CAVAT valuation report on the horse chestnut avenue
Tooting Bec Common, Wandsworth

Jeremy Barrell **BSc FArborA DipArb CBiol FICFor FRICS**

13th August 2017

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Summary

I am instructed by the Save Chestnut Avenue Campaign to inspect an avenue of horse chestnut trees on Tooting Bec Common and to use the CAVAT method (Appendix 1) to provide an expert opinion on the capital asset value of the trees proposed for removal by Wandsworth Borough Council. I visited the site in early August 2017 and carried out a detailed visual check of the trees as part of the valuation process.

I found 56 horse chestnut trees greater than 10cm trunk diameter and likely to live longer than five years that seem to be identified for removal under the Wandsworth proposal, and show their approximate location on the sketch site plan included as Appendix 2. I assessed the health, condition, and retention prospects, for all these trees based on my site observations, interpreted in the context of my decades of experience of making such assessments.

Using the London Tree Officers' Association approved CAVAT calculation spreadsheet (Appendix 3) and the Arboricultural Association's life expectancy guidance for horse chestnut (Appendix 4), I concluded that the current asset value of the 56 trees is £2,639,562.

Jeremy Barrell
13th August 2017

1: Introduction

1.1 Instruction

I am instructed by the Save Chestnut Avenue Campaign to carry out a CAVAT (Capital Asset Value for Amenity Trees) valuation of the significant horse chestnut trees in the horse chestnut avenue on Tooting Bec Common (See the *CAVAT Full Method: User's Guide* in Appendix 1). This avenue runs roughly north to south from the junction of Tooting Bec Road and Dr Johnson Avenue at the southern end, to the point where it meets Bedford Hill at the northern end. I was asked to explain the reasoning behind my valuation and provide a total pound sterling value for all the identified trees.

1.2 Previous report

I have written a previous preliminary report dated 17th January 2017, which can be downloaded at https://www.barrelltreecare.co.uk/resources/useful-documents/tooting-bec-common-horse-chestnut-avenue-report/. This current report is supplementary to that original report, and should be read in conjunction with it.

1.3 Conflicts of interest

All the work that I have done on this project has been free of charge. I do this as part of my professional commitment to provide independent advice in circumstances where trees are under threat. My time is financed through my business, Barrell Tree Consultancy (www.barrelltreecare.co.uk), and is justified through our Sustainability and Environmental Policy. As far as I am aware, I have not previously met those instructing me before my involvement in this project, and will not receive any financial benefit from any of my instructions. I do, however, declare and accept that I may benefit from my involvement through reputational enhancement. I also clarify that I do sometimes act as an advocate for trees, but in this instance, I am acting as an independent expert, and comply with the appropriate professional rules that apply to expert witnesses.

1.4 Qualifications and experience

This report is based on my site observations and information provided for the previous report, interpreted in the context of my experience. I have experience and qualifications in arboriculture, forestry, and biology (https://www.barrelltreecare.co.uk/assets/Uploads/J-Barrell-CV.pdf).

In general terms, I have been trained in tree valuation, including i-Tree, Helliwell, and CAVAT (https://www.barrelltreecare.co.uk/resources/useful-documents/career-summary-for-jeremy-barrell/), and have experience using those skills in a variety of legal cases. More specifically, I was on the development panel for CAVAT, as acknowledged on page 10 of that published document (Appendix 1), and the method of tree assessment that I developed in the 1980s called Safe Useful Life Expectancy (SULE) is an integral part of the CAVAT method. My participation in that project involved detailed correspondence over several years, and attending discussion/training events

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with Chris Neilan, the method developer. Additionally, I have decades of experience at using SULE, from its initial development in the late 1980s, right through to the current day, where it is an integral part of assessing trees on development sites using the TreeAZ and TreeABC methods (www.TreeAZ.com). I have published multiple peer reviewed papers and articles on SULE and its use, the most relevant of which can be accessed from my website at https://www.barrelltreecare.co.uk/resources/articles-and-papers/?tag=SULE.

I also have decades of training and experience of assessing the risk from trees. I demonstrate this on an international level by speaking on tree risk management at conferences around the world (https://www.barrelltreecare.co.uk/resources/useful-documents/career-summary-for-jeremy-barrell/) and attending court as an expert witness specialising in civil cases relating to harm arising from tree failures (https://www.barrelltreecare.co.uk/resources/useful-documents/summary-of-expert-witness-experience-of-jeremy-barrell/). Out of the 11 civil cases related to harm arising from tree failures in the English courts that have proceeded to written judgments since 2002, I have been involved in six. During this period, only two cases have gone to appeal, *Micklewright -v- Surrey County Council*, which was resolved in favour of the Defendant, and *Cavanagh -v- Witley Parish Council & Shepherd*, which is currently waiting to be heard, and I acted as an expert witness in both.

2: Site visit, observations, and data collection

2.1 **Site visit**

I was familiar with the trees through my previous visits and carried out this most recent visit on 4th August 2017, with my colleague, Alex Needs. The weather at the time of inspection was bright, still, and dry, with good visibility. During my visit, I took photographs as a record of what I saw and to illustrate specific points in this report.

2.2 **Tree inspection method and identification of each tree**

All my observations were from ground level by visual means using binoculars and a zoom lens camera to view the upper tree crowns. I had access to all the trees from all sides and there were no significant restrictions in what I could see, apart from dense foliage in places. I visually checked each tree from close to the base and from a distance, which is the standard approach to assessing the safety and condition of amenity trees. I measured the trunk diameters of all the trees at 1.5m above ground level using a conventional diameter tape. I assessed all the trees for the characteristics required to carry out the CAVAT valuation and describe those in more detail in section 2.4 below.

From my previous involvement in this project, I had access to a publicly available site plan showing tree numbers and locations originally prepared by Mr Gifford (the Gifford plan). I used this as the base plan for recording which trees I checked and include an updated version in Appendix 2. This plan is modified to remove any of the trees that are either dead, or close to death, or no longer present, and only shows horse chestnut trees. Additionally, I did not record any trees of 10cm diameter or less, measured at 1.5m above ground level, and so these have been removed from the original plan as well. Finally, where I found existing trees with no obvious number on the Gifford plan, I numbered them 1–9 on this plan. There were no obvious tags on most trees and so I used the numbering on the Gifford plan for consistency, but interpreted which trees I thought corresponded to the appropriate number. I note this because it was not absolutely clear in some cases which trees on site related to which number, but I am confident that each important tree has been assigned a number and that number is recorded on the plan. I decided that this was sufficient for the purposes of identifying the number of trees and their approximate location for the task of assessing a value. However, although this plan is sufficient to identify the approximate location of the important trees, I do stress that it is not accurate for showing the exact position of each tree.

2.3 **Summary of my observations on tree health and condition**

I chose mid-summer to carry out this tree valuation because it is the best time to visually assess tree health and condition, and specifically SULE, which is an important element of the CAVAT method. My previous inspections had been in autumn and winter, which limit the conclusions that can be drawn on how well the trees are growing and how long they are likely to live for. Apart from several young trees in very poor condition due to infection from bleeding canker (see my previous report for more detail on this), most of the remaining trees had limited obvious ongoing active infection from this pathogen that was an imminent threat to their retention. Some had wounds from previous infections, but these appeared to be compartmentalised and not causing obvious tree health deterioration, with vigorous woundwood growth around most of the old wounds. I also noted some damage from the horse chestnut leaf miner and infections by Guignardia leaf blotch, but these were not serious and hardly noticeable from distant views. They were noticeable when within a few metres of the leaves, but were not so obvious that they created an obvious unhealthy look to the foliage from a distance (Figure 1).

Figure 1: View of the avenue looking towards the north showing some of the leaves in the foreground where low levels of infection by leaf miner are visible as the brown blotches on the nearest leaves to the camera.

Although several trees had been removed and others had been severely pruned since my last visit, most of those that remained standing were alive and showing normal growth, apart from a few individuals that were excluded from this assessment.

2.4 Clarifications on the reasoning behind the CAVAT assessment

In total, 56 horse chestnut trees that were 10cm diameter or greater and assessed with the potential to be retained for more than five years were inspected and their details assessed. Each tree was inspected, allocated a number that corresponds to the number on the plan in Appendix 2, and data collected according to the guidance set out the *Full Method: User's Guide* in Appendix 1. The data was recorded in the companion spreadsheet for the method, downloaded from the LTOA website (www.ltoa.org.uk) and included as Appendix 3. In the order that the steps to the assessment are listed in that guidance document, I explain my reasoning as follows:

2: Site visit, observations, and data collection

- **Step 1 – Basic Value:** The trunk diameter for each tree was measured and inputted into the spreadsheet to calculate the basic value.
- **Step 2 – CTI Value:** Operation 1 established that the Community Tree Index Factor for Wandsworth is 175%. Operation 2 took the Note 4, Operation 2, bullet 1, as the appropriate guidance, i.e. "*Whether the tree is fully accessible to the public i.e. within a public highway, public park, or woodland. For these locations the accessibility score remains 100%.*" I assessed that the trees are in a park that is fully accessible to the public and so no deductions were applied.
- **Step 3 – Functional Value:** For crown size, I reduced by estimation the size of any crowns that were less than would be expected of typical nearby trees. For example, trees 963–967 had been heavily reduced in size by recent pruning and so I estimated that their crowns were reduced by 40–60% compared to other similar diameter, but unpruned, trees in the avenue. This is a subjective judgement based on the crown growth responses of nearby trees that had be severely pruned several years ago and were showing a very vigorous growth response. Where lesser crown reductions had been carried out, I estimated their crowns were reduced by up to 20% compared to other similar, but unpruned, trees in the avenue, e.g. tree 1029. Where I expected light pruning to be necessary to reduce the length of long branches for safety reasons, I adopted a reduction of 10–20%, e.g. tree 1030. For condition, I did not feel that the leaf condition warranted any significant reduction in functionality because the blotches were hardly apparent from the distant views (Figure 1). However, where there were signs of infection, to allow for varying interpretations of this subjective measure, and despite the guidance advising that such disfigurements should be "*obvious to the public*", I applied a 10% reduction for most trees. Please note that this negative figure is added to any crown size reductions in the overall functionality reduction percentage.
- **Step 4 – Adjusted Value:** I assessed that all the trees were an "*integral part of a designed landscape, including avenues or designed park or garden*", and so added a 10% upward adjustment for that factor. I decided that all the trees were appropriate to the location and so there was no need for any reductions for these factors.
- **Step 5 – Full Value:** I decided that most young to maturing trees, say up to 30–40 years old have the potential to live to the Arboricultural Association advice in its Guidance Note 4 of 100–200 years (Appendix 4), noting that this is not as hostile as a typical urban/street environment, and that good growing conditions pushes the expectation towards the upper end, so closer to 200 years. It is also relevant that all the trees can be managed for safety by pruning, which would be well within the bounds of normal management, so nothing unusual about that, or any need to reduce SULE because of it. I have noted trees with serious defects as having a SULE of 10–20 years because the existing hard pollards nearby are growing well, which proves that they can survive at least 10 years, backed up by my own examples of the same species in other locations. Where there is some question about structural integrity, I

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have I have allocated trees to the 20–40 years SULE category on the basis that there is nothing to indicate declining health that would mean they would be lost before 20 years. Where there is nothing obviously wrong with maturing to mature trees, then I see no reason why they should not survive for at least 40 years, which puts them in the 40–80 years SULE category. Younger trees without any obvious compromising conditions have the potential to live to their full life expectancy and so they are listed in the 80+ SULE category.

3: Conclusion

3.1 **The value of the trees**

Based on the above methodology, my assessment of the capital asset value of the 56 trees shown on the plan in Appendix 2 is £2,639,562, as calculated from the CAVAT spreadsheet included in Appendix 4.

Jeremy Barrell

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Appendix 1: LTOA CAVAT Full Method: User's Guide

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CAVAT
Capital Asset Value for Amenity Trees
Full Method

CAVAT

(Capital Asset Value for Amenity Trees)

Full Method: User's Guide

Christopher Neilan

Appendix 1: LTOA CAVAT Full Method: User's Guide

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Introduction

CAVAT (Capital Asset Value for Amenity Trees) provides a basis for managing trees in the UK as public assets rather than liabilities. It is designed not only to be a strategic tool and aid to decision-making in relation to the tree stock as a whole, but also to be applicable to individual cases, where the value of a single tree needs to be expressed in monetary terms.

It is intended particularly for councils and other Public Authorities and primarily for publicly owned trees. However, it may be used by other public bodies, including the Courts, private institutions and individuals. It complements other tools of arboricultural analysis, such as single tree hazard assessment systems. So far as possible it draws upon objective evidence and published data, but it also relies on expert arboricultural knowledge and in some cases assessments that are specific to CAVAT. It can therefore only be used by arboriculturists who have received relevant training, and who have the relevant skills and experience.

It is established in UK law, in the Town and Country Planning Act 1990 Section 198, that trees have value as a public amenity and therefore local planning authorities are given a duty to protect trees in the public interest. The legislation itself does not specify how amenity is to be assessed, leaving it open for the value of trees to be expressed in the most appropriate way for the intended purpose, and not necessarily in monetary terms. Because CAVAT is specifically designed as an asset management tool for trees that are publicly owned, or of public importance, it does express value in monetary terms, and in a way that is directly related to the quantum of public benefits that each particular tree provides. Applied to the tree stock as a whole it enables it to be managed as if it were a financial asset of the community. Applied to single trees it gives a value that is meaningful in itself but allows a comparison to be made with the value of other public trees.

CAVAT works by calculating a unit value for each square centimetre of tree stem, by extrapolation from the average cost of a range of newly planted trees. In the Full Method this basic value is adjusted to reflect the degree of benefit that the tree provides to the local population. The adjustment is designed to allow the final value to reflect realistically the contribution of the tree to public welfare through tangible and intangible benefits. (*See Note 1*).

The Two Methods

There are two versions of the CAVAT method. The Full Method, described in this Guide, is recommended for use in cases concerning individual trees or groups, when precision is required and sufficient time is available for a full assessment. The second, referred to as the Quick Method, is intended specifically as a strategic tool for management of the stock as a whole, as if it were a financial asset of the community. The data required is limited to the minimum necessary to express the value of the tree stock as a whole, to analyse it, and to provide information to assist with management decisions. The data may be collected in conjunction with regular surveys of the tree stock.

In effect, it is designed to enable the value of the public tree stock to be expressed as an index. The index would rise or fall with changes in the quality and character of the stock over time. The tree manager would act as an asset manage, showing evidence to increase the overall value year by year, bearing in mind the particular nature and disposition of the stock, and the opportunities and resources available. The Guide to the Quick Method is published separately.

General Instructions for the Full Method.

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Although the method is designed to be robust, prospective users need to be aware of certain key principles and the need for training to ensure consistency and accuracy of results.

Steps 1 and 2 in both methods rely on measurement, government data, and the conversion formula, updated annually to take account of inflation, but also the assessment of accessibility which is specific to CAVAT. Step 3, Functionality, relies on expert assessment, also specific to CAVAT. For example, when the health of the tree is assessed the key judgement is not whether it has flaws to the arboricultural expert, but to what extent those flaws detract from its current performance as a public amenity. Where there is no loss of performance no penalty is imposed. Any potential shortening of life expectancy, say as a result of structural weakness, would be considered separately at Step 5.

Steps 4 and 5 apply only to the Full Method. At Step 4 the adjustments for amenity rely on observation, but also plant knowledge; at Step 5 the assessor requires a good understanding of tree health, and the ability to estimate reliably the safe life expectancy of the tree.

Assessors must also be aware that CAVAT does not discount the value of trees generally to account for indirect problems that they may cause, such as the potential to cause structural damage, nor additional costs of management to resolve any such problems. This is because it is designed to give a cost/benefit analysis, and to allow for these costs within the method would lead to a form of double accounting. However, the Full Method does discount value as part of Step 4, Adjusted Value, when it is found that there is an intrinsic problem, that is to say direct harm is being caused by the tree without it being resolved by management.

The Full Method

The Full Method is used in situations when a more detailed and precise assessment of the value of trees as individuals is required. For example, it would be used when reviewing the management options available for an individual tree or a group or avenue.

In relation to cases involving subsidence, according to the JMP (Joint Mitigation Protocol) the levels of evidence to be submitted in cases involving public trees will be set by reference to a full CAVAT valuation to be undertaken by the Local Authority.

The Full Method involves a site inspection, and may in occasional cases involve further investigation, including internal decay detection or a climbing inspection. A full record of the inspection must be retained with appropriate evidence, including photographs.

The Variables

The Full Method involves five steps, and sets of key variables:

1. Basic value/unit value x size;
2. CTI value/location, in terms of population and use, and accessibility;
3. Functional value/functional status;
4. Adjusted value/amenity factors, both positive and negative; and
5. Full value/safe life expectancy.

Step 1: Basic Value.

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The basic value is calculated using trunk area as key measure of size. The trunk area is calculated in the standard way by using the measured trunk diameter or circumference, and converted to give the radius. The current national unit value factor is selected to allow the basic value to be calculated, using the equation:

$V = \pi \times \text{radius}^2 \times \text{unit value factor}$. (*See notes 2 and 3*).

A spreadsheet – the CAVAT calculation – Full Method available separately, has been produced to make the necessary calculations for the Full Method. When using it the basic value is automatically calculated, using the diameter and the UVF.

Step 2: CTI Value.

There are two operations in Step 2. Firstly, the basic value is adjusted to take account of the population density using the Community Tree Index (CTI) factor (*see note 4*). Then the modified basic value is discounted by up to 60%, according to how accessible the tree is in the particular location.

The CTI index factor is a measure of the relative population density potentially able to benefit from the trees, derived from Office of National Statistics (ONS) information. The values of the 7 CTI bands are shown in Table A. They vary from 100%, for the majority of the country, up to a maximum of 250% according to the published population density. The results as applied nationally to England can be found in the separate National Community Tree Index Table.

(Note: The CTI factor supersedes the previous value band approach, based on differential planting costs, which no longer applies).

Operation 1.
The CTI index gives the basic adjustment for the Local Authority. The effective CTI value factor is that given in the final column of the table. In some instances, however, the area may not be typical of the Local Authority's overall area. In that case the ward figure, also available form the ONS website, may be used, with the CTI index factor values as shown in Table A.

Operation 2.
The second operation is to consider the relative accessibility to the public of the tree in its general locality. The tree may retain 100% of its value, or be discounted by up to 60%.

Taken together, these 2 operations give the CTI value.

Step 3: Functional Value.

The CTI value is then reduced according to the surveyor's expert assessment of the tree's functionality, i.e. how well it is performing biologically, as against what would be expected of a well-grown and healthy tree of the same species and girth in that location.

The surveyor must consider crown size and crown condition (*see Note 5*). **Only one combined adjustment of the basic value is required**, giving overall functional value. Precision is required in the assessment, either maintaining the value at 100% or reducing it proportionately in increments of 10%.

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Step 4: Adjusted Value.

The functional value is then adjusted to take into account the surveyor's assessment of any special amenity factors and also the tree's appropriateness to the location. **One combined adjustment is made**; up to +/- 40% is possible. (*See Note 6*).

Step 5: Full Value.

Finally, the value is adjusted for safe life expectancy (SLE), assessed on the principles of SULE. (*See Note 7*). Trees with a safe life expectancy greater than 80 years retain 100% of their adjusted value; those with a life expectancy of less than 5 years lose 90%. The SLE adjustment bands are shown in Table E.

No reduction is made for a condition, e.g. structural weakness, where life expectancy is not shortened and the tree is judged to be safe. However, if management, e.g. crown reduction is required, the functional status is adjusted accordingly under Step 3, Functional Value. A tree that cannot be safely retained has a SLE score of 0, and thus a value of £0.

Notes

Note 1: CAVAT, Lifetime Benefit and the Trunk Formula Method

CAVAT has been designed primarily as an asset management tool. However, the full version is expressly designed for cases where the value of an individual tree needs to be expressed. The premise of CAVAT is that the widely accepted approach of depreciated replacement cost is used as the basis for a calculation of value since it is suitably robust, practicable and useful for these purposes.

The basis of the method is to calculate the value of a tree by extrapolation from the cost of a newly planted standard tree, using the ratio between their respective trunk areas as the critical measurement. This approach is also used in the Council of Tree and Landscape Appraisers (CTLA) "trunk formula method", an appraisal method widely used in the U.S.A. However the CAVAT methods are designed to give the value of trees as public assets in the UK in comparison to the CTLA method whose stated aim is to express the private value of the tree to its owner.

CAVAT allows for the contribution of the factors of location, relative contribution to amenity social value and appropriateness, and an assessment of functionality and life expectancy. Essentially, the planting cost basis is then modified by a consideration of the impact of those factors that contribute to the quantum of benefits that the public may expect to receive from it. The factors which are essentially related to "wear and tear" on the tree, including a shortened life expectancy, are dealt with in terms of depreciation. On the other hand factors based on variation from an arithmetic mean, (for example the particular benefits that flow from the characteristics of the species in question) allow for a either a potential increase or decrease in value.

Its results are broadly comparable with what research suggests both in the U.S.A. and the U.K. is a realistic estimate of the tangible lifetime benefits of trees to the community. The tangible benefits approach is reflected both in use of official population statistics to generate

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the CTI index rating in CAVAT and the nature of the adjustment for functionality, and also in the scale of the adjustments for accessibility and amenity factors.

Note 2: Basic Value.

The relevant measurement to calculate the value for an individual tree in the Full Method is the area of trunk at breast height, using the standard CTLA Trunk Formula Methodology, from which the basic value is calculated, using equation $A = \pi r^2$. The procedure, therefore, is first to measure the trunk radius in centimetres, (generally by converting the circumference to a radius by a "rounded-down" tape, or using the formula $r = c \div 2\pi$). The radius is then squared, and multiplied by π (pi, approx. 3.142). This is subsequently converted into the basic value by multiplying by the current UVF (unit value factor). When using the spreadsheet the basic value is calculated automatically, using the diameter and the UVF.

Note 3: The Unit Value Factor. (UVF)

The UVF represents the full cost of a newly planted tree in a given area, divided by its trunk area. It has two components; the nursery gate price, expressed in terms of the cost of each square centimetre of stem, (or unit area cost) and the planting cost (transport, planting, materials, immediate care and management costs, but *not* after-care). The calculation of the unit area cost is from the average cost of a basket of species rather than for each individual species, in order to eliminate differences based only on production factors or variations in demand. The initial specification used in this calculation was 12-14 cm. standard containerised trees, however prior research has subsequently demonstrated that size, as opposed to species or production methods, is not generally a critical factor in unit cost variation.

The current UVF represents the average cost per square centimetre of stem area of the ten most commonly planted species, containerised, at trade prices, and from equivalent and competitively prices nurseries including immediate planting costs. The best estimate of the planting cost factor has been found to be 150%, based on consultation with tree officers and within the wider landscape industry.

By applying the Community Tree Index factor, the national unit area value may then be modified to take account of the effects of location to the benefits received by the local population, (see note 4).

The unit area cost is upgraded each year in line with inflation, (using RPI/X) from an original survey in 2004/5. Again, this is to minimise fluctuations in the UVF unrelated to the tree stock's contribution to public amenity. The up to date figure is used in the current CAVAT calculations, available separately.

Note 4: Community Tree Index.

To generate the CTI index factor in the Full Method the adjustment is made in two stages; first according to the population density of the wider location, and secondly according to the tree's relative accessibility in that location. Any special characteristics of the immediate location are accounted for in step 4, Adjusted Value.

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Operation 1

The CTI index factor is a measure of the relative population density of the local authority, and thus the relative number of those potentially able to benefit from the local authority's trees. The CTI values for each Local Authority in England are shown in the separate National Community Tree Index table.

It may give more accurate results to calculate the stock value on a ward by ward basis, rather than by using the overall local authority value. This will depend upon an assessment of whether the local authority is relatively homogenous in character overall, or whether there are significant variations from ward to ward. Ward statistics are available from the Office for National Statistics, via the ONS website, https://www.ons.co.uk/Default.asp.

Operation 2

Having applied the factor for the general character of the area, the assessor then judges the relative accessibility of the tree within that area, and whether it is fully available to contribute to the public good. The potential CTI value after operation 1 may either be retained, by a score of 100%, or further reduced to a factor of 80%, 60% or 40% of its original value.

The key considerations under operation 2 are:

1. Whether the tree is fully accessible to the public i.e. within a public highway, public park, or woodland. For these locations the accessibility score remains 100%.
2. Wholly or partially accessible from public areas i.e. in a local authority owned location such as a school, local authority building or housing estate. For these locations the accessibility score is reduced to 80% of its original value.
3. A less accessible publicly owned area i.e. a courtyard of a building, sheltered housing unit or individual back gardens of local authority owned properties. For these locations the accessibility score maybe reduced to 40% or 60% of its original value.

A tree that is fully accessible and visible, in a prominent and well-used setting within the general area will score 100%; a tree not publicly accessible or visible will score 40% of its original value. A degree of judgement will be necessary to assess these scores.

Note 5: Functionality.

The basis of CAVAT is trunk area, but the crown area may often be reduced from what would be predicted for an average tree of the size by species characteristics, possibly exaggerated by grafting, as in many flowering cherries, or by pruning, or by natural events such as disease or branch failure. Alternatively, the crown may be fully present, but functioning poorly; in either case the assessor carefully estimates the adjustment to be made, so that the functional value represents as realistically as possible the actual capacity of the tree to provide public amenity. Only 1 adjustment is made for both crown size and condition.

The two considerations are:

1. Crown Size.

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The value is reduced proportionately if:

- the crown is reduced by regular pruning;
- the crown area has been reduced by natural causes, e.g. storm damage or disease, and the tree has not recovered; or
- the crown has failed to develop, e.g. because of top grafting onto a stronger stock, and is smaller than would be expected from the stem size.

2. Condition

If the tree is in functionally poor condition, including disfigurement by disease obvious to the public, the value is reduced proportionately. Such conditions would include:

- leaf or shoot disease;
- root disease, clearly affecting vitality;
- canker, or severe trunk lesions;
- fire damage.

No reduction is made at this stage for a condition, e.g. structural weakness, which does not affect the current functional status of the tree, providing that no immediate action (other than monitoring) is proposed. The value should be reduced proportionately in advance where there is an immediate need for arboricultural reasons e.g. structural weakness and hence the need to reduce the crown. This should be as soon as practicably possible, and no later than 1 Year. Pests such as Horse Chestnut Scale, diseases such as bacterial wetwood, or physical conditions such as uneven form or wounding are not taken into account, unless they are sufficiently severe to adversely affect biological functionality, to grossly affect appearance or to trigger crown reduction, etc.

A dead or effectively dead tree, or one requiring urgent removal, scores 0% value retained, and thus has a value of £0.

Note 6: Amenity and Appropriateness.

1. Amenity Factors

The value may be increased to take account of features of the tree that are of special benefit to the community. Special factor adjustment should be used sparingly; most trees will not have any special factor adjustment. There may be up to a maximum of 4 special factors and a total adjustment of up to 40%; (10% for each amenity factor, other than Veteran/Ancient Trees: 30%), for example:

Townscape and visual importance:

- integral part of a designed landscape, including avenues or designed park or garden;
- contribution to the setting of an important place or building;
- in a school, or by its entrance;
- in a particularly prominent location, e.g. a town centre, or at the entrance of a major public building, etc; or
- part of a wider grouping giving character to the area, e.g. long-maintained street pollards.

National or Local designations or connections:

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- in a Conservation Area, where the presence of trees has contributed to the designation;
- a locally designated tree, e.g. Landmark or Favourite Trees;
- a commemorative or memorial tree; or
- a tree known to be planted by a notable person.

Species characteristics:

- rare or unusual species; or
- attractive visual characteristics, e.g. notably attractive form, showy flowers, variegated foliage, attractive bark, etc. (N.B. count as 10% each, up to 20%);

or

Nature Conservation

- particular wildlife importance, e.g. a bat roost, heronry, etc;
- designated species in local BAP (Biodiversity Action Plan); or
- a Veteran/Ancient Tree. (N.B. counts as 30% by itself).

2. Appropriateness to the Location

Conversely, the value may be reduced as for amenity factors by 10% each and by up to 40% if the species is seriously inappropriate for its location causing a problem or foreseeable direct hazard not effectively controlled by management, for example:

Inappropriate species characteristics for the location causing obstruction or inconvenience:

- a weeping or low spreading habit in a narrow footpath;
- obstruction, e.g. vigorous spiny suckers across a footway;
- major surface roots damaging the footpath;
- large, squashy fruit in hard surfaced area;
- honeydew drip e.g. in a dedicated car park or playground.

Problems relating to the particular specimen:

- a pronounced lean, causing a potential obstruction;
- tree planting out of context, for example, a visually intrusive species in an otherwise consistent avenue.

Note 7: Safe Life Expectancy Adjustment

Safe Life Expectancy (SLE) is accounted for by a potential depreciation of up to 90% of the adjusted value. The principles followed to generate the adjustment are those of SULE, but the final step relating to usefulness is omitted in order to avoid double accounting. As generally in CAVAT, the banding approach is used, for robustness and to reflect some of the practical difficulties of estimating age. The surveyor may be expected to more accurately estimate the SLE in a tree's later years, when changes in the tree condition will have a much bigger impact on the SLE.

Trees with a safe life expectancy greater than 80 years retain 100% value; those with less than 5 years have 10% of their potential value. The weighting given to the intervening bands

Appendix 1: LTOA CAVAT Full Method: User's Guide

is derived from am exponential curve, on the basis that at less than 80 years life expectancy value is initially lost only slowly, but that towards the end of a tree's life the decline in value becomes increasingly swift. *(See Table B).* Eighty years is chosen as representing in round figures the current length of human life expectancy in the UK.

Tables

Table A: CTI Factors:

Population Density / Ha	CTI Factor %	CTI Band
<20	100	1
20 – 39	125	2
40 – 59	150	3
60 – 79	175	4
80 – 99	200	5
100 – 119	225	6
<119	250	7

Table B: Safe Life Expectancy Adjustment:

Life Expectancy (Years)	% Value Retained
80+	100
40 – 80	95
20 – 40	80
10 – 20	55
5 – 10	30
<5	10

Acknowledgements.

The author is grateful to past and present colleagues in Epping, including Russell Horsey, for his past and continuing advice and assistance, and Tracy Clarke for her trial survey in Theydon Bois, Stuart Forgione, Alex Sleet and Sarah Creitzman, and to the members of the LTOA and ETaLOG user groups and in particular to Dave Lofthouse, Jake Tibbetts,Ryan Nixon, Paul Maher and Matthew Searle for their encouragement, advice and assistance in developing and trialling the CAVAT method. Thanks are also owed to Becky Hesch for her support and to John Stokes, Scott Cullen and Jeremy Barrell among others for their kind advice. Any deficiencies in the work of course remain the author's own.

Particular thanks are due to the several nurseries that assisted with information for the author's research on unit costs, and to Mike Glover and Keith Sacre of Barchams, for their contributions to the work of the LTOA user group and for their encouragement. The author also gratefully acknowledges the work of Jeremy Barrell on SULE, the pioneering work over

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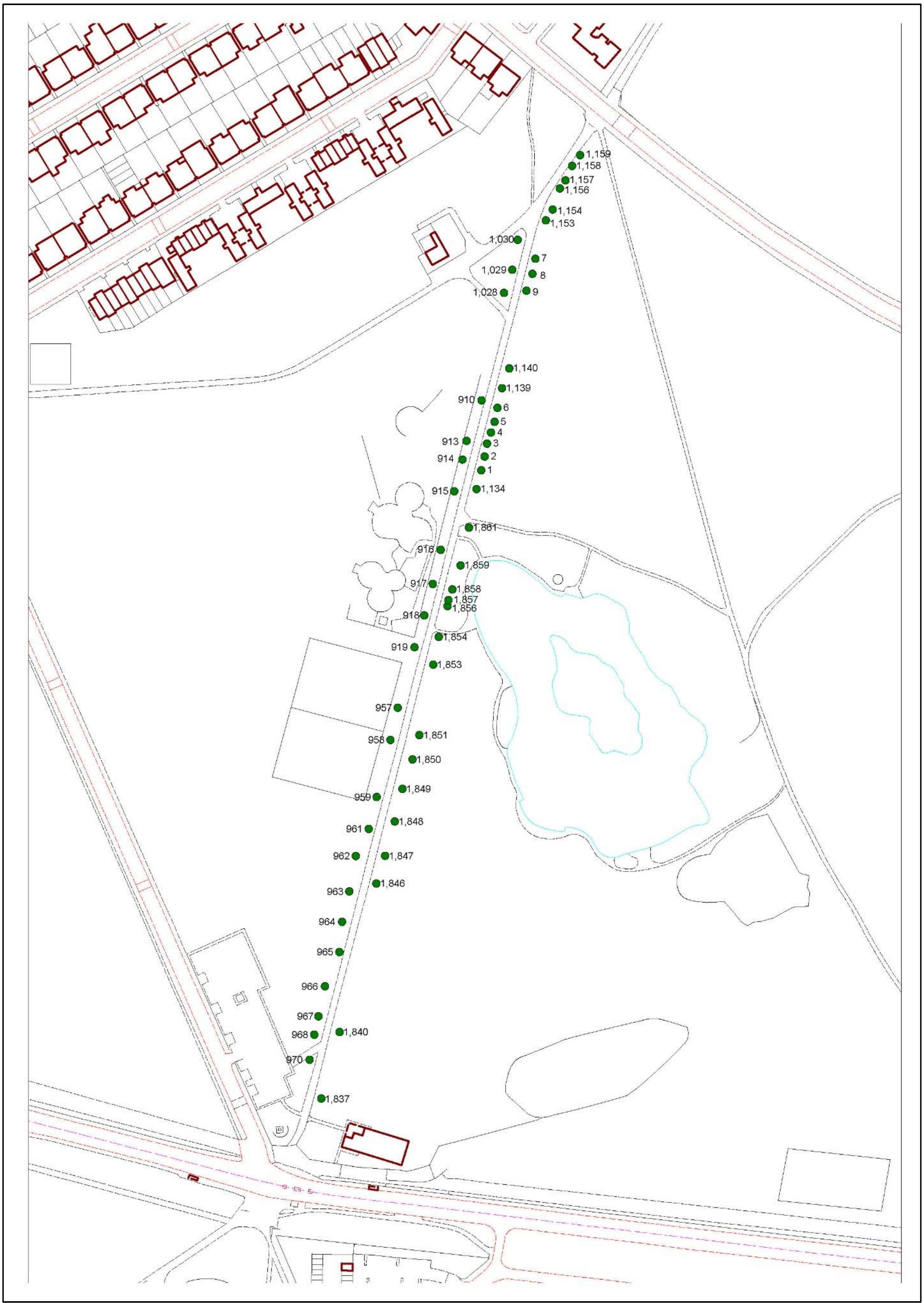
many years by Rodney Helliwell on the assessment of the monetary value of trees in the UK, and that of Scott Cullen in the USA.

Special mention must finally be made of Jim Smith, London Trees and Woodlands Framework Manager, for his invaluable support, advice and advocacy, and most of all to Andy Tipping, for having sufficient faith in CAVAT to put it into practice in Barnet, for his consistent championing of the project, and amongst many contributions for advocating the inclusion of population density as an improvement to the method, and with others for providing the means to do so.

Appendix 2: Sketch site plan showing approximate tree locations



Appendix 3: CAVAT spreadsheet

Project: Tooting Bec

Name of Surveyor: Alex Needs and Jeremy Barrell

Date: # 04/08/2017

CAVAT

CALCULATE VALUE OF TREE STOCK

CTI Factor (Please select): 175%

Cumulative Total: £ 2,639,562

Full Method | Quick Method | Print

Tree Information			Step 1: Basic Value		Step 2: CTI Value		Step 3: Functional Value		Step 4: Adjusted Value				Step 5: Final Value	FINAL VALUE
Tree No.	Species ID	Location (I.e near tree no. 1)	Stem Diameter (Manual entry)	Basic Value	Accessibility (Please select)	CTI Value	Functional Value Factor (Please select)	Functional Value	Amenity Factors (Please select)	Appropriateness (Please select)	Adjusted Value	Calculated Total	Life Expect. Factor (Please select)	
1	Horse Chesnut	Tooting Common	25	£ 7,795	100%	£ 13,641	90%	£ 12,277	1	No Change	100%	£ 12,277	80+	£ 12,277
2	Horse Chesnut	Tooting Common	26	£ 8,431	100%	£ 14,755	90%	£ 13,279	1	No Change	100%	£ 13,279	80+	£ 13,279
3	Horse Chesnut	Tooting Common	42	£ 22,001	100%	£ 38,501	90%	£ 34,651	1	No Change	100%	£ 34,651	80+	£ 34,651
4	Horse Chesnut	Tooting Common	26	£ 8,431	100%	£ 14,755	90%	£ 13,279	1	No Change	100%	£ 13,279	80+	£ 13,279
5	Horse Chesnut	Tooting Common	41	£ 20,966	100%	£ 36,690	90%	£ 33,021	1	No Change	100%	£ 33,021	80+	£ 33,021
6	Horse Chesnut	Tooting Common	50	£ 31,180	100%	£ 54,566	90%	£ 49,109	1	No Change	100%	£ 49,109	80+	£ 49,109
7	Horse Chesnut	Tooting Common	27	£ 9,092	100%	£ 15,911	90%	£ 14,320	1	No Change	100%	£ 14,320	80+	£ 14,320
8	Horse Chesnut	Tooting Common	13	£ 2,108	100%	£ 3,689	90%	£ 3,320	1	No Change	100%	£ 3,320	80+	£ 3,320
9	Horse Chesnut	Tooting Common	13	£ 2,108	100%	£ 3,689	90%	£ 3,320	1	No Change	100%	£ 3,320	80+	£ 3,320
910	Horse Chesnut	Tooting Common	68	£ 57,671	100%	£ 100,924	90%	£ 90,832	1	No Change	100%	£ 90,832	40 - 80	£ 86,290
913	Horse Chesnut	Tooting Common	16	£ 3,193	100%	£ 5,588	90%	£ 5,029	1	No Change	100%	£ 5,029	80+	£ 5,029
914	Horse Chesnut	Tooting Common	73	£ 66,464	100%	£ 116,312	90%	£ 104,681	1	No Change	100%	£ 104,681	20 - 40	£ 83,745
915	Horse Chesnut	Tooting Common	81	£ 81,830	100%	£ 143,202	90%	£ 128,882	1	No Change	100%	£ 128,882	40 - 80	£ 122,438
916	Horse Chesnut	Tooting Common	61	£ 46,409	100%	£ 81,215	90%	£ 73,094	1	No Change	100%	£ 73,094	40 - 80	£ 69,439
917	Horse Chesnut	Tooting Common	77	£ 73,947	100%	£ 129,408	90%	£ 116,467	1	No Change	100%	£ 116,467	20 - 40	£ 93,173
918	Horse Chesnut	Tooting Common	92	£ 105,564	100%	£ 184,737	40%	£ 73,895	1	No Change	100%	£ 73,895	10 - 20	£ 33,253
919	Horse Chesnut	Tooting Common	69	£ 59,380	100%	£ 103,915	90%	£ 93,523	1	No Change	100%	£ 93,523	40 - 80	£ 88,847
957	Horse Chesnut	Tooting Common	87	£ 94,401	100%	£ 165,203	70%	£ 115,642	1	No Change	100%	£ 115,642	20 - 40	£ 92,513
958	Horse Chesnut	Tooting Common	78	£ 75,880	100%	£ 132,791	70%	£ 92,953	1	No Change	100%	£ 92,953	20 - 40	£ 74,363
959	Horse Chesnut	Tooting Common	38	£ 18,010	100%	£ 31,517	100%	£ 31,517	1	No Change	100%	£ 31,517	80+	£ 31,517
961	Horse Chesnut	Tooting Common	73	£ 66,464	100%	£ 116,312	60%	£ 69,787	1	No Change	100%	£ 69,787	20 - 40	£ 55,830
962	Horse Chesnut	Tooting Common	91	£ 103,282	100%	£ 180,743	100%	£ 180,743	1	No Change	100%	£ 180,743	40 - 80	£ 171,706
963	Horse Chesnut	Tooting Common	66	£ 54,329	100%	£ 95,075	50%	£ 47,537	1	No Change	100%	£ 47,537	20 - 40	£ 38,030
964	Horse Chesnut	Tooting Common	92	£ 105,564	100%	£ 184,737	50%	£ 92,369	1	No Change	100%	£ 92,369	10 - 20	£ 41,566
965	Horse Chesnut	Tooting Common	109	£ 148,181	100%	£ 259,317	30%	£ 77,795	1	No Change	100%	£ 77,795	10 - 20	£ 35,008
966	Horse Chesnut	Tooting Common	79	£ 77,839	100%	£ 136,217	50%	£ 68,109	1	No Change	100%	£ 68,109	10 - 20	£ 30,649
967	Horse Chesnut	Tooting Common	90	£ 101,024	100%	£ 176,792	50%	£ 88,396	1	No Change	100%	£ 88,396	10 - 20	£ 39,778
968	Horse Chesnut	Tooting Common	31	£ 11,986	100%	£ 20,975	90%	£ 18,877	1	No Change	100%	£ 18,877	80+	£ 18,877
970	Horse Chesnut	Tooting Common	30	£ 11,225	100%	£ 19,644	90%	£ 17,679	1	No Change	100%	£ 17,679	80+	£ 17,679
1028	Horse Chesnut	Tooting Common	11	£ 1,509	100%	£ 2,641	90%	£ 2,377	1	No Change	100%	£ 2,377	80+	£ 2,377
1029	Horse Chesnut	Tooting Common	85	£ 90,111	100%	£ 157,694	70%	£ 110,386	1	No Change	100%	£ 110,386	40 - 80	£ 104,867
1030	Horse Chesnut	Tooting Common	69	£ 59,380	100%	£ 103,915	90%	£ 93,523	1	No Change	100%	£ 93,523	40 - 80	£ 88,847
1134	Horse Chesnut	Tooting Common	34	£ 14,418	100%	£ 25,231	90%	£ 22,708	1	No Change	100%	£ 22,708	80+	£ 22,708
1139	Horse Chesnut	Tooting Common	50	£ 31,180	100%	£ 54,566	90%	£ 49,109	1	No Change	100%	£ 49,109	80+	£ 49,109
1140	Horse Chesnut	Tooting Common	44	£ 24,146	100%	£ 42,256	90%	£ 38,030	1	No Change	100%	£ 38,030	40 - 80	£ 36,128
1153	Horse Chesnut	Tooting Common	22	£ 6,037	100%	£ 10,564	90%	£ 9,507	1	No Change	100%	£ 9,507	80+	£ 9,507
1154	Horse Chesnut	Tooting Common	65	£ 52,695	100%	£ 92,216	80%	£ 73,773	1	No Change	100%	£ 73,773	40 - 80	£ 70,084
1156	Horse Chesnut	Tooting Common	56	£ 39,113	100%	£ 68,447	70%	£ 47,913	1	No Change	100%	£ 47,913	20 - 40	£ 38,330
1157	Horse Chesnut	Tooting Common	20	£ 4,989	100%	£ 8,730	70%	£ 6,111	1	No Change	100%	£ 6,111	10 - 20	£ 2,750
1158	Horse Chesnut	Tooting Common	20	£ 4,989	100%	£ 8,730	100%	£ 8,730	1	No Change	100%	£ 8,730	80+	£ 8,730
1159	Horse Chesnut	Tooting Common	36	£ 16,164	100%	£ 28,287	90%	£ 25,458	1	No Change	100%	£ 25,458	5 - 10	£ 7,637
1837	Horse Chesnut	Tooting Common	17	£ 3,604	100%	£ 6,308	90%	£ 5,677	1	No Change	100%	£ 5,677	10 - 20	£ 2,555
1840	Horse Chesnut	Tooting Common	78	£ 75,880	100%	£ 132,791	30%	£ 39,837	1	No Change	100%	£ 39,837	20 - 40	£ 31,870
1846	Horse Chesnut	Tooting Common	75	£ 70,156	100%	£ 122,772	40%	£ 49,109	1	No Change	100%	£ 49,109	20 - 40	£ 39,287
1847	Horse Chesnut	Tooting Common	95	£ 112,561	100%	£ 196,982	100%	£ 196,982	1	No Change	100%	£ 196,982	40 - 80	£ 187,133
1848	Horse Chesnut	Tooting Common	78	£ 75,880	100%	£ 132,791	80%	£ 106,233	1	No Change	100%	£ 106,233	20 - 40	£ 84,986
1849	Horse Chesnut	Tooting Common	76	£ 72,039	100%	£ 126,068	70%	£ 88,248	1	No Change	100%	£ 88,248	20 - 40	£ 70,598
1850	Horse Chesnut	Tooting Common	73	£ 66,464	100%	£ 116,312	80%	£ 93,050	1	No Change	100%	£ 93,050	40 - 80	£ 88,397
1851	Horse Chesnut	Tooting Common	77	£ 73,947	100%	£ 129,408	100%	£ 129,408	1	No Change	100%	£ 129,408	40 - 80	£ 122,937
1853	Horse Chesnut	Tooting Common	70	£ 61,113	100%	£ 106,948	90%	£ 96,254	1	No Change	100%	£ 96,254	40 - 80	£ 91,441
1854	Horse Chesnut	Tooting Common	16	£ 3,193	100%	£ 5,588	90%	£ 5,029	1	No Change	100%	£ 5,029	80+	£ 5,029
1856	Horse Chesnut	Tooting Common	27	£ 9,092	100%	£ 15,911	90%	£ 14,320	1	No Change	100%	£ 14,320	80+	£ 14,320
1857	Horse Chesnut	Tooting Common	15	£ 2,806	100%	£ 4,911	90%	£ 4,420	1	No Change	100%	£ 4,420	80+	£ 4,420
1858	Horse Chesnut	Tooting Common	40	£ 19,955	100%	£ 34,922	90%	£ 31,430	1	No Change	100%	£ 31,430	20 - 40	£ 25,144
1859	Horse Chesnut	Tooting Common	21	£ 5,500	100%	£ 9,625	90%	£ 8,663	1	No Change	100%	£ 8,663	80+	£ 8,663
1861	Horse Chesnut	Tooting Common	28	£ 9,778	100%	£ 17,112	90%	£ 15,401	1	No Change	100%	£ 15,401	80+	£ 15,401

Appendix 4: Extract from the Arboricultural Association Guidance Note 4 by Rodney Helliwell

ii. Expected duration of visual amenity

An estimate should be made of the probable length of time that the tree is likely to contribute to the visual amenity of its location. This will take into account the normal biological life span of trees of that species, its current approximate age, and any factors which may be expected to extend or reduce its life expectancy. For trees which are likely to remain for some time as standing deadwood, a separate valuation based on a reduced *Size* for an additional length of time could be added. This would require some form of discounting of this additional future value; and the uncertainties over a) the life expectancy before the tree dies, b) the length of time that the dead tree is likely to remain standing, c) the rate at which it is likely to reduce in size, and d) the appropriate discount rate will make this a rather uncertain and complicated procedure; which is unlikely to be used for most trees.

It should be pointed out that, while some account is taken of the further duration of the tree, any future changes in its size and condition are not. In addition, the scoring is skewed to some extent in favour of the near future rather than the more distant future, in order to account for the greater uncertainty of the distant future and also the greater imperative to retain trees for the next few years rather than for 50 or 100 years from now. This is partly a reflection of the normal preference to have benefits now rather than later and also the fact that it would be easier to grow trees which would be able to act as significant replacements in 50 years time than in 5 years. This assessment is, therefore, based firmly in the present, but with some acknowledgement to the future.

"Biological" life expectancy. Although some trees can survive for several centuries or (in extreme cases) several thousands of years, most trees have a life expectancy of no more than 300 years under typical conditions in gardens, parks, or streets; and some tree species are unlikely to survive for more than 50 or 60 years. In areas such as large parks with relatively few people and where conditions are suitable for the species in question, some trees may be able to grow for perhaps twice as long, or more.

As a very general guide, some of our common tree species can be grouped into the following categories of biological life expectancy, under typical conditions in parks and gardens in lowland Britain and without any major pruning or other treatment:

350 years or more	*Yew*
250 - 350 years	*Common Oak, Sweet Chestnut, London Plane, Sycamore, Limes, Scots pine*
150 - 250 years	*Cedar of Lebanon, Hornbeam, Beech, Tulip Tree, Norway maple, Corsican pine, Common ash*
100 - 200 years	*Norway Spruce, Walnut, Red Oak, Horse Chestnut, Field Maple, Monkey Puzzle, Mulberry, Pear*
60 - 100 years	*Rowan, Whitebeam, Apple, Wild Cherry, Catalpa, Robinia, most Poplars, Willows, Cherries, Alders and Birches*

Table 2: Typical biological life expectancy of common tree species in urban conditions.

Continuing Professional Development

barrell
TREE CONSULTANCY

Field House
Fordingbridge Business Park
Ashford Road
Fordingbridge
Hampshire
SP6 1BY

01425 651470
info@barrelltreecare.co.uk
www.barrelltreecare.co.uk