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BIA Supplementary Information

L24/055/02

154 Royal College Street,

London

NW1 0TA

Revision	Date	Issued by	Changes
-	04.12.2024	A.Ronaldson	Initial Issue
A	08.01.2025	A.Ronaldson	Updated Geotechnical Review.
B	09.01.2025	A.Ronaldson	Updated GMA Note

Preface

Following the issue of JMS L24/055/02 - Basement Impact Assessment (Rev C) for the proposed development at 152 Royal College Street, London and subsequent Audit by Campbell Reith on behalf of Camden Council, please see below the Audit Tracker Extract highlighting remaining points of clarification required. This document is to be in addendum to the original report to address/ provide clarity on the outstanding points.

Query No	Subject	Query	Status	Date closed out
1	BIA	Qualifications not in accordance with requirements of CPG Basements - (page 22, Section 4.7: A Civil Engineer with the "CEng" (Chartered Engineer) qualification from the Engineering Council and a Member of the Institution of Civil Engineers ("MICE") with either demonstrable evidence that the assessments have been made in conjunction with an Engineering Geologist with the "cGeol" (Chartered Geologist) qualification from the Geological Society of London or a Registered Ground Engineering Professional, Specialist or Advisor as defined by the Register of Ground Engineering Professionals (RoGEP).) – open.	Open – See 4.1	
2	BIA	BIA refers to out of date guidance (CPG4). - Now updated – closed.	Closed	November 2024
3	BIA	The baseline conditions are not defined (ground and groundwater conditions, scheme dimensions, position and depth relative to neighbouring properties). - Scheme dimensions – clarified – closed. - Ground and groundwater conditions – clarified – closed. - Depth of neighbouring foundations at 156 unclear – a basement is referred to but also that underpinning of Party Wall will be required. Understood that 152 demolished. Is it assumed that 156 and 154 have the same basement depth currently? If unknown, state conservative assessment criteria – open.	Open – See 4.5	
4	Screening	Screening question responses are presented inconsistently and some have not been carried forward to scoping. As noted in Section 4, further information is required to support some of the screening responses. - Now updated – closed.	Closed	November 2024
5	Surface water	Proposed attenuation measures for the increase in hardstanding should be presented. - No detail of substance presented; a summary of calculations and size of attenuation / discharge rate to be achieved would be sufficient - open	Open – See 4.13	
6	BIA	No structural engineering information to support assessments and conclusions. Geotechnical soil parameters are not provided. - Outline structural information provided – closed. – provide information as Arup GSD Appendix G3 geotechnical parameters - open	Open – See 4.15	
7	BIA	Utility plans should be provided. - provided - closed	Closed	November 2024
8	Stability	Ground Movement Assessment (GMA) should consider ground movements around the excavation due to the yielding of the excavation and construction activities - Current assessment indicates up to Category 2 damage – this is not allowable under CPG Basements – open. - Current assessment is not considered conservative; a minimum of 5mm vertical / horizontal movement per stage of underpinning would be anticipated in dry, stable conditions. Its noted that underpinning through Made Ground with perched water is likely with dewatering to be implemented, which may further impact movements – open.	Open – See 4.17	
9	Stability	Further justification required to support building damage conclusions. - Current assessment indicates up to Category 2 damage – this is not allowable under CPG Basements – open. - Current assessment is not considered conservative; a minimum of 5mm vertical / horizontal movement per stage of underpinning would be anticipated in dry, stable conditions. Its noted that underpinning through Made Ground with perched water is likely with dewatering to be implemented, which may further impact movements / damage category – open.	Open – See 4.18	

Query 1 – Clarification of Qualifications

It is evident from Camden Local Plan (2017) Policy A5 that suitably qualified chartered structural engineers must be appointed to carry out the respective components of the Basement Impact Assessment, the policy document then refers to more specific requirements outlined in Camden Planning Guidance: Basements (2021).

The following authors contributed directly to this report..

Surface Flow and Flooding	– David Brunning – Beng, CWEM, MICWEM (Chartered Civil Engineer)
Hydrology	– Provided Separately
Land Stability	– Daniel Staines (CEng, MIStructE, Beng, PgDip (Construc. Management)

Based on the guidelines for qualified professionals it would therefore appear to be the section of the report regarding land stability which requires further clarification.

I would refer you to section 4.47 of CPG:2021 with respect to the qualifications required for Land Stability appraisals.

- A Civil Engineer with the "CEng" (Chartered Engineer) qualification from the Engineering Council and specialising in ground engineering;
- A Member of the Institution of Civil Engineers ("MICE") and a Geotechnical Specialist as defined by the Site Investigation Steering Group; or
- A Chartered Member of the Institute of Structural Engineers with some proof of expertise in engineering geology, with demonstrable evidence that the assessments have been made by them in conjunction with an Engineering Geologist with the "cGeol" (Chartered Geologist) qualification from the Geological Society of London.

It is advised that the BIA and supplementary report has been provided by a suitably qualified Chartered Member of the Institute of Structural Engineers with 20 year's experience in basement developments across London, and in accordance with the specific geotechnical recommendations contained within a number of interpretive reports accessed via the Camden planning records for relevant neighbouring sites, to ensure accuracy of geotechnical information, appropriate assessment of land stability, and consideration of reporting/recommendations from adequately qualified geotechnical specialists.

It should also be noted that the level of specialist consultant input and extent of information required by Camden Council is/ should be 'commensurate with the scale and location of the scheme' (Paragraph 6.115 Camden Local Plan (2017). It is argued given the limited nature of the scheme involving a minimal increase in largely existing basement footprint as part of a small residential scheme, this standard has been met at a minimum.

Query 3 – Clarification of Foundation depth to Neighbouring Properties.

It is apparent from visible construction and historic mapping that the properties of 152,154&156 were/ are a row of terraced houses of same age and construction. No.156 has been historically demolished but No.152 is still present sharing a party wall to the North.

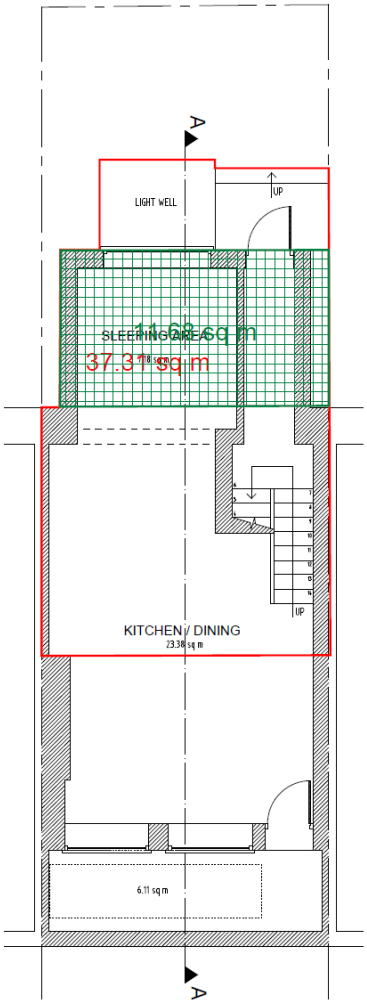
Given that the properties were constructed in the same manner and in the same configuration it would be prudent to presume that the existing foundation provision to No.152 is comparable to that of No.154, with a limited height basement and brick corbelled foundation extending beneath, internal floor levels to the basement are therefore anticipated to be the same/similar

It is understood from a ground movement assessment perspective that this construction represents the greatest level of excavation/ potential source of movement to the properties during the proposed works to No.154, as such has formed the worst-case approach to our assessments.

Query 5 – Surface Water Proposals

Assessment Summary.

Further to previous correspondence it is understood and agreed that the increase in surface water runoff will be minimal (please see calculations below). As discussed, levels of attenuation will be dependent on the agreed connection flow rate with the local water authority, however the inclusion of SUDs features can limit this requirement notably. Any attenuation crates etc. will be proportionate to the minor increase and can be positioned to the rear of the plot without detriment to the adjacent structures or underlying hydrology.



Proposed Basement Floor
Scale 1:100

Approximate increase in surface area to the rear catchment of the property is 30%

The Modified Rational Method can be used to consider the existing runoff rate for the 60 minute storm duration as set out in the equation:

Q (l/s) = Cv x Cr x 2.78 x I (mm/hr) x A (ha)

Rainfall Intensity (mm/hr) per Storm Event:

1:1yr - 48.163
1:30yr - 115.996
1:100yr - 152.499

Existing Run-off Rate per Storm Event:

1:1yr - 0.339
1:30yr - 0.817
1:100yr - 1.075

Increased Run-off Rate per Storm Event:

1:1yr - 0.480
1:30yr - 1.163
1:100yr - 1.530

In accordance with the published Advice Note on contents of a Surface Water Drainage Statement in London Borough of Camden; Section 2.1 states "Camden Planning Guidance 3 (CPG3) requires developments to achieve a greenfield run off rate once SuDS have been installed. Where it can be demonstrated that this is not feasible, a minimum 50% reduction in run off rate across the development is required."

On that basis, where greenfield run-off rates are unfeasibly low for such a small catchment area, the proposed run-off rate during the 1 in 100yr + 40% climate change would need to be set at: 0.75 l/s

Due to the small orifice plate required, upstream source control will be required in the form of SuDS. The proposals could include a small attenuation tank, bio-retention plants/pods on the rainwater downpipes, and silt traps ahead of the flow controls.

Query 6 – Geotechnical Parameters

It is understood from adjacent investigations/ borehole logs documented within the BIA that the soil profiles outlined below are anticipated.

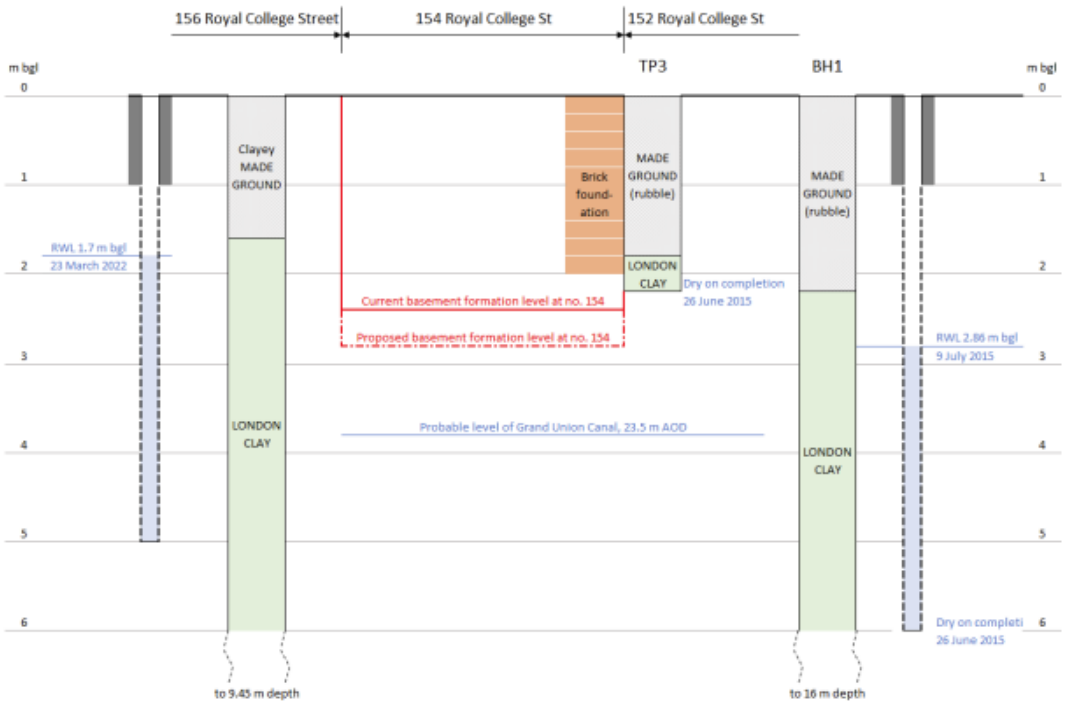


Figure 2.1 Borehole logs from 152 and 156 Royal College Street (looking north-eastwards)

It would appear that the made ground to No.152 is associated/ indicative of the historic demolition of the previous basement/ building, as such it would be prudent to presume that the properties of the soils to No.154 are in keeping with the prevailing conditions documented for No.156 and at depth for No.152 underlying the rubble layer.

The following geotechnical parameters are therefore expected/ advised.

Depth	Stratum	Effective Angle of Friction	Effective Cohesion (c')	Bulk Unit Density (kN/m^3)
0.00 - 1.80m	Made Ground	Conservatively 25º	0 kN/m^2	20 kN/m^3
1.80m - 9.45m +	London Clay	Typically, 20º	0 kN/m^2: 5kN/m^2 After 5.0m	20 kN/m^3

The above values are in keeping with standard information for the soil type and are consistent with those encountered during intrusive investigations/soil testing carried out for No.152 detailed in Soils Consultants SI detailed in planning application 2015/4396/P.

The basement permanent works designer should use these parameters to establish suitable active and passive earth pressure coefficients.

Query 8 & 9 – Anticipated Structural Movement/ Damage Categorisation

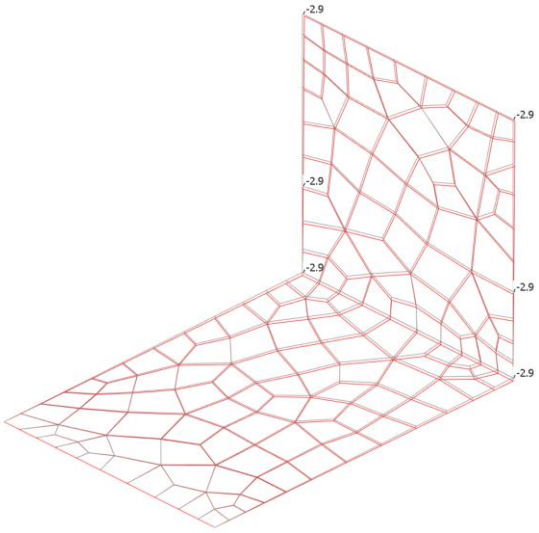
It is apparent from the proposals that there are two basement configurations present to the development, these have been discussed individually below for clarity to establish extent of estimated ground movement and subsequent residual damage characterisation in accordance with Ciria C760.

Main Underpin to Existing Footprint

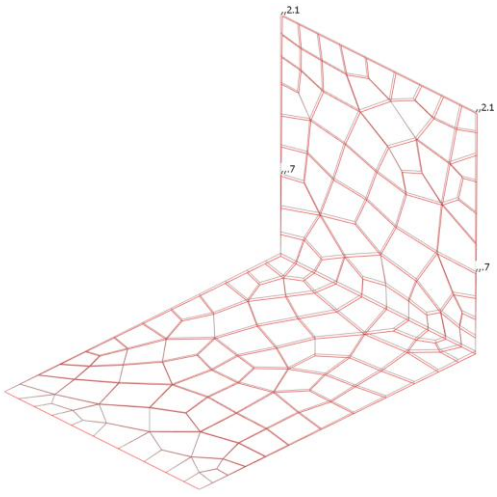
It is proposed to increase the depth of the existing basement to the remaining historic element of the property by approximately 1.0m to increase floor to ceiling clearance, it is understood that this will take the form of a reinforced concrete basement slab and external retaining wall.

Preliminary analysis of a typical 300mm thick slab/ wall construction using soils parameters outlined in query 6 has been carried out to examine wall displacement/settlements. It should be noted that this construction is to extend into the London Clay stratum underlaying the site as such design values have been selected accordingly.

Vertical Movement (within acceptable tolerances)



Horizontal Movement (within acceptable tolerances)



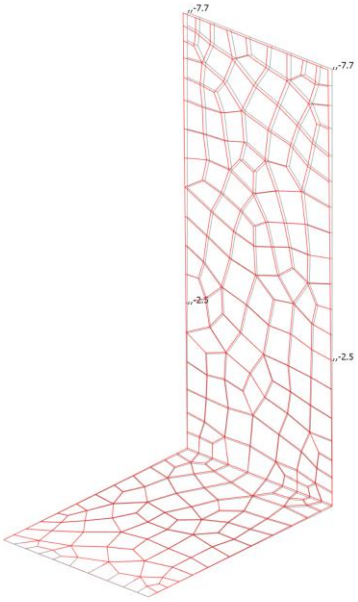
Based on general procedures for Stage 2 Damage Category Assessments outlined in section 6.3 of CIRIA C760 an effective horizontal tensile strain of approximately 0.05% is anticipated. As such the shorter underpin to the main property is likely to result in Damage Category 1 – Very slight in keeping with point 4.33 of Camden Planning Guidance: Basements (2021).

It should be noted that our estimate is based on effective methods of controlling ground water should it be encountered, and suitable back propping employed by the proposed contractor to engineer's design.

New Full Height Basement to Rear

The only full height component of basement excavation/retaining wall is to be located to the rear of both No.154 and No.156, extending through the made ground layer and founding into the London Clay beneath. An assessment has been made on worst case geotechnical parameters for made ground.

Horizontal Movement



The wall detailed above is typically remote from the foundations of the adjacent, any horizontal/ vertical movement will therefore have minimal impact to the rear garden and will not be of significance to the structures onsite.

Additional Geotechnical Review

Further to our assessment of the wall construction we have provided an additional review of the soil behaviours in both the unloading phase during basement excavations and in the permanent condition once the permanent structure has been completed, in order to establish/ quantify heave/ settlement and the subsequent effect on adjacent structures.

Heave

Given the nature of the clay subsoils vertical heave is anticipated where net bearing stresses are reduced from their current loading conditions, based on the previously defined bulk density of overburden soils of 20kN/m^2. A net unloading of 20kN/m^2 and 60kN/m^2 respectively to the internal basement area and new build element to the rear.

Using Skempton-Bjerrum a simplified one-dimensional method for estimating heave/ settlement values has been carried out as detailed in Appendix 1.1-1.4.

Short Term Vertical Heave/ Settlement

The full depth basement excavation to the rear will involve the removal of 3.0m of overburden from the clay layer in the temporary condition. Consideration of heave in the short-term undrained condition show a maximum vertical movement of +17.32mm.

To the party walls with 152 and 152 where foundation loads are in excess of the removed overburden a short-term vertical movement of 1.93mm is anticipated from the reduced stress during excavation.

All anticipated heave values present are within an industry accepted 25mm for normal construction tolerances.

Long Term Vertical Gound Movements (Drained Conditions)

To the rear full depth basement (once construction is complete) long term settlement will result in final vertical movement of +11.55mm. It should be noted that short term vertical heave movements will be reduced in the final preparation of the formation layer prior to placing of the concrete base slab. As long-term vertical movement will be notably less than this conservative value.

Final long-term settlement to the party walls is as illustrated in the graph on sheet 09, that is to say +1.93mm short term vertical heave (during excavation) -4.75mm long term settlement i.e. net settlement of -2.82mm.

Vertical And Horizontal Movement from Underpin Installation

Underpinning will take the form of stiff reinforced concrete walls with limited potential for deflection as highlighted on sheet 6 &7 of this report. However, it is recognised that any deflections that do occur will likely result in surface settlements with may impact neighbouring properties.

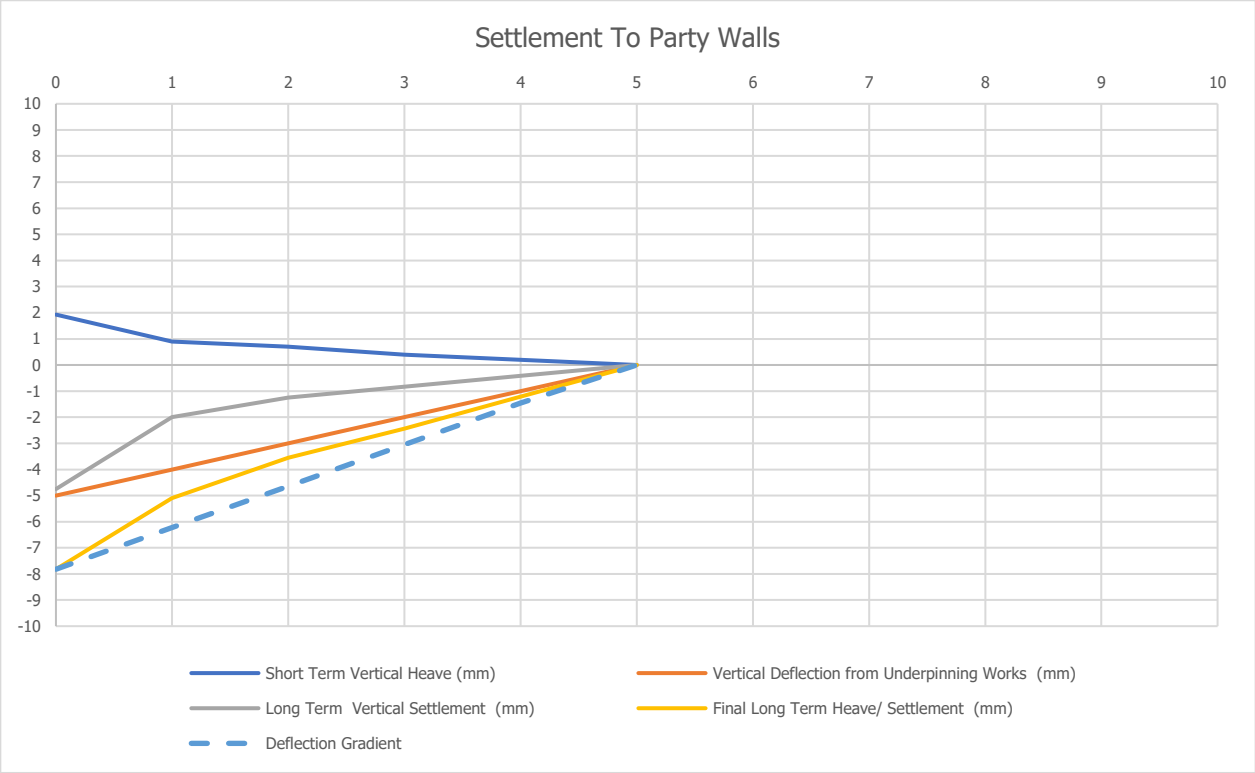
It is therefore advised to make a 5.0mm additional allowance to both vertical and horizontal settlements in consideration of ground movements, in keeping with the single stage underpinning methodology.

It should be noted that the presence of existing basement to the adjacent properties limits the excavation depth to approx. 1.0m, this will likely further restrict movements.

Updated Ground Movement Assessment Information.

A review of the structures adjoining the site indicate that the most susceptible properties to ground movements associated with the works are the neighbouring properties of 152& 156 Royal College Street.

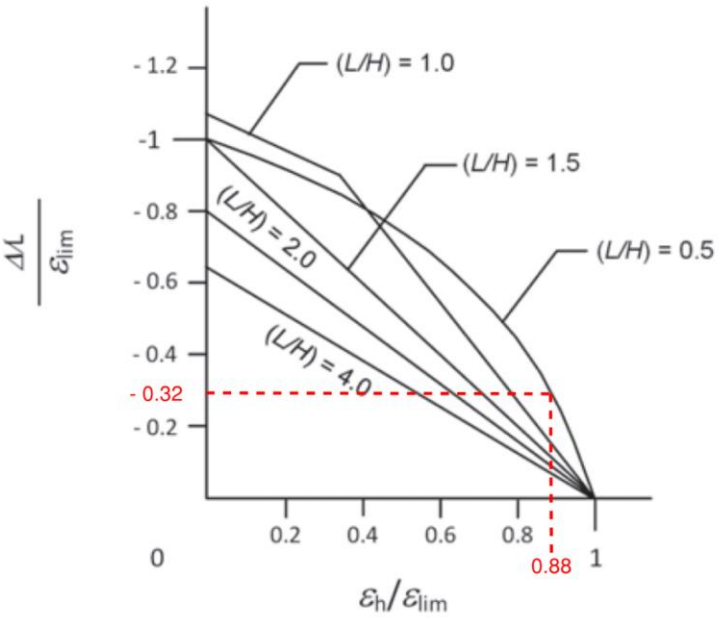
From analysis the following settlement graph demonstrates the anticipated soil movements within a 5.0m susceptible zone to the excavation/basement construction relative to each party wall line. Given that 154 is a mid-terrace property with similar construction present each side, similar movements would therefor be anticipated to each side.



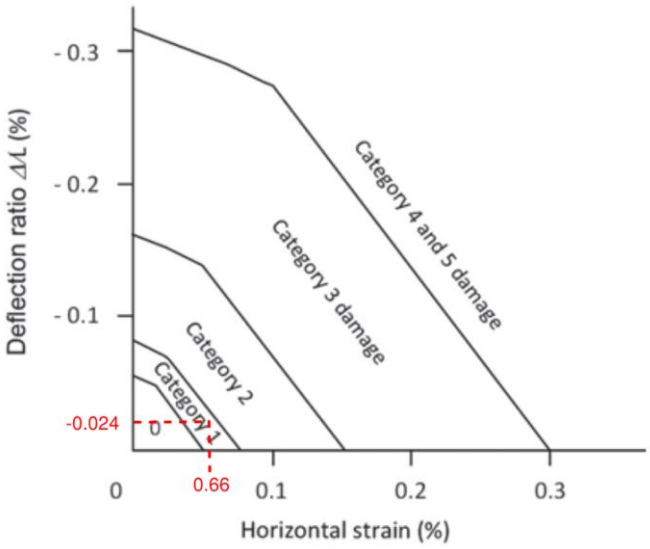
Summary of ground Movements and Corresponding Damage category (152&156 Royal College Street)

Adjacent Property	**152 Royal College Street**	**156 Royal College Street**
Building Width – L (m)	5.00	5.00
Building Height – H (m)	10.50	10.50
L/H = 0.476	0.50	0.50
Max Deflection	0.012	0.012
ΔL (%)	0.024	0.024
εlim	0.075	0.075
Δ/L/εlim	0.32	0.32
Length to Negligible Horizontal Movement (4x)	4	4
δh_{max} (m)	0.004	0.004
δh (m)	0.0021	0.0021
Δh/L (%) = εh	0.10	0.10
Damage Category	**<1**	**<1**

Influence on Horizontal strain on Δ/L/εlim



Relationship Between Damage Category and Deflection Ratio and Horizontal Tensile Strain (L/H=0.50)



Residual Risks from Ground Movement Assessment

It is evident from our assessments that the most likely cause of damage to adjacent structures associated with the works is not a result of the permanent works/ retaining wall design, but in the temporary soil stability of excavations given the potential presence of limited ground water and made ground.

It is therefore proposed to install all basement pins in careful sequence with the contractor to provide a robust design for the installation of temporary shoring during each pin installation to ensure stability of excavations at all times; as per the construction methodology outlined in the BIA.

Additionally, the temporary works engineer must also consider temporary dewatering strategies in case of encountering groundwater. Ground water encountered appears to be limited to perched water within the stratum of made ground to the rear. It is anticipated that water levels can be controlled by pumping into the adjacent sewer, appropriate approvals will need to be sought.

Appendix 1.1 – Heave/ Settlement Calculations – Unloading Phase (Rear)

Overburden Removed – 20kN/m^2 x 3.0m = 60kN/m^2

Initial

H / B = 7 / 5 = 1.4

D / B = 3 / 5 = 0.6

L / B = 5 / 4 = 1.25

Coefficients For Vertical Displacement

μ_0 = 0.95

μ_1 = 0.45

S_i = 0.95 x 0.45 x (60 x 5) /55 = **2.33mm**

Secondary

m = 3.5 / 7 = 0.5

n = 2.5/7 = 0.35

I_r = 0.075

$\Delta\sigma'$ = 4 x 60 x 0.075 = 18kN/m^2

S_{od} = 0.14 x 18 x 7 = 17.64

μ = 0.85

S_c = 0.85 x 17.64 = **14.99mm**

Total Heave/Settlement Predicted = 2.33 + 14.99 = 17.32mm

Appendix 1.2 – Heave/ Settlement Calculations – Long Term (Rear)

Overburden Removed – 20kN/m^2 x 3.0m = 60kN/m^2

Proposed Building Load = 20kN/m^2

Resultant Change in Stress = 40kN/m^2

Initial

H / B = 7 / 5 = 1.4

D / B = 3 / 5 = 0.6

L / B = 5 / 4 = 1.25

Coefficients For Vertical Displacement

μ_0 = 0.95

μ_1 = 0.45

S_i = 0.95 x 0.45 x (40 x 5) /55 = **1.55mm**

Secondary

m = 3.5 / 7 = 0.5

n = 2.5/7 = 0.35

I_r = 0.075

$\Delta\sigma'$ = 4 x 40 x 0.075 = 12kN/m^2

S_{od} = 0.14 x 12 x 7 = **11.76mm**

μ = 0.85

S_c = 0.85 x 17.64 = **9.99mm**

Total Heave/Settlement Predicted = 1.55 + 9.99 = 11.55mm

Appendix 1.3 – Heave/ Settlement Calculations – Unloading Phase (Party Wall)

Overburden Removed – 20kN/m^2 x 1.0m = 20kN/m^2

Existing Building Load = 110kN/m^2

Resultant Change in Stress = 130kN/m^2

Initial

H / B = 7 / 0.6 = 11.66

D / B = 1 / 0.6 = 1.52

L / B = 7 / 0.6 = 11.66

Coefficients For Vertical Displacement

μ_0 = 0.94

μ_1 = 1.45

S_i = 0.94 x 1.45 x (130 x 0.6) /55 = **1.93mm**

Appendix 1.4 – Heave/ Settlement Calculations – Long Term (Party Wall)

Permanent Building Load = 150kN/m^2

Resultant Change in Stress = 40kN/m^2

Initial

H / B = 7 / 0.6 = 11.66

D / B = 1 / 0.6 = 1.52

L / B = 7 / 0.6 = 11.66

Coefficients For Vertical Displacement

μ_0 = 0.94

μ_1 = 1.45

S_i = 0.94 x 1.45 x (140 x 0.6) /55 = **2.08mm**

Secondary

m = 3.5 / 7 = 0.50

n = 0.6/7 = 0.09

I_r = 0.02

$\Delta\sigma'$ = 4 x 40 x 0.02 = 3.20kN/m^2

S_{od} = 0.14 x 3.20 x 7 = **3.14mm**

μ = 0.85

S_c = 0.85 x 17.64 =**2.67mm**

Total Heave/Settlement Predicted = 2.08 + 2.67 = 4.75mm