GEOTECHNICAL CONSULTING GROUP
52A Cromwell Road, London SW7 5BE, United Kingdom.
Tel: +44 (0)20 7581 8348 Email: admin@gcg.co.uk
Fax: +44 (0)20 7584 0157 Web: www.gcg.co.uk

ROSS & PARTNERS

29 NEW END

RESPONSE TO BASEMENT IMPACT ASSESSMENT ADDENDUM AUDIT

Revision 0

02 May 2018

1 INTRODUCTION

This brief technical note has been prepared to address audit queries raised by Campbell Reith in Revision D1 of their audit document entitled "29 New End, London NW3 1JD – Basement Impact Assessment Addendum Audit" dated April 2018 (Reference [1]). The present note is limited to issues insofar as they relate to GCG's modelling reported in Revision 1 of GCG's document entitled "29 New End: Assessment of the effects of redevelopment on neighbouring buildings" dated October 2017 (Reference [2]).

2 RESPONSE TO QUERIES

The following points are aimed at addressing the audit queries in the order listed in the Audit Query Tracker of Appendix 2 of Reference [1]. As stated previously the points only address issues related to GCG's modelling reported in Reference [2].

1. Temporary works along the eastern and western site boundaries were modelled in an approximate manner providing nominal support to excavation faces for which temporary sheet piling is provided. In relation to the temporary work for the garden wall for Lawn House, the high level prop was conservatively ignored. Our modelling has also conservatively ignored any support offered by new piled foundations for the buttress to Lawn House.

2. The analysis reported in Reference [2] assumes that any dewatering is limited to the upper aquifer within the confines of the secant pile wall around the proposed basement and does not affect ground water conditions outside of the excavation footprint.

   In the modelling presented in Reference [2] long-term groundwater levels have been assumed to be unaltered from the current conditions. For the purpose of these analyses (considering SLS conditions) this is considered reasonable, as the proposed development is unlikely to significantly alter groundwater conditions, particularly given the topography of the area.

3. Our modelling reported in Reference [2] accounts for any "out of balance forces" as a result of the sloping nature of the site. In the temporary conditions temporary propping, comprising of steel props and walers, is provided at two levels transferring any "out of balance" across the site. The model ensure equilibrium conditions and does not indicate any significant global movements. In the permanent condition load transfer across the site if provided through horizontal floor slabs and core structures, which have been included in the model. Again, the model does not suggest any significant global movements associated with the transfer of loads from the temporary to the permanent propping system.

4. The Hampstead area and the surroundings are considered to be vulnerable to slope instability due to the ground conditions and the sloping gradient of the ground. Potential land instability has generally been associated to slopes of 8° or greater both in the London Clay and in the Claygate Member (Reference [3] and Reference [4]) although the mechanisms that could drive the potential instability are different in the two types of soils.

   Figure 1 shows the areas that are prone to slope stability issues as mapped by the British Geological Survey (BGS) (Reference [5]). The BGS mapping is based on factors such as geology and groundwater conditions, in addition to the slope angle.

   The site specific conditions at 29 New End do not suggest that issues with general land stability exist. The slope of the ground at the site is about 7º and, given the hydrological conditions, it is unlikely that pore water pressure increase in the clayey units of the Claygate Member could occur leading to instability of the ground.

   The proposed basement construction is not likely to adversely change the existing conditions. Retaining walls are being used to retain the ground behind the new basement. The walls will be propped during construction and in the long term and we understand that they have been designed for appropriate earth pressures. The 3D FE analyses simulating the proposed redevelopment as reported in Reference [2] confirmed that no issue of ground instability exist.

5. Table 3 in Reference [2] refers to a UDL of 40kPa for the proposed development. This table is taken directly from Reference [6], but the values given were only used in modelling the neighbouring buildings (see Section 3.4 of Reference [2]). For the proposed development the value of 40kPa was not used in the analysis. We appreciate that its inclusion may have been misleading. In actual fact the 3D FE analysis presented in Reference [2] accounted

for the loads imposed by the proposed development as outlined in the last paragraph of Section 3.3 of Reference [2] and closely replicated the actual loading given in the loading plan included in Figure A19 of Appendix A (Reference [2]) through point loads and line loads.

6. As outlined in Section 3.2 of Reference [2] a constant Young's modulus of 10MPa was assumed for the thin layer of Made Ground. This is considered to be reasonably conservative and is consistent with the value adopted in Reference [6].

The stiffness for the other strata was based on past experience and is consistent with the available SPT data as stated in Reference [2] and outlined in more detail below.

The drained stiffness for the two Bagshot sand layers can be compared to the SPT data (see Figure 2) using empirical relationships. In this case the following relationship was used:

$$E' = 2 \cdot N_{SPT}$$

The variation of N_{SPT} with depth for the two layers of Bagshot sand consistent with the assumed drained stiffness is indicated in Figure 2.

For the Bagshot clay and Claygate Member the drained stiffness used in the analysis can be compared with SPT data based on the following relationships:

$$E' = 0.8 \cdot E_U$$

$$E_U = f(z) \cdot c_u$$

$c_u = 5 \cdot N_{SPT}$ (accounting for variations in the ratio between c_u and N_{SPT} given in Reference [7])

The variation of undrained strength (c_u) with depth consistent with the assumed drained stiffness is compared to the values derived from the available SPT data in Figure 3.

In terms of f(z) a constant value of 450 has been assumed for the Bagshot bed clays. This is an empirical value typically assumed for large strains. It is considered to be a reasonably conservative value given the fact that relatively high strain levels were expected in this soil layer. For the Claygate Member f(z) has been assumed to increase with depth, (accounting for the expected reduction of strain levels with depth), as follows:

At +102mOD, the top of the Claygate Members, f(z) = 450 has been assumed, i.e. the same value as for the Bagshot bed clays. This is considered to be a conservative value at this level, which is already around 7m below the proposed basement excavation.

At +97mOD, 1.5 times the excavation depth below the basement, f(z) = 1.75 x 450 has been assumed. This conservatively accounts for an expected reduction of strains at this level.

At +60mOD, the top of the London Clay, f(z) = 2.5 x 450 has been assumed. This assumes "elastic" stiffness values at this level, where the strains due to redevelopment were expected to be negligible.

The assumed drained stiffness profile with depth is also broadly consistent with would be been obtained from the normalised stiffness decay curve for the London Clay Formation presented in References [8] and [9] based on the expected variation of mean effective stress with depth.

7. The work presented in Reference [2] has not considered the effects of pile installation in isolation, but looked at the overall combined effect of pile installation, bulk excavation, loading, etc. This overall approach is considered to be conservative as outlined in Section 4.2 of Reference [2]. At an earlier stage of the project (in April 2017) we produce a "Note on expected ground movements due to pile installation" (Reference [10]) which provides further background on expected ground movements as a result of pile installation. This note is appended for ease of reference.

8. Underslab drainage has not been modelled in the analysis presented in Reference [2]. We understand that this is in line with design assumptions.

9. We do not believe that this query relates to the modelling work presented in Reference [2].

3 REFERENCES

[1] Campbell Reith (2018). *29 New End, London NW3 1JD – Basement Impact Assessment Addendum Audit.* Project Number 12727-64, Revision D1, April 2018

[2] Geotechnical Consulting Group (2017). *29 New End: Assessment of the effects of redevelopment on neighbouring buildings*. Revision 1, 25 October 2017

[3] Denness, B & Riddols, B W. (1976). The influence of geological factors on slope stability in the London clay of south Essex, England. *Bulletin of Engineering Geology and the Environment.* Volume 13, Number 1, 37-40.

[4] Ellison, R.A., Woods, M.A., Allen, D.J., Forester, A., Pharoah, T.C., & King, C. (2004). *Geology of London: Special memoir for 1:50000 Geological sheets 256 (North London), 257 (Romford), 270 (South London), 271 (Dartford)*. British Geological Survey

[5] Arup (2010). *Camden geological hydrogeological and hydrological study*. London Borough of Camden

[6] A-squared Studio (2017). 29 New End – 3D Ground Movement Assessment. *Technical report, Revision 6, April 2017*.

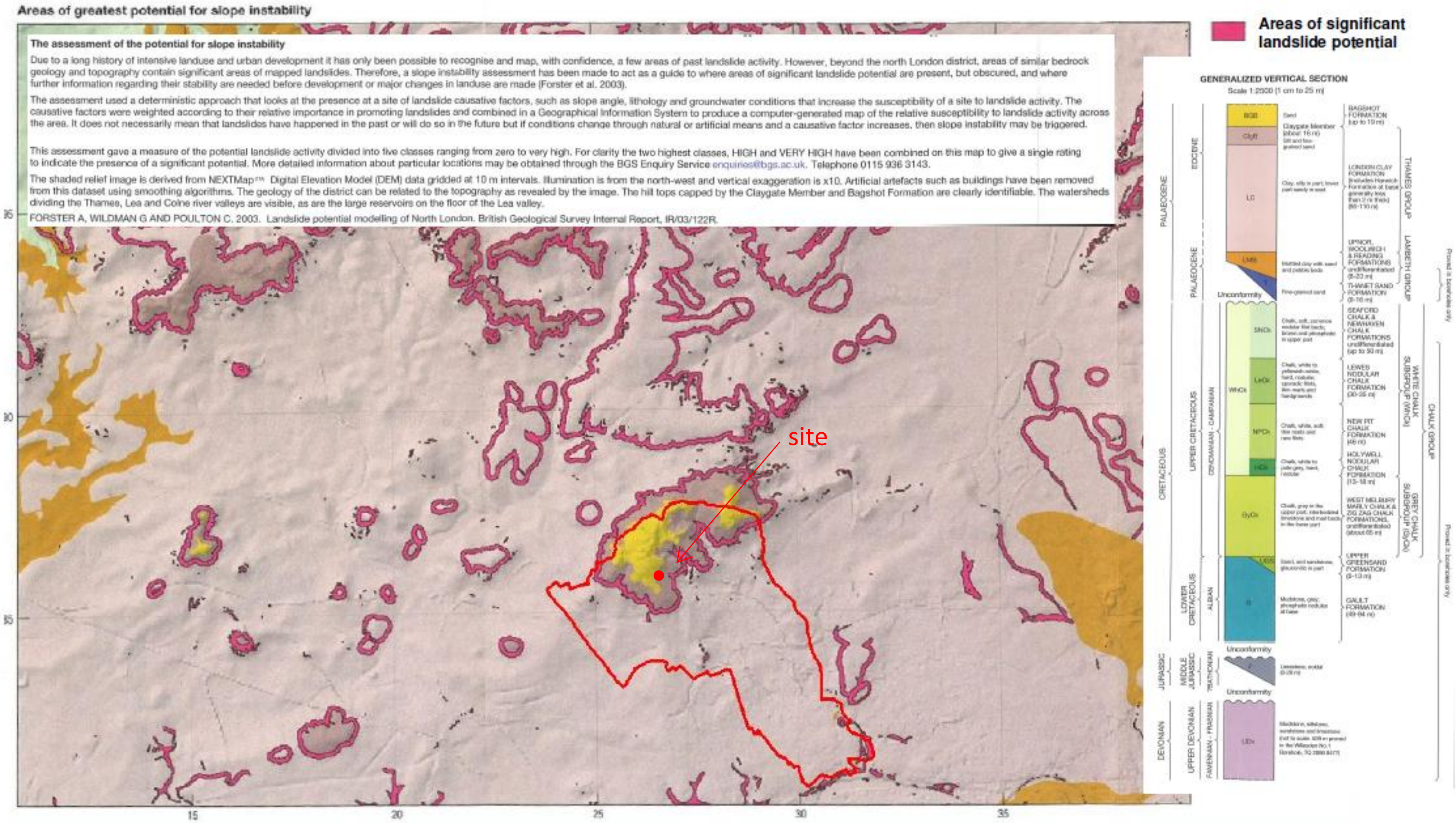
[7] Stroud, M.A. & Butler, F.G. (1975). The standard penetration test and the engineering properties of glacial materials. *The Engineering Behaviour of Glacial Materials*. p. 124-135

[8] Hight, D.W., Gasparre, A., Nishimura, S., Anh-Minh, N., Coop, M.R. & Jardine, R.J. (2007). The London clay at T5: An overview of the characterisation study. *Géotechnique*, 57(1), pp 3-18

[9] Gasparre, A., Hight, D.W., Coop, M.R. & Jardine, R.J. (2014). The laboratory measurement and interpretation of the small-strain stiffness of stiff clays. *Géotechnique*, 64(12), pp 942–953

[10] Geotechnical Consulting Group (2017). *29 New End Road: Note on expected ground movements due to pile installation*. Revision 0, April 2017

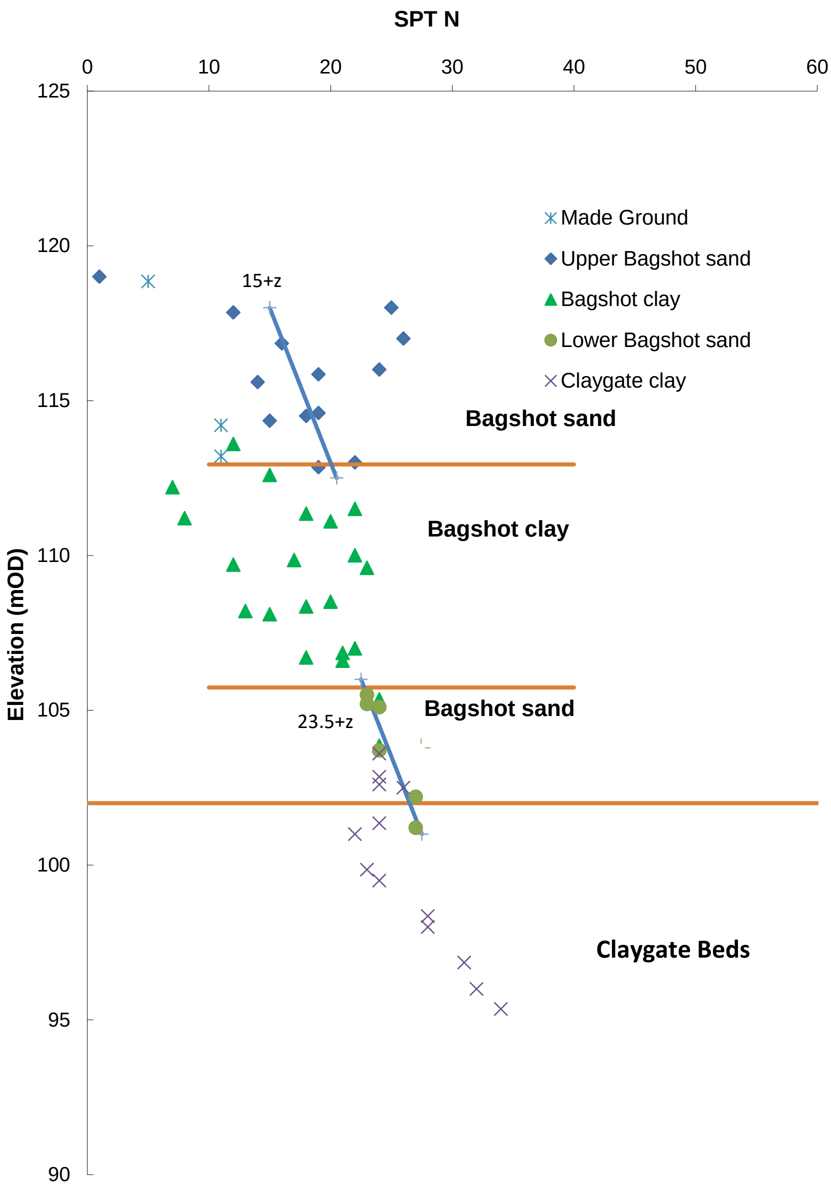
FIGURES



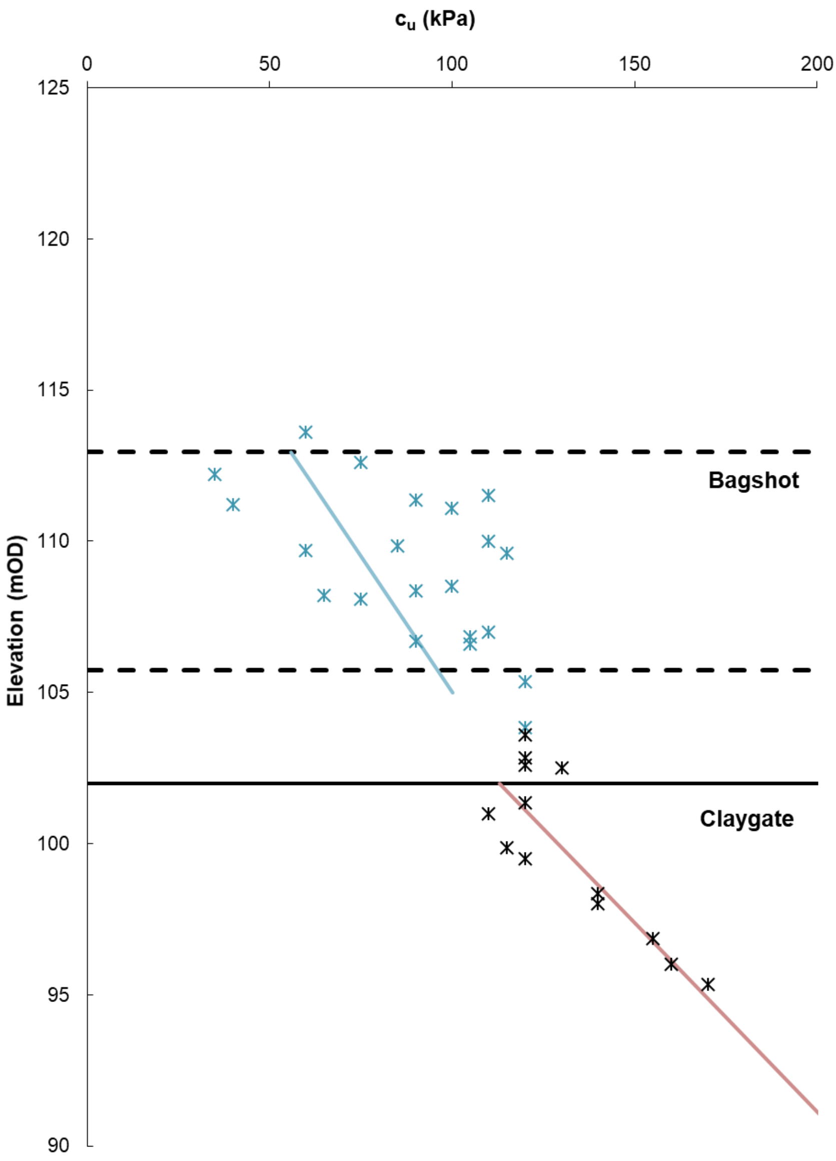
Source - British Geological Society, 1:50,000 Series
England and Wales Sheet 256 – North London

Camden Geological, Hydrogeological and Hydrological Study

GCG	**Ross & Partners** 29 New End	**Figure 1**
	Areas of significant landslide potential Reference [5]	



	Ross & Partners 29 New End	**Figure 2**
	SPT test data with assumed variation in Bagshot sand layers	



	Ross & Partners 29 New End	**Figure 3**
	Undrained strength profile derived from SPT data	