.50000	0.0	0.0	0.0	0.0
48.819	34.70769	103.86923	-0.50000	0.0	0.0	0.0	0.0
50.772	35.00000	105.80000	-0.50000	0.0	0.0	0.0	0.0

Specific Building Damage Results - Vertical Displacements

Structure: A | Sub-structure:

Dist.	Coordinates			Displacements
	x	y	z	z
[m]	[m]	[m]	[m]	[mm]
Vertical Offset 1				
0.0	47.30000	41.60000	-0.50000	4.8281
1.9073	47.32143	39.69286	-0.50000	5.2805
3.8145	47.34286	37.78571	-0.50000	5.0269
5.7218	47.36429	35.87857	-0.50000	4.3855
7.6291	47.38571	33.97143	-0.50000	3.5529
9.5363	47.40714	32.06429	-0.50000	2.6753
11.444	47.42857	30.15714	-0.50000	1.8547
13.351	47.45000	28.25000	-0.50000	1.1497
15.258	47.47143	26.34286	-0.50000	0.57633

Dist.	Coordinates x	y	z	Displacements z
[m]	[m]	[m]	[m]	[mm]
17.165	47.49286	24.43571	-0.50000	0.10770
19.073	47.51429	22.52857	-0.50000	0.029891
20.980	47.53571	20.62143	-0.50000	0.0
22.887	47.55714	18.71429	-0.50000	0.0
24.794	47.57857	16.80714	-0.50000	0.0
26.702	47.60000	14.90000	-0.50000	0.0

Structure: B | Sub-structure: Sub #

Dist.	Coordinates x	y	z	Displacements z
[m]	[m]	[m]	[m]	[mm]
Vertical Offset 1				
0.0	47.30000	41.60000	-0.50000	4.8281
2.0000	49.30000	41.58750	-0.50000	6.1029
4.0001	51.30000	41.57500	-0.50000	6.1103
6.0001	53.30000	41.56250	-0.50000	6.1176
8.0002	55.30000	41.55000	-0.50000	6.1249
10.000	57.30000	41.53750	-0.50000	6.1321
12.000	59.30000	41.52500	-0.50000	6.1393
14.000	61.30000	41.51250	-0.50000	6.1464
16.000	63.30000	41.50000	-0.50000	6.1534

Structure: C | Sub-structure: Sub #

Dist.	Coordinates x	y	z	Displacements z
[m]	[m]	[m]	[m]	[mm]
Vertical Offset 1				
0.0	64.20000	14.90000	-0.50000	0.0
1.9011	64.13571	16.80000	-0.50000	0.0
3.8022	64.07143	18.70000	-0.50000	0.0
5.7033	64.00714	20.60000	-0.50000	0.0
7.6043	63.94286	22.50000	-0.50000	0.043745
9.5054	63.87857	24.40000	-0.50000	0.14229
11.407	63.81429	26.30000	-0.50000	0.65219
13.308	63.75000	28.20000	-0.50000	1.3190
15.209	63.68571	30.10000	-0.50000	2.1861
17.110	63.62143	32.00000	-0.50000	3.2341
19.011	63.55714	33.90000	-0.50000	4.3817
20.912	63.49286	35.80000	-0.50000	5.4849
22.813	63.42857	37.70000	-0.50000	6.3374
24.714	63.36429	39.60000	-0.50000	6.6706
26.615	63.30000	41.50000	-0.50000	6.1534

Structure: D | Sub-structure: Sub #

Dist.	Coordinates x	y	z	Displacements z
[m]	[m]	[m]	[m]	[mm]
Vertical Offset 1				
0.0	55.30000	41.60000	-0.50000	6.0955
1.9076	55.34286	39.69286	-0.50000	6.6680
3.8152	55.38571	37.78571	-0.50000	6.3658
5.7229	55.42857	35.87857	-0.50000	5.5267
7.6305	55.47143	33.97143	-0.50000	4.4251
9.5381	55.51429	32.06429	-0.50000	3.2719
11.446	55.55714	30.15714	-0.50000	2.2152
13.353	55.60000	28.25000	-0.50000	1.3392
15.261	55.64286	26.34286	-0.50000	0.66522
17.169	55.68571	24.43571	-0.50000	0.15098
19.076	55.72857	22.52857	-0.50000	0.045292
20.984	55.77143	20.62143	-0.50000	0.0
22.891	55.81429	18.71429	-0.50000	0.0
24.799	55.85714	16.80714	-0.50000	0.0
26.707	55.90000	14.90000	-0.50000	0.0

Structure: E | Sub-structure: Sub #

Dist.	Coordinates x	y	z	Displacements z
[m]	[m]	[m]	[m]	[mm]
Vertical Offset 1				
0.0	63.50000	36.40000	-0.50000	5.7926
1.8444	65.34444	36.40000	-0.50000	5.7926
3.6889	67.18889	36.40000	-0.50000	5.7926
5.5333	69.03333	36.40000	-0.50000	5.7926
7.3778	70.87778	36.40000	-0.50000	5.7926
9.2222	72.72222	36.40000	-0.50000	5.7926
11.067	74.56667	36.40000	-0.50000	5.7926
12.911	76.41111	36.40000	-0.50000	5.7926
14.756	78.25556	36.40000	-0.50000	5.7926
16.600	80.10000	36.40000	-0.50000	4.6396

Structure: F | Sub-structure: Sub #

Dist.	Coordinates x	y	z	Displacements z
[m]	[m]	[m]	[m]	[mm]
Vertical Offset 1				
0.0	74.40000	41.60000	-0.50000	6.0955
0.86683	74.41667	40.73333	-0.50000	6.4882
1.7337	74.43333	39.86667	-0.50000	6.6576
2.6005	74.45000	39.00000	-0.50000	6.6403
3.4673	74.46667	38.13333	-0.50000	6.4700
4.3341	74.48333	37.26667	-0.50000	6.1780
5.2010	74.50000	36.40000	-0.50000	5.7926

Structure: G | Sub-structure: Sub #

Dist.	Coordinates x	y	z	Displacements z
[m]	[m]	[m]	[m]	[mm]
Vertical Offset 1				
0.0	74.40000	41.60000	-0.50000	6.0955
0.95000	75.35000	41.60000	-0.50000	6.0955
1.9000	76.30000	41.60000	-0.50000	6.0955
2.8500	77.25000	41.60000	-0.50000	6.0955
3.8000	78.20000	41.60000	-0.50000	6.0955
4.7500	79.15000	41.60000	-0.50000	6.0955
5.7000	80.10000	41.60000	-0.50000	5.0107

Structure: H | Sub-structure: Sub #

Dist.	Coordinates x	y	z	Displacements z
[m]	[m]	[m]	[m]	[mm]
Vertical Offset 1				
0.0	82.40000	66.70000	-0.50000	6.6677
1.9323	82.35909	64.76818	-0.50000	6.6659
3.8645	82.31818	62.83636	-0.50000	6.6636
5.7968	82.27727	60.90455	-0.50000	6.6610
7.7290	82.23636	58.97273	-0.50000	6.6579
9.6613	82.19545	57.04091	-0.50000	6.6544
11.594	82.15455	55.10909	-0.50000	6.6505
13.526	82.11364	53.17727	-0.50000	6.6462

Dist.	Coordinates x	y	z	Displacements z
[m]	[m]	[m]	[m]	[mm]
15.458	82.07273	51.24545	-0.50000	6.6414
17.390	82.03182	49.31364	-0.50000	6.6362
19.323	81.99091	47.38182	-0.50000	6.6306
21.255	81.95000	45.45000	-0.50000	6.6245
23.187	81.90909	43.51818	-0.50000	6.6180
25.119	81.86818	41.58636	-0.50000	5.2364
27.052	81.82727	39.65455	-0.50000	4.8903
28.984	81.78636	37.72273	-0.50000	4.6910
30.916	81.74545	35.79091	-0.50000	4.1134
32.848	81.70455	33.85909	-0.50000	3.3361
34.781	81.66364	31.92727	-0.50000	2.5042
36.713	81.62273	29.99545	-0.50000	1.7210
38.645	81.58182	28.06364	-0.50000	1.0460
40.577	81.54091	26.13182	-0.50000	0.49430
42.510	81.50000	24.20000	-0.50000	0.072021

Structure: I | Sub-structure: Sub #

Dist.	Coordinates x	y	z	Displacements z
[m]	[m]	[m]	[m]	[mm]
Vertical Offset 1				
0.0	82.40000	66.70000	-0.50000	6.6677
0.93005	83.33000	66.69000	-0.50000	6.6087
1.8601	84.26000	66.68000	-0.50000	6.3833
2.7902	85.19000	66.67000	-0.50000	6.0292
3.7202	86.12000	66.66000	-0.50000	5.5801
4.6503	87.05000	66.65000	-0.50000	5.0665
5.5803	87.98000	66.64000	-0.50000	4.5151
6.5104	88.91000	66.63000	-0.50000	3.9490
7.4404	89.84000	66.62000	-0.50000	3.3878
8.3705	90.77000	66.61000	-0.50000	2.8477
9.3005	91.70000	66.60000	-0.50000	2.3409

Structure: J | Sub-structure: Sub #

Dist.	Coordinates x	y	z	Displacements z
[m]	[m]	[m]	[m]	[mm]
Vertical Offset 1				
0.0	91.70000	66.60000	-0.50000	2.3409
0.82500	91.70000	67.42500	-0.50000	1.9705
1.6500	91.70000	68.25000	-0.50000	1.9412
2.4750	91.70000	69.07500	-0.50000	1.8895
3.3000	91.70000	69.90000	-0.50000	1.8173

Structure: K | Sub-structure: Sub #

Dist.	Coordinates x	y	z	Displacements z
[m]	[m]	[m]	[m]	[mm]
Vertical Offset 1				
0.0	58.10000	71.20000	-0.50000	6.5587
1.9769	60.07647	71.15882	-0.50000	6.5671
3.9538	62.05294	71.11765	-0.50000	6.5753
5.9307	64.02941	71.07647	-0.50000	6.5832
7.9076	66.00588	71.03529	-0.50000	6.5908
9.8845	67.98235	70.99412	-0.50000	6.5980
11.861	69.95882	70.95294	-0.50000	6.6050
13.838	71.93529	70.91176	-0.50000	6.6116
15.815	73.91176	70.87059	-0.50000	6.6178
17.792	75.88824	70.82941	-0.50000	6.6238
19.769	77.86471	70.78824	-0.50000	6.6294
21.746	79.84118	70.74706	-0.50000	5.4024
23.723	81.81765	70.70588	-0.50000	4.8752
25.700	83.79412	70.66471	-0.50000	4.4250
27.677	85.77059	70.62353	-0.50000	3.9802
29.653	87.74706	70.58235	-0.50000	3.2957
31.630	89.72353	70.54118	-0.50000	2.5155
33.607	91.70000	70.50000	-0.50000	1.7532

Structure: L | Sub-structure: Sub #

Dist.	Coordinates x	y	z	Displacements z
[m]	[m]	[m]	[m]	[mm]
Vertical Offset 1				
0.0	58.10000	82.20000	-0.50000	1.0510
1.9667	58.10000	80.23333	-0.50000	1.8747
3.9333	58.10000	78.26667	-0.50000	2.9062
5.9000	58.10000	76.30000	-0.50000	4.0770
7.8667	58.10000	74.33333	-0.50000	5.2469
9.8333	58.10000	72.36667	-0.50000	6.2041
11.800	58.10000	70.40000	-0.50000	6.6653

Structure: M | Sub-structure: Sub #

Dist.	Coordinates x	y	z	Displacements z
[m]	[m]	[m]	[m]	[mm]
Vertical Offset 1				
0.0	58.10000	70.40000	-0.50000	6.6653
0.90000	57.20000	70.40000	-0.50000	6.6653
1.8000	56.30000	70.40000	-0.50000	6.6653
2.7000	55.40000	70.40000	-0.50000	6.6653
3.6000	54.50000	70.40000	-0.50000	6.6653
4.5000	53.60000	70.40000	-0.50000	6.6653
5.4000	52.70000	70.40000	-0.50000	6.6653
6.3000	51.80000	70.40000	-0.50000	6.6653
7.2000	50.90000	70.40000	-0.50000	6.6653

Structure: N | Sub-structure: Sub #

Dist.	Coordinates x	y	z	Displacements z
[m]	[m]	[m]	[m]	[mm]
Vertical Offset 1				
0.0	50.80000	70.40000	-0.50000	6.6653
1.9701	50.91667	72.36667	-0.50000	6.2041
3.9402	51.03333	74.33333	-0.50000	5.2469
5.9104	51.15000	76.30000	-0.50000	4.0770
7.8805	51.26667	78.26667	-0.50000	2.9062
9.8506	51.38333	80.23333	-0.50000	1.8747
11.821	51.50000	82.20000	-0.50000	1.0510

Structure: O | Sub-structure: Sub #

Dist.	Coordinates x	y	z	Displacements z
[m]	[m]	[m]	[m]	[mm]
Vertical Offset 1				
0.0	15.00000	56.70000	-0.50000	0.0
1.7784	16.77143	56.54286	-0.50000	0.0
3.5568	18.54286	56.38571	-0.50000	0.0
5.3352	20.31429	56.22857	-0.50000	0.0
7.1135	22.08571	56.07143	-0.50000	0.0

Dist.	Coordinates x	y	z	Displacements z
[m]	[m]	[m]	[m]	[mm]
8.8919	23.85714	55.91429	-0.50000	0.0
10.670	25.62857	55.75714	-0.50000	0.0
12.449	27.40000	55.60000	-0.50000	0.0

Structure: P | Sub-structure: Sub #

Dist.	Coordinates x	y	z	Displacements z
[m]	[m]	[m]	[m]	[mm]
Vertical Offset 1				
0.0	27.40000	55.60000	-0.50000	0.0
1.9528	27.69231	57.53077	-0.50000	0.011419
3.9055	27.98462	59.46154	-0.50000	0.031228
5.8583	28.27692	61.39231	-0.50000	0.047853
7.8111	28.56923	63.32308	-0.50000	0.062027
9.7639	28.86154	65.25385	-0.50000	0.074449
11.717	29.15385	67.18462	-0.50000	0.085782
13.669	29.44615	69.11538	-0.50000	0.060924
15.622	29.73846	71.04615	-0.50000	0.059052
17.575	30.03077	72.97692	-0.50000	0.052600
19.528	30.32308	74.90769	-0.50000	0.041825
21.480	30.61538	76.83846	-0.50000	0.025163
23.433	30.90769	78.76923	-0.50000	0.0
25.386	31.20000	80.70000	-0.50000	0.0
27.339	31.49231	82.63077	-0.50000	0.0
29.292	31.78462	84.56154	-0.50000	0.0
31.244	32.07692	86.49231	-0.50000	0.0
33.197	32.36923	88.42308	-0.50000	0.0
35.150	32.66154	90.35385	-0.50000	0.0
37.103	32.95385	92.28462	-0.50000	0.0
39.055	33.24615	94.21538	-0.50000	0.0
41.008	33.53846	96.14615	-0.50000	0.0
42.961	33.83077	98.07692	-0.50000	0.0
44.914	34.12308	100.00769	-0.50000	0.0
46.866	34.41538	101.93846	-0.50000	0.0
48.819	34.70769	103.86923	-0.50000	0.0
50.772	35.00000	105.80000	-0.50000	0.0

Specific Building Damage Results - All Segments

Structure: A | Sub-structure:

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]	
0.0	1	0.0	8.6751	Sagging	0.011154	0.015426	0.032297	845.89E-6	459.91E-6	4627.4	0 (Negligible)
	2	8.6751	8.4903	Hogging	0.0033975	0.033381	0.037685	-437.51E-6	459.91E-6	15581.	0 (Negligible)

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

Structure: B | Sub-structure: Sub #

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]	
0.0	1	0.0	15.999	Sagging	0.0068850	-0.030579	0.0061653	0.0024524	-638.98E-6	2516.1	0 (Negligible)

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

Structure: C | Sub-structure: Sub #

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]	
0.0	1	9.5054	8.7127	Hogging	0.0053106	0.046726	0.049387	-577.48E-6	-603.29E-6	13986.	0 (Negligible)
	2	18.218	8.3961	Sagging	0.014282	0.067224	0.080044	-766.77E-6	-603.29E-6	3878.0	2 (Slight)

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

Structure: D | Sub-structure: Sub #

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]	
0.0	1	0.0	8.4992	Sagging	0.014723	0.067417	0.080763	-770.84E-6	604.12E-6	3799.8	2 (Slight)
	2	8.4992	8.6695	Hogging	0.0053084	0.046791	0.049438	-578.75E-6	604.12E-6	14044.	0 (Negligible)

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

Structure: E | Sub-structure: Sub #

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]	
0.0	1	0.0	2.4593	None	0.0	0.0	0.0	0.0	0.0	2.2413E+18	0 (Negligible)
	2	2.4593	2.4593	Sagging	0.0	0.0	0.0	0.0	0.0	7.9245E+18	0 (Negligible)
	3	4.9185	3.0741	None	0.0	0.0	0.0	0.0	0.0	15.689E+18	0 (Negligible)
	4	7.9926	2.4593	Sagging	0.0	0.0	0.0	0.0	0.0	7.9245E+18	0 (Negligible)
	5	10.452	0.61481	None	0.0	0.0	0.0	0.0	0.0	15.849E+18	0 (Negligible)
	6	11.067	5.5323	Sagging	0.013888	-0.0047236	0.015102	141.78E-6	625.23E-6	2359.4	0 (Negligible)

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

Structure: F | Sub-structure: Sub #

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]	
0.0	1	0.0	5.2000	Sagging	0.013356	0.071760	0.090397	-790.32E-6	-452.73E-6	3237.4	2 (Slight)

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

Structure: G | Sub-structure: Sub #

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

from Line for Vertical Movement Calculations		Segment	Start [m]	Length [m]	Curvature	Deflection [m]	Ratio [%]	Average Horizontal Strain [%]	Max. Tensile Strain [%]	Maximum Gradient of Horizontal Displacement Curve	Maximum Gradient of Vertical Displacement Curve	Min. Radius of Curvature [m]	Damage Category
0.0		1	0.0	2.8500	None	0.0	0.0	0.0	0.0	0.0	0.0	-	0 (Negligible)
		2	2.8500	2.8490	Sagging	0.025384	-0.10517	0.024913	0.0031673	0.0011455		662.34	0 (Negligible)

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

Structure: H | Sub-structure: Sub #

from Line for Vertical Movement Calculations		Segment	Start [m]	Length [m]	Curvature	Deflection [m]	Ratio [%]	Average Horizontal Strain [%]	Max. Tensile Strain [%]	Maximum Gradient of Horizontal Displacement Curve	Maximum Gradient of Vertical Displacement Curve	Min. Radius of Curvature [m]	Damage Category
0.0		1	0.0	24.482	Sagging	0.0035425	-0.0062525	0.0013275	0.0011898	715.88E-6	8870.4		0 (Negligible)
		2	24.482	3.6165	Hogging	0.0081392	-0.090262	0.018637	0.0012313	715.88E-6	15645.		0 (Negligible)
		3	28.098	5.9726	Sagging	0.0043577	0.025354	0.030417	-378.44E-6	430.39E-6	17967.		0 (Negligible)
		4	34.071	6.5066	Hogging	0.0022766	0.032106	0.033753	-388.24E-6	430.39E-6	29205.		0 (Negligible)

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

Structure: I | Sub-structure: Sub #

from Line for Vertical Movement Calculations		Segment	Start [m]	Length [m]	Curvature	Deflection [m]	Ratio [%]	Average Horizontal Strain [%]	Max. Tensile Strain [%]	Maximum Gradient of Horizontal Displacement Curve	Maximum Gradient of Vertical Displacement Curve	Min. Radius of Curvature [m]	Damage Category
0.0		1	0.0	6.3185	Sagging	0.0080537	0.065001	0.074696	-721.44E-6	608.29E-6	4930.9		1 (Very Slight)
		2	6.3185	2.9811	Hogging	0.0010438	0.056745	0.057109	-587.66E-6	608.29E-6	23721.		1 (Very Slight)

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

Structure: J | Sub-structure: Sub #

from Line for Vertical Movement Calculations		Segment	Start [m]	Length [m]	Curvature	Deflection [m]	Ratio [%]	Average Horizontal Strain [%]	Max. Tensile Strain [%]	Maximum Gradient of Horizontal Displacement Curve	Maximum Gradient of Vertical Displacement Curve	Min. Radius of Curvature [m]	Damage Category
0.0		1	0.0	2.2821	Hogging	0.0092403	-0.012373	0.0068475	197.65E-6	448.98E-6	1575.2		0 (Negligible)
		2	2.2821	1.0169	Sagging	381.93E-6	-0.016116	0.0032307	180.78E-6	87.567E-6	32356.		0 (Negligible)

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

Structure: K | Sub-structure: Sub #

from Line for Vertical Movement Calculations		Segment	Start [m]	Length [m]	Curvature	Deflection [m]	Ratio [%]	Average Horizontal Strain [%]	Max. Tensile Strain [%]	Maximum Gradient of Horizontal Displacement Curve	Maximum Gradient of Vertical Displacement Curve	Min. Radius of Curvature [m]	Damage Category
0.0		1	0.0	21.505	Sagging	0.0046320	-482.04E-6	0.0060922	63.200E-6	620.69E-6	8853.7		0 (Negligible)
		2	21.505	3.9004	Hogging	0.0021509	-0.091512	0.018343	0.0014507	620.69E-6	18228.		0 (Negligible)
		3	25.405	6.5904	Sagging	0.0032926	0.014383	0.018099	410.47E-6	394.55E-6	27546.		0 (Negligible)
		4	31.996	1.6105	Sagging	0.0	0.033844	0.033844	-338.33E-6	385.50E-6	84501.		0 (Negligible)

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

Structure: L | Sub-structure: Sub #

from Line for Vertical Movement Calculations		Segment	Start [m]	Length [m]	Curvature	Deflection [m]	Ratio [%]	Average Horizontal Strain [%]	Max. Tensile Strain [%]	Maximum Gradient of Horizontal Displacement Curve	Maximum Gradient of Vertical Displacement Curve	Min. Radius of Curvature [m]	Damage Category
0.0		1	0.0	5.6358	Hogging	0.0031370	0.051886	0.053636	-571.70E-6	-594.97E-6	17220.		1 (Very Slight)
		2	5.6358	6.1632	Sagging	0.0067065	0.064186	0.071413	-693.17E-6	-594.97E-6	6829.9		1 (Very Slight)

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

Structure: M | Sub-structure: Sub #

from Line for Vertical Movement Calculations		Segment	Start [m]	Length [m]	Curvature	Deflection [m]	Ratio [%]	Average Horizontal Strain [%]	Max. Tensile Strain [%]	Maximum Gradient of Horizontal Displacement Curve	Maximum Gradient of Vertical Displacement Curve	Min. Radius of Curvature [m]	Damage Category
0.0		1	0.0	7.1990	Sagging	0.0	0.0	0.0	0.0	0.0	0.0	-	0 (Negligible)

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

Structure: N | Sub-structure: Sub #

from Line for Vertical Movement Calculations		Segment	Start [m]	Length [m]	Curvature	Deflection [m]	Ratio [%]	Average Horizontal Strain [%]	Max. Tensile Strain [%]	Maximum Gradient of Horizontal Displacement Curve	Maximum Gradient of Vertical Displacement Curve	Min. Radius of Curvature [m]	Damage Category
0.0		1	0.0	6.1750	Sagging	0.0066964	0.063962	0.071188	-690.74E-6	593.93E-6	6855.6		1 (Very Slight)
		2	6.1750	5.6447	Hogging	0.0031309	0.051705	0.053454	-569.69E-6	593.93E-6	17276.		1 (Very Slight)

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

Structure: O | Sub-structure: Sub #

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

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

Structure: P | Sub-structure: Sub #

Vertical Offset from Line for Vertical Movement Calculations	Segment	Start [m]	Length [m]	Curvature	Deflection [m]	Average Horizontal Strain [%]	Max. Tensile Strain [%]	Maximum Gradient of Horizontal Displacement Curve	Maximum Gradient of Vertical Displacement Curve	Min. Radius of Curvature [m]	Damage Category

from Line for Vertical Movement Calculations			Ratio	Horizontal Strain	Tensile Strain	Gradient of Horizontal Displacement Curve	Gradient of Vertical Displacement Curve	Radius of Category Curvature
[m]	[m]	[m]		[%]	[%]	[%]		[m]
0.0	All settlements are less than the Settlement Trough Limit Sensitivity.							

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

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

Structure: A | Sub-structure:

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	0.011154	0.033381	459.91E-6	5.2775	0.037685	845.89E-6	459.91E-6	15581.	4627.4	0 (Negligible)

Structure: B | Sub-structure: Sub #

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	0.0068850	-0.030579	-638.98E-6	6.1534	0.0061653	0.0024524	-638.98E-6	-	2516.1	0 (Negligible)

Structure: C | Sub-structure: Sub #

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	0.014282	0.067224	-603.29E-6	6.6617	0.080044	-766.77E-6	-603.29E-6	13986.	3878.0	2 (Slight)

Structure: D | Sub-structure: Sub #

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	0.014723	0.067417	604.12E-6	6.6623	0.080763	-770.84E-6	604.12E-6	14044.	3799.8	2 (Slight)

Structure: E | Sub-structure: Sub #

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	0.013888	-0.0047236	625.23E-6	5.7926	0.015102	141.78E-6	625.23E-6	-	2359.4	0 (Negligible)

Structure: F | Sub-structure: Sub #

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	0.013356	0.071760	-452.73E-6	6.6576	0.090397	-790.32E-6	-452.73E-6	-	3237.4	2 (Slight)

Structure: G | Sub-structure: Sub #

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	0.025384	-0.10517	0.0011455	6.0955	0.024913	0.0031673	0.0011455	-	662.34	0 (Negligible)

Structure: H | Sub-structure: Sub #

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	0.0081392	-0.090262	715.88E-6	6.6677	0.033753	0.0012313	715.88E-6	15645.	8870.4	0 (Negligible)

Structure: I | Sub-structure: Sub #

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	0.0080537	0.065001	608.29E-6	6.6677	0.074696	-721.44E-6	608.29E-6	23721.	4930.9	1 (Very Slight)

Structure: J | Sub-structure: Sub #

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	0.0092403	-0.016116	448.98E-6	2.3409	0.0068475	197.65E-6	448.98E-6	1575.2	32356.	0 (Negligible)

Structure: K | Sub-structure: Sub #

Vertical Offset from	Deflection Ratio	Average Horizontal	Maximum Slope	Maximum Settlement	Max. Tensile	Maximum Gradient of	Maximum Gradient of	Min. Radius of	Min. Radius of	Damage Category

Line for Vertical Movement Calculations	Strain		Strain	Horizontal Displacement Curve	Vertical Displacement Curve	Curvature (Hogging)	Curvature (Sagging)	
[m]	[%]	[%]	[mm]	[%]		[m]	[m]	
0.0	0.0046320	-0.091512 620.69E-6	6.6294	0.033844	0.0014507	620.69E-6	18228.	8853.7 0 (Negligible)

Structure: L | Sub-structure: Sub #

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	0.0067065	0.064186	-594.97E-6	6.6650	0.071413	-693.17E-6	-594.97E-6	17220.	6829.9	1 (Very Slight)

Structure: M | Sub-structure: Sub #

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	6.6653	0.0	0.0	0.0	-	-	0 (Negligible)

Structure: N | Sub-structure: Sub #

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	0.0066964	0.063962	593.93E-6	6.6653	0.071188	-690.74E-6	593.93E-6	17276.	6855.6	1 (Very Slight)

Structure: O | Sub-structure: Sub #

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: P | Sub-structure: Sub #

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]	

Specific Building Damage Results - Critical Segments within Each Structure

Structure Name	Parameter	Critical Sub-Structure	Critical Segment	Start [m]	End [m]	Curvature	Maximum Slope	Maximum Settlement [mm]	Max. Tensile Strain [%]	Min. Radius of Curvature (Hogging) [m]	Min. Radius of Curvature (Sagging) [m]	Damage Category
A	Maximum Slope		1	0.0	8.6751	Sagging	**459.91E-6**	5.2775	0.032297	-	4627.4	0 (Negligible)
	Maximum Settlement		1	0.0	8.6751	Sagging	459.91E-6	**5.2775**	0.032297	-	4627.4	0 (Negligible)
	Max. Tensile Strain		2	8.6751	17.165	Hogging	459.91E-6	3.0716	**0.037685**	15581.	-	0 (Negligible)
	Min. Radius of Curvature (Hogging)		2	8.6751	17.165	Hogging	459.91E-6	3.0716	0.037685	**15581.**	-	0 (Negligible)
	Min. Radius of Curvature (Sagging)		1	0.0	8.6751	Sagging	459.91E-6	5.2775	0.032297	-	**4627.4**	0 (Negligible)
B	Maximum Slope	Sub #	1	0.0	15.999	Sagging	**638.98E-6**	6.1534	0.0061653	-	2516.1	0 (Negligible)
	Maximum Settlement	Sub #	1	0.0	15.999	Sagging	638.98E-6	**6.1534**	0.0061653	-	2516.1	0 (Negligible)
	Max. Tensile Strain	Sub #	1	0.0	15.999	Sagging	638.98E-6	6.1534	**0.0061653**	-	2516.1	0 (Negligible)
	Min. Radius of Curvature (Hogging)		-	-	-	-	-	-	-	-	-	-
	Min. Radius of Curvature (Sagging)	Sub #	1	0.0	15.999	Sagging	638.98E-6	6.1534	0.0061653	-	**2516.1**	0 (Negligible)
C	Maximum Slope	Sub #	1	9.5054	18.218	Hogging	**603.29E-6**	3.9031	0.049387	13986.	-	0 (Negligible)
	Maximum Settlement	Sub #	2	18.218	26.614	Sagging	603.29E-6	**6.6617**	0.080044	-	3878.0	2 (Slight)
	Max. Tensile Strain	Sub #	2	18.218	26.614	Sagging	603.29E-6	6.6617	**0.080044**	-	3878.0	2 (Slight)
	Min. Radius of Curvature (Hogging)	Sub #	1	9.5054	18.218	Hogging	603.29E-6	3.9031	0.049387	**13986.**	-	0 (Negligible)
	Min. Radius of Curvature (Sagging)	Sub #	2	18.218	26.614	Sagging	603.29E-6	6.6617	0.080044	-	**3878.0**	2 (Slight)
D	Maximum Slope	Sub #	1	0.0	8.4992	Sagging	**604.12E-6**	6.6623	0.080763	-	3799.8	2 (Slight)
	Maximum Settlement	Sub #	1	0.0	8.4992	Sagging	604.12E-6	**6.6623**	0.080763	-	3799.8	2 (Slight)
	Max. Tensile Strain	Sub #	1	0.0	8.4992	Sagging	604.12E-6	6.6623	**0.080763**	-	3799.8	2 (Slight)
	Min. Radius of Curvature (Hogging)	Sub #	2	8.4992	17.169	Hogging	604.12E-6	3.9000	0.049438	**14044.**	-	0 (Negligible)
	Min. Radius of Curvature (Sagging)	Sub #	1	0.0	8.4992	Sagging	604.12E-6	6.6623	0.080763	-	**3799.8**	2 (Slight)
E	Maximum Slope	Sub #	6	11.067	16.599	Sagging	**625.23E-6**	5.7926	0.015102	-	2359.4	0 (Negligible)
	Maximum Settlement	Sub #	2	2.4593	4.9185	Sagging	0.0	**5.7926**	0.0	-	7.9245E+18	0 (Negligible)
	Max. Tensile Strain	Sub #	6	11.067	16.599	Sagging	625.23E-6	5.7926	**0.015102**	-	2359.4	0 (Negligible)
	Min. Radius of Curvature (Hogging)		-	-	-	-	-	-	-	-	-	-
	Min. Radius of Curvature (Sagging)	Sub #	6	11.067	16.599	Sagging	625.23E-6	5.7926	0.015102	-	**2359.4**	0 (Negligible)
F	Maximum Slope	Sub #	1	0.0	5.2000	Sagging	**452.73E-6**	6.6576	0.090397	-	3237.4	2 (Slight)
	Maximum Settlement	Sub #	1	0.0	5.2000	Sagging	452.73E-6	**6.6576**	0.090397	-	3237.4	2 (Slight)
	Max. Tensile Strain	Sub #	1	0.0	5.2000	Sagging	452.73E-6	6.6576	**0.090397**	-	3237.4	2 (Slight)
	Min. Radius of Curvature (Hogging)		-	-	-	-	-	-	-	-	-	-
	Min. Radius of Curvature (Sagging)	Sub #	1	0.0	5.2000	Sagging	452.73E-6	6.6576	0.090397	-	**3237.4**	2 (Slight)

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
	Curvature (Sagging)											
G	Maximum Slope	Sub #	2	2.8500	5.6990	Sagging	**0.0011455**	6.0955	0.024913	-	662.34	0 (Negligible)
	Maximum Settlement	Sub #	1	0.0	2.8500	Sagging	0.0	**6.0955**	0.0	-	-	0 (Negligible)
	Max. Tensile Strain	Sub #	2	2.8500	5.6990	Sagging	0.0011455	6.0955	**0.024913**	-	662.34	0 (Negligible)
	Min. Radius of Curvature (Hogging)		-	-	-	-	-	-	-	-	-	-
	Min. Radius of Curvature (Sagging)	Sub #	2	2.8500	5.6990	Sagging	0.0011455	6.0955	0.024913	-	**662.34**	0 (Negligible)
H	Maximum Slope	Sub #	1	0.0	24.482	Sagging	**715.88E-6**	6.6677	0.0013275	-	8870.4	0 (Negligible)
	Maximum Settlement	Sub #	1	0.0	24.482	Sagging	715.88E-6	**6.6677**	0.0013275	-	8870.4	0 (Negligible)
	Max. Tensile Strain	Sub #	4	34.071	40.577	Hogging	430.39E-6	2.8098	**0.033753**	29205.	-	0 (Negligible)
	Min. Radius of Curvature (Hogging)	Sub #	2	24.482	28.098	Hogging	715.88E-6	5.6924	0.018637	**15645.**	-	0 (Negligible)
	Min. Radius of Curvature (Sagging)	Sub #	1	0.0	24.482	Sagging	715.88E-6	6.6677	0.0013275	-	**8870.4**	0 (Negligible)
I	Maximum Slope	Sub #	1	0.0	6.3185	Sagging	**608.29E-6**	6.6677	0.074696	-	4930.9	1 (Very Slight)
	Maximum Settlement	Sub #	1	0.0	6.3185	Sagging	608.29E-6	**6.6677**	0.074696	-	4930.9	1 (Very Slight)
	Max. Tensile Strain	Sub #	1	0.0	6.3185	Sagging	608.29E-6	6.6677	**0.074696**	-	4930.9	1 (Very Slight)
	Min. Radius of Curvature (Hogging)	Sub #	2	6.3185	9.2995	Hogging	608.29E-6	4.0658	0.057109	**23721.**	-	1 (Very Slight)
	Min. Radius of Curvature (Sagging)	Sub #	1	0.0	6.3185	Sagging	608.29E-6	6.6677	0.074696	-	**4930.9**	1 (Very Slight)
J	Maximum Slope	Sub #	1	0.0	2.2821	Hogging	**448.98E-6**	2.3409	0.0068475	1575.2	-	0 (Negligible)
	Maximum Settlement	Sub #	1	0.0	2.2821	Hogging	448.98E-6	**2.3409**	0.0068475	1575.2	-	0 (Negligible)
	Max. Tensile Strain	Sub #	1	0.0	2.2821	Hogging	448.98E-6	2.3409	**0.0068475**	1575.2	-	0 (Negligible)
	Min. Radius of Curvature (Hogging)	Sub #	1	0.0	2.2821	Hogging	448.98E-6	2.3409	0.0068475	**1575.2**	-	0 (Negligible)
	Min. Radius of Curvature (Sagging)	Sub #	2	2.2821	3.2990	Sagging	87.567E-6	1.9016	0.0032307	-	**32356.**	0 (Negligible)
K	Maximum Slope	Sub #	1	0.0	21.505	Sagging	**620.69E-6**	6.6294	0.0060922	-	8853.7	0 (Negligible)
	Maximum Settlement	Sub #	1	0.0	21.505	Sagging	620.69E-6	**6.6294**	0.0060922	-	8853.7	0 (Negligible)
	Max. Tensile Strain	Sub #	4	31.996	33.606	Sagging	385.50E-6	2.3746	**0.033844**	-	84501.	0 (Negligible)
	Min. Radius of Curvature (Hogging)	Sub #	2	21.505	25.405	Hogging	620.69E-6	5.5519	0.018343	**18228.**	-	0 (Negligible)
	Min. Radius of Curvature (Sagging)	Sub #	1	0.0	21.505	Sagging	620.69E-6	6.6294	0.0060922	-	**8853.7**	0 (Negligible)
L	Maximum Slope	Sub #	1	0.0	5.6358	Hogging	**594.97E-6**	3.9197	0.053636	17220.	-	1 (Very Slight)
	Maximum Settlement	Sub #	2	5.6358	11.799	Sagging	594.97E-6	**6.6650**	0.071413	-	6829.9	1 (Very Slight)
	Max. Tensile Strain	Sub #	2	5.6358	11.799	Sagging	594.97E-6	6.6650	**0.071413**	-	6829.9	1 (Very Slight)
	Min. Radius of Curvature (Hogging)	Sub #	1	0.0	5.6358	Hogging	594.97E-6	3.9197	0.053636	**17220.**	-	1 (Very Slight)
	Min. Radius of Curvature (Sagging)	Sub #	2	5.6358	11.799	Sagging	594.97E-6	6.6650	0.071413	-	**6829.9**	1 (Very Slight)
M	Maximum Slope		-	-	-	-	-	-	-	-	-	-
	Maximum Settlement	Sub #	1	0.0	7.1990	Sagging	0.0	**6.6653**	0.0	-	-	0 (Negligible)
	Max. Tensile Strain	Sub #	1	0.0	7.1990	Sagging	0.0	6.6653	**0.0**	-	-	0 (Negligible)
	Min. Radius of Curvature (Hogging)		-	-	-	-	-	-	-	-	-	-
	Min. Radius of Curvature (Sagging)		-	-	-	-	-	-	-	-	-	-
N	Maximum Slope	Sub #	1	0.0	6.1750	Sagging	**593.93E-6**	6.6653	0.071188	-	6855.6	1 (Very Slight)
	Maximum Settlement	Sub #	1	0.0	6.1750	Sagging	593.93E-6	**6.6653**	0.071188	-	6855.6	1 (Very Slight)
	Max. Tensile Strain	Sub #	1	0.0	6.1750	Sagging	593.93E-6	6.6653	**0.071188**	-	6855.6	1 (Very Slight)
	Min. Radius of Curvature (Hogging)	Sub #	2	6.1750	11.820	Hogging	593.93E-6	3.9197	0.053454	**17276.**	-	1 (Very Slight)
	Min. Radius of Curvature (Sagging)	Sub #	1	0.0	6.1750	Sagging	593.93E-6	6.6653	0.071188	-	**6855.6**	1 (Very Slight)
O	All settlements are less than the Settlement Trough Limit Sensitivity.											
	All settlements are less than the Settlement Trough Limit Sensitivity.											
	All settlements are less than the Settlement Trough Limit Sensitivity.											
	All settlements are less than the Settlement Trough Limit Sensitivity.											
	All settlements are less than the Settlement Trough Limit Sensitivity.											
P	All settlements are less than the Settlement Trough Limit Sensitivity.											
	All settlements are less than the Settlement Trough Limit Sensitivity.											
	All settlements are less than the Settlement Trough Limit Sensitivity.											
	All settlements are less than the Settlement Trough Limit Sensitivity.											
	All settlements are less than the Settlement Trough Limit Sensitivity.											

Specific Building Damage Results - All Combined Segments

Structure: A | Sub-structure:

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

No structures have segments combined.

Structure: B | Sub-structure: Sub #

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

No structures have segments combined.

Structure: C | Sub-structure: Sub #

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

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

No structures have segments combined.

Structure: D | Sub-structure: Sub #

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

No structures have segments combined.

Structure: E | Sub-structure: Sub #

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

No structures have segments combined.

Structure: F | Sub-structure: Sub #

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

No structures have segments combined.

Structure: G | Sub-structure: Sub #

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

No structures have segments combined.

Structure: H | Sub-structure: Sub #

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

No structures have segments combined.

Structure: I | Sub-structure: Sub #

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

No structures have segments combined.

Structure: J | Sub-structure: Sub #

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

No structures have segments combined.

Structure: K | Sub-structure: Sub #

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

No structures have segments combined.

Structure: L | Sub-structure: Sub #

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

No structures have segments combined.

Structure: M | Sub-structure: Sub #

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

No structures have segments combined.

Structure: N | Sub-structure: Sub #

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

No structures have segments combined.

Structure: O | Sub-structure: Sub #

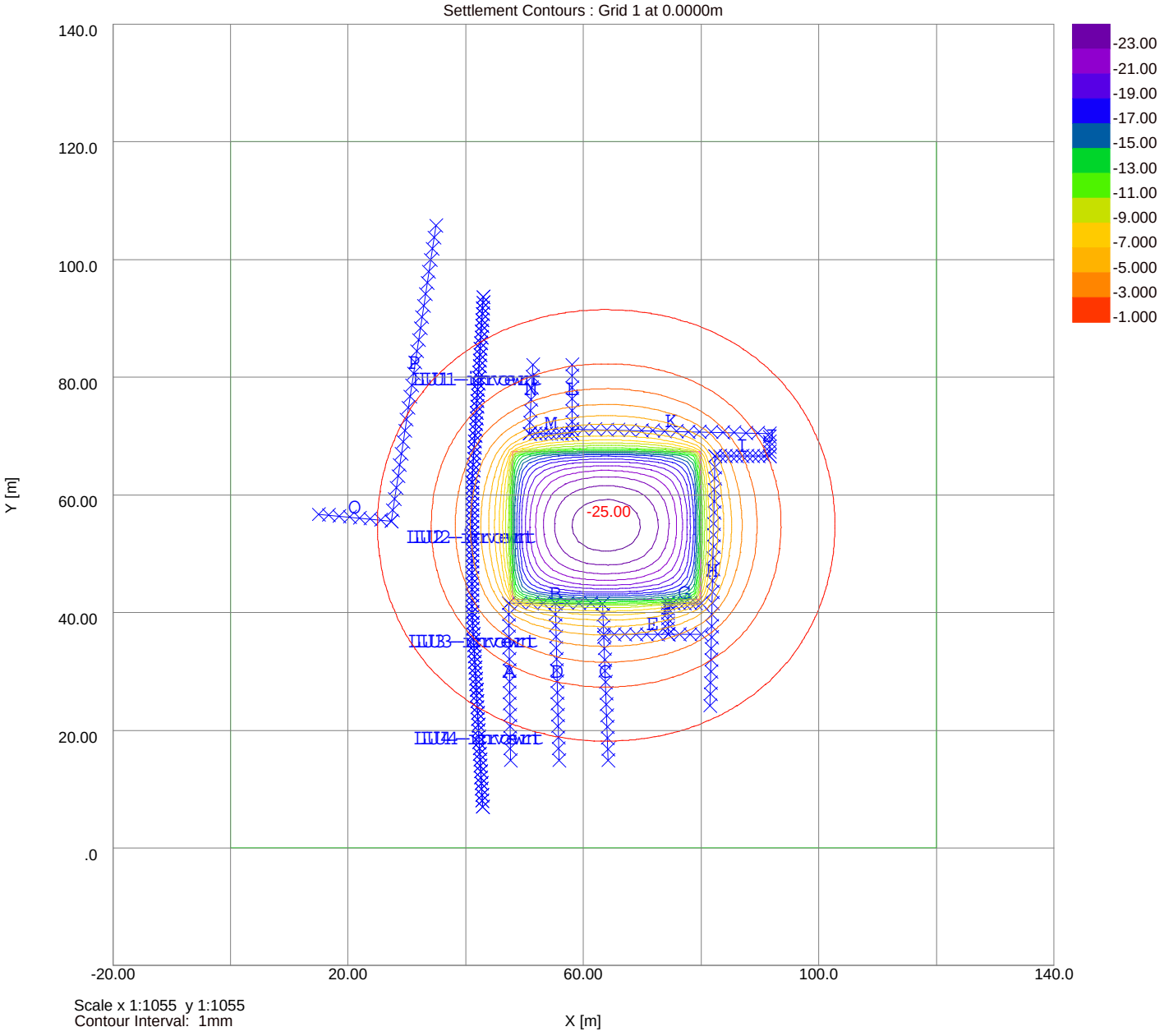
Vertical Offset from Line for Vertical	Combined Segment	Start	Length	Curvature Ratio	Deflection	Average Horizontal Strain	Max. Tensile Strain	Damage Category
[m]		[m]	[m]	[%]		[%]	[%]	

No structures have segments combined.

Structure: P | Sub-structure: Sub #

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

No structures have segments combined.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140.0
120.0
100.0
80.00
60.00
40.00
20.00
.0
Y [m]
-20.00
20.00
60.00
100.0
140.0
X [m]
-25.00
-23.00
-21.00
-19.00
-17.00
-15.00
-13.00
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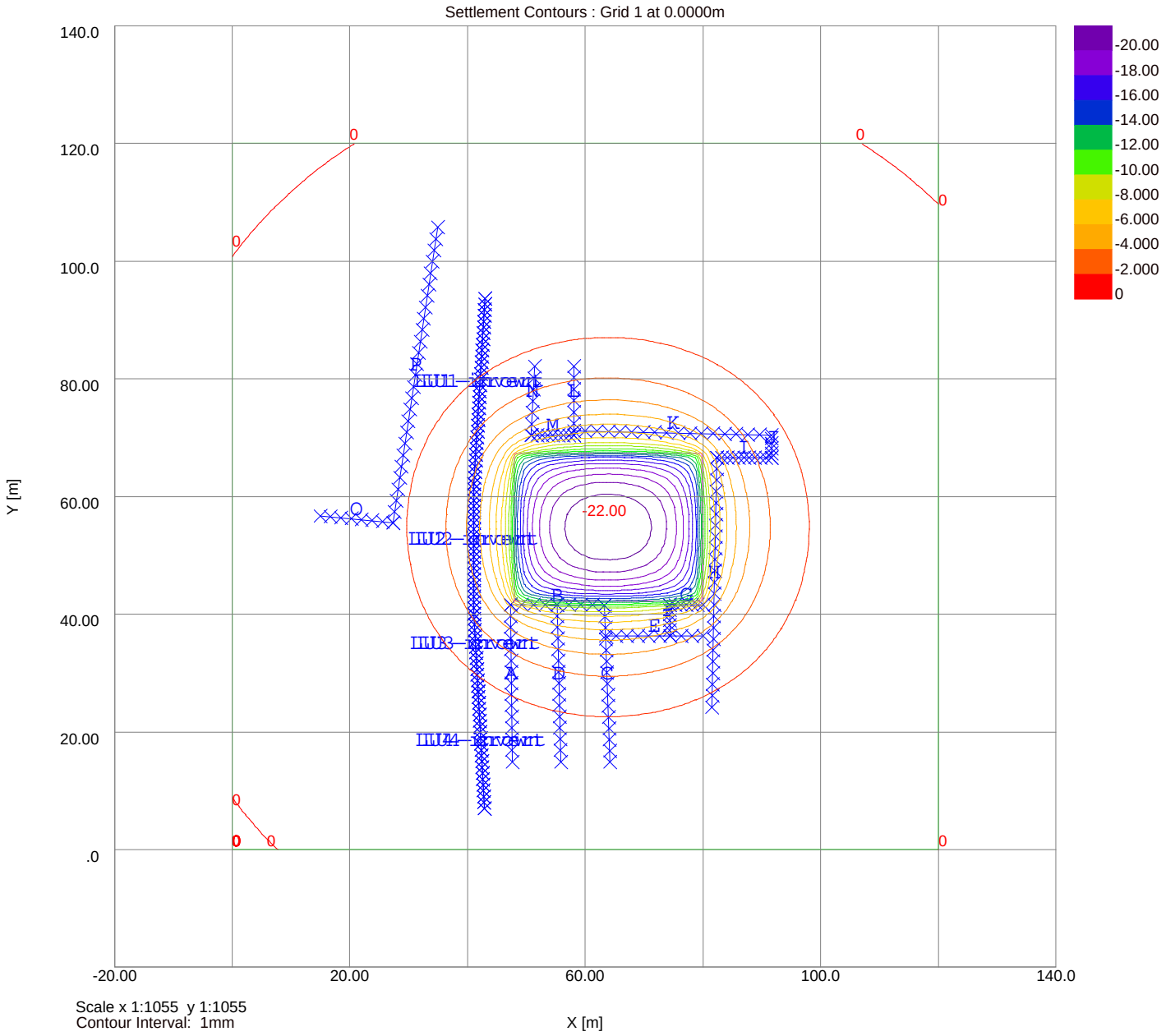
-3.000
-1.000
Scale x 1:1055 y 1:1055
Contour Interval: 1mm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-20.00
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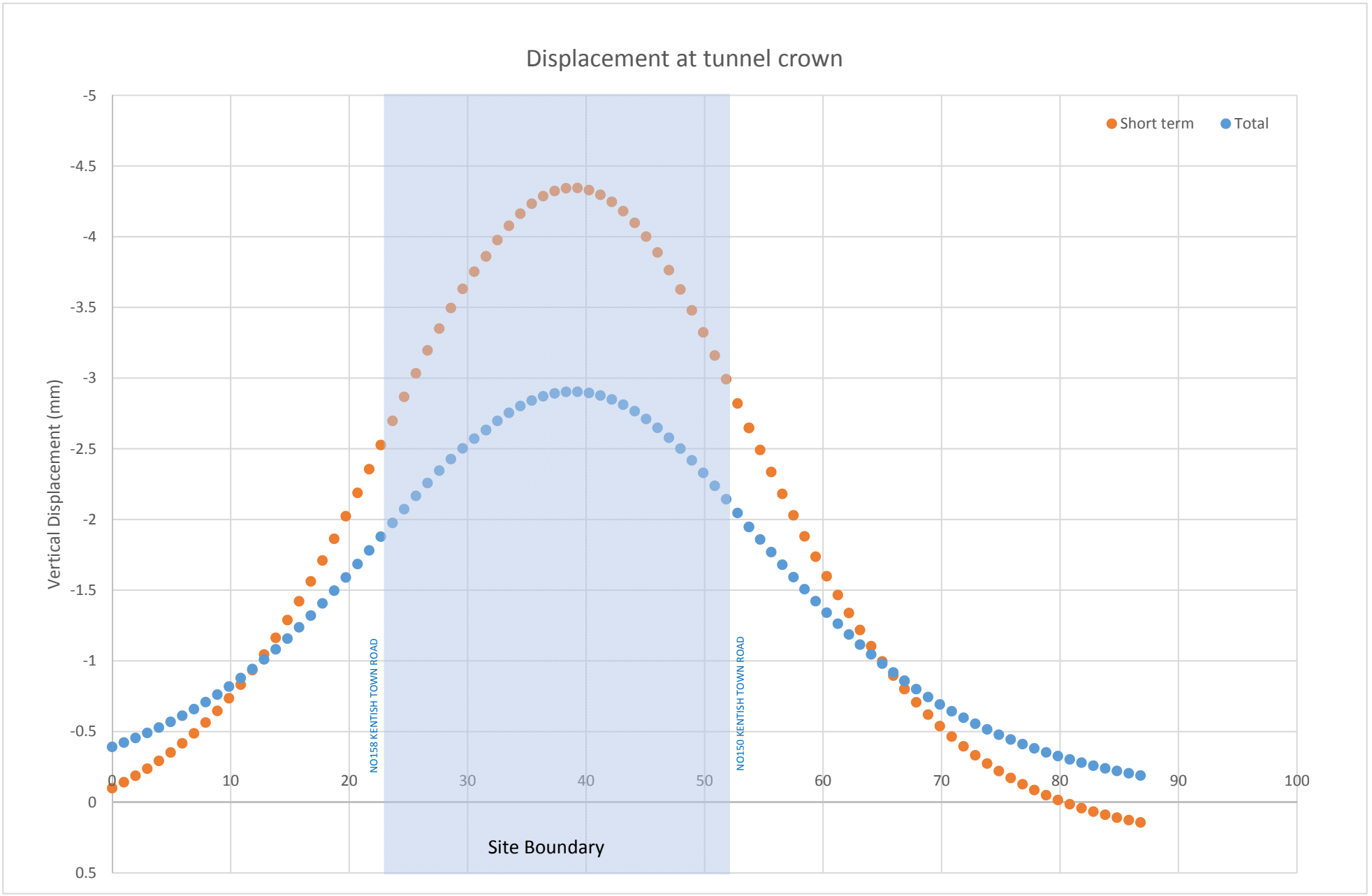
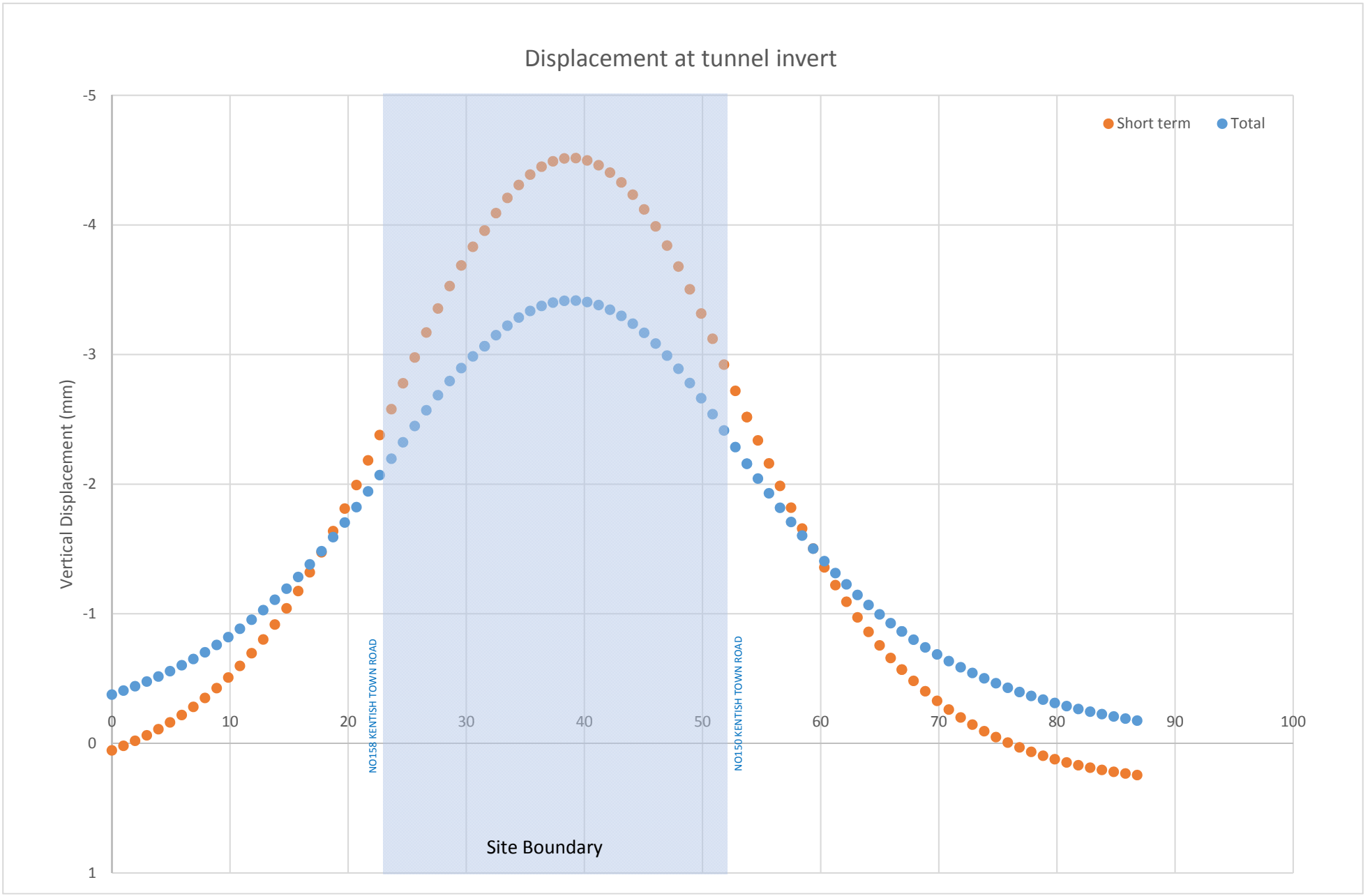
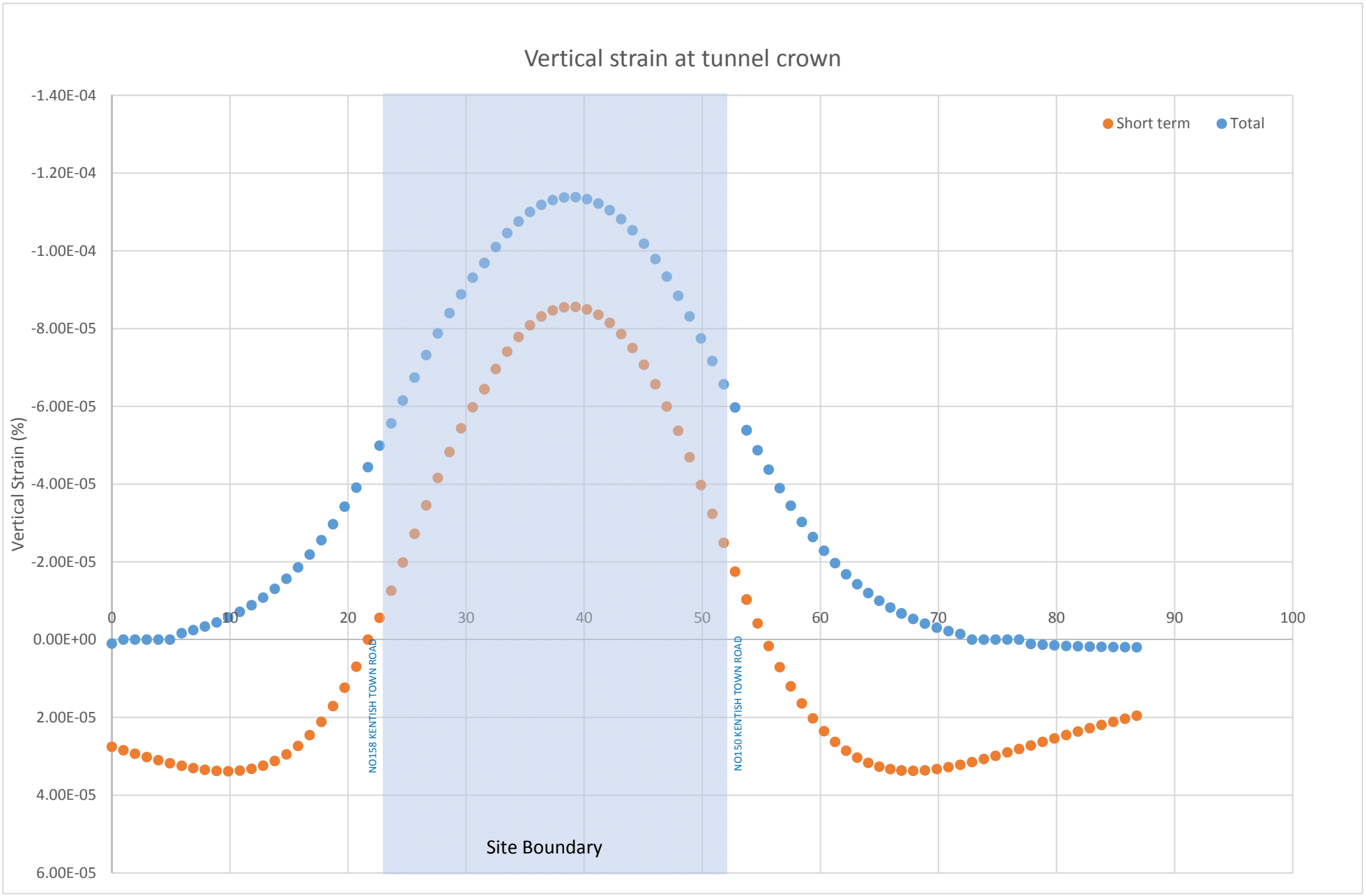
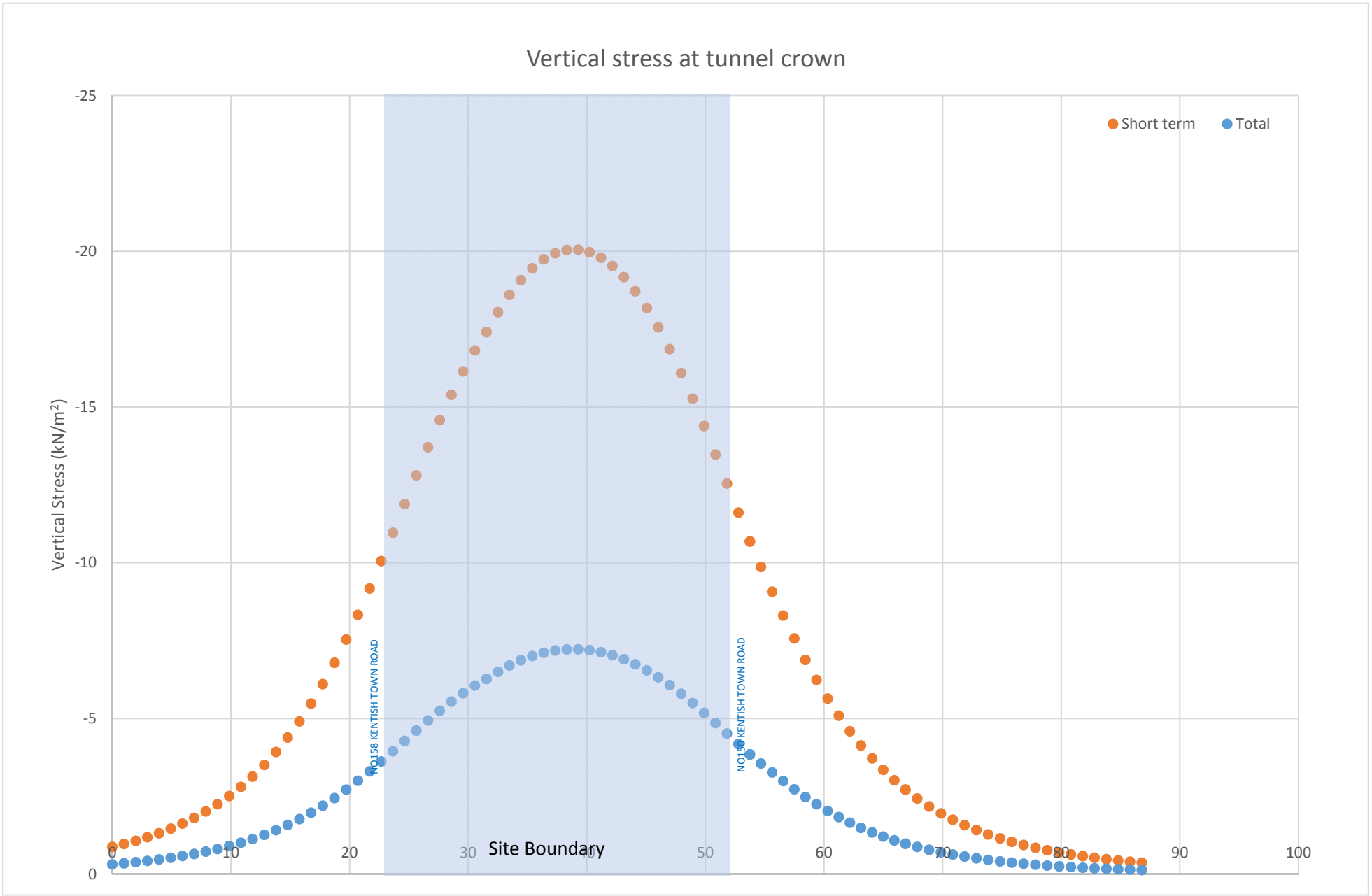
-6.000
-4.000
-2.000
0
-22.00
140.0
120.0
100.0
80.00
60.00
40.00
20.00
.0
Y [m]
-20.00
20.00
60.00
100.0
140.0
X [m]
Scale x 1:1055 y 1:1055
Contour Interval: 1mm


Displacement at tunnel crown
Short term
Total
Vertical Displacement (mm)
-5
-4.5
-4
-3.5
-3
-2.5
-2
-1.5
-1
-0.5
0
0.5
0
10
20
30
40
50
60
70
80
90
100
NO158 KENTISH TOWN ROAD
NO150 KENTISH TOWN ROAD
Site Boundary


Displacement at tunnel invert
Short term
Total
Vertical Displacement (mm)
-5
-4
-3
-2
-1
0
1
0
10
20
30
40
50
60
70
80
90
100
NO158 KENTISH TOWN ROAD
NO150 KENTISH TOWN ROAD
Site Boundary


Vertical strain at tunnel crown
Short term
Total
Vertical Strain (%)
-1.40E-04
-1.20E-04
-1.00E-04
-8.00E-05
-6.00E-05
-4.00E-05
-2.00E-05
0.00E+00
2.00E-05
4.00E-05
6.00E-05
0
10
20
30
40
50
60
70
80
90
100
NO158 KENTISH TOWN ROAD
NO150 KENTISH TOWN ROAD
Site Boundary


Vertical stress at tunnel crown
Short term
Total
Vertical Stress (kN/m²)
-25
-20
-15
-10
-5
0
0
10
20
30
40
50
60
70
80
90
100
NO158 KENTISH TOWN ROAD
NO158 KENTISH TOWN ROAD
Site Boundary

Geotechnical & Environmental Associates (GEA)
is an engineer-led and client-focused independent specialist providing a complete range of geotechnical and contaminated land investigation, analytical and consultancy services to the property and construction industries.

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where information can be found on all of the services that we offer.

GEA Geotechnical & Environmental Associates