- Planning
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IN THE HIGH COURT OF JUSTICE,
QUEEN'S BENCH DIVISION

Claim No.
HQ10X1869 –

MULLINGER, BOWEN, FARLEY & FARTHING
AND
THE NATIONAL TRUST

EXPERT EVIDENCE (ARBORICULTURE)
OF
JULIAN FORBES-LAIRD

SUPPLEMENTARY REPORT ON QTRA

Prepared for the Claimants, on instructions from:

Ellisons Solicitors

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Summary

In my opinion, there are four areas of particular concern regarding the approach and function of QTRA:

1. The QTRA calculation does not include an allowance for the way in which the level of danger varies according to the attributes of the person or people exposed to it;
2. The calculation relies on a prediction of the timing of tree failure which significantly exceeds arboriculturists' ability to do this;
3. The assessments of failure likelihood and target occupancy are annualised, which is unrealistic; and
4. The valuation of a notional human life inherent within QTRA is inappropriate,

These difficulties substantially arise from the probabilistic nature of the QTRA method: as well as having grave doubts as to certain aspects of the method, I consider that this type of approach is a functionally inappropriate way to assess tree risk.

1 Introduction

1.1 This report comprises Expert Evidence supplemental to that contained in my principal report dated 7th April 2011. It is prepared and submitted under the same instructions, circumstances and undertakings as pertain to that report.

1.2 In the Experts' Joint Statement, it was agreed (at paragraph 30) that;

> *Since the NT's risk management at Felbrigg did not use either THREATS or QTRA, the Experts agree that the retrospective application of these methods cannot directly test the adequacy of that management. The Experts further agree that the NT's own risk management system and its implementation at Felbrigg should be appraised on its own merits.*

1.3 In light of this agreed position, after our meeting I invited Dr Lonsdale to resile from his reliance on QTRA, but he declined to do so. Accordingly, I am now instructed by solicitors for the Claimants to prepare this review, so that the Court can be appraised of certain aspects of QTRA which, it is fair to say, are considered to be controversial within the arboricultural profession.

1.4 Finally, Dr Lonsdale refers to another tree risk assessment method, THREATS (for 'Tree Hazard: Risk Evaluation and Treatment System'). This free-to-use method (which is not a probability calculator) was designed by me and is now in widespread national and international use.

1.5 Whilst noting that Dr Lonsdale's application of THREATS is discussed at paragraphs 23 – 29 of the Experts' Joint Statement, I wish to draw attention to the fact that I do not rely on it in my principal report. This is because I consider that an after-the-fact assessment of whether a tree was under responsible management by means of reverse-engineering inevitably subjective risk calculation methods has low credibility.

2 QTRA - Areas of concern

2.1 The principle of relative danger

The QTRA User Manual[3] states that the assessor should he 'mindful' of children's differing perception to danger, with which advice I agree. However, no guidance is provided on how the recommended mindfulness should be factored into the probability calculation; the increased exposure to hazard of those of impaired mobility is not considered at all. As such, I consider that QTRA does not properly assess the actual risk in respect of people at elevated vulnerability, even within its own terms.

2.2 The impossibility of accurately predicting the timing of tree failure

An essential element of QTRA is that the assessment is annualised, a core principle that confers two serious difficulties.

2.2.1 The first difficulty relates to the inherent need to predict timing of failure. The thought process required of the QTRA user is *for a given defect on a particular tree, how many out of 1000 such defects on similar trees would the assessor expect to fail in a year*. This construct, which requires significantly greater precision than other mainstream tree risk assessment methods, is an inevitable consequence of QTRA's probabilistic nature.

2.2.2 There are three serious obstacles in the path of an accurate prediction of failure timing:

1. It far exceeds the current arboricultural knowledge base (even assuming that this could *ever* provide a sound basis for such a precise assessment);
2. It requires the user to make accurate predictions concerning inherently unpredictable dynamic, climatically influenced systems; and
3. It relies on a very unrealistic level of knowledge and experience of most, arguably all, tree surveyors.

2.2.3 Currently unpublished research by Nottingham Trent University[4] confirms the problem: based on an analysis of a dataset exceeding 20,000 trees, it has been found that whilst competent tree surveyors can correctly identify defects, their estimation of annualised timing of failure is subject to an error in excess of 40%.

2.2.4 This research appears to confirm that QTRA makes demands on users that they are simply not equipped to meet. Decisions made about annualised failure risk being subject to an inherent 40% error, the outcome of a QTRA analysis cannot be relied on.

2.2.5 In fact, the question at issue is how QTRA deals with uncertainty, which is an unavoidable element in the evaluation of tree structural response to environmental factors, including decay, over time. The second report to Government of the HSE's *Interdepartmental Liaison Group on Risk Assessments*[5] (ILGRA) considers the question of how risk assessment systems deal with uncertainty in the following terms:

> "Dealing with uncertainty: The [Interdepartmental liaison] group suggested that in assessing risks where there is considerable uncertainty a clear distinction should be made between processes that are deterministic (where the cause assures the outcome) and those which are stochastic (where the outcome depends on chance). Unfortunately, for environmental risks, it is often the case that though one can readily identify the deterministic factors that must be present before the risk from a hazard is realised, the presence of these factors does not automatically mean that the risk *will* be realised because whether this happens or not is stochastic in nature. By analogy, one must hold a lottery ticket (a deterministic condition) to be entered in the draw. But possession of a ticket cannot guarantee winning a prize because that is a stochastic phenomenon."

2.2.6 This is a key difficulty with predicting timing of failure, which QTRA appears to address as though it were solely deterministic whereas in fact it is indelibly *stochastic* as well: the identification of a defect does not confer inevitability that the defect will ever result in failure, especially within the defined timeframe of a single year.

The ILGRA report concludes this discussion with the following observation:

> "Failure to distinguish deterministic from stochastic processes can cause confusion when assessing and managing risks."

2.3 Flaws in the target occupancy assessment

2.3.1 The second consequence of the annualised approach relates to the number of people exposed to hazard. To illustrate the problem: I know of a country estate that features a wood-pasture populated with pedunculate (English) oaks, where the land is used almost wholly for grazing but where the owner recently held a four-day rock festival: for 361 days of the pertinent year the site was substantially unoccupied by people, but for the other four days there were approximately 30,000 visitors.

2.3.2 Contemporary thinking on risk control, including current normative industry practice on tree safety management, recommends assessing the risk according to an event-specific approach. For example, BS8800:2004 'Occupational health and safety management systems'[6] makes it quite clear (see, for example, its paragraph 3.5.1 (b)) that in order to be effective, a risk assessment should 'react to changing demands', i.e. it should be scenario specific.

2.3.3 A further example is found in the National Trust's 'Health and Safety Instruction No. 11 – Tree Safety Management'[7]. This states at its paragraph 2.1 that 'temporary events can change the [target] zone designation for a limited period'. This approach reflects the thinking of BS8800:2004 and, of course, is also obvious common sense.

2.3.4 However, under the annualised approach of QTRA, the 'footfall' of the concert is spread across 365 days, such that the 'target occupancy' is just over 82 people per day. As well as ignoring the visitor density within potential impact areas, the annualised approach also ignores seasonal factors that frequently drive tree failure, This is, of course, highly relevant to an accurate determination of the risk: the relative exposure of people to hazard changes significantly with timing, not just with context.

it is fair to say, then, that QTRA's approach to target assessment is substantially out of step with current practice, tree response to environmental factors and common sense.

2.4 Problems with target value

Two issues arise here, variously to do with the valuation of objects and the monetary value assumed for a human life. As the matter in hand relates to people, I do not intend to address the valuation of objects further.

2.4.1 Concerning the value of a human life, under QTRA this is set at £1million, being the upper end of the scale currently used by the Health and Safety Executive[8]. A detailed critique of this aspect of QTRA has been prepared by Professor John Adams of UCL[9]. Whilst noting that "the QTRA methodology is elaborate and labour intensive and requires information that frequently doesn't exist" Professor Adams goes on to point out the inherent problems of attributing a cost value to human life.

2.4.2 According to Professor Adams, chief amongst these problems are:

1. Humans are neither repairable nor replaceable: they are not analogous to property and so they cannot and should not be compared to it; and
2. Because humans are irreplaceable, it is not actually possible to compensate those left behind for the loss of a loved one

Professor Adams considers that even to attempt to fix a value on human life is functionally inappropriate. I agree with this opinion.

Statement of Compliance with the Duties of an Expert Witness

I understand that my duty as an expert witness in this matter is to any court before which my evidence may come, including such successors in jurisdiction as may arise. I have complied with this duty and will continue to comply with it. I have set out, in this report, all matters relevant to the issues on which my expert opinion is given. This includes details of any matters that might run counter to my overall conclusions, and/or to the interests of my instructing client. As such, this report is written in compliance with Part 35 Civil Procedure Rules governing expert witnesses and I have addressed it to the court.

Statement of Truthfulness

The contents of this report comprise my honest opinion on the matters addressed herein, and are a true and accurate reflection of my conclusions. I confirm that I have made clear which facts and matters referred to in this report are within my own knowledge and which are not. These that are within my own knowledge I confirm to be true. The opinions I have expressed represent my true and complete professional opinions on matters to which they refer.

JULIAN FORBES-LAIRD

Signed on 27th May 2011

References

1 Occupiers' Liability Act 1957, downloadable at:
http//www.opsi.gov.uk/acts/acts1957/pdf/ukpga_19570031 en.pdf

2 Tomlinson v Congleton Borough Council [2003] 1 AC 46; [2004] UKHL 47, downloadable at:
www.flac.uk.com/downloads.html

3 Quantified Tree Risk Assessment User Manual V3.4-07 QTRA Ltd 2007

4 Dr Marcus Bellett-Travers (Managing Director of Trees Project Ltd, an NTU Life Sciences spin-out company) pers. comm. to the author, 2009

5 'Risk Assessment and Risk Management: Improving policy and practice within government departments' Health and Safety Executive Interdepartmental Liaison Group on Risk Assessment, second report to Ministers 1998, downloadable at:
http//www.hse.gov.uk/aboutus/meetings/committees/ilgra/minrpt2.tm

6 BS8800:2004 'Occupatlonal health and safety management systems- Guide' BSI 2004

7 'Health and Safety instruction No. 11 – Tree Safety Management', National Trust 2007

8 Generic terms and concepts in assessment and regulation of industrial risk. HSE (DDE2). 1995e, HSE Books.

9 'How does the HSE Distinguish Real Risk from Trivial Risk?' A paper presented by Professor John Adams, UCL, at 'The Future of Tree Risk Management' conference, Bristol 2007

10 News item in the Birmingham Mail, 25th March 2010

11 See, for example. 'Amenity Valuation of Trees & Woodlands' (the Helliwell System) Arboricultural Association Guidance Note no. 4