Simon Pryce Arboriculture

Report

Client:	**Dr S Michie**
Site:	**Rear of 106 Highgate Road, London, NW5 1PB**
Subject:	**Trees and their implications for foundation design, effects of the proposal on the trees**
Inspection date:	**11 August 2016**
Report date:	**17 August 2016**
Reference:	**16/046**
Author:	**Simon Pryce, B.Sc., F.Arbor.A, C.Biol, M.I.Biol, MICFor Arboricultural Association Registered Consultant**

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1 Introduction

1.1 This report has been prepared on the instructions of Snelling & Sheriff on behalf of Dr Michie, the owner of 106 Highgate Road, NW5 1PB in connection with the proposal to extend the lower ground floor to the rear.

1.2 I have been asked to inspect trees growing near the area concerned, to identify them, assess their condition and advice on the implications for the proposed work, in particular the foundation depths that would be required in order to comply with the specifications in NHBC Standards Chapter 4.2, Building near trees. Details of the foundation design and other structural matters are being dealt with by Consulting Engineers Michael Chester & Partners of Mill Hill.

1.3 I have also assessed possible effects of the work on the trees.

1.4 This report is based on a site visit and inspection on the morning of 11 August 2016 with Michael Snelling. The trees were inspected from the rear garden of no.106 and from no.108 by arrangement with the residents.

1.5 General matters are discussed below and the trees are listed in the attached schedules with dimensions and other relevant information. They are shown on the site plans, based on an original drawing by Snelling & Sherriff.

2 Background

The site

2.1 No.108 Highgate Road is a Victorian terraced house between no.108 to the left and 104 to the right, both similar dwellings, although 104 has a modern conservatory built onto the rear, extending out at existing lower ground floor level. No. 106 has an original single storey outbuilding at the rear left, the back wall of which is formed by the boundary wall with the rear garden of no.104.

Proposal

2.2 The proposal is to demolish the existing rear outbuilding and to extend the lower ground floor into the rear garden to occupy the former outbuilding footprint and extend across the full width of the garden. The attached plans show the existing site and the new footprint has been superimposed in blue.

Ground conditions

2.3 There is no record of any on site investigation of ground conditions but the 1:50,000 online British Geological Survey (BGS) shows the local subsoil as London clay, which is several metres deep in this area.

3 Trees

3.1 There are some small shrubs and other non woody vegetation in the rear garden of no.106, but the only trees in the vicinity are a quince in the rear garden of no.104 and a rowan and golden rain tree (also known as pride of India) in the rear garden of 108. There is also a large ivy growing on the roof of the outbuilding and up the back walls of 106 and 108.

3.2 The local planning authority is the London Borough of Camden and the houses are in Dartmouth Park Conservation Area. Their web site does not have any site specific information about tree preservation orders (TPOs), but their records show that they permitted the pruning of the golden rain tree in 1995 and 2008 under the conservation area procedures, which suggests that it is not subject to a TPO.

4 Discussion

General comments

4.1 Tree roots grow with little force but can damage buildings and other heavy structures indirectly if the sub soil is a clay that shrinks as it is dried by the roots extracting water and the foundations do not extend below the zone affected. The local subsoil is London clay, which has a high potential for shrinkage and swelling with changes in moisture content, which could lead to problems with the proposal if the foundations are not designed to accommodate likely effects of the trees.

4.2 New buildings can be made more resistant to this by deepening the foundations beyond the depths to which roots from nearby trees are likely to cause significant shrinkage. The National House Building Council's current guidelines, NHBC Standards, Chapter 4.2, 2016 specify suitable depths, based on:

1. The shrinkage potential of the soil (Plasticity Index).
2. The distance between the building and any trees to be retained within likely influencing distance.
3. The likely mature size (height) of the tree and its water demand; species are classified High, Medium or Low water demanders.

4.3 The standard contains list of the commoner trees with likely maximum heights and water demand categories to be used in the assessment. Two of the trees here are not listed and the standard advises that "*Information may be obtained from suitable alternative authoritative sources for trees not listed in this chapter.*"

Assessments

4.4 The local subsoil is London clay, so the assessment is based on a highly shrinkable soil and the distances between the trees and new building are matters of fact. This leaves the assessment of the tree's water demand categories and potential maximum heights.

1) Golden rain tree

4.5 This is native to east China and Korea and has no closely related species hardy in the UK, but is distantly related to maples (*Acer)* and horse chestnuts (*Aesculus)*, which are generally moderate water demanders. It is not particularly rare yet there appear to be no cases of it causing subsidence. These points suggest that it is a moderate water demanding species. It is known to reach 15m in the UK, although this one has been reduced and, given its location near the back of no.108, it is likely that it will be maintained at a reduced size. This gives a foundation depth of 2.0m for the nearest part of the building.

2) Rowan

4.6 This is the only tree listed by the NHBC Standard and is considered a moderate water demander with a maximum mature height of 11m. In fact this one is being suppressed by the golden rain tree, is diseased and in decline, so the likelihood of it attaining full size and vitality is minimal. The calculated foundation depth is 2.1m.

3) Quince

4.7 This is not listed by the NHBC, but is a member of the Pomoideae family, closely related to apples and pears and sometimes used as a root stock for fruiting pear trees. Apples and pears are all moderate water demanding species although hawthorn, which is in the same family is classified as high. Quinces are capable of reaching 10m, although that is exceptional, this one has been reduced a few years ago and is in a location overhanging the conservatory where it might well be maintained to stop it reaching full size. Calculated depth from the Standard is 2.2m.

4.8 The foundation depths above are all measured from ground level at the base of the tree to the base of the foundation. The model of root growth in the standard assumes uniform growing conditions, which is not the case here, as the foundations of the existing buildings will inhibit root growth, leading to increased spread in other directions. However there is nothing to suggest that the root systems will be so irregular in extent and depth as to warrant increasing the calculated depths, other than the usual proviso that they might need to be reviewed if roots are found at greater depths during the work.

Heave

4.9 Large vigorous trees can cause a persistent moisture deficit at depth where the soil does not rehydrate fully in winter. If these die or are removed the consequent prolonged rehydration and swelling of the desiccated soil can lead to heave damage in buildings nearby, especially if they were built after the moisture deficit established. These three trees are relatively small and unlikely to have caused any persistent desiccation to date, although they are capable of some more growth. The new foundation could incorporate anti-heave measures if the engineers consider that appropriate.

Effect of the building on the trees

4.10 Building work can damage existing trees and measures to avoid this are specified in British Standard 5837: 2012, Tree in relation to design, demolition and construction – Recommendations. One of these is that root protection areas (RPAs) are established round retained trees and that no ground work takes place within them. The starting point is that a single trunked tree's RPA has an area equivalent to a circle with a radius 12 times the trunk diameter measured at 1.5m above ground. Where existing site conditions or other factors indicate that root spread is asymmetrical, the RPA shape should be adjusted to a polygon of the same area, provided this reflects a sound assessment of likely root distribution.

4.11 The second schedule contains the relevant dimensions for the RPAs of these trees and they are shown on the second site plan. The RPA of tree 2 does not extend into 106 at all. With tree no.1 0.3m^2 of the RPA is under the building footprint, while with tree 3 the figure is 0.4m^2. These amount to 0.7% and 3% of the RPAs respectively, which is insignificant and well within what healthy trees like these will tolerate, especially as both have easier rooting conditions in other direction within the gardens in which they are growing.

4.12 Trees can tolerate root losses, so the RPAs do not represent the entire root system, which will normally extend farther. They are also are based on the size of the tree when surveyed. Therefore the fact that the RPAs do not currently extend under the building does not conflict with the NHBC assessment.

4.13 These trees are all in adjacent gardens and this is a small scale project with the only access through the house, so they are not vulnerable to incidental damage from the work. The existing boundary walls and site layout will safeguard them without any need for additional tree protection measures.

5 Conclusions

5.1 The local subsoil is London clay, which is highly shrinkable and which creates a potential for trees to cause subsidence in buildings.

5.2 Suitable foundation depths have been calculated using NHBC Standards Chapter 4.2, 2016. Where trees are not listed in the standard the water demands and growth rates have been assessed by comparison with related species.

5.3 The trees are all growing in adjacent gardens and are not vulnerable to direct or incidental damage from the proposal. The existing boundary walls will safeguard them without any need for additional protective measures.

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Arboricultural Association Registered Consultant

Tree no.	Species	Distance D	Height	Trunk dia.	Max ht H	WD	D/H	depth	Comments
The trees are described in sequence as shown on the plan. Maximum heights and water demands for tree 2 are from NHBC Standards Chapter 4.2, trees 1 and 3 are not listed in the standard and the figures are derived as set out in the report. Depths are based on highly shrinkable clay. M = moderate water demand.									
1	Golden rain tree	3.25m	8m	300mm	15m	M	.22	2.0m	Exotic species with no close relatives hardy in the UK for comparison, although it is distantly related to maples and horse chestnuts, which are generally moderate water demanding species. It is unusual but not very rare yet there appear to be no recorded cases of it causing subsidence. Medium sized tree of moderate growth rate so is probably moderate water demand. This one is close to the back of the house and has been crown reduced periodically, no doubt to maintain clearance. Camden's records show that being allowed in 1995 and 2008.
2	Rowan	1.8m	5m	110mm	11m	M	.16	2.1m	One sided and being suppressed by the golden rain tree and has signs of fire blight in some twig ends. Classified by NHBC as a moderate water demander but is in the lower part of the category. It has sparse foliage, indicating decline, its healthy life expectancy is limited and it would be beneficial to remove it to limit the spread of the disease.
3	Quince	1.3m	5m	160mm	10m	M	.13	2.2m	Healthy looking, although it is in the adjacent garden and decking has been built round the base with the trunk emerging from a hole. Not listed by NHBC but is closely related to apples and pears, in fact it is often used as a root stock for grafted pears. There it has been treated as moderate water demand.

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106
Highgate Rd

EXISTING Rear Gardens - plan

PROJECT: 106 Highgate Road, Fitzroy Terrace NW5 1PB
DRAWING No: 106 Highgate Rd existing plans.21
DATE: July 2016
SCALE:
SNELLING & SHERRIFF

A3 sheet @ 1/50 scale

Simon Pryce Arboriculture

Client:
Dr S Michie

Site:
106 Highgate Road, London,
NW5 1PB

Title:
Tree survey - foundation depth assessment

Date: 11 August 2016

Ref: 16/046 | Rev:

Scale: 1:100 at A4

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Original drawing:
Michael Snelling

Notes:

106
Highgate Rd

EXISTING Rear Gardens - plan

PROJECT: 106 Highgate Road, Fitzroy Terrace NW5 1PB
DRAWING No: 106 Highgate Rd existing plans.21
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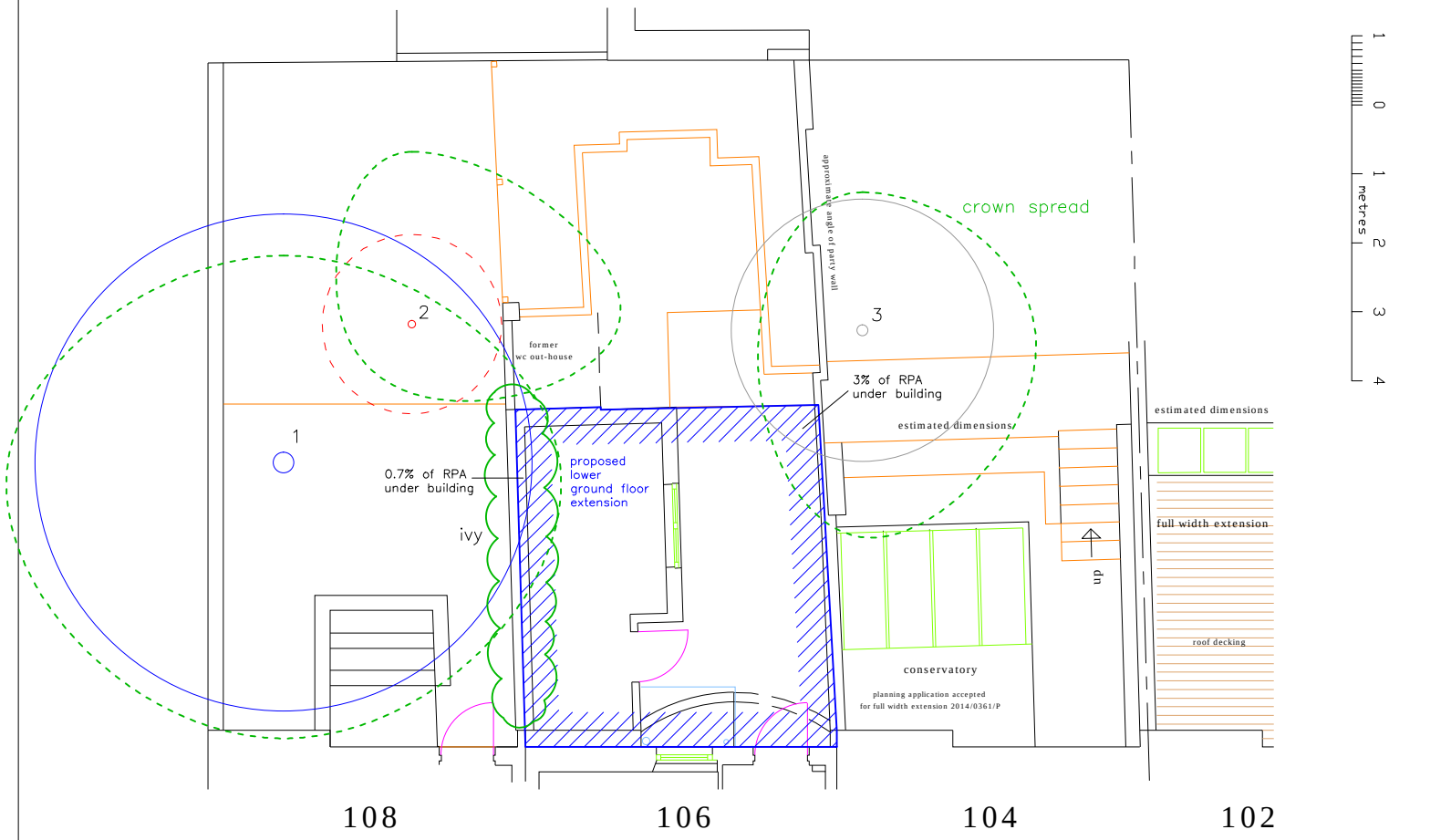
SNELLING & SHERRIFF



A3 sheet @ 1/50 scale

Simon Pryce Arboriculture

Client:
Dr S Michie

Site:
106 Highgate Road, London,
NW5 1PB

Title:
Tree survey and impact assessment as per BS5837:2012

Date: 11 August 2016

Ref: 16/046 Rev:

Scale: 1:100 at A4

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Original drawing:
Michael Snelling

Root protection areas [RPAs] are colour coded according to retention category from BS5837:2012, Trees in relation to demolition, design and construction:

A = green
B = blue
C = grey
U = red - dashed - also used to denote dead trees with no RPA
Crown spreads = mid green

Site: **106 Highgate Road, London, NW5**

Inspection date: **11 August 2016 by Simon Pryce**

Tree no.	Species	Age / vigour	Ht. m	Spread				Dia. mm	RPA rad m	RPA area m^2	Crwn ht. m	Comments and recommendations	Cat
				N	S	E	W						
1	Golden Rain *Koelreuteria paniculata*	MA/N	8	3	4	4	4	300	3.6	41	4	Exotic tropical species with no close relatives hardy in the UK. Has been crown reduced at least twice, the last time about eight years ago. Contains some dead wood but is sound and healthy. Will need reducing again periodically to maintain clearance from the house.	**B**
2	Rowan *Sorbus aucuparia*	MA/L	5	2.5	1	3	1	110	1.3	5.5	2	Suppressed by the previous tree, has sparse foliage and is suffering from fire blight, a bacterial disease that can affect related species including apple, hawthorn and pear.	**U**
3	Quince *Cydonia oblonga*	MA/N	5	2	3	2.5	1.5	160	1.9	12	3	Healthy specimen, has been reduced in the past to about 3m and grown on.	**C**

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Notes

Observations are made from ground level unless stated otherwise.
Trunk diameters are measured in millimetres at 1.5m above ground or at the narrowest point between the root buttresses and branch flare in multiple trunked trees; in such cases this is indicated by [c].
Crown spreads are taken from the trunk centre to the end of the longest live branches in the directions indicated [usually the four cardinal compass points]
Crown height is the clearance under the lowest significant branches.

Tree ages are estimated as below, based on the normal life expectancy of a tree of the species concerned on the site:

Immature.	[IM]	Newly planted or self-set tree.
Young	[Y]	Young tree that is established but has not yet attained the size or form of a fully developed example of its type.
Middle aged	[MA]	Between one third and two thirds of its estimated lifespan.
Mature	[M]	Over two thirds of it's estimated life span.
Over mature	[OM]	Declining and/or approaching the end of it's natural lifespan.
Dying/Dead	[D]	Dead/dying or so badly decayed that it should be removed without delay if a potential threat.

Vigour is assessed on the basis of what is normal for that the species concerned as:

High	[H]
Normal	[N]
Low	[L]
Dead / dying	[D]

Root protection areas [RPAs] - BS5837:2012

For single trunked trees these are calculated as an area equivalent to a circle with a radius 12 times the trunk diameter at 1.5m. For multiple trunked trees it is based on the diameter of a single trunk that would have the same cross sectional area at 1.5m.

Any deviation from a circular plot should take into account the following factors whilst still providing adequate protection for the roots.

- The shape and disposition of the root system when known to be influenced by past or existing site conditions, such as the presence of roads, structures and underground services.
- Topography and drainage.
- The soil type and structure.
- The likely tolerance of the tree to root disturbance based on factors such as species, age and past management.

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Tree categories – based on BS5837: 2012, Trees in relation to design, demolition and construction - Recommendations

Trees for removal				
Category and definition				**Colour code**
Category U				**Red**
Those in such a condition that they cannot realistically be retained as living trees in the context of the current land use for longer than 10 years	• Trees that have a serious, irremediable structural defect, such that their early loss is expected due to collapse in the foreseeable future, including any that will become unviable after the removal of other U category trees. (e.g. where, for whatever reason, the loss of companion shelter cannot be mitigated by pruning.) • Trees that are dead or showing signs of significant immediate and irreversible decline. • Trees infected with pathogens significant to the health and/or safety of other trees nearby, or very low quality trees suppressing better ones nearby. *NOTE: Category U trees can have existing or potential conservation value which it might be desirable to preserve.*			
Trees for retention				
Category and definition	**Criteria – sub categories**			**Colour code**
	1 – mainly arboricultural values	**2 – mainly landscape values**	**3 – mainly cultural / conservation values**	
Category A				
Trees of high quality with an estimated remaining life expectancy of at least 40 years.	Trees that are particularly good examples of their species, especially if rare or unusual; or those that are essential components of groups or formal or semi-formal arboricultural features (e.g. the dominant and/or principal trees within an avenue)	Trees, groups or woodlands of particular visual importance as arboricultural and/or landscape features	Trees, groups or woodlands of significant historical, commemorative or conservation value. (e.g. veteran trees or wood -pasture)	**Green**
Category B				
Trees of moderate quality with an estimated remaining life expectancy at least 20 years.	Trees that might be included in category A, but are downgraded because of impaired condition (e.g. presence of significant though remediable defects, including unsympathetic past management and storm damage), such that they are unlikely to be suitable for retention for beyond 40 years; or trees lacking the special quality necessary to merit the category A designation.	Trees present in numbers, usually growing as groups or woodlands, such that they attract a higher collective rating than they might as individuals; or trees occurring as collectives but situated so as to make little visual contribution to the wider locality	Trees with material conservation or other cultural benefits.	**Blue**
Category C				
Trees of low quality with an estimated remaining life expectancy of at least 10 years, or young trees with a stem diameter below 150 mm	Unremarkable trees of very limited merit or such impaired condition that they do not qualify in higher categories	Trees present in groups or woodlands, but without this conferring on them significantly greater collective landscape value; and/or trees offering low or only temporary/transient landscape benefits	Trees with no material conservation or other cultural benefit.	**Grey**