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TECHNICAL NOTE G1206-TN-01-E1

Project	8 PILGRIMS LANE NW3 1SL- 2012/5825/P - APPEAL	**Project Ref**	G1206
Subject	On Grieg Ling 05/02/14 Additional Basement Information and Footing–Undrained–Plaxis Report.	**Date**	11/2014

(7) GROUNDWATER

Chemical permeation grouting to reduce water ingress will not work in the soil described and tested for this site. In order to accept grout shallow soil needs to be non-cohesive with less than 4% silt and permeability of between approximately 10^{-4} and 10^{-6} m/second; i.e. it has to be "open" enough for the grout to penetrate. The Lister tests show that the material likely to be encountered in the intended excavations has between 20% and 88% silt and clay, and classifies as high plasticity clay with a permeability of 10^{-7} m/second; 10 times less permeable than required for grouting. (Note that permeability values shown by the Lister report are wrong. When the available test measurements are used as required by the British Standard, the highest permeability possible is 10^{-7}m/sec rather than the 10^{-6} m/sec value reported).

Grouting in these conditions causes the voids in the soil to block close to the point at which the grout is injected. Attempting to overcome the blockage by increasing injection pressure fractures the ground. That can increase water flow and cause ground heave and/or structural movement.

CGL COMMENT & RKD RESPONSES

(1) S2.2 Response Para 3.

The "design line" plotted by RKD on the CGL diagram exaggerates the strength of the ground near the surface. The test results indicate that the mean ground strength near the surface should be 30 rather than 50KPa. See below for further comment.

(11) S4.1 PLAXIS Analysis of No 8/6 Party Wall movement during front basement excavation

The Plaxis report does not model the true situation. The excavation depth of 0.4m is wrong and the Architect's drawn requirement will prevent the sloping face of the excavation being formed. I made this clear in my December 2012 report. Quite apart from that though, it cannot be a competent model because the existing construction of the wall and its footing have not been sufficiently defined.

Attached sketch G1206-SK-01-E1 shows (a) the information about the existing construction that has and has not been found by the appellant and (b), how constructing the front basement according to the Architects' and Grieg Ling drawings will affect what must currently be supposed to exist. The sketch is the best interpretation of the developer's intention which is possible at the present time.

Figures 1 to 5 attached are simplified diagrammatic results of a ground movement and stability analysis made for the excavation process depicted by the sketch. Software used is GeoStudio 2012, May 2014 Release, Basic Version, by Geo-Slope International Ltd Calgary.

Figure 1 estimates the deformation caused by the party wall footing. The building has been there for more than a hundred years and the analysis allows for that.
Figure 2 shows the shear stresses caused by the deformation.
Figure 3 estimates the immediate deformation that would result from the excavation.
Figure 4 shows the shear stresses that would result from the change.
Figure 5 estimates how the stability of the foundation would be immediately affected by the excavation.

Note that the application drawings design a situation which would be dangerous.

The ground under the party wall would be unstable and the party wall would slide into No 8 basement excavation. This was the conclusion of paragraph 84 of my December 2012 report. The warning has been ignored.

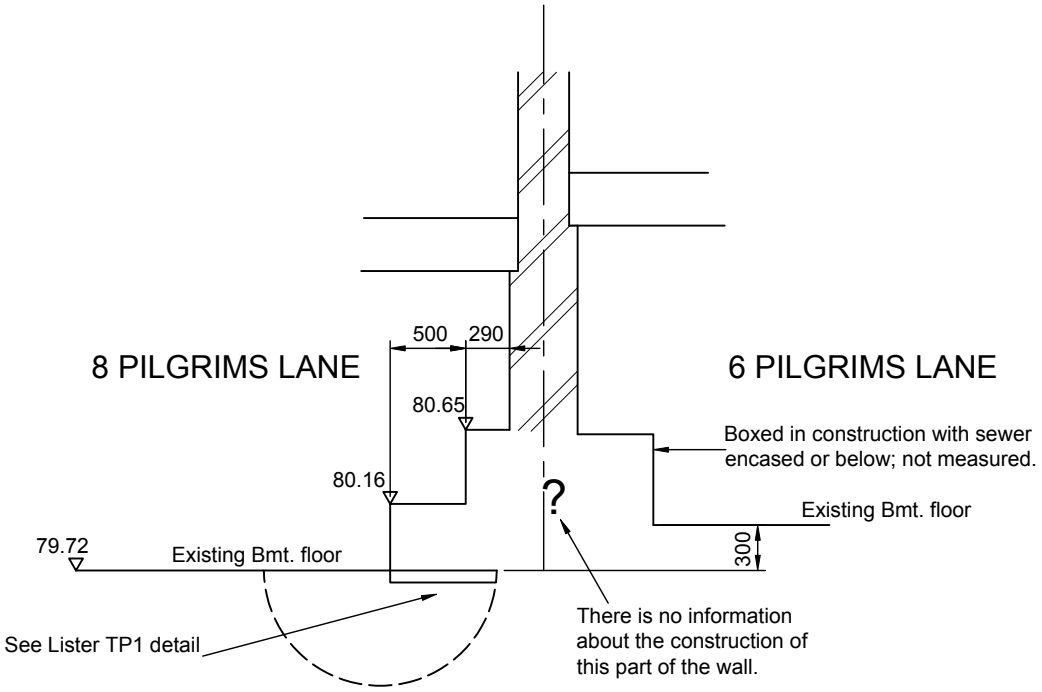
Note that this conclusion and the inadequate safety factor of 0.79 shown by Figure 5 are based upon the ground strength of 50 KPa assumed for the Plaxis calculation. The more realistic ground strength value of 30KPa noted above results in a further reduced safety factor of 0.48.

The Plaxis analysis in the application, and now in the appeal, models a situation which even allowing for the paucity of valid information is completely false. It compounds the error by modelling ground movement only and stating that since the calculated movement is small, all will be well.

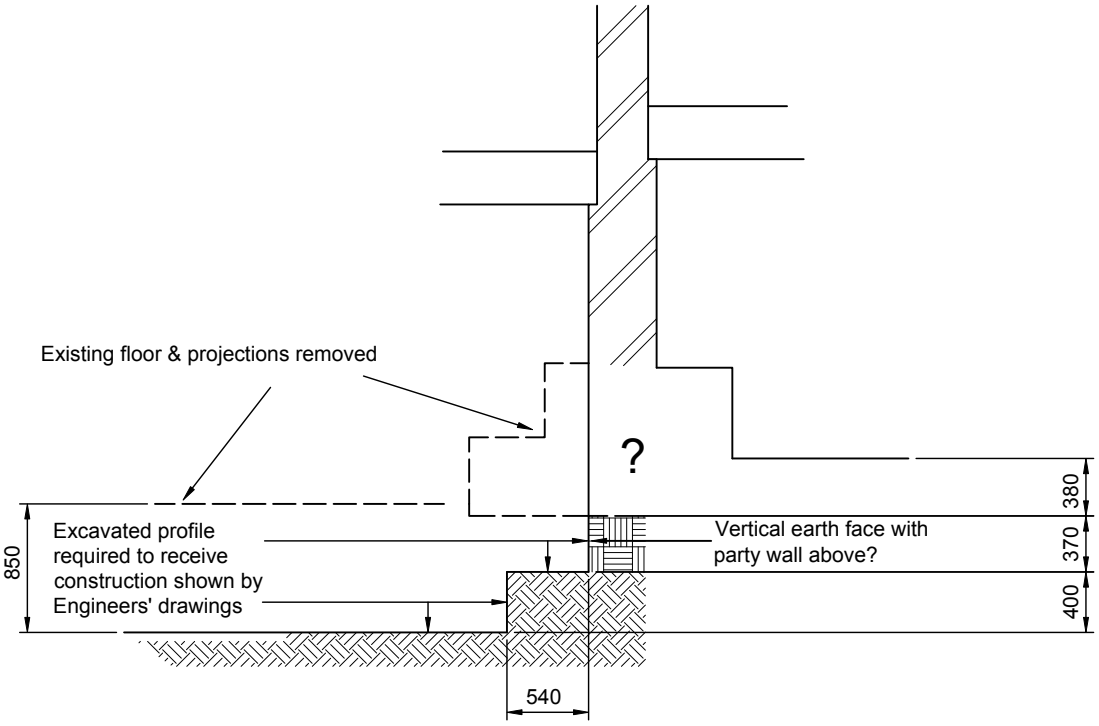
The results attached also estimate that movement due to the excavation would be very small. But they also show that the shear stresses caused would be much greater than the ground strength.

Used in their simplest form, finite element programs like Plaxis and GeoStudio do not show ground failure directly; calculated ground stresses just go on getting higher and higher as movement occurs. It is necessary to either interpret the results sensibly or extend the analysis with a stability module to define that risk.

Neither the application nor the appeal documents have done that and with current knowledge the consequence for No 6 Pilgrims Way is potentially dire.



EXISTING SECTION AT TP1



CONSTRUCTION SECTION AT TP1

This sketch collates information from the Lister ground investigation report and Architects' and Engineers' drawings. The designers do not know how the base of the wall is constructed, do not propose to underpin the existing party wall and show no means of restraining the vertical earth face.
The RKD "Plaxis" analysis presented by the Engineers purports to show that the situation is satisfactory and that there is no risk of significant damage to No 6.

E1 14/11/14 First issue

ELDRED GEOTECHNICS *Consulting Environmental & Geotechnical Engineers* 11A Woodside Chelsfield Orpington Kent BR6 6HY Tel. 01689 869406	PROPOSED BASEMENT EXTENSION 8 PILGRIMS LANE NW3 1SL	G1206-SK-01-E1	
	PROPOSED EXCAVATION OF FRONT BASEMENT AT [PARTY WALL WITH No 6	1:50	11/14

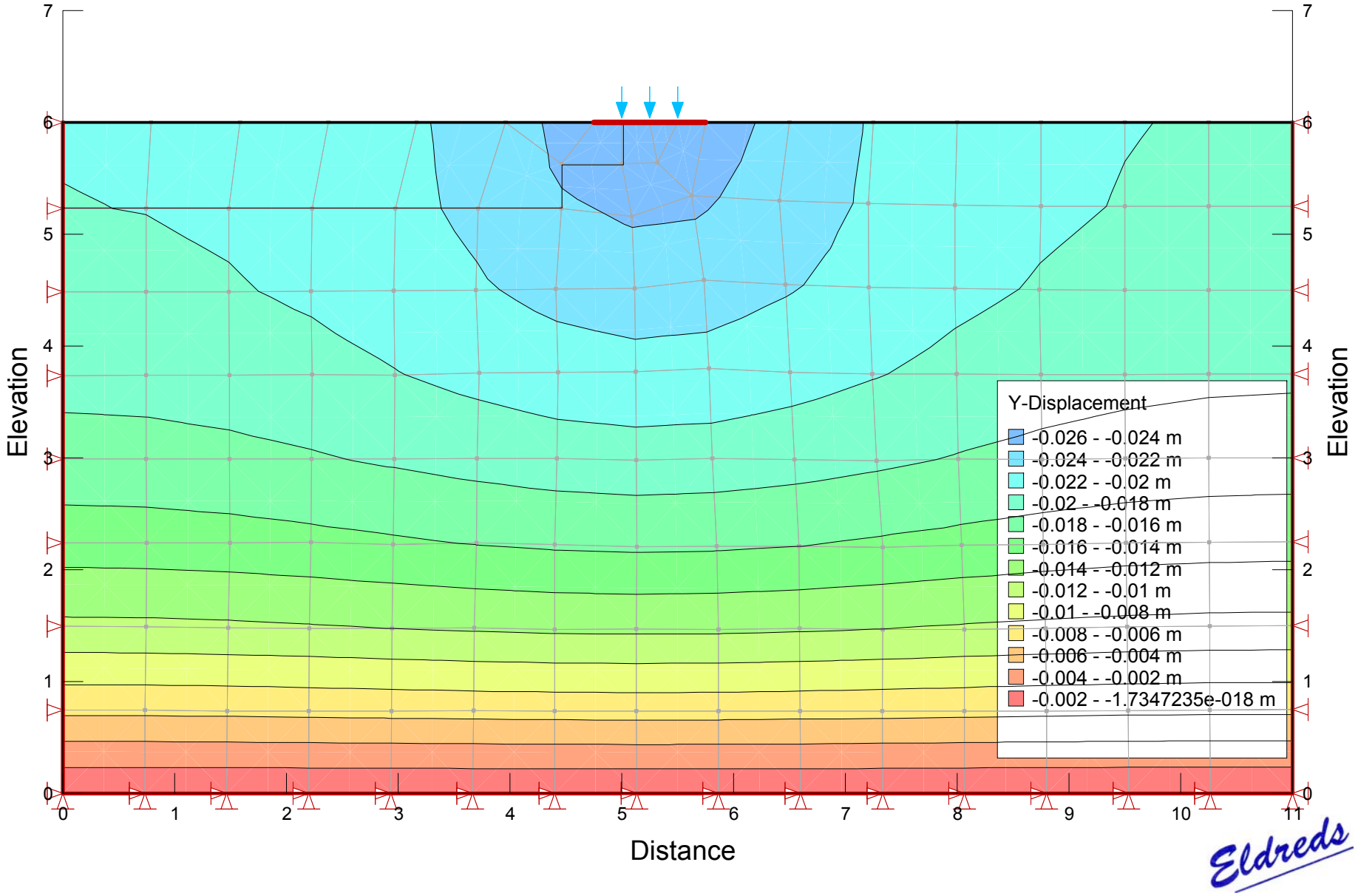
G1206 - 8 PILGRIMS LANE NW3
STAGED EXCAVATION ANALYSIS; 8/6 FRONT PARTY WALL
STAGE 1: EXISTING CONDITIONS - FEA ANALYSIS - DRAINED

Figure 1

MATERIALS

Name: Slightly sandy silty clay - drained Model: Linear Elastic (Effective) Unit Weight: 19 kN/m³ Poisson's Ratio: 0.2

Phi' = 25 degrees, c' = 5 KPa. E' 1m - 10m = 12000+4000Z KPa



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G1206 - 8 PILGRIMS LANE NW3

STAGED EXCAVATION ANALYSIS; 8/6 FRONT PARTY WALL

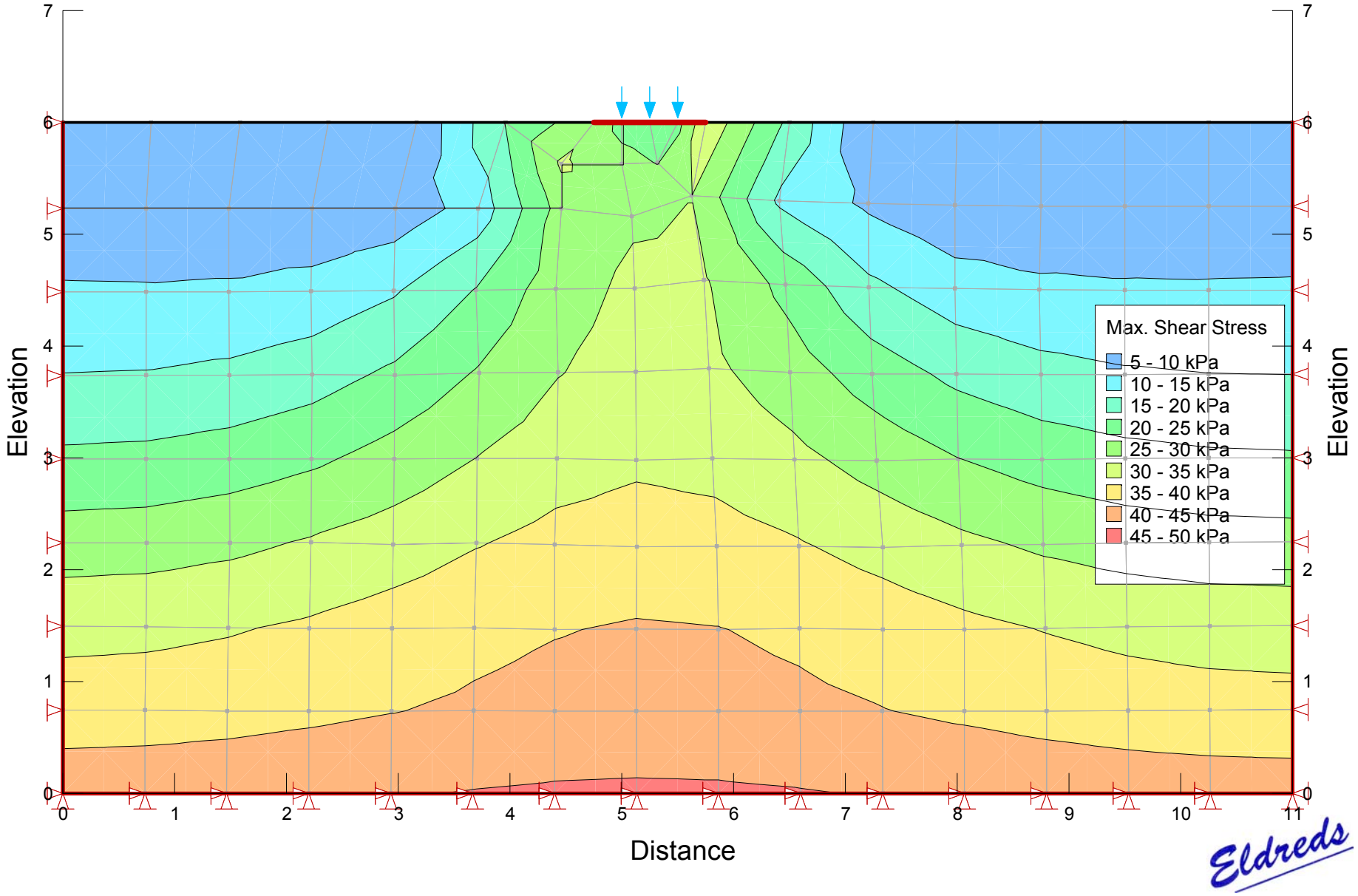
STAGE 1: EXISTING CONDITIONS - FEA ANALYSIS - DRAINED

Figure 2

MATERIALS

Name: Slightly sandy silty clay - drained Model: Linear Elastic (Effective) Unit Weight: 19 kN/m³ Poisson's Ratio: 0.2

Phi' = 25 degrees, c' = 5 KPa. E' 1m - 10m = 12000+4000Z KPa



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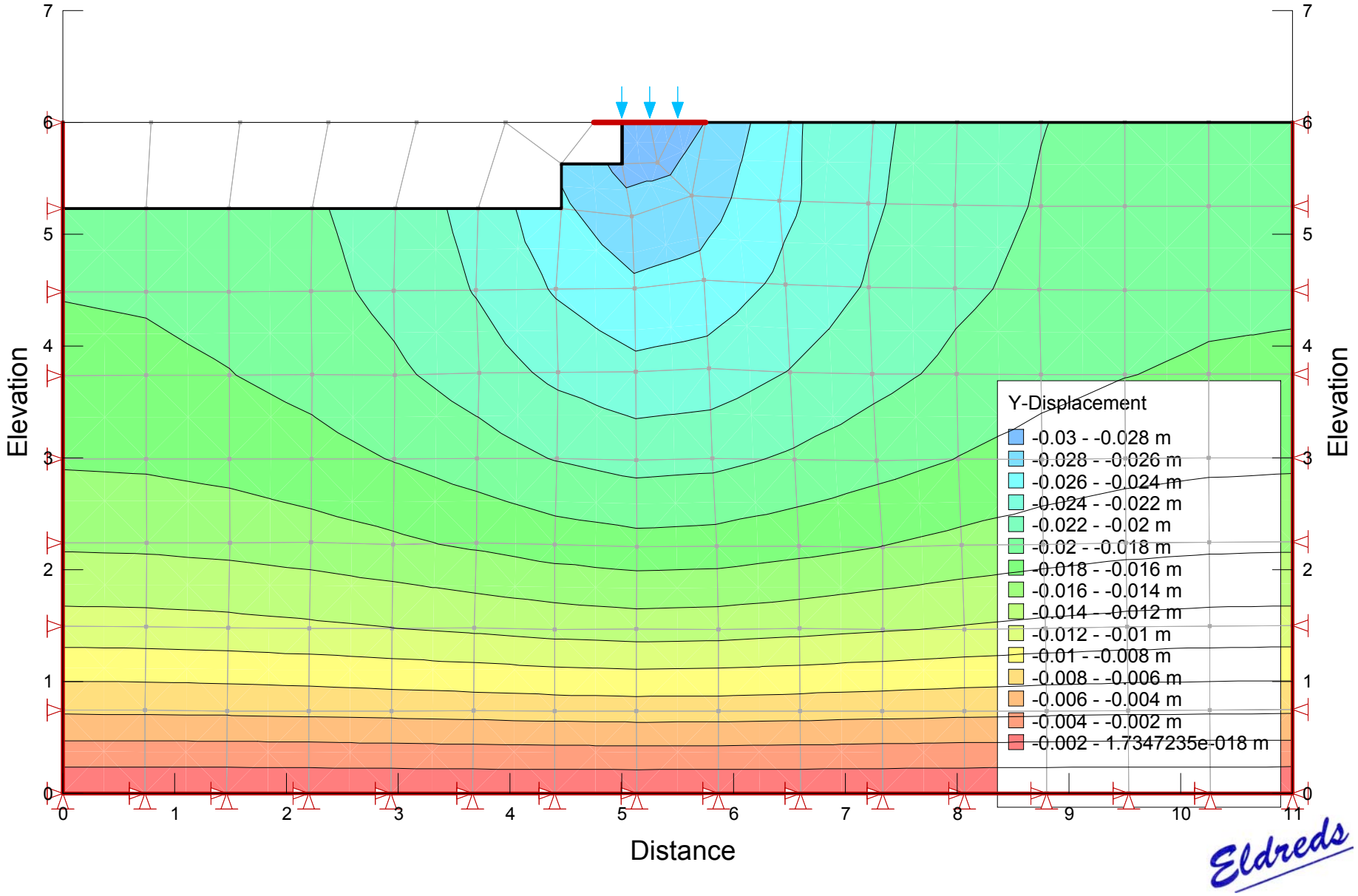
G1206 - 8 PILGRIMS LANE NW3
STAGED EXCAVATION ANALYSIS; 8/6 FRONT PARTY WALL
STAGE 2: EXCAVATION -F.E. ANALYSIS - UNDRAINED CONDITIONS.

Figure 3

MATERIALS
Name: Slightly sandy silty clay - undrained Model: Linear Elastic (Total) Unit Weight: 19 kN/m³ Poisson's Ratio: 0.49

E 1m - 10m 15000+5000Z KPa



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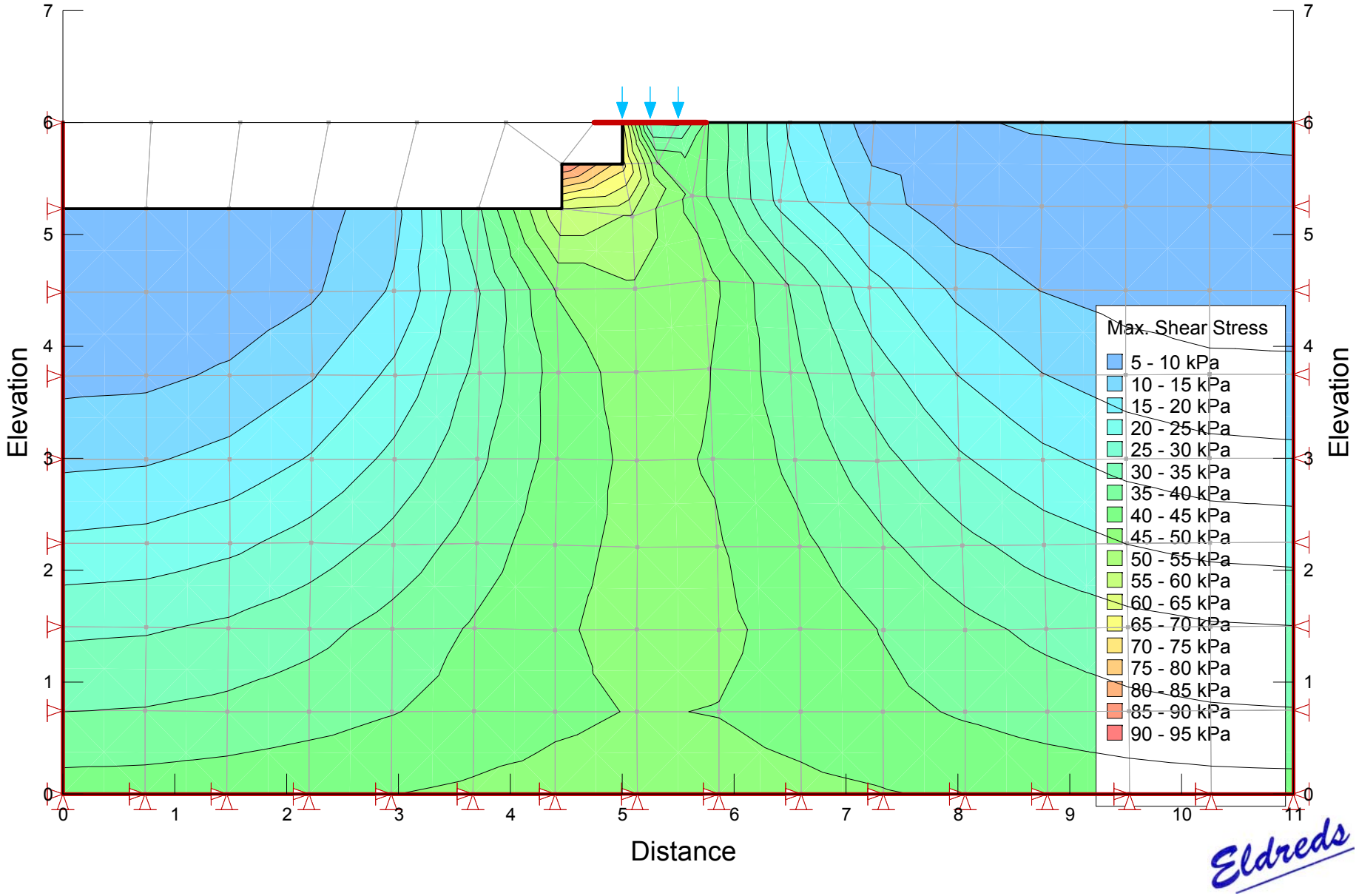
G1206 - 8 PILGRIMS LANE NW3
STAGED EXCAVATION ANALYSIS; 8/6 FRONT PARTY WALL
STAGE 2: EXCAVATION -F.E. ANALYSIS - UNDRAINED CONDITIONS.

Figure 4

MATERIALS
Name: Slightly sandy silty clay - undrained Model: Linear Elastic (Total) Unit Weight: 19 kN/m³ Poisson's Ratio: 0.49

E 1m - 10m 15000+5000Z KPa



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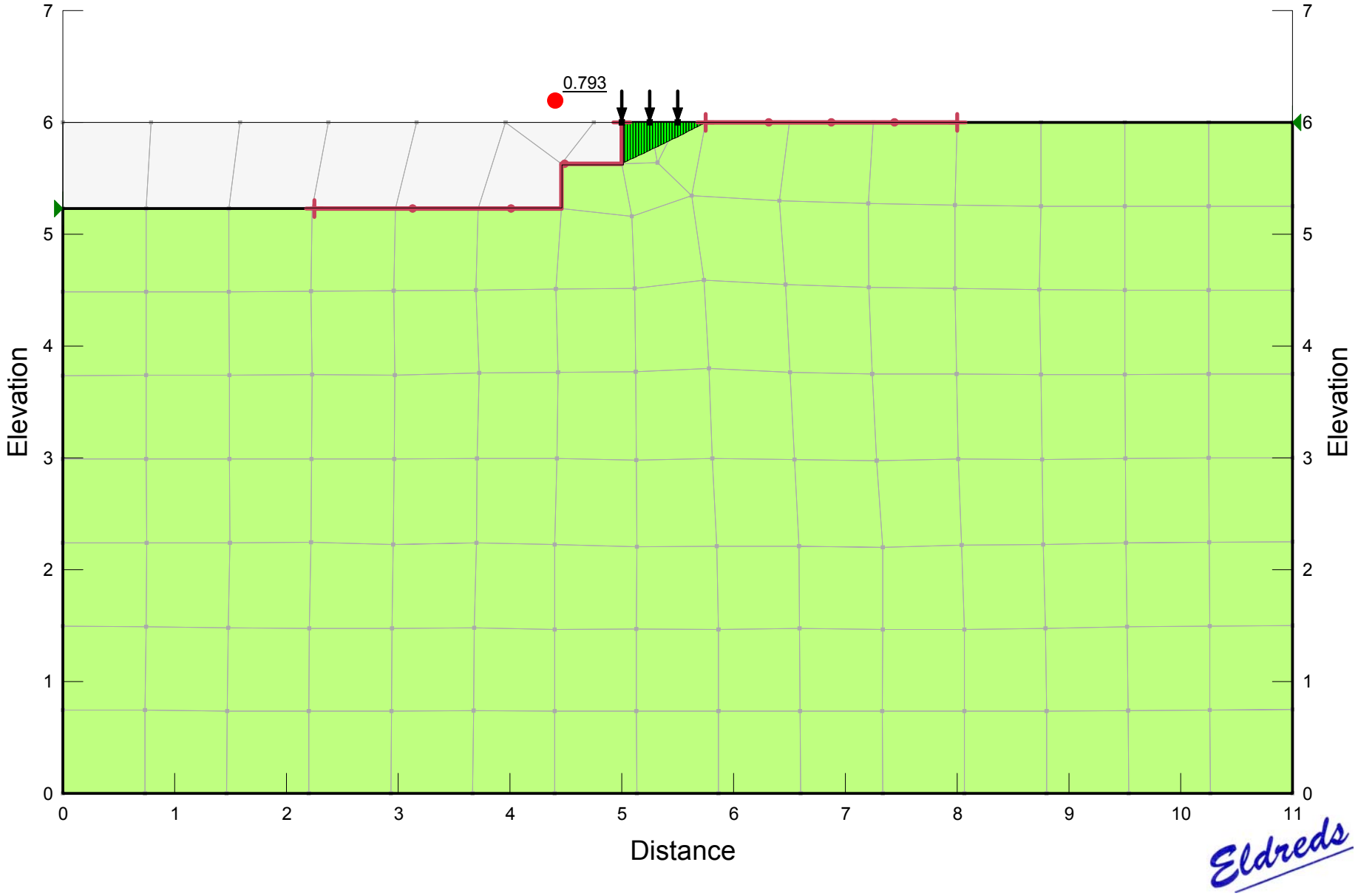
G1206 - 8 PILGRIMS LANE NW3
STAGED EXCAVATION ANALYSIS; 8/6 FRONT PARTY WALL
STAGE 3: STABILITY ASSESSMENT - UNDRAINED CONDITIONS - DERIVED FROM F.E. STRESS ANALYSIS

Figure 5

Name: Slightly sandy silty clay - undrained Model: Mohr-Coulomb Unit Weight: 19 kN/m³ Cohesion': 50 kPa Phi': 0 °
Party wall footing load modelled as 3 x 40KN Point Loads; slip within notional footing width prevented

CRITICAL FACTOR OF SAFETY = 0.793 = FAIL



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