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August 12th 2005

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My reference::WARRINGTON/HPA/KSL/002

Your reference:11739/DIC/JMC

Report on trees associated with subsidence at 26/28 Warrington Crescent W9. Mr N Foster & Mr G Ridnell

Terms of reference:

The purpose of this report is to consider the effect of the surveyed trees included in the location diagram (Appendix 1) on the rear of 26 & 28 Warrington Crescent W9.

Date of inspection:

July 25th 2005

Documents provided

Preliminary Specialist Investigation Report by D.Carr Consulting Engineer dated March 1st 2005

Factual Report by PC &D dated December 22nd 2004

Soil tests by Ian Farmer Associates dated January 14th 2005

Root identification by Dr.Ian Richardson dated January 12th 2005

Crack monitoring from December 22nd 2004 to July 24th 2005

List of Appendices:

1. Tree table and scaled location diagram.
2. Photographs taken July 25th 2005
3. Extracts from 1868 and 1893 Ordnance Survey maps

1.0 History and topography of the site and surveyed trees relative to the reported damage to Numbers 26 and 28.

1.1 The southern end of Warrington Crescent which includes Numbers 26 and 28 was built in the early 1860s after construction of St. Saviours Church at the top of Warwick Avenue had been commenced in 1855. The original layout remains unchanged and has not been extended to the rear as suggested.

1.2 The northern end and the triangular communal garden at the rear was completed in the 1890s, the trees which are the subject of the current survey are plotted on the 1893 OS map, see appendix three.

1.2.1 This northern section of the Victorian development was stepped back from the line of trees simply because it was sited at the northern peak of the triangle formed by Warrington Crescent and Sutherland Avenue.

1.3 The surveyed plane trees have all the characteristics of late Victorian planting including the remains and scars caused by the old wrought iron tree guards.

1.3.1 The original trees were pollarded at 2m to 3m from ground level producing a framework of limbs about 1.5m in radial length which were within easy reach and traditionally they would have been repollarded to the same point usually on a one or two year pruning cycle.

1.3.2 This low framework of large limbs still survives in the trees at the rear of the northern, stepped back section of Warrington Crescent and in one tree on the extreme southern section.

1.3.3 Opposite to numbers 26/28 the original low limbs have been removed leaving single or double upright trunks bearing large callused wounds, see photographs one, two and three. All of the plane trees have been allowed to develop 16m high crowns and have been topped at about 10.5m to 11m. Judging from the trunk or limb diameter below the topping point this probably took place in the mid 1970s after a long period of neglect.
The surveyed trees now seem to be subject to regular topping or pollarding at height on a three year cycle.

1.3.4 Paradoxically the trees which still carry the low Victorian branch framework are far larger in total crown area than the the single and double trunks in front of Numbers 26/28, this is because the crown starts at 3m and extends to the full height of the tree.

1.4 The triangular amenity area at the rear is on a barely discernable slope downwards from north to south.
There are no remaining water courses still visible, the old Ranleigh open sewer which joined the River Westbourne further down stream was some 300m to the west of the site, both these water courses were piped well before 1900.

1.5 The triangular open space and all the trees and shrubs within it is managed by the Formosa Amenity Company which itself is owned jointly by the free holders of the adjacent properties in Warrington Crescent. All the trees are individually covered by tree preservation orders, in addition the properties are listed and part of the Conservation Area.

1.6 I have been advised by Mr.Roger Harper of Pembertons, Surveyors that the plane trees are pollarded at height on a three year rotation and that an application to repollard was submitted to Westminster City Council in June of this year. Usually applications are dealt with in about eight weeks but the Formosa Amenity Company do not intend to carry out the proposed tree work until October 2005.

1.6.1 The regrowth on the trees at the moment supports Mr. Harper's description of the pruning cycle which means that the last pruning work would have been carried out at the end of the 2002 growing season, ie in the autumn of 2002 or the winter of 2002/2003. The timing is critical and will be discussed in paragraph 5.0 below, briefly this means that the trees would have carried only first year growth during the drought of summer 2003.

2.0 The following information was provided informally by Mr. G. Ridnell during my site inspection.

2.1 Mr. Ridnell has lived in the basement flat of No 28 since December 2004. Cracking was first noticed by Mr. Ridnell in about June of this year. No doors have stuck to date.

3.0 Brief summary of trial pit and bore hole data

3.1 The single trial pit and borehole was excavated at the base of the rear elevation opposite to the party wall between Numbers 26 and 28.

3.2 The rear elevation is founded at a depth of 0.7m on medium swell potential clay , desiccation was found below a depth of 1.5m.

3.3 Live plane roots were identified at the underside of the foundation. Roots too fine for identification, but thought not to be plane, were also found at the underside of the foundation. Fine roots were observed but not identified to a depth of 1.4m.

4.0 Crack monitoring.

4.1 All four crack monitors closed from December 22nd 2004 to June 5th 2005, 1A by a maximum of 3.25mm and 1C by a minimum of 0.17mm. This modest but steady closure has taken place in spite of the exceptionally dry winter and spring.

4.2 The July 24th readings were taken during the peak growing season and show a maximum opening of 2.84mm. The readings to date are entirely consistent with the influence of vegetation.

5.0 Discussion.

5.1 At the present time the trees are at their maximum size in between pruning operations ie they have just peaked after three growing seasons. This is the weakness of pruning at height on a three year cycle, in July and August 2005 maximum crown surface area has coincided with a severe drought after the driest winter on record.

5.2.1 The last severe drought was in late summer 2003 but if the pruning schedule was followed then the trees would have been at their smallest size within the three year cycle. In this case during their first year's growth after pruning in the autumn and winter of 2002 / 2003.

5.2.2 Mr. Carr found that previous damage was repaired in 2002 and then recurred in the summer of 2003 see DIC paragraph 3. The 2002 damage could tally with the peak size of the trees ie in the third year of growth but further damage in summer 2003 means that the three year pruning cycle was unequal to severe drought conditions.

5.3 The two terraces and the surveyed trees on the rear boundary have coexisted for well over 100 years. However at the current stage of the investigation we have no reliable history of any earlier damage which may have been associated with trees or how the properties reacted to the major droughts since 1976. For instance I would expect damage to have taken place well well to the left or north of Numbers 26 & 28 simply because the last tree carries a much bigger crown and is about 5.5m from the rear elevation.

5.3.1 There are obvious gaps in the line of trees which suggests that at least two trees have been lost, the reason for their removal is currently unknown.

5.3.2 There is no doubt that the remaining trees have been subject to completely different pruning regimes, some trees still carry multi stemmed crowns from the Victorian pollard framework howbeit that they have been allowed to reach the common height of 16m to 17m. Others have been reduced to a single trunk and carry large and partially decayed pruning wounds where the old pollard limbs have been cut back to the trunk.

5.3.3 All the surveyed trees have recently been subject to the same three year pollarding cycle at 10m to 11m from ground level for six or seven years at least. However we do not know when, or more importantly, why this was instigated or how large the trees were before reduction.

6.0 Conclusion.

6.1 I believe that the principal cause of the reported damage to Numbers 26 and 28 is seasonal soil moisture extraction by the plane trees at the rear of the property, notably T3, T4, T5 and T6.

6.2 This opinion is supported by the following matters of fact:

6.2.1 The identification of plane roots beneath the foundation.

6.2.2 Soil tests show that the foundation bears upon desiccated highly shrinkable clay.

6.2.3 The crack monitoring shows seasonal variation entirely consistent with the active and dormant growth cycle of the trees.

7.0 The option of remedial tree work.

7.1 The incidence of damage in 2002 and the return of further damage in 2003 demonstrates that the current pruning system has not protected Numbers 26 and 28, if structural measures are to be avoided then an alternative tree management system has to be considered, such measures include:

7.2 Increase the frequency of pollarding at the current height

7.2.2 The main disadvantage would be cost, pollarding at height already costs some £275.00 per tree every three years.

7.3 Reduce the height of the pollard framework in an attempt to restore the traditional Victorian annual or biennial pollarding at 5m.

7.3.1 This would now be a difficult and slow process because most of the old cutting points have been completely removed, some of the old pruning wounds have decayed and the single trunks are malformed.

8.0 Alternative long term tree management measures.

8.1 The cost of pollarding say 5 of the boundary trees on the southern section at 11m every three years could be in the order of £1375.00. Add to this the harsh appearance of the topped trees, the threat of damage, the cost of structural repairs and the possible short term safe life expectancy of some of the trees then the option of removal and replacement becomes economically and aesthetically attractive.

8.2 A cheap alternative would be to remove T3, T4, T5 and T6 Plane. Because of the existing gaps in the row of planes this would provide room for ten silver birch planted at 3m centres, Birch would establish very quickly and need very little maintenance for the next thirty years.

9.0 Summary of conclusions and recommendation.

9.1 The cause of subsidence to Numbers 26/28 is seasonal desiccation by the plane trees on the amenity land at the rear of the property.

9.2 Formosa Amenity Co Ltd are responsible for the open space but do not intend to prune the plane trees until October 2005. Any alternative pruning system or selective tree replacement would need another planning application.

9.3 The history of damage to both properties and the continuing crack monitoring of Number 26 shows that the current three year pruning cycle is inadequate.

9.4 The best solution is to remove at least the planes affecting Numbers 26/28 and replace with a low moisture demand species such as silver birch.

9.5 In the long term tree replacement would be largely financed by avoiding the present costly and inadequate three year cycle of pollarding at height.

H. Paul Arnold.

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26 Warrington Crescent, London W9.

Location \ Date	22-Dec-04	13-Mar-05	24-Apr-05	05-Jun-05	24-Jul-05
Monitor No.1A	43.00	41.85	40.45	39.75	42.59
Monitor No.1B	48.33	47.82	47.56	47.53	48.10
Monitor No.1C	51.92	51.71	51.75	51.76	51.72
Monitor No.2A	32.05	31.19	30.22	29.76	31.67
Monitor No.2B	47.41	47.23	47.31	47.29	47.33
Monitor No.2C	45.48	44.91	44.43	44.10	45.21

Date	Monitor No.1A		Monitor No.1B		Monitor No.1C		Monitor No.2A		Monitor No.2B	
	Reading	Movement	Reading	Movement	Reading	Movement	Reading	Movement	Reading	Movement
Dec-04	43.00	0.00	48.33	0.00	51.92	0.00	32.05	0.00	47.41	0.00
Mar-05	41.85	-1.15	47.82	-0.51	51.71	-0.21	31.19	-0.86	47.23	-0.18
Apr-05	40.45	-2.55	47.56	-0.77	51.75	-0.17	30.22	-1.83	47.31	-0.10
Jun-05	39.75	-3.25	47.53	-0.80	51.76	-0.16	29.76	-2.29	47.29	-0.12
Jul-05	42.59	-0.41	48.10	-0.23	51.72	-0.20	31.67	-0.38	47.33	-0.08
0	Max	0	Max	0	Max	0	Max	0	Max	0
-3.25	Min	-3.25	Min	-0.8	Min	-0.21	Min	-2.29	Min	-0.18

Monitor No.2C	
Reading	Movement
45.48	0.00
44.91	-0.57
44.43	-1.05
44.10	-1.38
45.21	-0.27
Max	0
Min	-1.38

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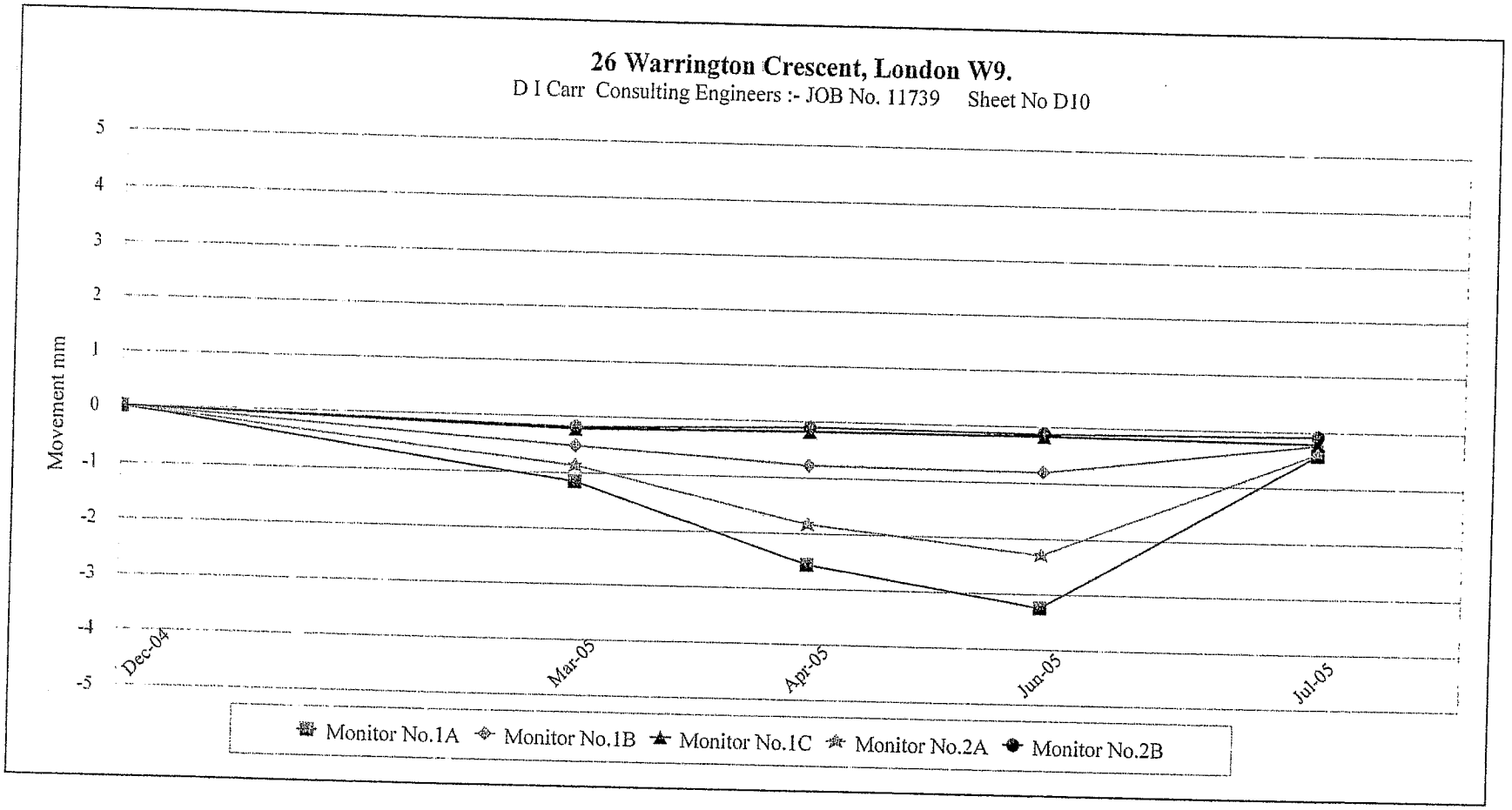

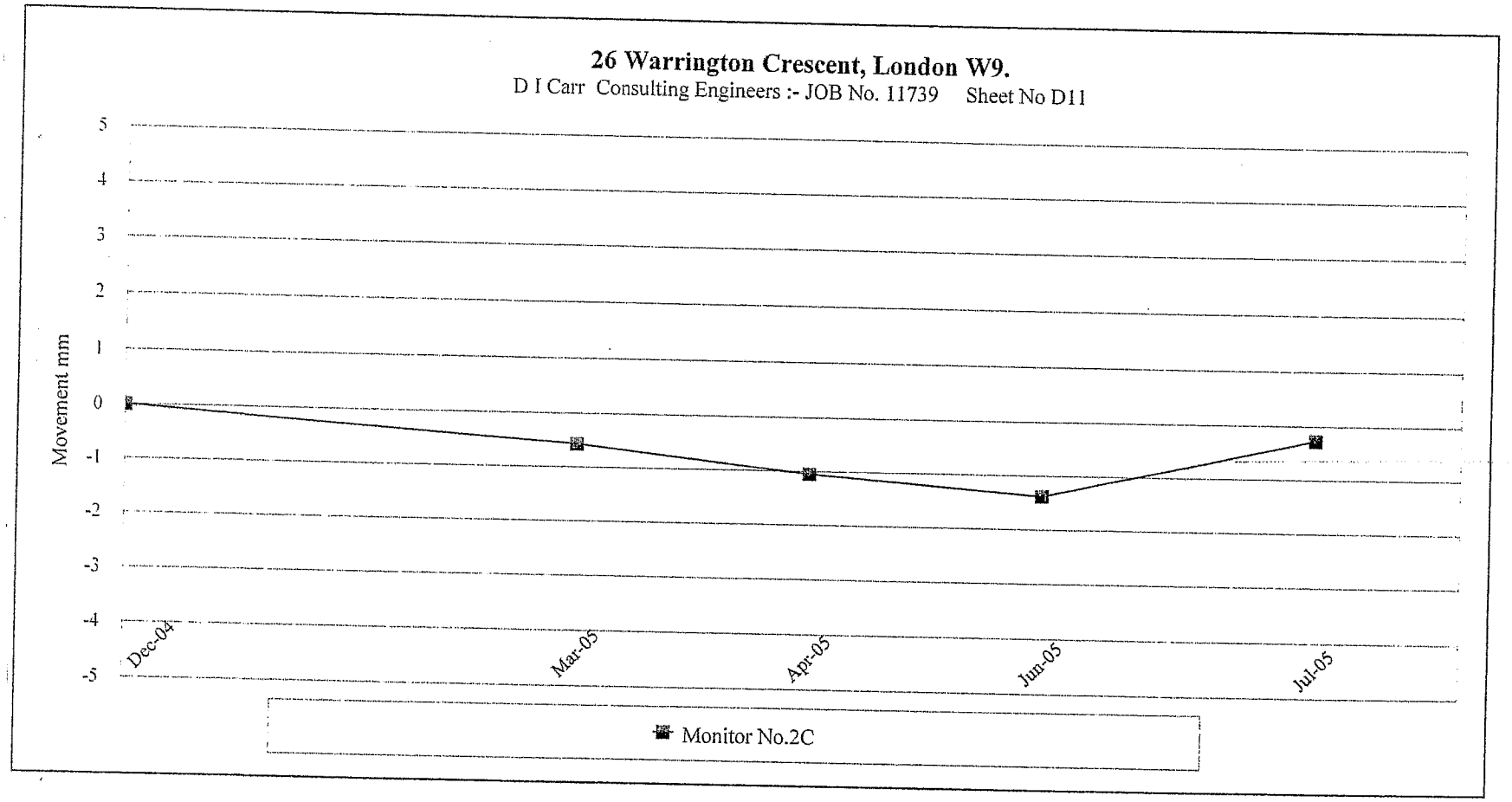
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Movement mm
5
4
3
2
1
0
-1
-2
-3
-4
-5
Dec-04
Mar-05
Apr-05
Jun-05
Jul-05
Monitor No.2C