Our Ref: J11894

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08 October 2015

Archetype Associates Ltd
121 Gloucester place
London - W1U 6JY

For the attention of Masoud Parvardin

Dear Sirs,

Re: 36 Redington Road, London NW3

Further to the audit report produced by Campbell Reith dated September 2015 (ref 12066-41 Rev D1), in relation to the BIA submitted as part of the planning application for the above address.

Campbell Reith raised a number of items in that audit report where they required further clarification, and these are answered in turn below and within the attached addendum. We have, for clarity, used the same referencing numbers for these points as adopted by Campbell Reith within their Appendix 2.

Query No 1: both of our BIA reports (stages1&2) and (stages 3&4) had the involvement of a chartered civil engineer M W Stevenson, who is a signatory to both reports. Morris is also a chartered geologist so does fall into the category of a chartered civil engineer having experience in engineering geology.

Query No 2: confirmation of the exact nature of the foundations of No 38 Redington Road is outside the scope of our works. Whilst we also used the documentation on the London Borough of Camden's planning website to understand what was proposed at the neighbouring site, we obviously have no knowledge of the 'as built' nature of the building's foundations, or realistically have any way of determining them without intrusive works in agreement with the neighbour.

Query No 3: as discussed in our stage 3&4 report we had assumed that the basement excavation would be propped both in the temporary condition and in the final works. We had therefore undertaken our ground movement analysis assuming a high stiffness (propped) wall conditions. Given the Structural Engineering Report had proposed a cantilevered design, there was obviously a mismatch in our technical submissions. As suggested by Campbell Reith we have re-run the Ground Movement Analysis assuming a low stiffness (unpropped) wall approach and this is reported as an addendum to our BIA (Stages 3&4) report; and a copy is attached.

As can be seen within this addendum, the predicted movements in relation to 7 Redington Gardens and the adjacent highway using a cantilever wall approach are significantly greater than for the propped situation. As outlined within CPG4, planning permission will only be given where it is demonstrated that the proposals will not cause any harm to the built environment. With this in mind we would suggest forwarding our addendum to the structural engineer for them to assess whether the proposed methodology is still appropriate or whether propping and ground movement monitoring may need to be adopted; which would be our favoured option and may be required to satisfy the requirements of Camden and Campbell Reith.

Query No 4: this is outside the scope of our works and will need to be confirmed by the structural engineer.

Query No 5: we made recommendations regarding this subject within our BIA (stages 3&4) report, however the proposals will need to be confirmed by the structural engineer.

Query No 6: we made recommendations regarding this subject within our BIA (stages 3&4) report, however the proposals will need to be confirmed by the structural engineer.

Query No 7: flood risk assessment is outside the scope of our works.

Query No 8: assessment of the increased volumes of surface water and capacity of the existing sewer is outside the scope of our works.

We trust we have clarified the points raised by Campbell Reith as far as we are able and that the above points are clear. However should further information or clarifications be required please do not hesitate to contact the undersigned.

Yours faithfully,

J N Race MSc CGeol
For and on behalf of
Southern Testing Laboratories Limited
encs

ADDENDUM

SITE; 36 REDINGTON ROAD, ADDENDUM TO REPORT J11894

A GROUND MOVEMENT ANALYSIS BASED ON PROPOSED UNPROPPED WALL.

1 Impact of the Proposed Basement in terms of Ground Movement

Following an audit carried out by Campbell Reith of the Basement Impact Assessment the original Ground Movement Analysis has been revised. In the original Ground Movement Analysis (GMA) it was assumed that the walls would be fully propped and would therefore act as high stiffness (propped) walls. However it is now understood that the walls will not be propped and will therefore act as low stiffness (cantilevered) retaining walls. The Audit also required that in addition to the effects of the proposed construction on No 7 Redington Gardens that the ground movement assessment should be revised to reflect the proposed construction methodology and any impact on the highway considered.

The original GMA also assumed that, given the adjacent property No. 38 Redington Road was formed using piled foundations with bored pile retaining walls, that the effects of the proposed works will be negligible. The construction details relating to No 38 Redington Road should be confirmed by the Structural Engineer/Architect to substantiate this assumption.

1.1 Assumptions and model used for the analysis of ground movements

Allowing for thickness of the slab, etc, the formation level of the proposed basement will be about 3.5m below existing site levels. It is proposed to construct the basement by installing contiguous bored piles. The length of the piles is to be determined by the piling contractor, but given a retained height of approximately 3.5m, a length of 11m has been assumed for the purpose of this analysis (as outlined within the structural engineer's 'Method Statement for Subterranean Development').

The effect of demolition of the building and excavation of the soil to form the basement will cause a reduction in stress at the new formation level, due to the weight of the building and soil removed. This unloading of the ground is normally modelled as producing a short-term (undrained) response followed by a longer term (drained) response. The predicted ground response was modelled using the OASYS program PDISP. This program assumes a linear elastic behaviour of the soil and a flexible structure. In reality, the finite stiffness of the structure(s) will tend to redistribute or smooth out the movements, when compared to those predicted by PDISP. The settlement calculations therefore represent free field movements unaffected by the stiffness of the structure(s) and are likely to be conservative (i.e. the distortions of the structure would be less than those obtained from the predicted movements).

For PDISP modelling purposes London Clay was assumed to extend from ground surface to depth. The rigid base for the analysis was taken as 40m BGL. The soil parameters used are presented in section 20 of this report. Site ground level was taken as an arbitrary value of 100m OD, the rigid base for the analysis was taken as 60m OD.

1.2 Movements from demolition & excavation

The current structure has been estimated to apply a loading of approximately 25kPa over its footprint. Demolition and excavation of 3.5m of soil to form the basement will therefore produce an unload at the new formation level of about 90kPa.

A short-term (undrained) analysis was undertaken to determine the heave movements likely to arise as a result of the demolition and excavation. This indicated a maximum undrained heave of about 15mm occurring within the central area of the basement (see Figure U1 included in Appendix F). For the purpose of illustrating the likely heave displacements occurring beneath the neighbouring property, No. 7 Redington Gardens and the adjacent highway, displacement lines were extended from the nearest corner of the basement excavation towards No. 7 Redington Gardens (Figure LU1) and also from the mid-point of the basement wall nearest to the highway (Figure LU2).

The neighbouring property is located approximately 5m from the corner of the excavation and an undrained heave movement of 1mm is indicated at the nearest corner of No. 7 Redington Gardens reducing to zero at the furthest side.

In the case of the highway (Figure LU2) which is approximately 1.0m from the basement wall, the predicted undrained heave movement is 4.5mm reducing to 1mm approximately 6metres from the wall i.e. 5metres from the site boundary.

The movements of the ground following construction were also analysed for the long-term (drained) case. The analysis was again undertaken for the combination of the unloading due to demolition and excavation of the basement. The PDISP assessment indicates a maximum long-term drained heave of about 23mm occurring within the central area of the basement area (Figure V1). Referring to displacement line plot (Figure LV1) a heave movement of 2.25mm is indicated at the nearest corner of No. 7 Redington Gardens reducing to near zero on the furthest side of the property.

In the case of the highway (Figure LV2) which is approximately 1.0m from the basement wall, the predicted long-term drained heave movement at the site boundary is 8mm reducing to <1mm approximately 10metres from the wall i.e. 9metres from the site boundary.

It should be noted that the above values of heave given take no account of the effect of the proposed piled retaining wall to restrain vertical movements of the soil. It should also be noted that in practice, the heave movements that develop from unloading the soil do not occur in isolation from other ground movements associated with basement construction and excavation (as discussed below).

1.3 Movements due to pile installation and basement excavation

In addition to the changes in vertical stress caused by demolition of the property and the excavation of the soil to form the basement, the installation of a piled wall, and then the removal of soil from in front of the new walls will also generate both horizontal and vertical movement in the ground. Assessment of the ground movements resulting from the pile installation and the excavation to form the basement has been undertaken with reference to CIRIA guide C580 "Embedded retaining walls – guidance for economic design". This provides guidance on the horizontal and vertical movements of the soil adjacent to an embedded retaining wall as a result of pile installation and of excavation in front of the wall based on numerous case histories, for the

cases of a high stiffness (propped) retaining wall and a low stiffness (cantilevered) retaining wall. In this case a low stiffness (cantilevered) wall has been assumed.

Estimates of movements due to pile installation and basement excavation using CIRIA guide C580, are based on empirical data. Since such data is likely collected during and soon after construction, it is assumed to include any short term heave element. However, long-term ground movements from changes in vertical stress would likely not have occurred when the measurements of ground movement were made.

1.3.1 Movements due to Pile Installation

Ground movement guidance in C580 is divided into movements resulting from pile installation and from the mass excavation in front of the wall. However, the empirically derived relationship for ground movements resulting from pile installation given in the CIRIA guide is now considered to be overly conservative, since more recent projects have demonstrated that significantly smaller movements can be achieved with good quality workmanship, with negligible horizontal movements caused by pile installation, and vertical movements limited to 0.025% of pile length, and extending no more than 1.5 times the pile length from the pile wall. The length of the proposed contiguous piles has yet to be determined, but a pile length of 11m and has been assumed as the basis to calculate ground movements.

Referring to the displacement line plot (Figure CL1), the effect of the pile installation of an 11m long piled wall on No. 7 Redington Gardens would be expected to generate about 2.7mm of vertical movement (settlement) at the pile wall, with vertical movements reducing linearly with distance from the wall, becoming negligible at a distance of about 16.5m from the face of the wall. Taking the corner of No. 7 Redington Gardens to be 5 metres from the nearest corner of the basement, a settlement of approximately 1.9mm is predicted at the nearest corner of that property reducing to 0.3mm on the furthest side of the property.

In the case of the adjacent highway (Figure CL2), it is predicted that about 2.7mm of vertical movement (settlement) at the pile wall will occur, with vertical movements again reducing linearly with distance from the wall, reducing to zero at a distance of about 16.5m from the face of the wall. Given that the wall is some 1m from the highway, the predicted movement at this distance is approximately 2.6mm.

1.3.2 Movements due to Excavation in Front of the Piled Wall

The methodology within C580 indicates that the excavation to create the basement will, for a low stiffness (cantilevered) wall, produce horizontal movements of 0.4% of the excavation depth at the wall, with movements extending to four times the depth of the excavation, while vertical movements will be about 0.35% of the excavation depth at the wall, with such movements becoming zero at four times the depth of the excavation.

Referring to the displacement line plot (Figure EL1), the resultant horizontal movement of No. 7 Redington Gardens in towards the corner of the excavation are likely to be about 9mm reducing to zero on the furthest side. The predicted vertical settlement of No. 7 Redington Gardens is 5.5mm reducing to zero on the furthest side of the property.

In the case of the adjacent highway (Figure EL2) horizontal movements at the boundary of the site i.e. 1m from the wall are predicted to be 13mm reducing to zero 14m from the wall (13m from the

site boundary). The predicted vertical movements range between approximately 10mm at the boundary of the site reducing to zero 13m from the site boundary.

The movements derived from the CIRIA guidance are based on the empirical data within C580. As such, it is assumed that they include any short term element of ground movement due to vertical stress change. However, it is unlikely that the C580 data includes the long-term movements resulting from vertical stress changes. Total ground movements resulting from the proposed development are therefore taken as the sum of the predicted ground movements using C580, plus the difference in estimated PDISP movements between short and long-term conditions.

1.4 Summary of Ground Movements

In summary the cumulative short term effects of the pile installation and bulk excavation indicate that the No. 7 Redington Gardens will experience about 7.4mm of settlement and 9mm of horizontal movement on the nearest corner of the property with zero horizontal movements and 0.3mm vertical movement on the furthest side of the property.

As noted previously, it is unlikely that the C580 data includes the long-term movements resulting from vertical stress changes. Therefore total vertical ground movements resulting from the proposed development are taken as the sum of the predicted ground movements using C580, plus the difference in movement between short and long-term, as predicted from the PDISP analysis.

For the long-term drained condition, predicted movements of No. 7 Redington Gardens will be 6.2mm of settlement and 9mm horizontal movement on the nearest corner of the property with zero horizontal movements and 0.3mm settlement on the furthest side of the property.

On the basis of the above, the horizontal strain across No. 7 Redington Gardens is estimated to be around 0.09% with deflection ratios of between 0.08% (short term) and 0.06% (long term).

The combination of horizontal and vertical strains for the short-term and long-term conditions therefore suggests a damage category 3 and 2 respectively (slight to moderate) as classified within C580 for No. 7 Redington Gardens. The above assumes good quality working practice during pile construction is employed. Given the above categories of damage noted the Engineer may wish to consider the use of propping measures.

In the case of the nearby highway, a combined plot of horizontal and vertical movements associated with pile installation and bulk excavation are given in Figure CU1 and for the long-term drained condition Figure CU2. The Highway Department should be consulted in relation to the predicted movements. Again if the movements are considered unacceptable the use of propping measures may need to be considered. Given the magnitude of these predictions at the very least remedial works to the footway would be anticipated.

Finally a formal monitoring system should be employed during construction in order to observe and monitor ground movements, especially in critical areas such as boundaries and with neighbouring properties. Monitoring data should be checked against predefined trigger limits to give early indications if any deviating ground movements are occurring.

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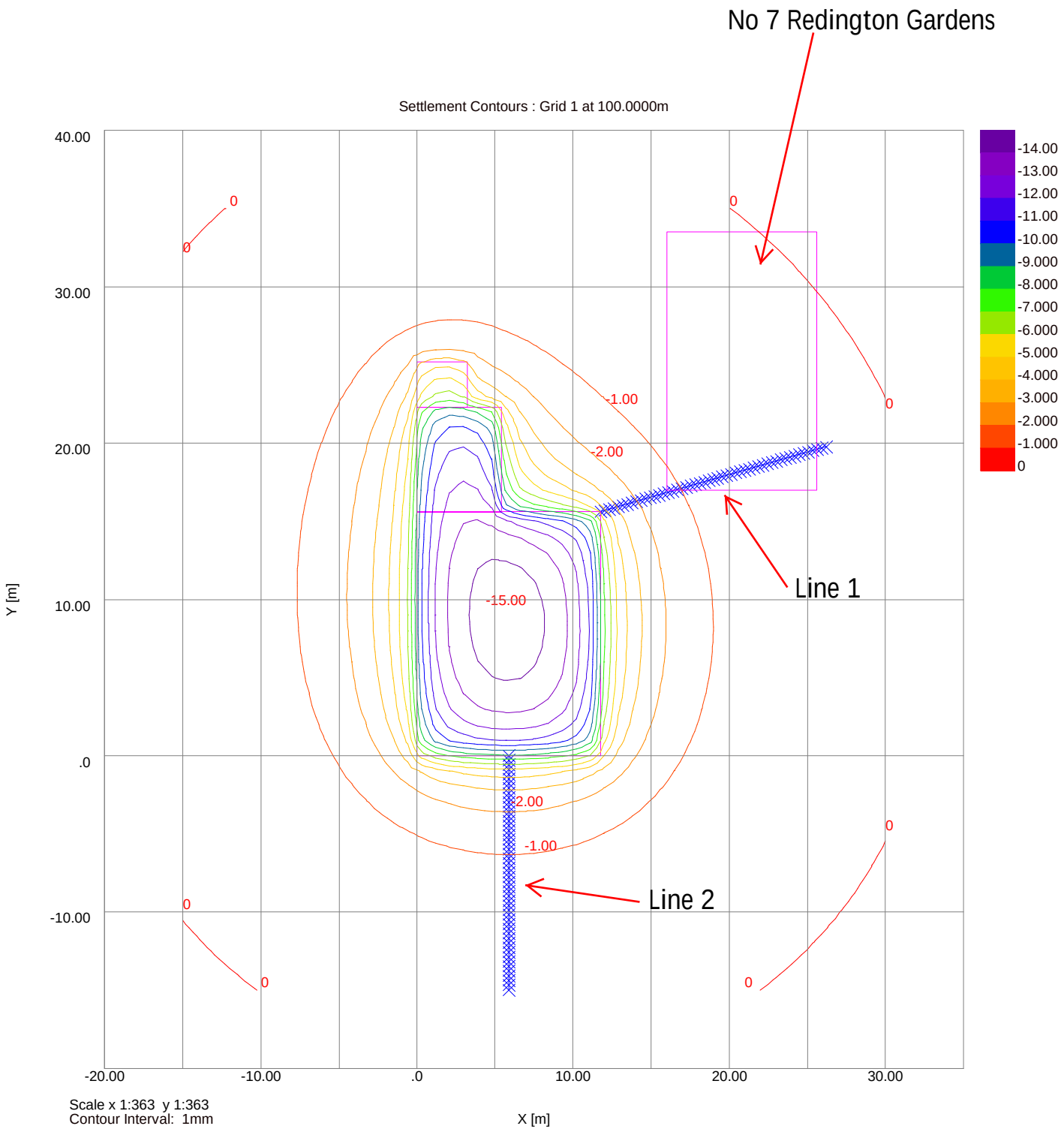
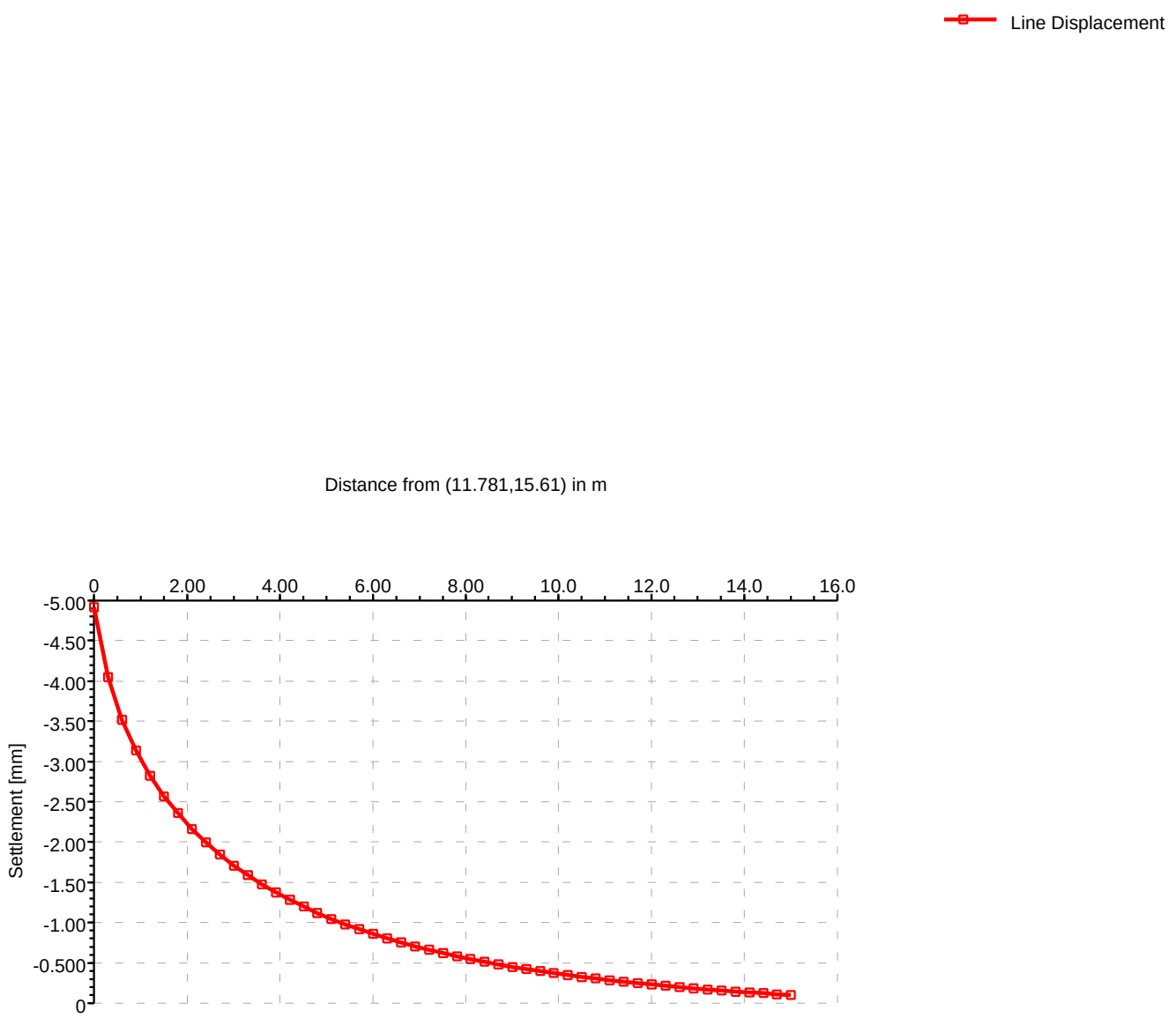
36 Redington Road
Undrained Analysis
Figure U1



Displacement for Line 1



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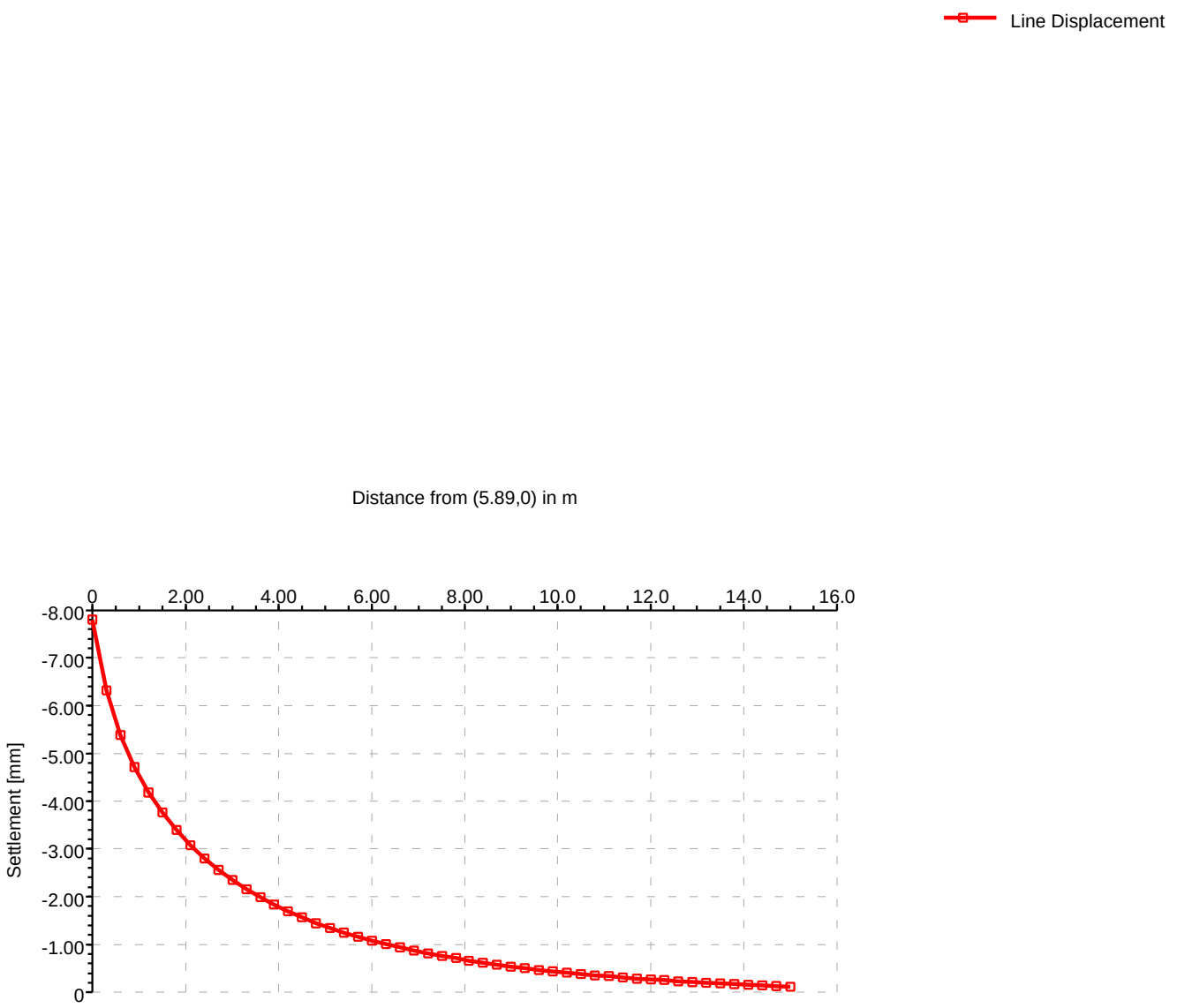

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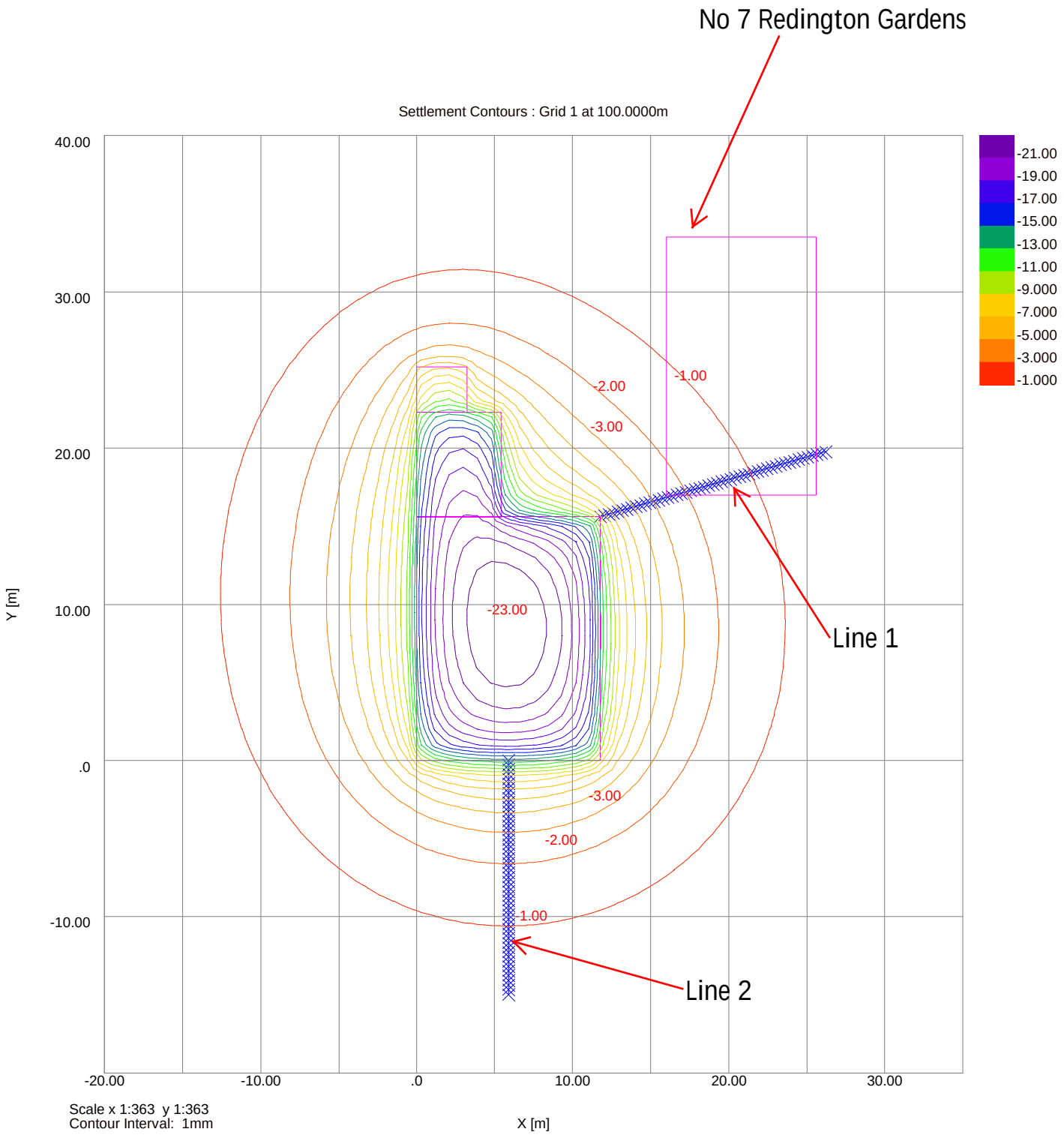
Made by	Date	Checked

36 Redington Road
Drained Analysis
Figure V1



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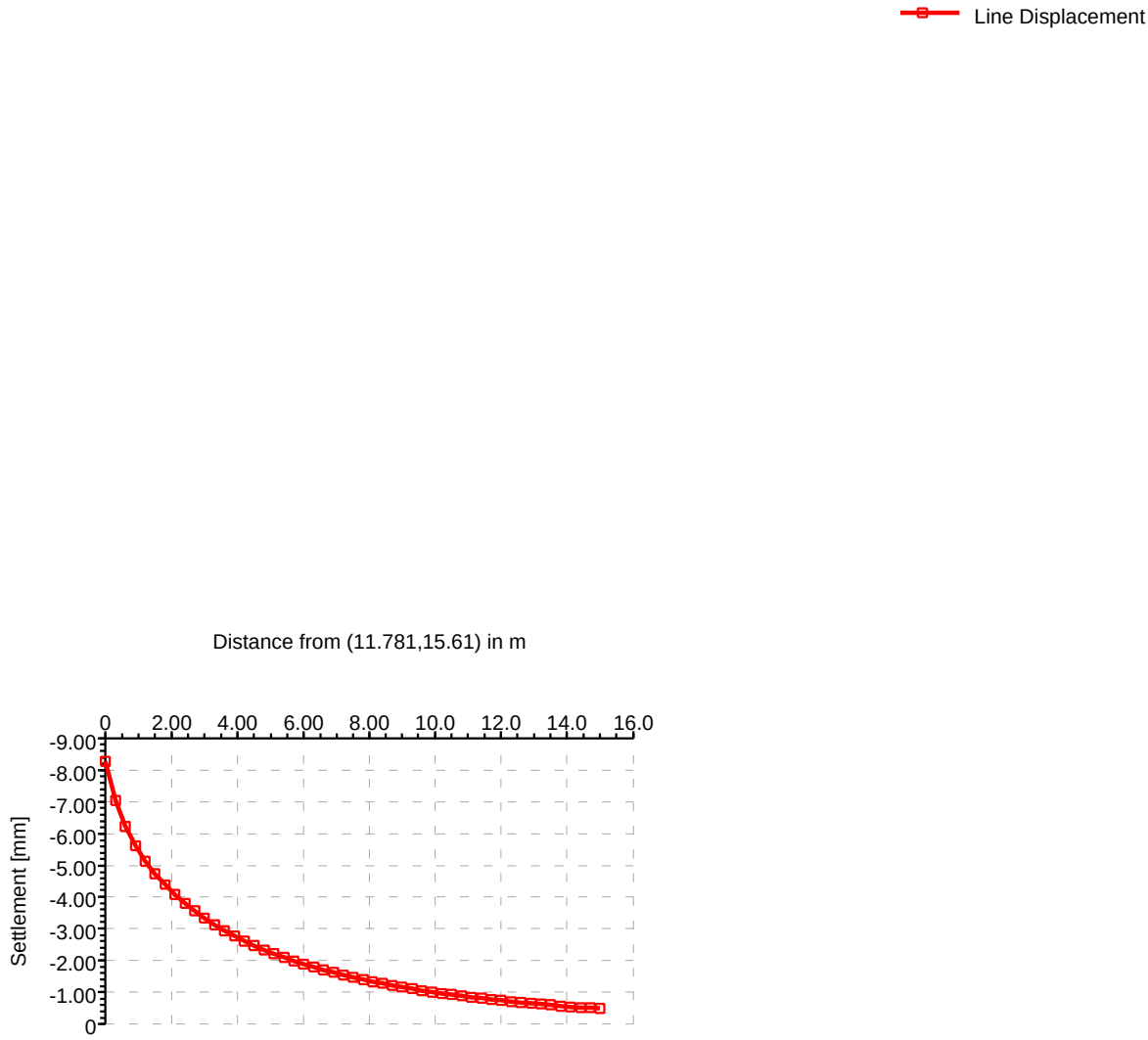

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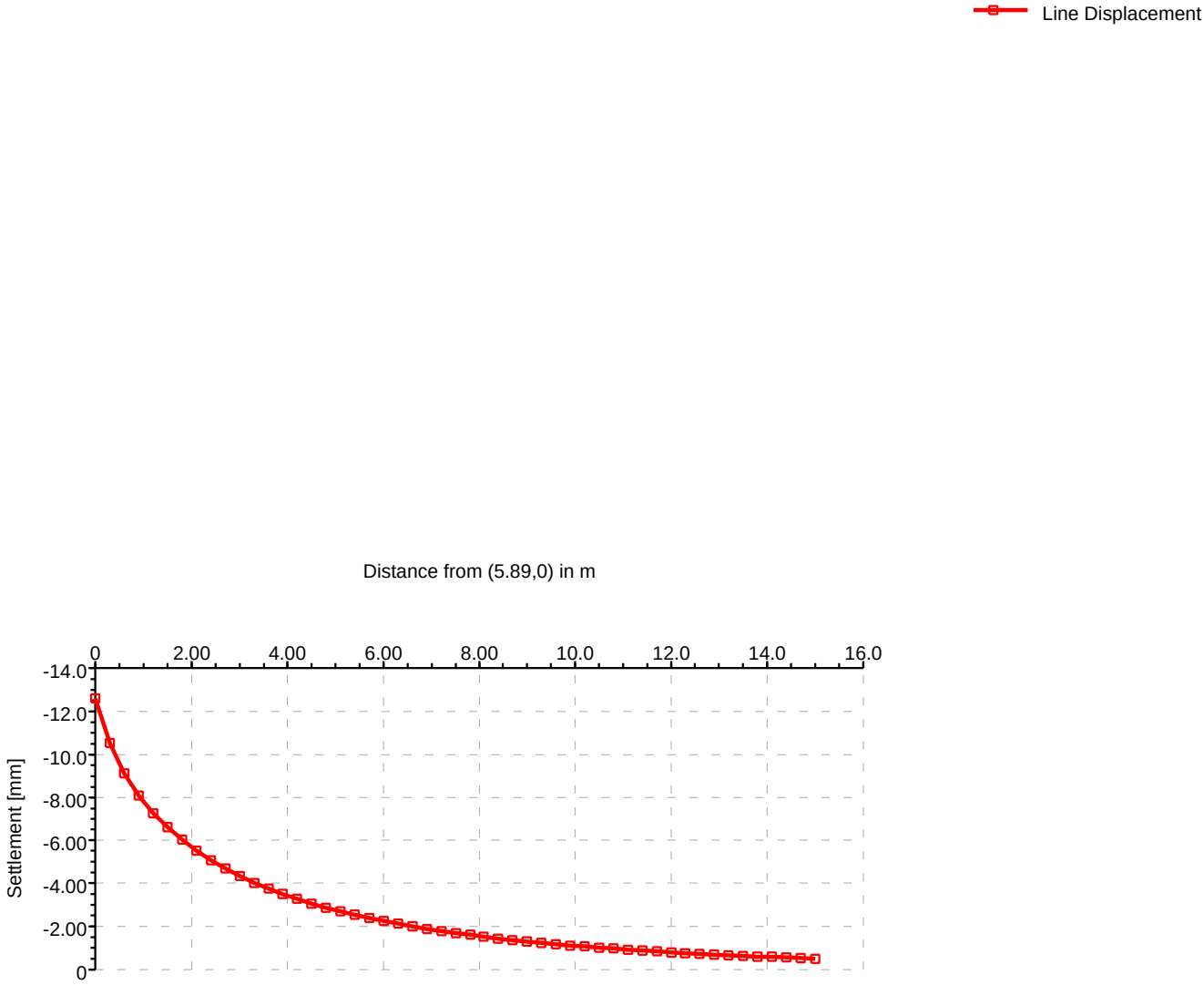
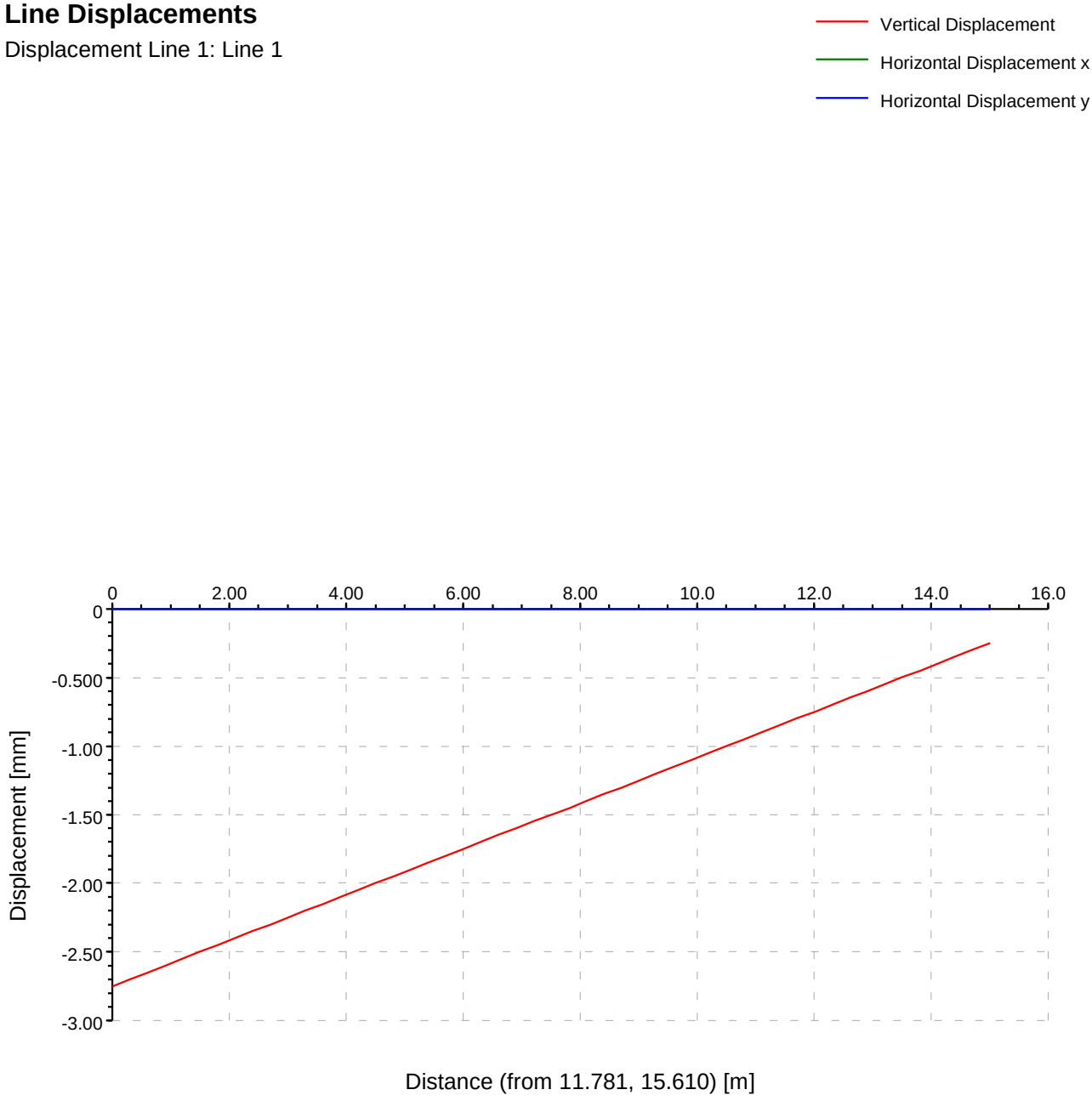


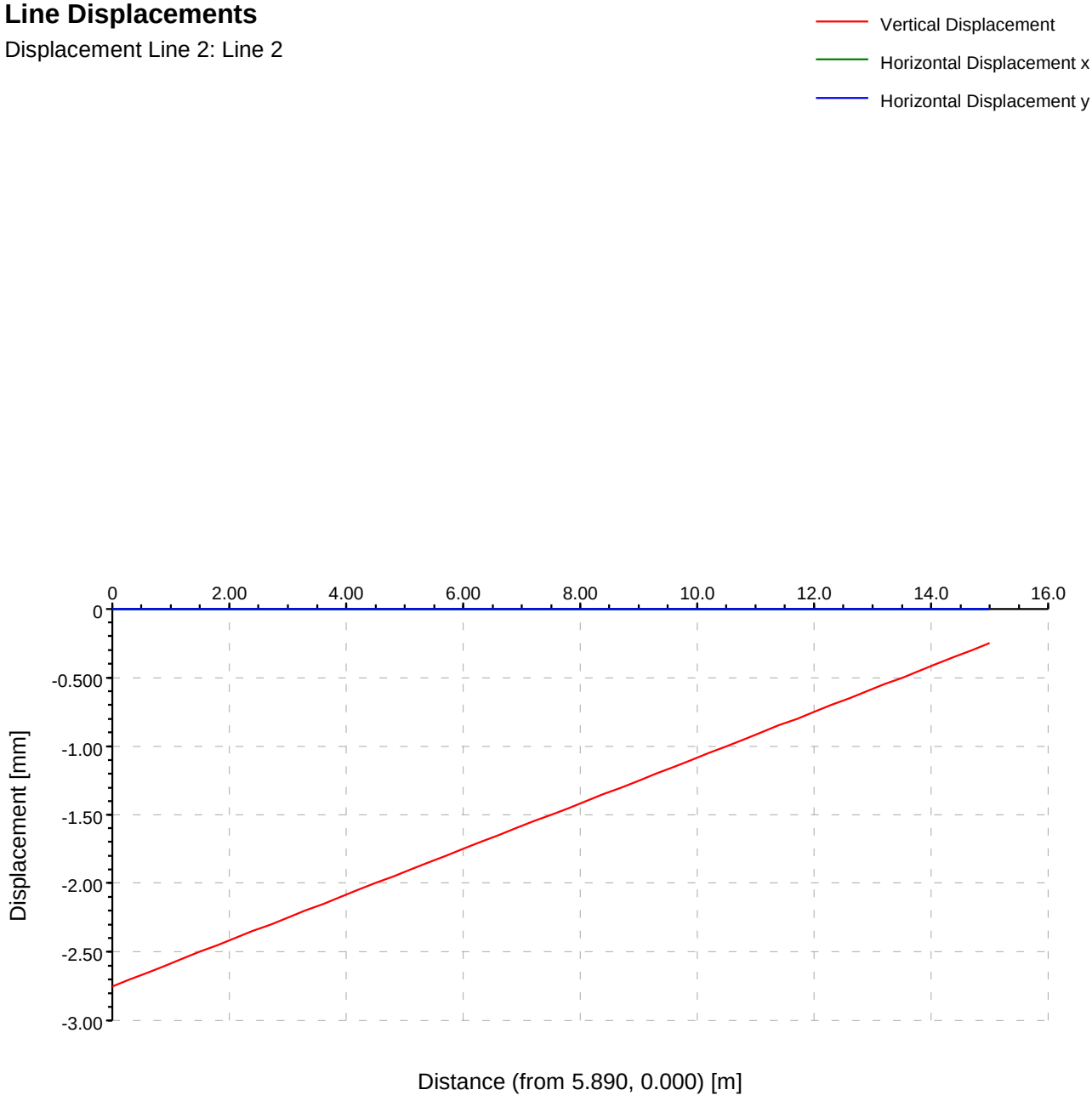
Line Displacements

Displacement Line 1: Line 1



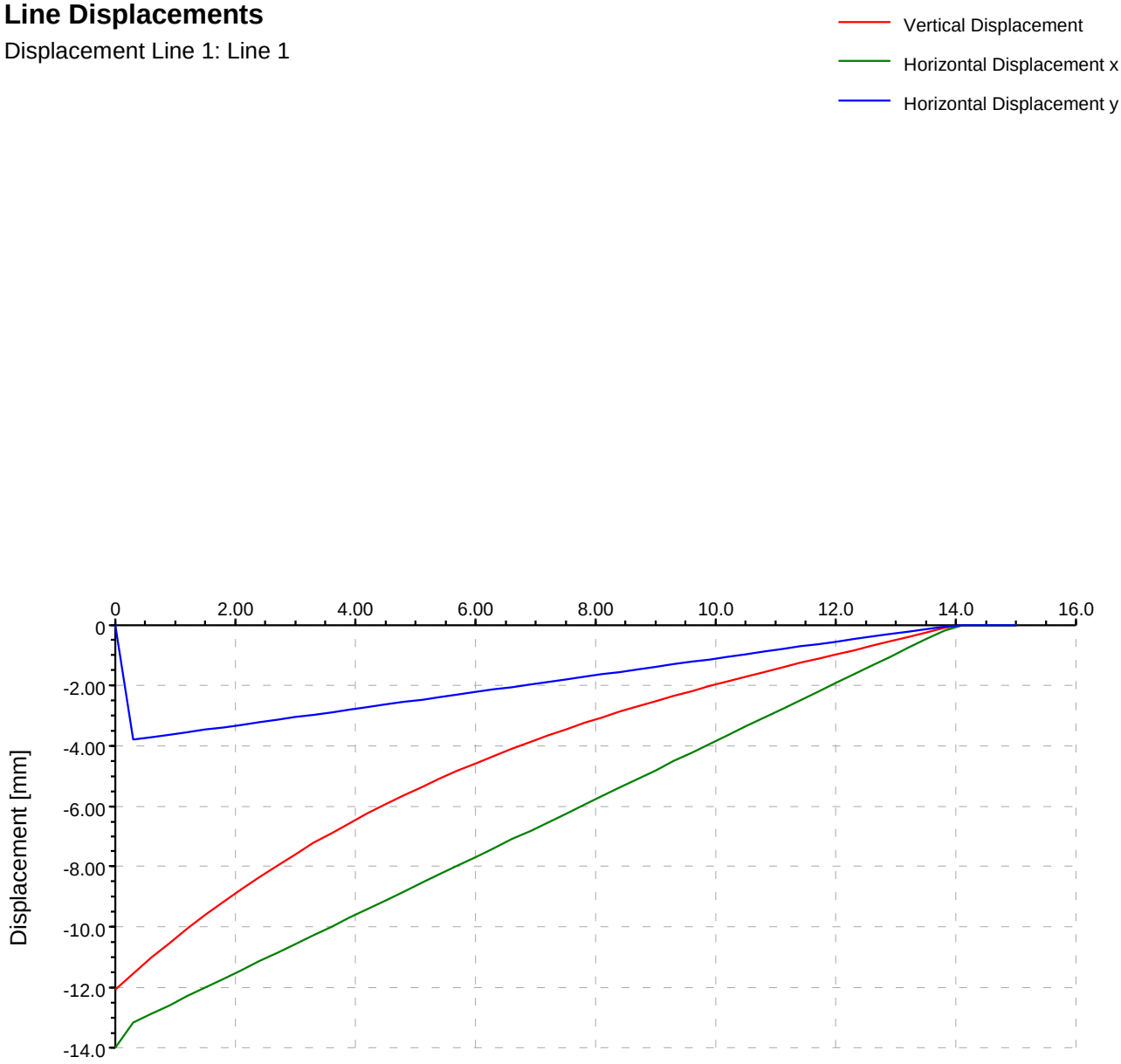
Line Displacements

Displacement Line 2: Line 2



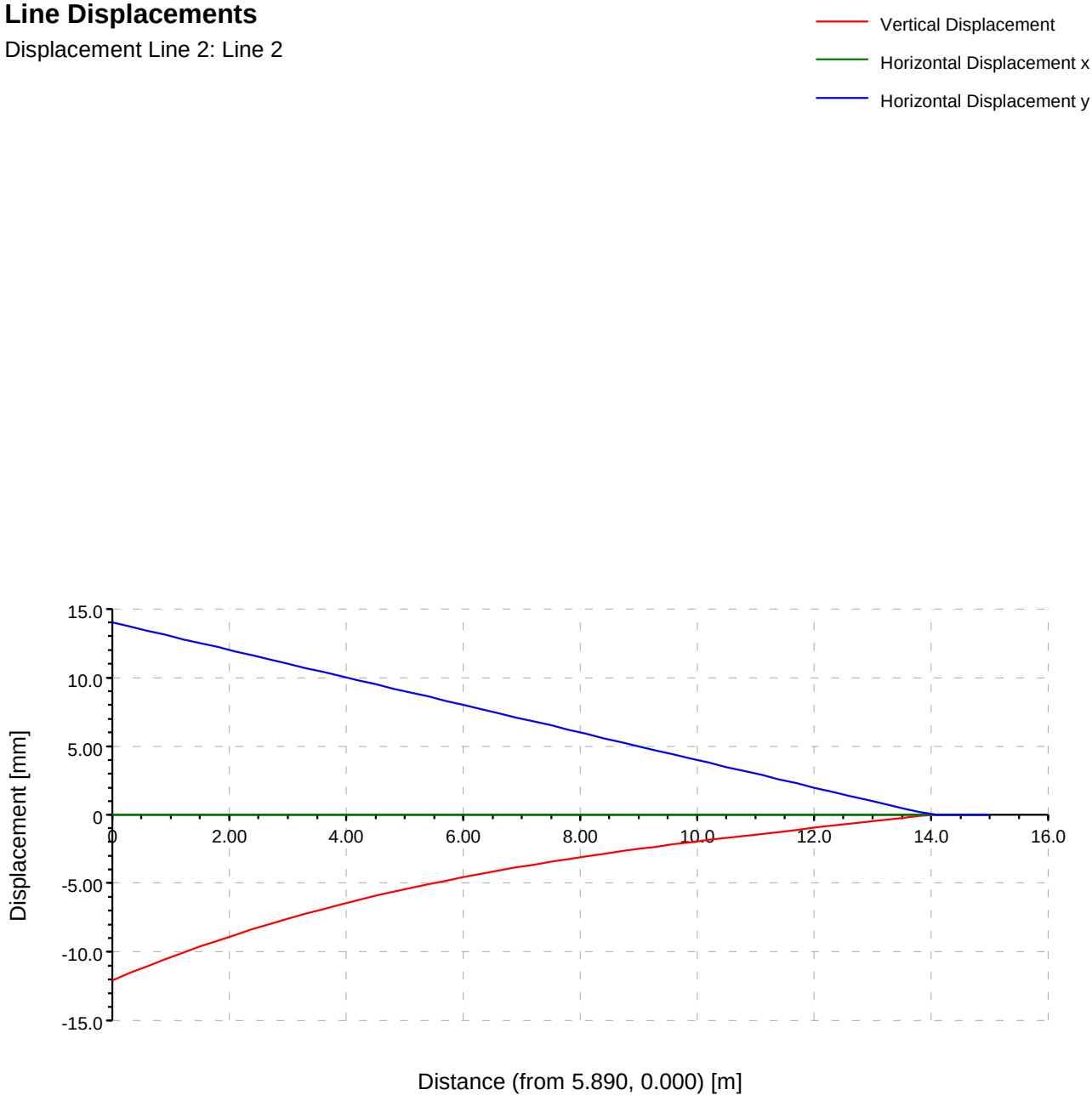
Line Displacements

Displacement Line 1: Line 1



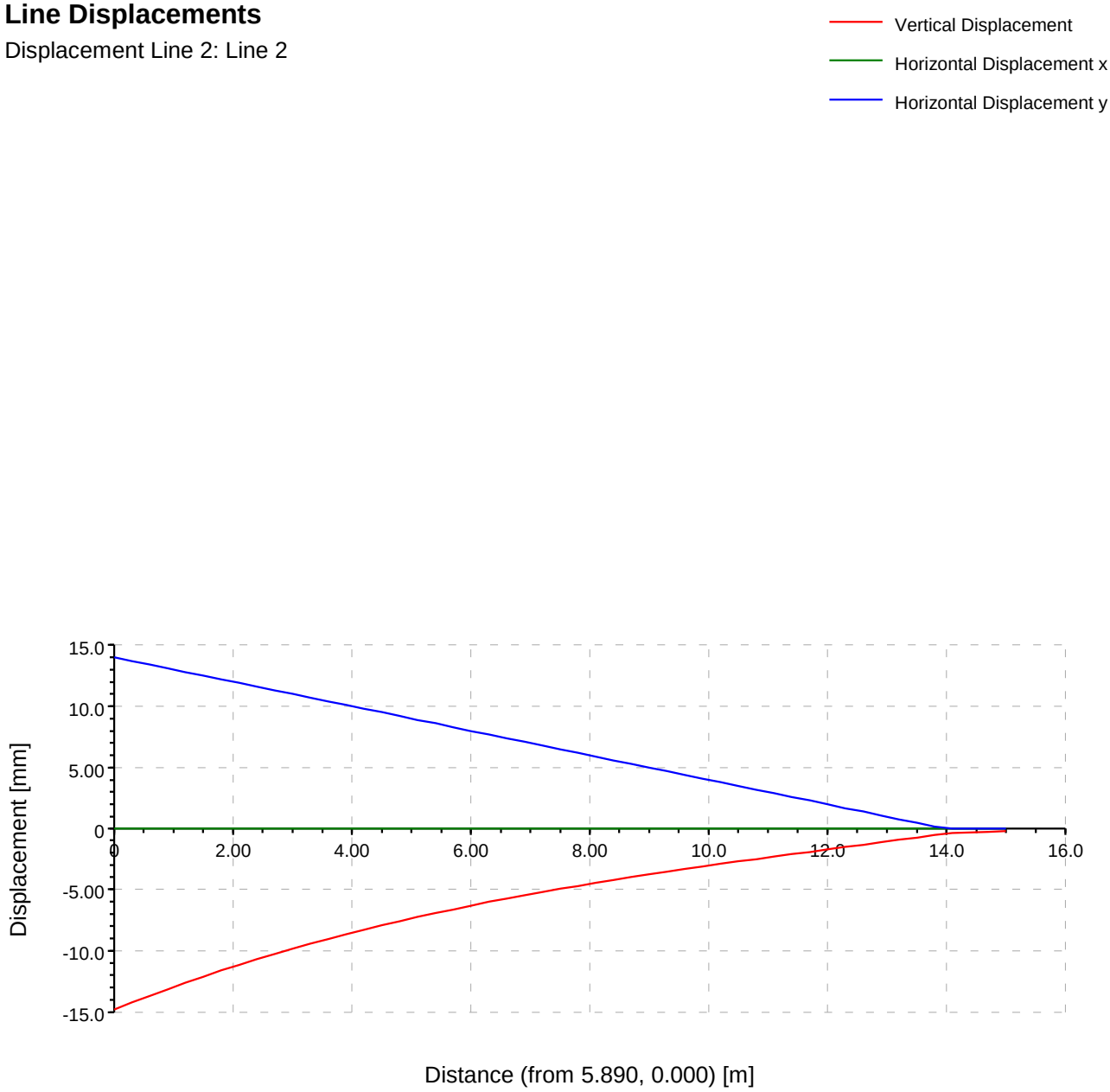
Line Displacements

Displacement Line 2: Line 2



Line Displacements

Displacement Line 2: Line 2



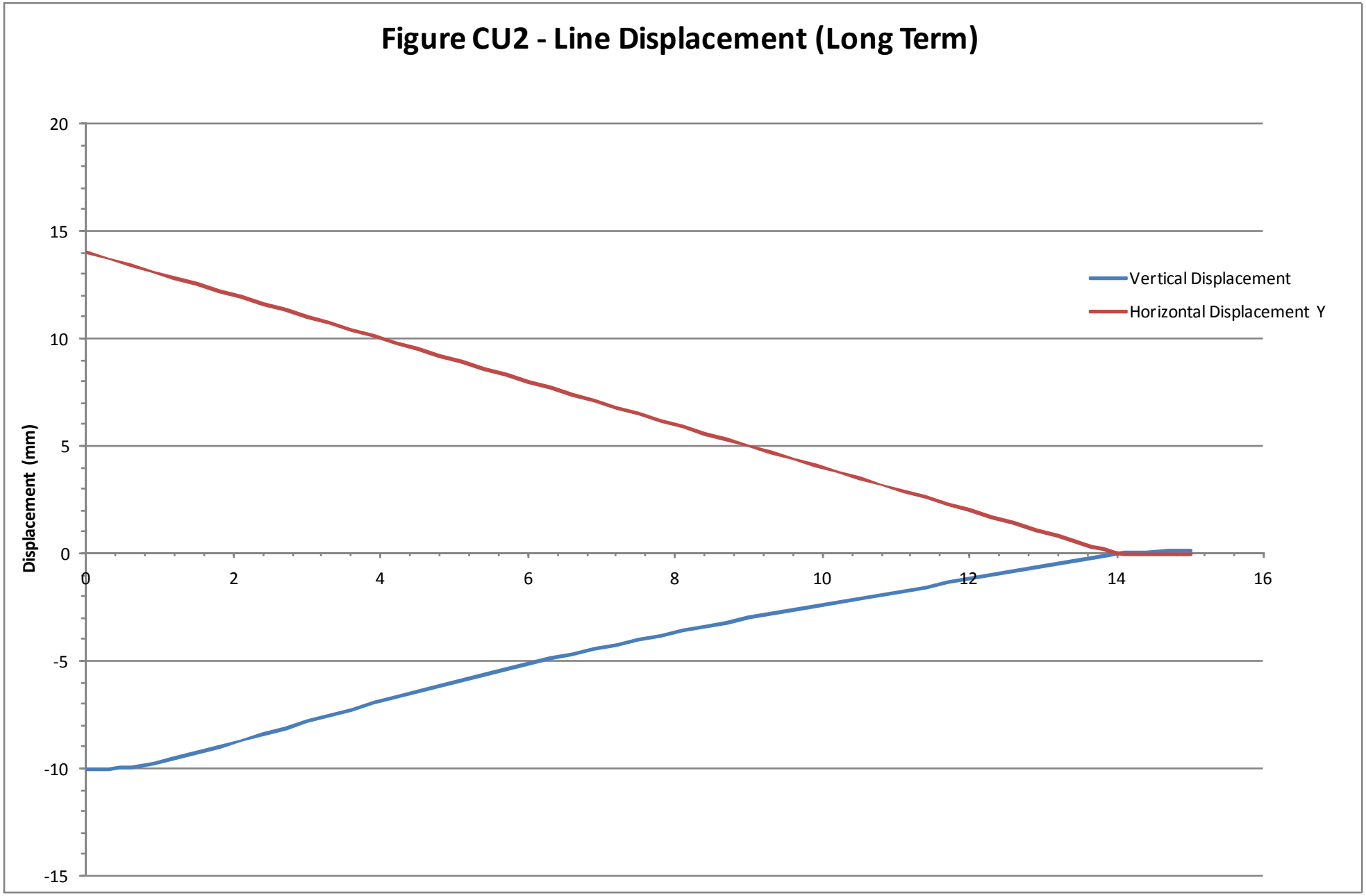


Figure CU2 - Line Displacement (Long Term)
Displacement (mm)
20
15
10
5
0
-5
-10
-15
0
2
4
6
8
10
12
14
16
Vertical Displacement
Horizontal Displacement Y