M25 junction 10/A3 Wisley Interchange TR010030

9.100 Applicant's Response to RHS's Deadline 7 Submission

Rule 8(1)(c)(i)

Planning Act 2008

Infrastructure Planning (Examination Procedure) Rules 2010

Volume 9

May 2020

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Examination Procedure) Rules 2010

M25 junction 10/A3 Wisley interchange

Development Consent Order 202[x]

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Rule Number:	Rule 8(1)(c)(i)
Planning Inspectorate Scheme Reference	TR010030
Application Document Reference	TR010030/9.100
Author:	M25 junction 10/A3 Wisley interchange project team, Highways England and Atkins

Version	Date	Status of Version
Rev 0	01 May 2020	Deadline 8

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1. Introduction

1.1.1 This document sets out Highways England's response to RHS's document *Appendix 1 - RHS comments on REP6-010: HE's response to RHS's deadline 5 submissions* [REP7-040] and to RHS's document *Appendix 3 - Letter from Barrell Tree Consultancy to Royal Horticulture Society* [REP7-042]

1.1.2 Where issues raised within the submission have been dealt with previously by Highways England, a cross reference to that response or document is provided to avoid unnecessary duplication. The information provided in this document should, therefore, be read in conjunction with the material to which cross references are provided.

1.1.3 In order to assist the Examining Authority, Highways England has not provided comments on every point made by RHS, including for example statements which are matters of fact and those which it is unnecessary for Highways England to respond to. However, and for the avoidance of doubt, where Highways England has chosen not to comment on matters contained in the response, this should not be taken to be an indication that Highways England agrees with the point or comment raised or opinion expressed.

2. Highways England's response to RHS document *Appendix 1 - RHS comments on REP6-010: HE's response to RHS's deadline 5 submissions* [REP-040]

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4	In particular the RHS notes that many of the points made by HE in REP6-010 have already been shown to be flawed through RHS's document REP6-024 submitted at Deadline 6. In particular, the Freeths LLP submissions in REP6-024 demonstrate the fundamental errors in NE's and HE's approach with regard to the assessment of air quality impacts of the DCO Scheme on land within the Thames Basin Heaths SPA <150m from the roads. This fundamental error is perpetuated through the majority of the content of REP6-010 which is therefore equally flawed on that basis. Instead the following comments merely address paragraphs in HE's REP6-010 with content which has not previously been addressed by RHS.	These issues have already been responded to in Highways England's Deadline 7 response [REP7-008].
2.1.1	Although HE chose not to review the RHS Alternative Scheme components, all of the distances set out in REP5-046 were measured from the same set of plans as those from which the Existing and DCO Scheme distances were measured and hence they can be taken as being accurate.	Highways England accepts that the measured distances for the RHS Alternative Scheme presented by RHS in REP5-046 are based on the same set of plans as those from which the existing and DCO Scheme distances were measured. However, Highways England has not independently checked the RHS measurements to confirm that they are correct.
2.2.1	HE disputes the reference to the switch in RHS traffic from the SRN to the LRN but the data referred to in REP5-047 and REP5-052 (page 2) is all sourced from HE's own work and is therefore assumed to be accurate.	Highways England does not dispute the numbers in Appendix B in [REP5-047], as the numbers are from Highways England's traffic modelling. However, Highways England does dispute the comparison that RHS make that derives the quoted 30% switch of traffic from the Strategic Road Network (SRN) to the Local Road Network (LRN). This is because it is based on a comparison between the Do-something scenario with the 2015 Base, when the correct comparison is between the Do-something

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		and Do-minimum scenario, which shows a 20% switch in traffic from the SRN to the LRN.
2.2.6	HE has presented no evidence to support its claim that the closure of Wisley Lane will be significantly safer than maintaining the existing (not RHS proposed) junction (not access) with the A3	See Table 4.6 in [APP-136] (Transport Assessment Report) which compares accidents in the do-minimum and do-something scenarios on the A3.
2.3.1 - 4	There is now a great deal of back-tracking by HE with regard to its reliance on the accident data. HE is now using phrases like; (i) 'the data is open to interpretation', (ii) 'based on the information available to police at the time of the incident', (iii) 'data are often self-reported and even more likely to be a subjective view of what happened' and (iv) 'the matter is open to debate'. This shows the unreliability of HEs assertion as to the cause of the accidents. For the reasons the RHS has already explained, HE's attempt to link the accidents to left-out movements from Wisley Lane is fundamentally flawed	It is unreasonable to characterise these paragraphs, which explain the situation, as back-tracking. In particular, paragraph 2.3.3 of REP6-010 explains the importance of accident rates in this matter, as follows: *Highways England recommend the use of accident rates, in consideration of road safety, as these make no judgement on fault, merely providing a rate which a given number of accidents on a stretch of road is comparable to other parts of the network. As noted in Section 4 of REP4-005 (in row "REP1-38-2" of the table), the northbound merge of Wisley Lane with the A3 has a significantly higher accident rate than average.*
3.1.2	It is irrelevant for HRA purposes that guidance documents do not require a focus on NOx levels. As set out in Freeths LLP's Annex (REP6-024, paragraphs 11 and 51), the Court of Justice of the European Union HRA caselaw clearly requires this. Freeths LLP's Annex has also explained why it is wrong for HE to focus only on air quality impacts on the land within the SPA which is >150m from the roads.	An SiAA for HRA is not prescriptive, but "should be appropriate to the task in hand" (Champion v North Norfolk DC [2015], quoted in NEA001 paragraph 5.8 [REP3-021]). Natural England were consulted on the HRA and did not request consideration of NOx concentrations (see Comments on Royal Horticultural Society's Deadline 5 Submission [REP6-010], paragraph 3.1.2, and Applicant's Response to Examining Authority's Second Written Questions [REP5-014], 2.3.1). An appropriate assessment should consider the likely effects on the qualifying features, and in the case of SPAs, on the supporting habitats, which in this case are over 150 metres from the road (see Applicant's comments on RHS's Deadline 3 submission [REP4-005], chapter 2, reference 11, and Applicant's Response

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		to Examining Authority's Second Written Questions [REP5-014], 2.3.1). Paragraphs 11 and 51 of the Freeths Annex at REP6-024 do not mention the requirement for NOx concentrations to be reported in an HRA and to imply that they do is misleading.
3.2.1 - 3.2.5	With reference to 3.2.3, the RHS does not agree with the traffic flow figures used by HE for an event day (see REP6-024, Proposition 1.4, pdf page 83), so RHS cannot agree that the figures used do not represent the AADT flow	The SoCG (TR010030/Volume 9.38 (2)) states agreement in part. The reasons for only partial agreement are given in the extracts from the SoCG below. However, the fundamental fact remains that Highways England did not model an average day at RHS but volumes of traffic that are consistent with an event day. RHS state that: *However, there remains uncertainty regarding RHS traffic as cross referencing with the model output suggests that not all of this traffic is actually assigned to the network. For example, the 2022 RHS 2 way AADT flow in Table 3.10 of REP1-010 states an RHS Garden traffic flow of 8857 PCUs, whereas the model output and flow plots provided to RHS by HE for the whole 'Wisley Zone' (of which RHS is a part) is lower at 8238 in the DoMinimum and lower again in the DoSomething at 8095* Highways England states: *The small difference between the numbers quoted by RHS opposite is a result of delays around the modelled network preventing all the modelled traffic completing their journeys within the modelled hour. The model used, SERTM, covers the whole of the south east of England in some detail and notwithstanding the improvements to the A3 and M25 associated with this scheme, it is delays outside of this Scheme's study area that results in some trips not completing journeys within the modelled hour.*

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3.2.1 - 3.2.5	With reference to 3.2.3, the RHS does not agree with the traffic flow figures used by HE for an event day (see REP6-024, Proposition 1.4, pdf page 83), so RHS cannot agree that the figures used do not represent the AADT flow. In terms of 3.2.4, as stated above, the RHS does not agree with the traffic flow figures used by HE for an event day (see REP6-024, Proposition 1.4, pdf page 83), so RHS cannot agree that the figures used do not represent the AADT flow. The second part of the response relates to HE ignoring impacts within 150 m of the roads, which is a proposition not accepted by RHS as set out elsewhere in this document and in REP6-024	See above and HE's response against 1.4 in the Draft SoCG with RHS [REP5-050] and HE's response against 2.1.3 in [REP6-010]. The SiAA is required to examine the implications of the scheme for the qualifying features and supporting habitats. These are present at locations over 150 metres from the road as documented in Applicant's comments on RHS's Deadline 3 submission [REP4-005], chapter 5, reference 2.1.1 and Applicant's Response to Examining Authority's Second Written Questions [REP5-014], 2.3.1, and therefore it is only appropriate to consider the effects of air quality on the SPA at these locations.
4.1.2. and 4.1.8	The RHS remains of the view that HE / NE's position, that the woodland is merely a buffer and need not be restored, is incorrect. 14. The RHS refers to its previous submissions on this point (REP6-024). 15. In addition, HE's compensatory habitat measures directly contradict NE's and HE's approach that the buffer must retained. The suite of compensatory measures presented by HE (see AS- 012 Additional Submission - Applicant's Response to Rule 6 - 5.3 Habitats Regulations Assessment Figures (Revision 2) - Accepted at the discretion of the Examining Authority figures 15) include clear felling of woodland within the SPA 'in order to allow heathland restoration' (paragraph 4.2.1 of REP4-014), thereby demonstrating that NE and HE see clear felling of this woodland within the SPA as advantageous to the SPA.	RHS's Deadline 6 submission [REP6-024] has been responded to by Highways England [REP7-008]. As Natural England has explained in response 2.4.7d within Natural England's response to the ExA's second written questions [REP5-032], the achievement of favourable condition for the Ockham and Wisley Commons SSSI component part of Thames Basin Heaths SPA is dependent upon improvement of the condition of the existing heathland resource, not expansion of heathland through large-scale felling of woodland. As explained in 3.8.2 of Highways England's response to ExQ3 [REP7-004], this is not to say that the clearance of some areas of this woodland would conflict with the conservation objectives of the SPA, but rather, that the management of the Ockham and Wisley Commons SSSI component of the Thames Basin Heaths SPA does not require the removal of additional woodland in order to achieve favourable condition for the site. The clearance of some areas of woodland within SPA enhancement areas is part of the suite of compensatory

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		measures, which (as explained in 3.8.2 of Highways England's response to ExQ3 [REP7-004]), fall outside 'normal practice' and would not have occurred as part of the existing management of the SPA. The suite of compensatory measures do not contradict Natural England's view as stated in response 2.4.7d within Natural England's response to the ExA's second written questions [REP5-032], that '*Natural England has consistently advised against the removal of the woodland 'buffer' in areas of the site alongside the A3 and M25*'. As explained in response to question 3.8.2 in Highways England's response to ExQ3 [REP7-004], the only location where woodland is cleared alongside the A3 or M25 as part of the suite of compensatory measures is at the replacement Cockcrow bridge (areas E1 and E2 as shown in Figure 13 of the HRA figures [AS-006]). This was a well-considered decision in order to maximise the effectiveness of the proposed green bridge by providing a continuous heathland link either side of the green bridge, and was agreed with Natural England, Forestry Commission, RSPB, Surrey Wildlife Trust and Surrey County Council. This is an exceptional and unique opportunity, and to claim that it contradicts Natural England's consistent approach is unfounded. In all other locations, a woodland buffer along the edge of the A3 and M25 is being retained.
4.2.1	The nitrogen deposition rates in Table 8 do not include the contribution of ammonia from road traffic; therefore, they are not correct. As a conservative assumption, the ammonia contribution from road traffic can be taken into account by doubling the deposition due to NOx from road traffic. On this basis the increases in Table 8 would be doubled, so a 0.6% increase would become 1.2%. As a consequence, it can be seen that increases above 1% extend out to 100m from the	As explained in Applicants Response to Examining Authority Third Written Questions [REP7-004], 3.4.3 and Applicants Comments on Royal Horticulture Society's Deadline 6 submission [REP7-008], paragraph 2.2.48 ammonia concentrations can be seen to decrease rapidly away from the roadside, and any contribution of ammonia from road vehicles would not have a discernible effect at the distance at which the supporting habitats for the qualifying features are present, at over

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	road on Transect 1 and out to 75m from the road on Transect 4, i.e. well into the SPA. RHS has set out elsewhere in this document and in REP6-024 that this part of the SPA needs protecting	150 metres from the road. The contribution to nitrogen deposition at points closer to the road than this is not relevant.
4.3.1	The RHS notes that HE states at paragraph 4.3.1 that the SIAA determined (point 11, page 9, REP4-005) that it is not possible to conclude no adverse effect, based on land take from the SPA and the potential for the woodland being lost to contribute to an invertebrate source. However, we note that on many occasions HE has in fact stated that there in fact will be an adverse effect on site integrity through this pathway, see for example:3 The Statement to Inform an Appropriate Assessment of the DCO Scheme dated 3 March 2020 at paragraph 7.2.24 (APP-043) states: "The loss of this land will represent a permanent and irreversible adverse effect on the integrity of the Thames Basin Heaths SPA, with respect to the conservation objectives to 'maintain the extent and distribution of the habitats of the qualifying features' and 'maintain or restore the distribution, abundance and availability of key prey items'…" Even at point 11, page 9, REP4-005, just above the very reference given by HE at paragraph 4.3.1, HE itself states "The SIAA has aligned with this approach, and it is important to note that Highways England have identified an adverse effect to the integrity of the SPA as a result of the Scheme, and in accordance with Article 6(4) of the Habitats Directive" (emphasis added) NE and HE have similarly acknowledged that the DCO Scheme "will lead to an adverse effect on integrity of the SPA" through woodland "land take" from the SPA, see paragraph 3.2.12 of HE / NE	The SiAA [REP4-018] concluded that it was not possible to ascertain that the physical loss of woodland and its potential to contribute to an invertebrate resource would have no adverse effect on the SPA. This is a precautionary approach as it is unlikely that the loss of this woodland would actually have an adverse effect on the SPA qualifying species, when it is the heathland habitats which support them for nesting and foraging, and therefore the heathland habitats are likely to provide all of the invertebrate resource that they need. As explained in paragraph 7.2.23 and paragraphs 7.4.1 to 7.4.7 of the SiAA [REP4-018], based on the precautionary principle, it was assumed that the complete loss of woodland habitat within the SPA (permanent loss of 5.9 ha and temporary loss of 8.7 ha) would result in a quantifiable reduction in overall invertebrate biomass at a magnitude which cannot be disregarded in view of the SPA's conservation objectives. Therefore, a risk to site integrity was acknowledged and an adverse effect was identified with regards to the physical loss of woodland habitat, based on the precautionary approach that an adverse effect could not be ruled out. In this matter, not ruling out an adverse effect results in the same conclusion as identifying an adverse effect. As explained in paragraph 2.2.17 of Highways England's response to RHS's Deadline 6 submission [REP7-008], there is a profound difference between the ecological implications for prey availability from a loss of woodland habitat (permanent loss of 5.9 ha and temporary loss of 8.7 ha) compared to a minor change in

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	Statement of Common Ground dated 3 March 2020 (“SoCG”) (REP5-003)	air quality across the extensive areas of woodland buffer habitats that remain. An adverse effect as a result of air quality changes can indeed be ruled out.
4.4.3	HE accepts that there is an in-combination increase in nitrogen deposition, even at distances beyond 150m from the roads. RHS document REP6-024 para 54.7 (on pdf page 25) shows that these in combination increases in nitrogen deposition are in fact up to 6% of the critical load when ammonia is taken into account. This is well above the 1% criterion below which the impacts are usually considered to be insignificant and this is the position at distances beyond 150m from the roads. HE has not evaluated the ecological effects of these substantial increases even beyond 150m from the roads, let alone <150m from the roads, so cannot conclude that there is no reasonable scientific doubt as to the absence of adverse effects to the integrity of the SPA. It is also irrelevant in terms of the “in combination” HRA legal requirement that (as HE states in paragraph 4.4.3) “the Scheme makes no material contribution to this in-combination increase at the distance that the heathland occurs” (this is a reference to the increase of <0.01 kgN/ha/yr cited in paragraph 4.4.3, which is taken from Table 4, page 164 of REP5-003, but note that this increase is underestimated, as it does not include the ammonia contribution from road traffic). HE has clearly conceded (by undertaking an in-combination assessment, see section B.5 starting on page 162 of REP5-003, called a sensitivity test) that an in-combination assessment is appropriate and required in this case. On that basis the combined impacts of the Scheme with other plans or projects must be regarded as relevant and be taken into	Highways England does not accept that there is an in-combination increase in nitrogen deposition at distances beyond 150 metres from the roads. The calculated nitrogen deposition rates are provided in Revised Nitrogen deposition rates within the Thames Basin Heath SPA [REP5-024], and show either a decrease or no change at the transect points located at 150 or 200 metres away from the road. The in combination assessment for the HRA was undertaken correctly as stated in Applicant's comments on RHS's Deadline 3 submission [REP4-005] response to Highways England point 2.9 (page 56). As noted in REP5-003 the results in Table 4 simply show the results of a highly conservative sensitivity test and should not be used in the HRA. At the locations of the supporting habitats for the qualifying features of the SPA, the contribution from ammonia emissions from road vehicles to nitrogen deposition will not be discernible (see paragraph 2.2.48 of Applicants Comments on Royal Horticulture Society's Deadline 6 submission [REP7-008]).

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	account as is required under Regulation 63(1) of the Conservation of Habitats and Species Regulations 2017.	
4.4.4	HE states here that the Scheme does not cause any adverse effects on the SPA due to air quality in combination with other plans and projects. This however is unsupported by any evidence. Most importantly, HE has not considered the in-combination impacts on the SPA <150m of the roads, where the road traffic air quality levels and impacts, both alone and in-combination, will be even greater than in the heathland zone >150m from the roads.	The in combination assessment is discussed in Response to RHS Comments on Air Quality [REP2-022], paragraph 2.9.1, in Applicant's comments on RHS's Deadline 3 submission [REP4-005] (points 11,12 and 13) and in Comments on Royal Horticultural Society's Deadline 5 Submission [REP6-010], paragraphs 3.1.5 to 3.1.7. Also see response to point 4.4.3 above.
4.5.1	The RHS acknowledges that the RHS Alternative would not entirely avoid impacts on the SPA from either the air quality or land take impact pathways. The RHS has stated its position in its draft statement of common ground with HE, see REP6- 024, page 99: NA9 Relevant Issue: Impacts of the RHS Alternative on the SPA, RHS Wisley Position: “The RHS Alternative would reduce Scheme impacts on the SPA” (emphasis added). The RHS Alternative Scheme would however reduce the air quality levels impacts by comparison to the DCO Scheme as the RHS Alternative would greatly decrease annual mileage generated thereby reducing the increase in nitrogen deposition and other pollutants arising from the scheme. In comparison with the proposed signposted route of the DCO Scheme, the RHS Alternative would result in 2.6 million km per annum less travel.	It is noted that the RHS acknowledges that the RHS Alternative would not entirely avoid impacts on the SPA from either the air quality or land take impact pathways. As demonstrated in Point 11 of Highways England’s comments on RHS’s Deadline 3 submission [REP4-005], in Section 4 of Highways England’s comments on RHS’s Deadline 5 submission [REP6-010] and in Section 2.2 of Highways England’s comments on RHS’s Deadline 6 submission [REP7-008], the SiAA has correctly determined that the Scheme will not lead to an adverse effect on the SPA as a result of changes in air quality. The SiAA identified an adverse effect with regards to the physical loss of woodland habitat, based on the precautionary approach that an adverse effect could not be ruled out. Therefore, as explained in Section 4.5 of Highways England’s comments on RHS’s Deadline 5 submission [REP6-010], based on the precautionary approach, the Scheme will cause an adverse effect on the SPA as a result of land take. The Scheme

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		will not lead to an adverse effect on the SPA as a result of changes in air quality. As explained in Section 4.5 of Highways England's comments on RHS's Deadline 5 submission [REP6-010] and in paragraph 2.2.29 of Highways England's comments on RHS's Deadline 6 submission [REP7-008], due to the requirement of additional land take, the RHS alternative scheme is not a better alternative. Due to the additional land take Highways England disagree with RHS's position in NA9 of the SOCG that RHS submitted at Deadline 6 [REP6-024] where the RHS state that the RHS alternative scheme would reduce impacts on the SPA.
4.5.2. and 4.5.4 - bullet point 2	HE states that the RHS Alternative would be worse in terms of the "land take within the SPA" impact pathway than the DCO Scheme. There will in fact be no additional impact on the integrity of the SPA from the RHS Alternative Scheme through SPA land impacts compared to the DCO Scheme. The DCO Scheme will have a permanent land take from the SPA of 5.9 ha (see paragraph 3.3.21 of REP4-018). The DCO Scheme will have a temporary impact on the SPA of 8.7ha (see paragraph 3.3.21 of REP4-018). The RHS Alternative Scheme will, by contrast, require an additional, permanent land take from the SPA of 3.63m2 and an additional, temporary land impact within the SPA of 28.0m2. Thus the total additional SPA land impact (temporary plus permanent) of the RHS Alternative Scheme at Wisley Lane (by contrast to the DCO Scheme) is 31.63m2. This additional SPA land impact is shown in Figure 1.	The additional SPA land required by the RHS Alternative design assumes a that a number of departures from standard would be approved for the geometry of their connector road, for details please see Appendix A in - Draft Statement of Common Ground with Royal Horticultural Society - Highways and Traffic [REP5-050]. Furthermore, the width of the connector road linking Wisley Lane with the northbound A3 does not allow for a 3.3m hard shoulder, 0.7m offside hard strip, and the land take does not allow for the visibility requirements around the 56m radius curve. As explained in the response to 4.5.1 above, the SiAA has identified an adverse effect with regards to the physical loss of woodland habitat and has determined that the Scheme will not lead to an adverse effect on the SPA as a result of changes in air quality. Therefore, the RHS alternative scheme would not reduce impacts on the SPA when compared to the Scheme as it increases, not decreases land take from the SPA. In addition, if the necessary departures from standard for the geometry of the RHS Alternative

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	3.63m2 of SPA permanent land take amounts to an additional 0.00615% when compared to the 5.9ha (59,000m2) of SPA land take that is to be permanently lost to the DCO Scheme. 28m2 of temporary land take amounts to an additional 0.032% when compared to the 8.7ha (87,000m2) SPA land take that is to be temporarily taken by the DCO Scheme. The overall total additional land take (both permanent and temporary) from the SPA as a result of the RHS Alternative Scheme is 31.63m2. This amounts to an additional 0.02% of the SPA when compared to the 87000 + 59000 = 146,000m2to be taken under the DCO Scheme. This cannot be considered material in any way. Notwithstanding the tiny scale of the additional SPA land impact of the RHS Alternative Scheme by comparison to the DCO Scheme, the RHS Alternative Scheme will have no additional impact on the integrity of the SPA through the land impact pathway. This is because: (i) The additional 31.63m2 area of SPA land to be affected under the RHS Alternative Scheme consists of the road verge which is already occupied by street furniture. See the photos in Figures 2 and 3 below. (ii) This area is therefore part of the SPA “site fabric” as defined by Natural England as “land and/or permanent structures present within a designated site boundary which are not, and never have been, part of the special interest of a site, nor do they contribute towards supporting a special interest feature of a site in any way, but which have been unavoidably included within a boundary for convenience or practical reasons. Areas of site-fabric will be deliberately excluded from condition assessment and will not be expected to make a contribution to the achievement of conservation	design were not approved, then the land take from the SPA would be considerably greater than RHS are proposing, leading to an even larger adverse effect on the SPA.

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	objectives" (taken from NE's Internal Guidance – Approach to advising competent authorities on Road Traffic Emissions and HRAs V1.4 Final – June 2018, page 16). (iii) As such the works in this area under the RHS Alternative Scheme have no impact at all on the integrity of the SPA and must be disregarded.	
4.5.3	HE's statement that it has already been demonstrated that there will be no adverse effect on the SPA as a result of air quality impacts from the DCO Scheme, is simply incorrect. The RHS has demonstrated comprehensively through its REP6-024 submission by Freeths LLP that this is incorrect. The fact that NE has agreed with the approach taken in the SIAA does not negate the fact that HE has erred in its assessment of the air quality impacts. Likewise, the fact that HE here is (apparently, according to paragraph 4.5.3) using the same approach as on other projects does not correct the errors in this case. Since the correct conclusion is that an adverse effect on SPA integrity via the air quality impact pathway from the DCO Scheme cannot be ruled out, then air quality impacts must feature in the analysis of alternative solutions as is made clear by Court of Justice of the uropean. Union's judgment in C-304/05 paragraph 83 "the assessment of any imperative reasons of overriding public interest and that of the existence of less harmful alternatives require a weighing up against the damage caused to the site by the plan or project under consideration.	All issues raised in RHS's Deadline 6 submission [REP6-024] have already been responded to in depth in Highways England's Deadline 7 response [REP7-008], confirming that the SiAA was undertaken correctly, that the Scheme will not lead to an adverse effect on the SPA as a result of changes in air quality and that therefore the RHS alternative would not be less harmful. Highways England considers the agreement of the SiAA approach and findings with Natural England (as recorded in the SOCG between Highways England and Natural England [REP5-003]), and the consistency of the SiAA with the position set out by the High Court in their decision in Compton Parish Council v Guildford Borough Council [2019] EWHC 3242 ('the Compton Case') to be extremely relevant and does not accept the attempted dismissal given by RHS.

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4.5.4	As noted above, in comparison with the proposed signposted route of the DCO Scheme, the RHS Alternative would result in 2.6 million km per annum less travel (note, that this reduction is on all roads, not only the A3) which will inevitably lead to fewer emissions and less serious air quality impacts. HE must assess accurately the air quality impacts of the DCO Scheme and the RHS Alternative to identify the beneficial effects of the RHS Alternative and this will no doubt be assisted by the responses by HE to be given at Deadline 7 to the questions in section 13 in ExQ3.	As stated in Applicant's comments on RHS's Deadline 3 submission [REP4-005], chapter 2, point 10, and chapter 5, point 2.1.1 (page 43) RHS Alternative would not affect the findings of either the SiAA or the air quality assessment provided in the ES. Highways England has not modelled the RHS Alternative because it does not consider that the left turn from Wisley Lane on to the A3 is a safe option.

3. Highways England's response to RHS document Appendix 3 - *Letter from Barrell Tree Consultancy to Royal Horticulture Society* [REP7-042]

3.1.1 Highways England (HE) has considered the letter dated 17 April 2020 from Barrell Tree Consultancy to the RHS submitted by RHS at Deadline 7 [REP7-042].

3.1.2 The letter is heavily caveated as regards to the information considered by Mr Barrell in reaching his conclusions. He refers to the two documents he has seen and stresses that he has not visited the site or seen the trees.

3.1.3 He refers to his concerns about a number of omissions, numbered 1-7.

3.1.4 As regards points 1, 2, 3 and 5 all of these are addressed in Appendix 7.3 of the environmental statement [APP-089] the Veteran trees and Arboricultural Impact Assessment. Mr Barrell makes no mention of having considered this document and presumably he has not done.

3.1.5 Sections 7.2 & 7.4 of Appendix 7.3 cover the method of recording and the analysis of the tree data captured. This addresses **point 1** in Mr Barrell's letter.

3.1.6 Appendix B of Appendix 7.3 addresses **point 2** in the letter. The Appendix contains the Scheme wide tree survey schedule. This includes the RHS trees recorded in this location and details all tree data collected in accordance with BS 5837 requirements.

3.1.7 Section 7.2, paragraph 7.2.1.1 of Appendix 7.3 confirms that the tree survey was carried out by experienced and qualified arboriculturists'. This addresses **point 3** in the letter.

3.1.8 Appendix A, section A.2 of Appendix 7.3 explains how trees were measured to inform the root protection area calculations. This addresses **point 5** in the letter.

3.1.9 Section 7.4, paragraphs 7.4.7.1 to 7.4.7.5 of Appendix 7.3 explains that Highways England's arboriculturists identified 7 trees within RHS Wisley at risk of removal. These being tree reference numbers T197, T192, T185, T184, T181, T183 & T176. The trees were potentially affected due to the extent of the earthworks required within the A3 verge. This included the two redwood trees (T184 and T183) that are of particular concern to RHS.

3.1.10 In November 2019 Highways England's arboriculturists undertook a further detailed assessment in order to establish the lateral extents of mappable tree roots around the trees and how the Scheme would impact upon them. This involved mapping the rooting areas of the trees using impulse technology, an innovative approach used in the Thames Tideway scheme and during the construction of the A14 Cambridge to Huntingdon Improvement Scheme.

3.1.11 The results of this survey work informed the documents referred to by Mr Barrell. However, a technical note produced by Highways England's arboriculturists that included the method, outputs and conclusions of this assessment has not been submitted to the examination to date and these conclusions were used to inform the proposed design modification (within limits of deviation shown on the works plans) mentioned in the report to which Mr Barrell refers (i.e. HE551522-ATK-HML-A3_J1-RP-CH-000001).

3.1.12 This technical note is appended to this response and covers an assessment of the impacts from the works as originally proposed in this location, namely a retaining wall structure and extensive works in the A3 verge as part of the A3 widening in this location. The technical note also addresses **point 4** of Mr Barrell's letter regarding the explanation of the phrase 'structural root zone'.

3.1.13 The modification proposed relates to a requirement in the dDCO to protect them, namely requirement 18 [REP6-003]. The requirement restricts intrusive works except with the consent of RHS within certain areas related to the trees, namely the area containing the mapped root zones along with a 1m offset.

3.1.14 Highways England agrees with Mr Barrell regarding the root protection area (RPA) capping at 15m according to BS5837. Highways England's arboriculturists did not apply at cap of 15m because RPAs can be modified in line with the BS5837:2012 guidance to take into account conditions not conducive for tree root growth, such as (in this case) the A3 and existing hard infrastructure. The realignment proposed in this location minimises/removes construction within the verge and any impacts on the RPAs of the trees.

3.1.15 The further investigations that were conducted went above the consideration of the RPA as given in BS 5837:2012 in order to gain a better understanding of the lateral spread of the larger roots associated with stability and the storage of starch. Consideration was given to the lateral extent of the mapped root zone to augment, but not replace, the consideration of the RPAs. The use of the impulse technology allowed Highways England to better understand the root systems of the trees. It establishes a radial extent of tree roots of 25mm diameter and greater, to allow detailed analysis of the impacts of the works on the structural integrity of the tree. Roots of 25mm diameter and greater are those considered essential to the tree's health and stability, hence the need to determine where these are located. Roots of less than 25mm diameter are generally considered to be primary functioning for water and mineral uptake, and these could extend beyond the mapped areas. However, within the BS5837 it is recognised practice that such roots can be trimmed where needed, and if clump forming only on the advice of an arboriculturist.

3.1.16 Mr Barrell questions the use of the phrase 'structural root zone'. Whilst this phrase is not mentioned in the BS5837 recommendations, it's use is explained in the technical note appended to this response and was relevant in understanding the impact of the proposals on the structural integrity of the trees. The 1m depth of the structural root zone indicated in the drawing of document REF HE551522-ATK-HML-A3_J1-RP-CH-000001 was included to demonstrate the working depth of the impulse tomography equipment used, rather than the depth of the structural root zone measured.

3.1.17 The protection measures for these trees are to be detailed within an arboricultural method statement (AMS) required as part of the CEMP required to be approved under Requirement 3 of the Draft DCO. This will include updating the tree protection plan to show the locations of any protective barriers or ground protection. The AMS will also detail the requirements for monitoring and supervision by an arboriculturist. This addresses **point 6 & 7** in the letter.

3.1.18 Mr Barrell's conclusion that the analysis undertaken by Highways England is not credible or fit for purpose is wrong and has been formed without his reviewing all available documentation or requesting any further information.

Appendices

Appendix A. Technical note

Technical Note

Project:	M25 junction 10/A3 Wisley Interchange		
Subject:	RHS Wisley tree impacts		
Author:	Thomas Dale		
Date:	14/01/2020	Project No.:	5190926

Document history

Revision	Purpose description	Origin-ated	Checked	Reviewed	Authorised	Date
Rev 1.0	DRAFT for review	TD	JM	NW	GB	JAN 2020

Client signoff

Client	Highways England
Project	M25 junction 10/A3 Wisley Interchange
Project No.	5190926
Client signature / date	

1. Introduction

Atkins Limited (Atkins) has been commissioned by Highways England to undertake further assessment of 7no. trees located in the boundary of RHS Wisley that were identified as part of the Development Consent Order (DCO) application as being at threat of removal from the proposed M25 junction 10/A3 Wisley interchange (the Scheme').

The layout of the proposals along this section of the Scheme require widening of the A3 carriageway. Including the provision of a retaining structure for the remaining A3 embankment.

2. Discussion

The 7no. trees were recorded as part of the tree survey undertaken for the Scheme, and the details captured within Appendix 7.3 Veteran trees and Arboricultural Impact Assessment of the Environmental Statement (ES). The tree survey schedule data has been copied out and included within Appendix B of this report.

The tree survey data collected for the ES was in accordance with British Standard *BS5837:2012 'Trees in Relation to Design, Demolition and Construction – Recommendations'.* Accordingly, their stem diameters informed the calculation for their root protection areas (RPAs). This being the area around a tree deemed *'to contain sufficient roots and rooting volume to maintain the tree's viability'* (para 3.7; BS5837:2012).

It is represented as a circle around the tree, with the percentage of encroachment into this circular area providing more informed judgement on the ability to retain a tree both in terms of structural integrity and ongoing vitality of the tree. This layout does not consider existing site conditions that could affect the morphology of the tree roots, and *'modifications to the shape of the RPA'* (para 4.6.2; BS5837:2012) can be undertaken through arboricultural assessment.

In this location the RHS Wisley boundary fence is not set on substantial and continuous foundations that could potentially be acting as a root barrier to growth towards the A3 verge, so the circular representation of the RPAs was not altered as part of the original reporting, hence their identification for 'potential removal'.

Similarly, as the verge is also sloping down adjacent to 5no. of the trees it means the soil environment and topography cannot be deemed a limiting factor to tree root growth. Whereas if the embankment was rising steeply then the built-up ground would be providing less favourable conditions to root growth, meaning their spread would likely be inhibited.

3. Further assessment

In order to establish the radial root spread of the trees a root mapping assessment was undertaken. This required the use of impulse technology using an Arboradix.

The details of this equipment and the full reporting from this assessment along with cross section tomographs from an Arbortom are presented in Appendix C of this report.

The cross section tomographs provide a visual image of the internal condition of the tree at the point it is taken. This image can then be analysed to determine whether any of the trees have significant internal defects that warrant the actual removal/crown management of the trees due to their condition and the subsequent risk they pose to users of the A3.

The mapped root zones have then been used to inform cross section drawings covering the trees and to inform on the current impacts of the proposals.

4. The trees

All 7no trees are located within RHS land at Wisley. The *BS5837:2012* data and methodology are contained within Appendix A&B of this report.

They are located within a linear tree belt that runs broadly between Mill Lane and Wisley Lane within RHS Wisley.

The 7no. trees are detailed in table 1.0 below, and the table includes their current condition, estimated age and estimated remaining contribution in years.

The estimated age of the trees follows 'Mitchell's Rule' (Mitchell, 1974). The estimated remaining contribution in years follows the BS5837:2012 guidance, i.e. <10yrs, 10+ yrs, 20+yrs and 40+yrs, based on the BS Category classification cascade chart illustrated in Appendix A3 of this report.

Table 1.0: Tree condition, estimated age and life expectancy:

TREE REF	SPECIES	IMPULSE TOMOGRAPH RESULTS AND CROWN CONDITION	AGE ESTIMATE (yrs)	BS5837:2012 Est'd remaining contribution in years
T176	Norway Maple	No significant defects. Crown vitality good at time of survey.	25mm per year 90+ or -	20+
T181	Red Oak	Localised defect, indicative of decay or cracking. Centralised, strength loss is estimated to be 2% and not currently significant. Crown vitality good at time of survey.	25mm per year 75+ or -	20+
T183	Giant Redwood	Area of low velocities in central zone of the stem. Not conclusive as decay. Tree species extremely difficult to test using impulse tomography owing to extensive bark inclusions common to growth pattern of the species. Resistance drilling may possibly provide more conclusive results. Crown vitality good at time of survey.	75mm per year 70+ or -	40+
T184	Giant Redwood	Area of low velocities in central zone of the stem. Not conclusive as decay. Tree species extremely difficult to test using impulse tomography owing to extensive bark inclusions common to growth pattern of the species. Resistance drilling may possibly provide more conclusive results. Crown vitality good at time of survey.	75mm per year 70+ or -	40+
T185	Turkey Oak	No significant defects. Crown vitality good at time of survey.	25mm per year 78+ or -	20+
T192	Populus x generosa 'Beaupre'	Localised defect, indicative of decay or cracking. Centralised, strength loss is estimated to be 7% and not currently significant. Crown vitality good at time of survey.	50mm per year 58+ or -	20+
T197	Populus x canadensis 'Gaver' (Hybrid Black Poplar)	Localised defect, indicative of decay or cracking. Centralised, strength loss is estimated to be 4% and not currently significant. Crown vitality good at time of survey.	50mm per year 47+ or -	20+

5. The scheme

The proposals for the A3 verge and the retaining structure are detailed below:

1. Crib Wall retaining structure, see image 1.0 below;

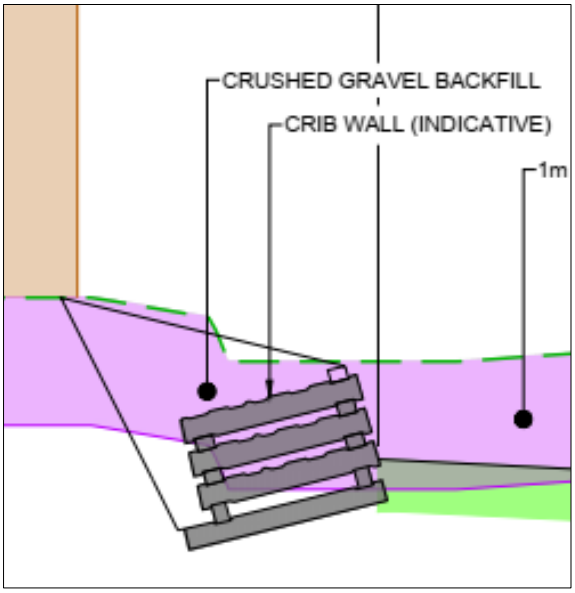


Image 1.0: Crib wall retaining structure, requiring the excavation of the verge beyond the extents of the structure to enable the inclusion of a crushed gravel backfill.

2. Grassed verge and associated comms and utilities, see image 2.0 below;

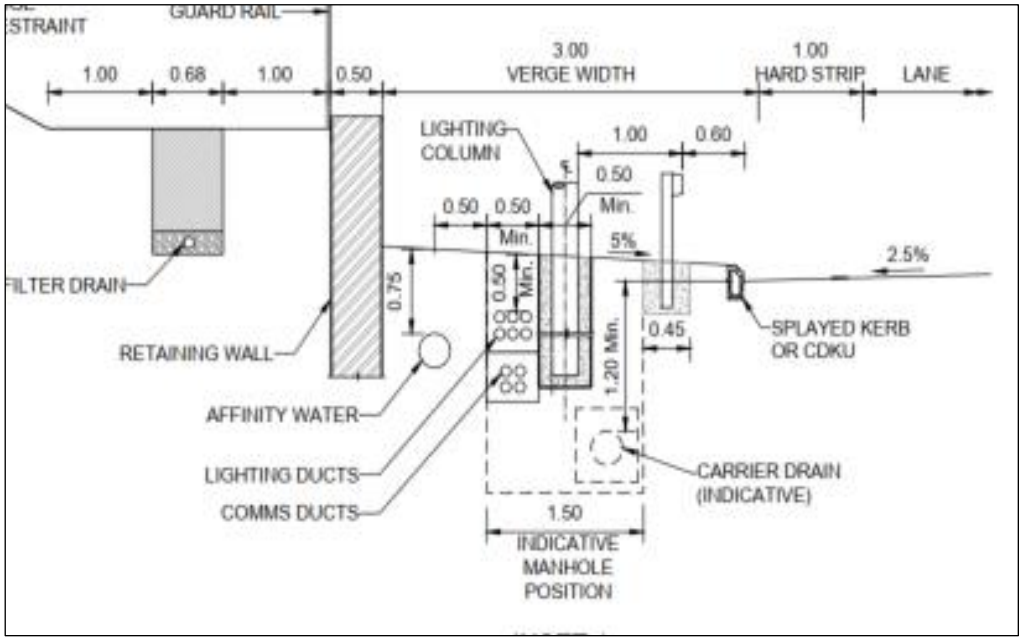


Image 2.0: proposed verge and associated comms and utilities.

These proposals are standard design layouts, meaning any potential change would need to be agreed through a departure from standard or through detailed design modifications.

6. Root zone mapping

The Arboradix assessment is detailed within Appendix C of this report.

The mapped root zones have been overlaid onto the tree protection plans to enable the production of cross-sections illustrated on drawing numbers:

1. HE551522-ATK-ELS-A3_L1_ML-DR-LL-000001 Rev P01.1 sheet 1; and,
2. HE551522-ATK-ELS-A3_L1_ML-DR-LL-000001 – Sheet 2 Rev P01.1.

These cross sections show the mapped root zones with a 1m depth to its outer extents. This falls in line with the Arboradix's recording capacity and given a tree's root system is predominantly limited to the top 600mm of soil and is dominated by long, relatively small, lateral roots spreading out close to the soil surface (Biddle, 1998), it's reasonable to apply a 1m depth for the extents of the radial root spreads recorded.

The current scheme proposals have been utilised to inform table 2.0 below. The table below considers the trees in relation to the following:

1. Estimated percentage encroachment of the crib wall installation within the recognised RPA as calculated within BS5837:2012.
2. Estimated percentage encroachment of the proposed crib wall installation within the measured root system utilising Arboradix system.
3. Linear distance between stem and measured root system extent toward carriageway.
4. Linear distance between tree stem and proposed retaining wall location, measured in Autocad using provided drawings of current design.
5. This is calculated by subtracting distances in line 4 from distances in line 3 above. The linear encroachment within the measured root system will affect both structural stability of the tree as well as tree health, whereas the overall percentage of root loss will generally affect the health of the tree, water uptake and storage of starches (energy). tree health is measurement together with a risk assessment in regard to potential de-stabilisation of the tree, viability of retention and preliminary options.
6. The Structural Root Zone of each tree has been estimated by referencing available documentation: A critical distance for root cut trees of a radius within three times the trunk diameter measured at 1.5m above ground level has been researched and suggested (Fraedrich, Smiley, 2002). The Structural Root Zone (SRZ) is given within Australian standard AS4970-2009 as the area required for tree stability but notes that a larger area is required to maintain a viable tree. The SRZ radius = (D x 50)0.42 x 0.64) where D = trunk diameter in m, measured above the root buttresses.
7. Calculated Risk Rating based on the % linear encroachment of the proposed retaining wall within the estimated structural root zone.<9% = Low. 10 – 20% = Moderate. 20 – 40% = High. >40% = Very High
8. Consideration by Arboriculturist as to the viability of tree retention given species, age etc.
9. Consideration by Arboriculturist as to the viability of tree retention given loss of soil volume.
10. Preliminary consideration by Arboriculturist as to the options that may be available to retain tree, whilst reducing risk of failure of the root system consequent to proposed works.

Technical Note

ATKINS

		T176 Norway Maple	T181 Red Oak	T183 Giant Redwood	T184 Giant Redwood	T185 Turkey Oak	T192 Populus x generosa 'Beupre'	T197 Hybrid Black Poplar
1.	Estimated percentage encroachment by closest proposed excavation for crib wall within RPA.	42%	43%	44%	48%	49%	18%	18%
2.	Estimated percentage encroachment by closest proposed excavation for crib wall within Measured Root System.	28%	43%	18%	35%	49%	2%	11%
3.	Distance of Measured Root System extending toward carriageway.	3.0 metres	4.0 metres	5.0 metres	6.0 metres	4.0 metres	6.0 metres	5.0 metres
4.	Distance of main stem to closest proposed excavation for crib wall.	0.6 metres	0.5 metres	1.5 metres	0 metres	0.2 metres	5.4 metres	4.1 metres
5.	Linear encroachment in metres of closest proposed excavation for crib wall within Measured Root System.	2.4 metres	3.43 metres	3.5 metres	6.0 metres	4.0 metres	0.6 metre	0.9 metre
6.	Estimated Structural Root Zone	2.8 metres	2.45 metres	4.95 metres	5.15 metres	2.45 metres	3.25 metres	2.75 metres
7.	Risk of de-stabilising tree. This is assessed by calculating the % linear encroachment of the excavation for the crib wall within Estimated Structural Root Zone.	Very High 78%	Very High 79%	Very High 71%	Very High 100%	Very High 92%	Low 0%	Low 0%
8.	Is it viable to reduce crown of the tree to allow the retention of the tree.	No.	No.	No.	No.	No	Yes, but this is a vigorous species, ongoing, regular pruning will be required to retain safely.	Yes, but this is a vigorous species, ongoing, regular pruning will be required to retain safely.

		T176 Norway Maple	T181 Red Oak	T183 Giant Redwood	T184 Giant Redwood	T185 Turkey Oak	T192 Populus x generosa 'Beupre'	T197 Hybrid Black Poplar
9.	Is the reduced soil volume available viable in relation to the tree health in the foreseeable future?	No.	No	No.	No	No	Yes	Yes
10	Preliminary evaluation of options to retain tree whilst reducing risk of failure of root system consequent to proposed works.	Relocate retaining structure further from tree.	Relocate retaining structure further from tree.	Relocate retaining structure further from tree.	Relocate retaining structure further from tree.	Relocate retaining structure further from tree.	Treatment of roots during excavations. Soil amelioration. Possible crown reduction. Arboricultural monitoring of works.	Treatment of roots during excavations. Soil amelioration. Possible crown reduction. Arboricultural monitoring of works.

7. Structural root zones

The linear encroachment within the measured root system will affect both structural stability of the tree as well as tree health. The root system of a tree is a key component in tree stability (Smiley, 2008). When roots are decayed, cut, or damaged, tree stability and health maybe reduced (Matheny and Clark, 1994; Hamilton, 1998). However, the threshold point at which root damage increases the risk of tree failure has some available documentation which has been referenced to inform this technical note.

The Structural Root Zone of each tree has been estimated by referencing the available documentation:

1. A critical distance for root cut trees of a radius within three times the trunk diameter has been researched and suggested (Fraedrich, Smiley, 2002).
2. The Structural Root Zone (SRZ) is given within Australian standard AS4970-2009 as the area required for tree stability but notes that a larger area is required to maintain a viable tree. The SRZ radius = (D x 50)0.42 x 0.64) where D = trunk diameter in m, measured above the root buttresses.

The SRZ's estimated for reach tree has been included within table 2.0 and also on the cross-section drawings.

8. Design modifications

The proposals along this location require modifications in order to retain the trees. The preference would be to retain the existing verge as it currently is and move the works into the carriageway by utilising the central reserve.

Design modifications should be undertaken in consultation with the arboriculturist.

Appendix A. Key & British Standard 5837:2012 Survey Table

A.1. Survey key

Tree No: Sequential reference number given to the tree or group of trees as shown on the tree survey drawings.

Species: This is the common name given to the tree. The botanical name is sometimes given.

Height (Ht.): tree height from the base of the tree to its full stem height, measured in metres (m). Measurements are taken to the nearest half metre.

Stem diameter (mm): measured in accordance with Figure A1 below. Measurements are rounded to the nearest 10mm.

Branch spread (m): measurement of crown spread to the four cardinal points; if the crown is balanced a single measurement is given. Crown spread plotted on the tree survey drawings. Measurements are taken to the nearest half metre.

1st significant branch and direction of growth (m): measurement of the height of the first significant branch above ground level, given in metres and direction of growth e. g. 2. 4-N

Canopy height (m): height of the canopy above ground level. Measurements are taken to the nearest half metre.

Life stage: The following abbreviations are used:

Y = Young trees <1/5 life expectancy.

SM = Semi-Mature trees 1/5 – 2/5 life expectancy.

EM = Early Mature trees 2/5 – 3/5 life expectancy.

M = Mature trees 3/5 – 4/5 life expectancy

OM= Over-Mature trees >4/5 life expectancy

Vitality: Good, fair, poor or dead

Good – a tree with little or no obvious physiological defects; leaf density and colour are typical for the species, bud, flower and fruit production are good and there are no signs of dieback at any point throughout the crown.

Fair – a tree with moderate physiological defects; leaf density is less than typical for the species, leaf cover is chlorotic, bud, flower or fruit production are deficient, there are signs of minor dieback within the crown, there is a moderate degree of deadwood within the crown.

Poor – a tree with major or multiple physiological defects; evidence of extensive crown thinning, bud, flower or fruit production is poor or missing, there are signs of advanced dieback throughout the crown, there is extensive or major deadwood throughout the crown.

Dead – a tree that has died due to either old age, drought, disease, pest infestation, physical damage to the main stem or rooting system, or a combination of these factors.

General observations, particularly of structural and/or physiological condition: e. g. observations of any decay and physical defect.

Preliminary management recommendations: any identified preliminary management to rectify defects recorded in general observations. These may include the need for further detailed inspection, or works to address immediate hazard to life or property.

Estimated remaining contribution, in years:

<10

10+

20+

40+

Category grading: As per BS 5837:2012 chart in accordance with Figure A2 below.

A – Illustrated as light green (RGB code 000-255-000)

B – Illustrated as mid blue (RGB code 000-000-255)

C – Illustrated as grey (RGB code 091-091-091)

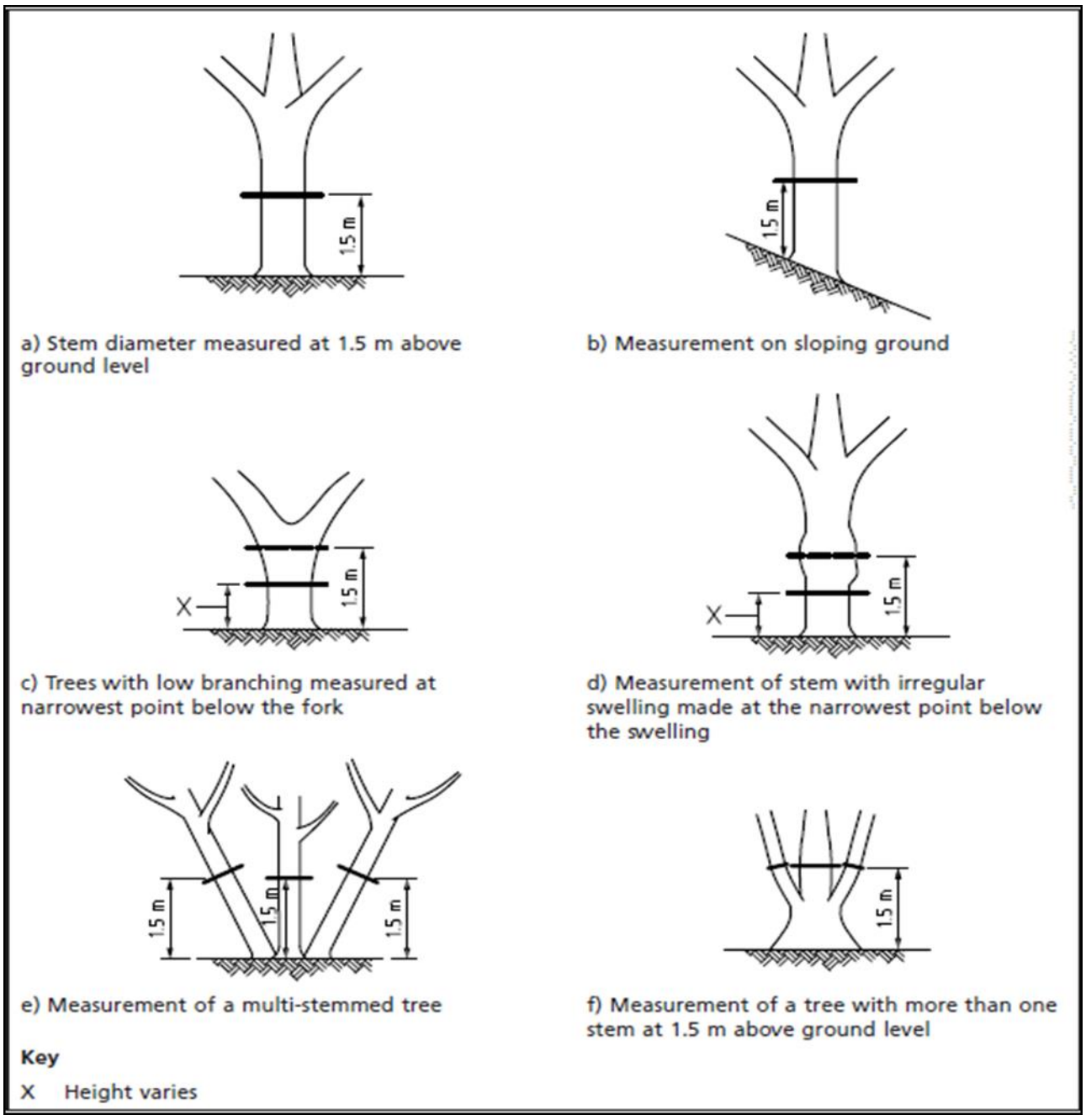
U – Illustrated as dark red (RGB code 127-000-000)

Root Protection Area (m^2): plotted around each of the category A, B and C trees on relevant drawings, illustrating the minimum area around a tree deemed to contain sufficient roots and rooting volume to maintain the tree's viability. The protection of the roots and soil structure is treated as of paramount importance.

(Note: Red hash tag '#' will denote that a measurement is estimated)

A.2. Measuring table

Measurement of tree stems dependant on tree form.



A.3. BS 5837:2012 cascade chart

Cascade chart for tree quality assessment from BS 5837:2012

Table 1 **Cascade chart for tree quality assessment**

Category and definition	Criteria (including subcategories where appropriate)			Identification on plan
Trees unsuitable for retention (see Note)				
Category U 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, including those that will become unviable after removal of other category U trees (e.g. where, for whatever reason, the loss of companion shelter cannot be mitigated by pruning) • Trees that are dead or are showing signs of significant, immediate, and irreversible overall decline • Trees infected with pathogens of significance to the health and/or safety of other trees nearby, or very low quality trees suppressing adjacent trees of better quality *NOTE Category U trees can have existing or potential conservation value which it might be desirable to preserve; see **4.5.7**.*			See Table 2
	1 Mainly arboricultural qualities	**2 Mainly landscape qualities**	**3 Mainly cultural values, including conservation**	
Trees to be considered for retention				
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 conservation, historical, commemorative or other value (e.g. veteran trees or wood-pasture)	See Table 2
Category B **Trees of moderate quality** with an estimated remaining life expectancy of 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 value	See Table 2
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 value	See Table 2

Appendix B. Tree survey schedule

Tree no.	Species	Height (m)	Stem diameter (mm)	Crown spread (m)	1st major branch height (m) / Direction	Canopy height	Life stage	Vitality	General observations Structural and/or physiological condition	Preliminary management recommendations	Established remaining contribution	Category grading	IMPACT	Root Protection Area radius
T176	Norway Maple	19	740	7,W-5	1.5	1.5	M	Good	Cultivar 'Charles F. Irish', W-964156-A, 1.8m from boundary fence; DIAMETER AT 900 Stem growth occluding large girdling root to south; established decay and cavities at branch tear wounds above crown break; occasional natural bracing where branches crossing in same area	No works required at present	20+	B2	POT REM	8.9
T181	Red Oak	17	600	7.5, W-3.5	4-E	4	EM	Good	W19981893-A. 1.7m from boundary fence. Crown previously lifted to west. Occluding wounds present. Crown overhangs boundary fence to east. Occasional small diameter dead wood in lower crown.	No works presently required	20+	B2	POT REM	7.2
T183	Giant redwood	24	1700	4.5	2	1	M	Good	Dominant specimen, uncompromised excurrent form, 2.8m from boundary fence, growing on pronounced mound; RHS Wisley catalogue no. W19981903-A	No works required at present	40+	A1/2/3	POT REM	15.0
T184	Giant redwood	27	1790	4.5	2	1	M	Good	500mm from boundary fence; earth at base mounded; small bleed points where low branches removed on boundary side, wounds now mostly covered by bark; RHS Wisley catalogue no. W19981903-B	No works required at present	40+	A1/2/3	POT REM	15.0
T185	Turkey Oak	16	620	7, W-4.5	3-SE	2	EM	Good	Growing directly on boundary fence. Basal flare in contact with fence. Co-dominant stems from 2.5m, union appears sound. Light ivy encroachment on main stem. Crown cut back to east. Occasional small to moderate diameter dead wood in lower and middle crown.	No works presently required	20+	B2	POT REM	7.4
T192	Populous x generosa 'Beaupre'	20	930	8.5,8.5,9, 6.5	3-E	3	M	Good	W903156-B. Populous x generosa 'Beaupre'. Crown overhangs boundary. Pronounced south scaffold branch. Occasional moderate diameter dead wood in middle crown.	No works presently required	20+	B2	POT REM	11.2

Tree no.	Species	Height (m)	Stem diameter (mm)	Crown spread (m)	1st major branch height (m) / Direction	Canopy height	Life stage	Vitality	General observations Structural and/or physiological condition	Preliminary management recommendations	Established remaining contribution	Category grading	IMPACT	Root Protection Area radius
T197	Hybrid black poplar	28	740	10.0	2-E	1	M	Good	Cultivar x canadensis 'Gaver', W903152-A, 4m from boundary fence; open upright form, occasional small diameter branch tears; part-torn branch to east resting on boundary fence; small diameter deadwood only	Remove part-torn branch if adjacent to proposed works	20+	B2	POT REM	8.9

Appendix C. Writtle Forest Report

Writtle Forest
Consultancy

Tree Root Mapping

An evaluation of probable rooting area of 7no. trees located within the garden of RHS Wisley relating to Highways England M25 J10 improvement scheme.

RHS Wisley

Ref No: 190615

Client:	Mr Thomas Dale Atkins Peterborough Business Park, Lynch Wood, Peterborough PE2 6FZ
Date instructed:	October 2019
Instructed by:	Mr Thomas Dale
Visited by:	J. Mills & R. Dymott
Date of Visit:	5th, 6th, 26th and 27th November 2019
Prepared by:	J. Mills
Date completed:	8h January 2020

Contents

1. Introduction, Site Details & Overview of Trees

1.1 Instruction

Writtle Forest Consultancy Ltd has been instructed by Mr Tom Dale to map the root morphology of 7no. trees located at the bounds of RHS Wisley. The work is to gain a better understanding of the probable extent and morphology of root systems associated with these trees in relation to proposed excavations and the installation of a retaining wall.

1.2 Description and General Aspects of the Site

All 7no trees are located within the Royal Horticultural Society's garden at Wisley. They are located within an extensive tree belt along the south-eastern boundary of the site, between Mill Lane and Wisley Lane.

The 7no. trees are comprised of the following as referenced in the documentation excerpts provided to us by Atkins Global.

1. T176 Norway Maple
2. T181 Red Oak
3. T183 Giant Redwood
4. T184 Giant Redwood
5. T185 Turkey Oak
6. T192 *Populus x generosa* 'Beaupre'
7. T197 *Populus x canadensis* 'Gaver' (Hybrid Black Poplar)

2. Methods and Equipment

2.1 Arboradix

Measurements relating to the detectable rooting area of the tree were carried out using the Arboradix.

This is a sensor mounted on a rigid pole that is hit with a mallet when in contact with the ground at measured locations. This induces mechanical impulses into the ground around the tree. If there is a sufficiently sized woody root with good contact to the soils below the measurement point the impulse can be transmitted to the tree where the other sensors receive it. Generally, this applies to roots in excess of 25mm diameter.

Measurements are made until no signals are received by the sensors or if tests can no longer be carried out due to obstructions, roads, walls etc. A consequent graph shows whether the signal is received and the speed at which this signal travels from the point of measurement to the tree. The graph displays coloured points at the testing locations where a connection between the soils and the roots is made.

Green lines represent high velocities between the testing location and the tree stem, Yellow lines represent medium velocities and Red lines low velocities.

2.2 Limitations

There are a number of factors that may influence the impulse speed; for example, high soil compaction increases the virtual sonic speed and high moisture contents leads to lower speeds. Loose soils, such as made up ground, gravel and sand will also reduce sonic speeds and potentially limit connection. Also, the upper section of roots may be intact and decayed beneath, but the impulse recorded by the equipment would have travelled through the intact wood. To this end the speed of the measurement is not deemed as important as the determination of whether a root is detected or not.

2.3 Mapping

The results obtained are calibrated and aligned in Auto Cad to produce an overall depiction of the probable rooting area for the trees. This is based on drawing an area linking the extents of the positive connection of the woody roots with the soils (regardless of speed of the individual signal), around the tree.

3. Proposed Works

It is understood that the proposed works entail the widening of the existing carriageway. That this will in turn necessitate the installation of a retaining wall within the existing highway verge adjacent to the south-eastern boundary.

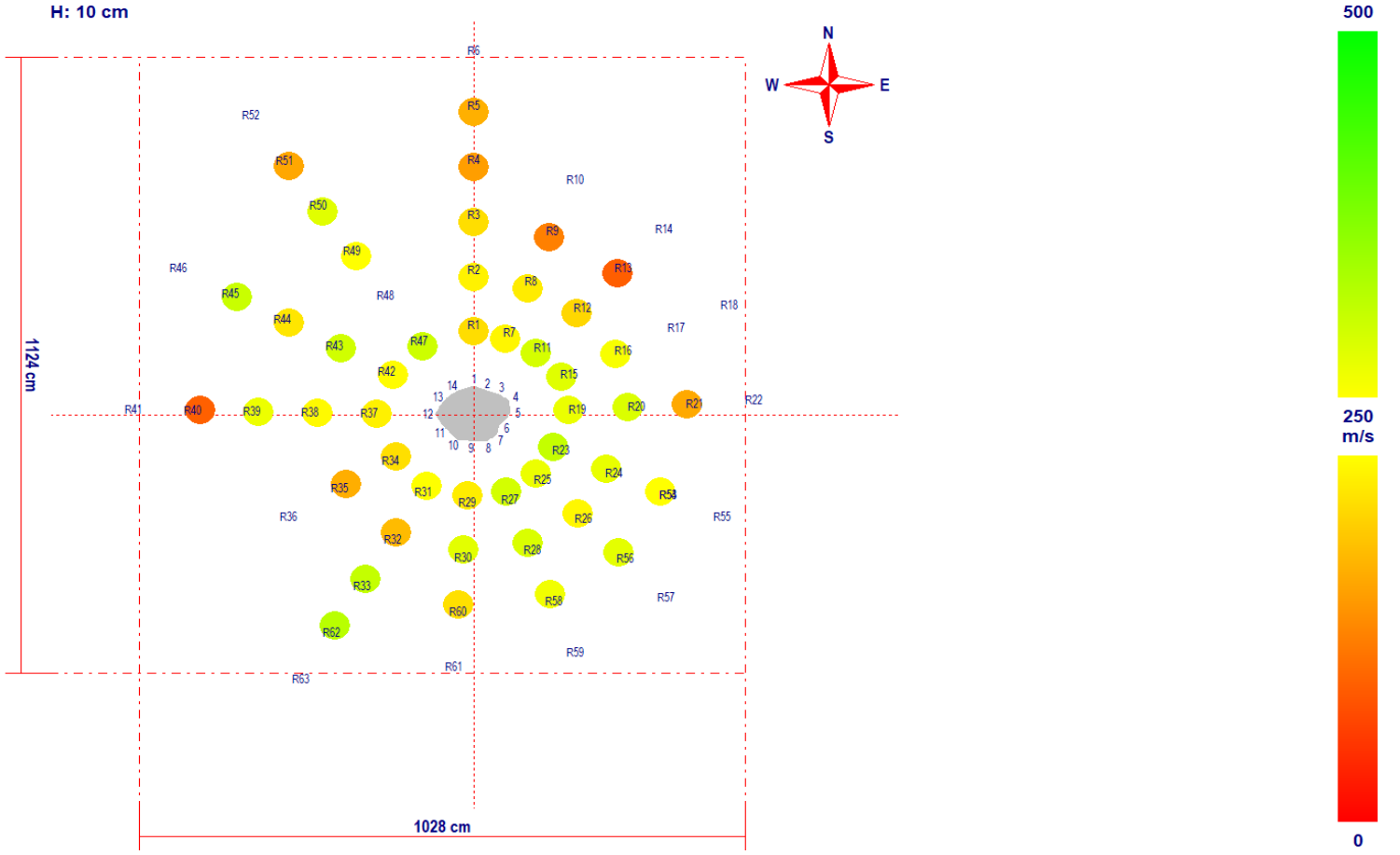
4. Results

4.1 Root Morphology – T176 Norway Maple

Project: Atkins A3
Location: RHS Wisley

Tree: T176
Tree species: Acer

Date: 06/11/2019
North: 0°

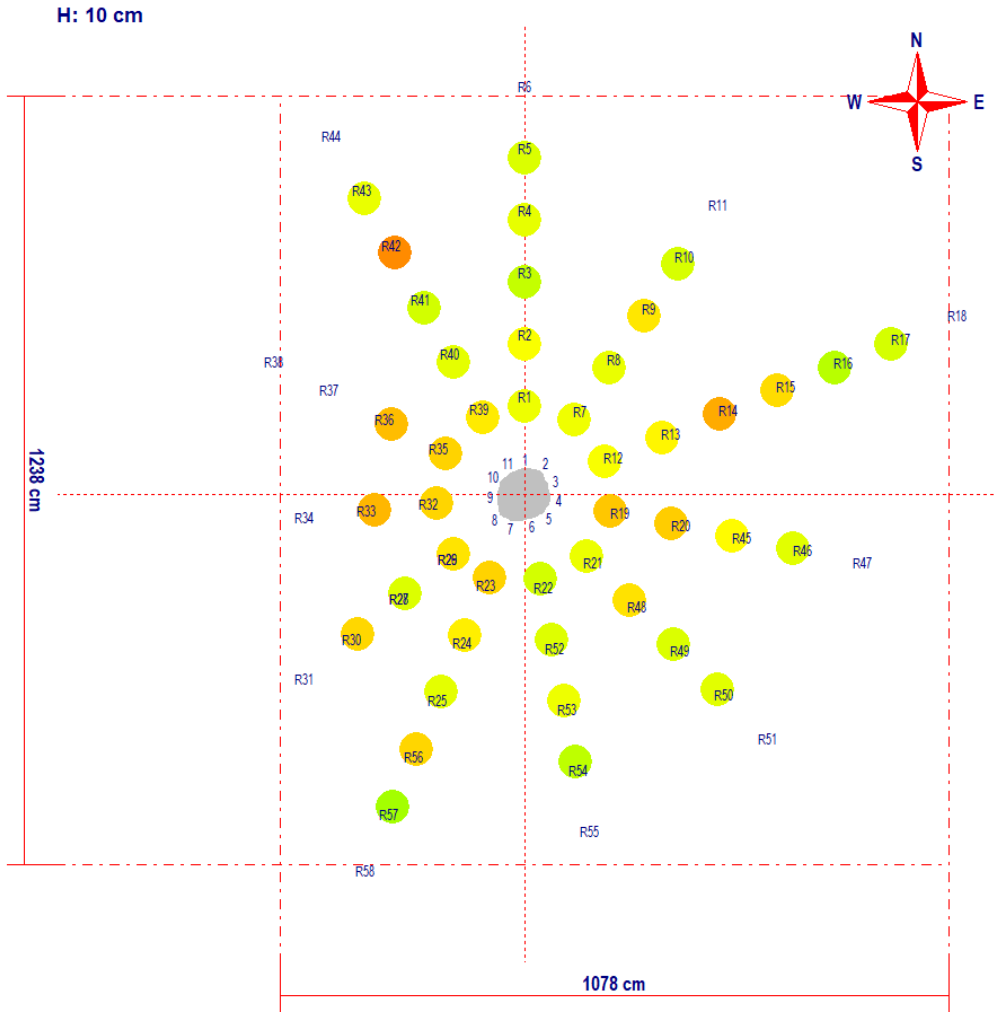


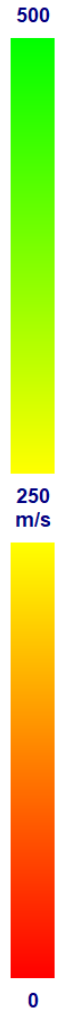
4.2 Root Morphology – T181 Red Oak

Project: Atkins A3
Location: RHS Wisley

Tree: T181
Tree species: Quercus

Date: 06/11/2019
North: 0°



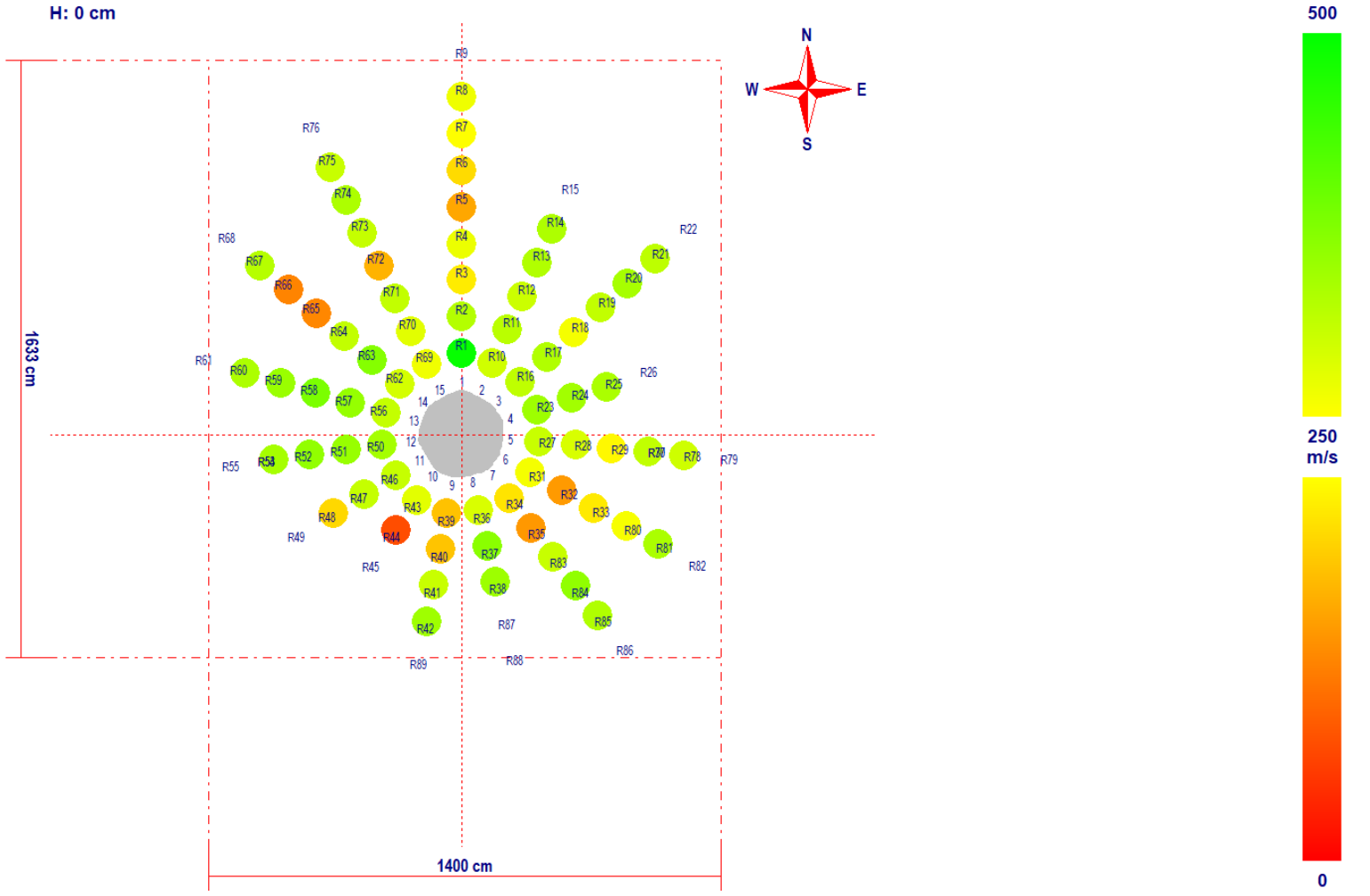


4.3 Root Morphology – T183 Giant Redwood

Project: Atkins
Location: RHS Wisley

Tree: T183
Tree species: Sequoiadendron

Date: 06/11/2019
North: 0°

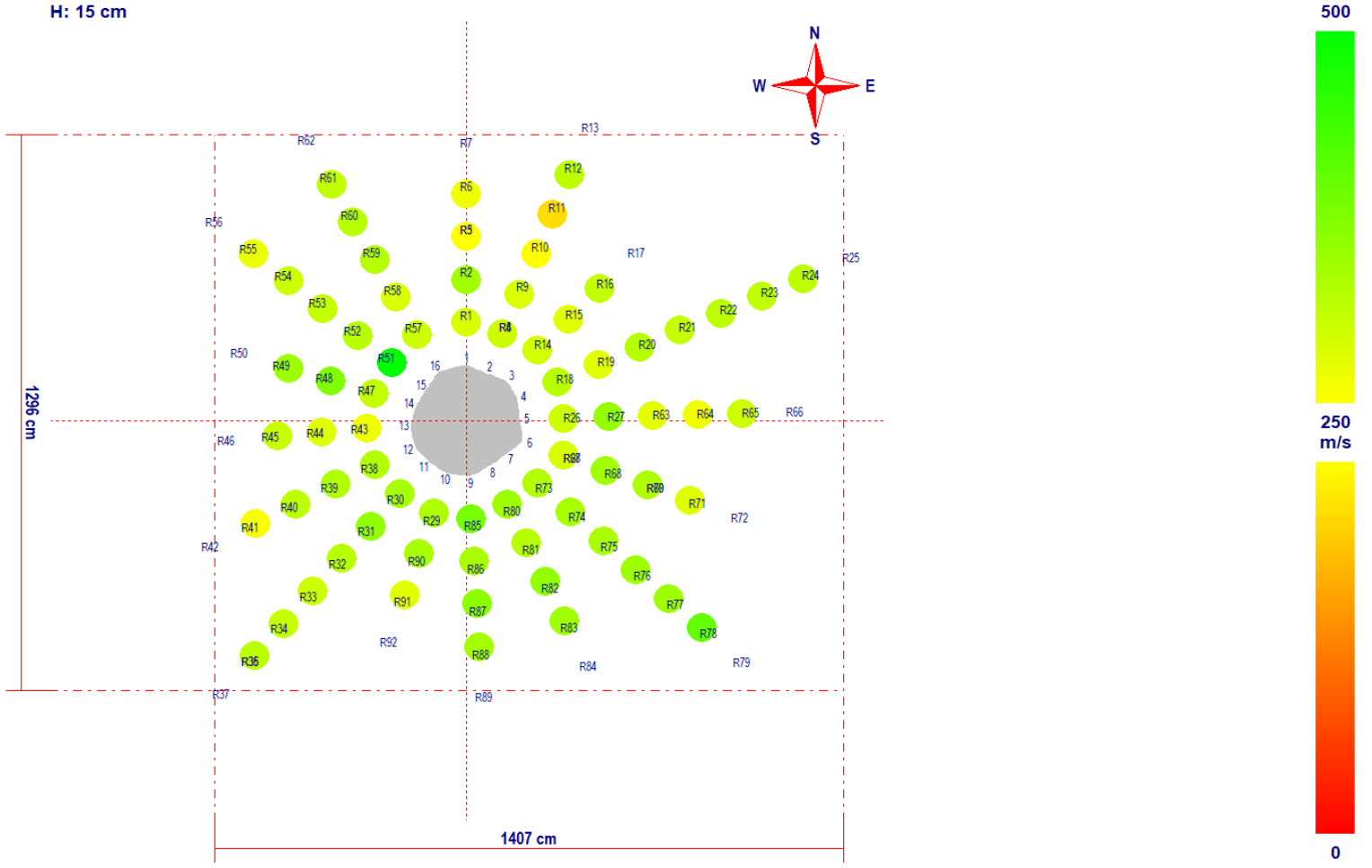


4.4 Root Morphology – T184 Giant Redwood

Project: Atkins A3
Location: RHS Wisley

Tree: T184
Tree species: Sequoiadendron

Date: 06/11/2019
North: 0°

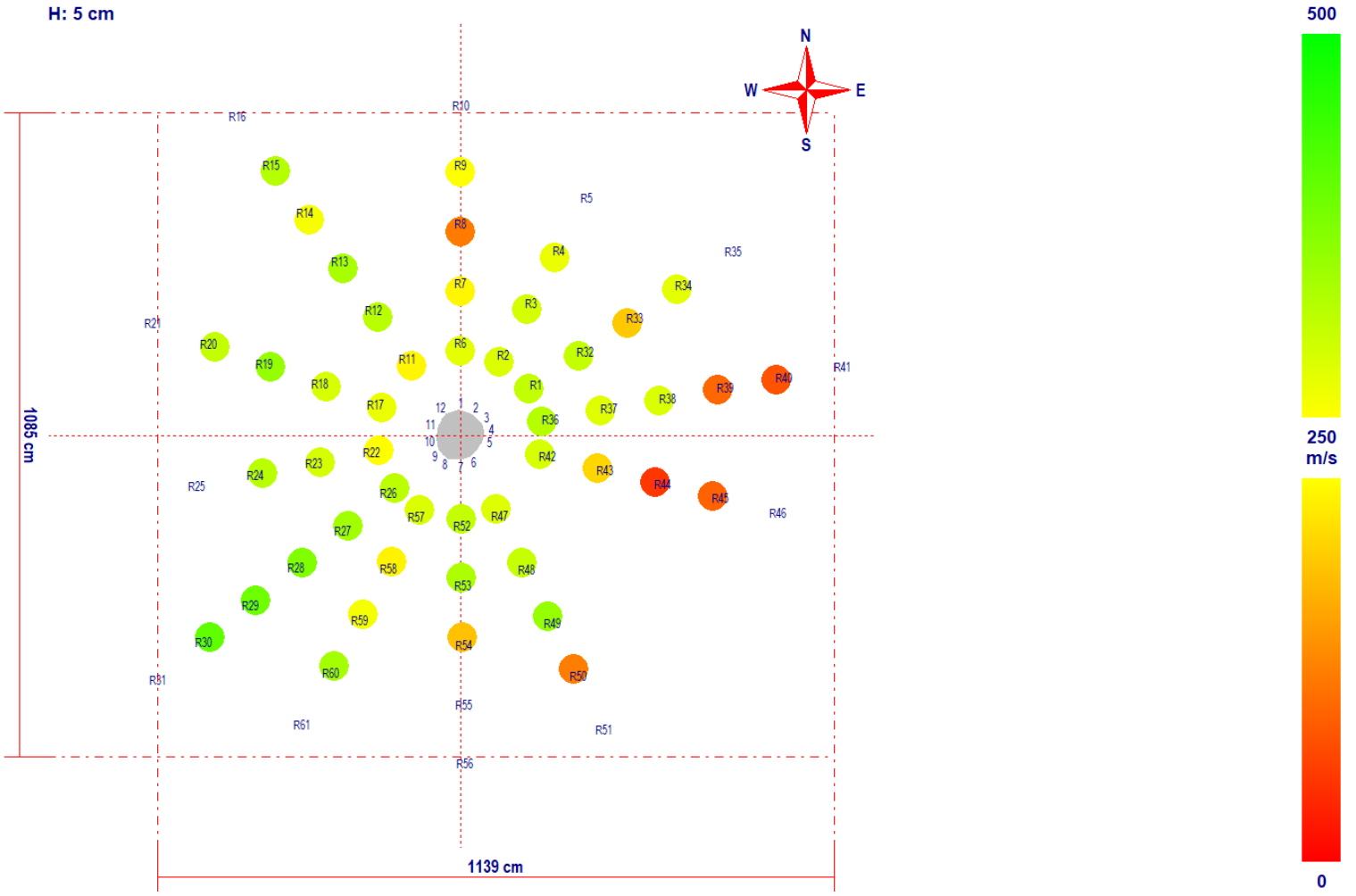


4.5 Root Morphology – T185 Turkey Oak

Project: RHS Wisley
Location:

Tree: T185
Tree species: Quercus

Date: 05/11/2019
North: 0°

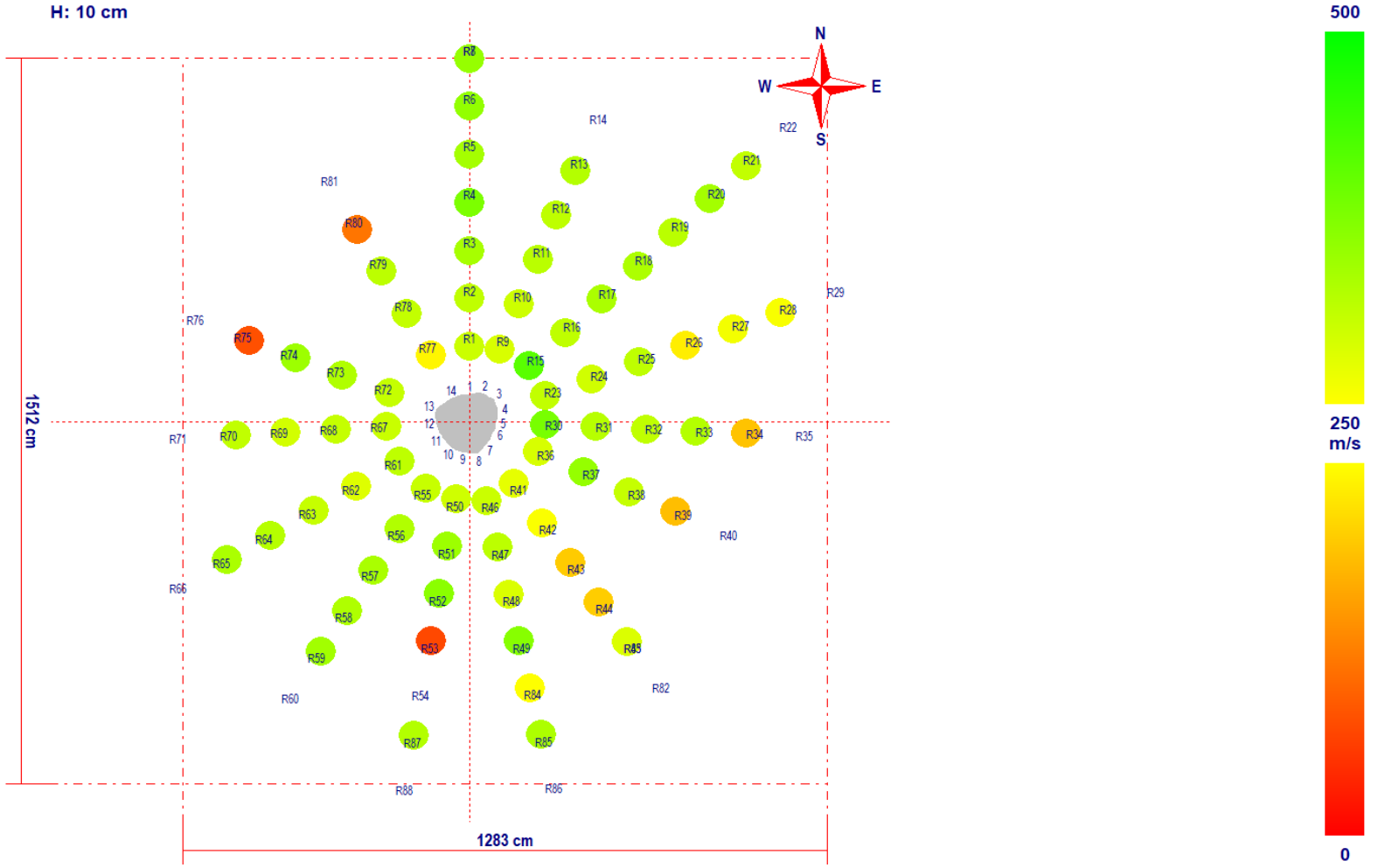


4.6 Root Morphology – T192 Poplar

Project: Atkins A3
Location: Wisley

Tree: T192
Tree species: Populus

Date: 05/11/2019
North: 0°

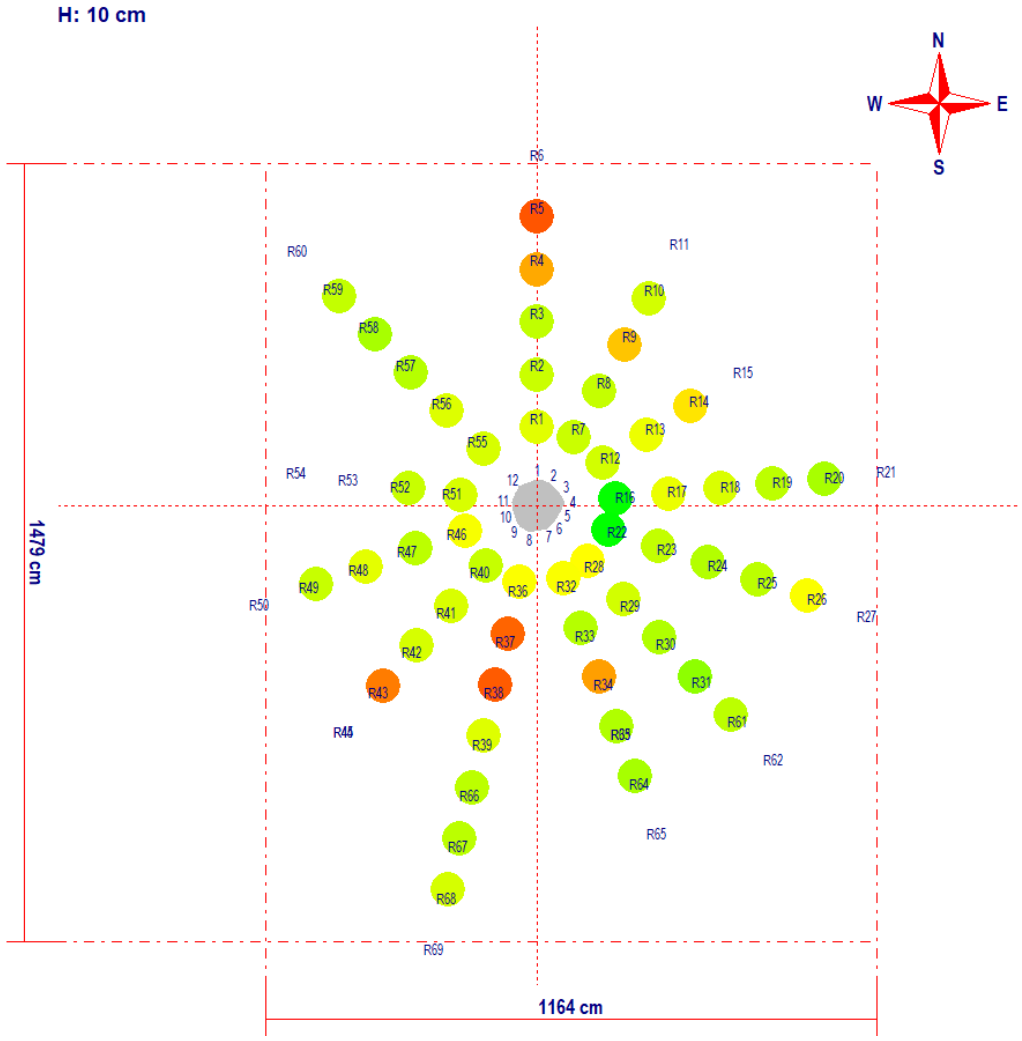


4.7 Root Morphology – T197 Poplar

Project: Atkins A3
Location: RHS Wisley

Tree: T197
Tree species: Populus

Date: 05/11/2019
North: 0°



Appendix 1: Photographs

Photo 1: Showing sensors attached to stem base of tree T176.

Photo 2: Showing sensors attached to stem base of T181

Photo 3: Showing sensors attached to stem base of T183

Photo 4: Showing sensors attached to stem base of T184

Photo 5: Showing sensors attached to stem base of T185

Photo 6: Showing sensors attached to stem base of T192

Photo 7: Showing sensors attached to stem base of T197

Appendix 2: Arbotom Impulse Tomography testing

As part of the instruction Impulse Tomography testing was carried out to assess the structural integrity of the stems close to ground level. All 7no trees were tested.

Arbotom Impulse Tomography - Methodology

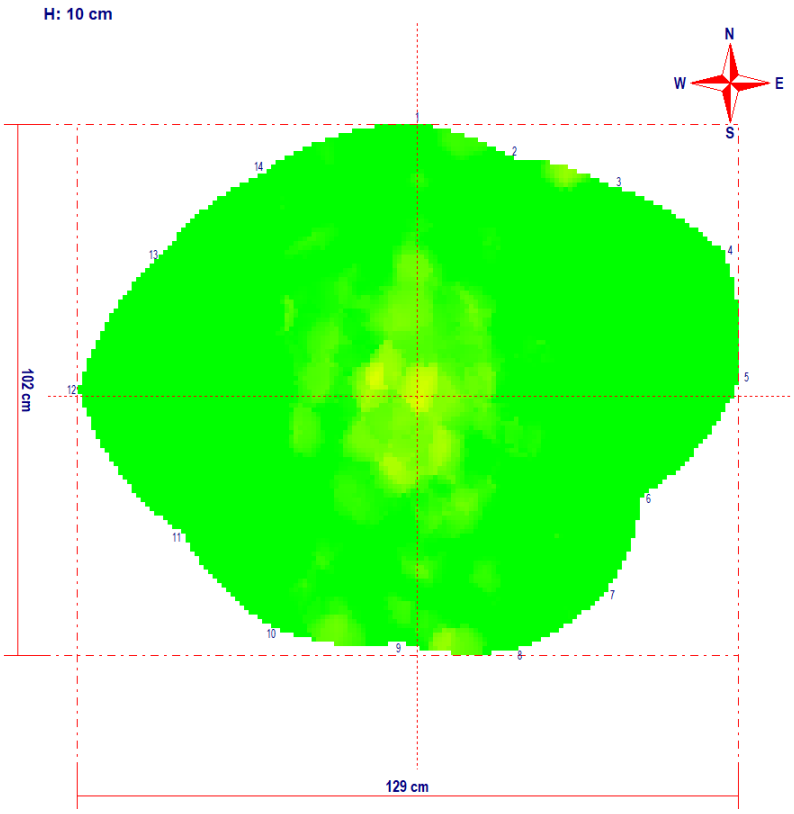
The Stress-wave ('sonic') tomogram of the main stem identifies decayed or compromised wood as areas in purple/red; those areas with strong and intact wood structure are identified in green and partially damaged wood in yellow and orange.

T176 Norway Maple - Impulse tomography test at 10cm above ground level

Project: Atkins A3
Location: RHS Wisley

Tree: T176
Tree species: Acer

Date: 06/11/2019
North: 0°

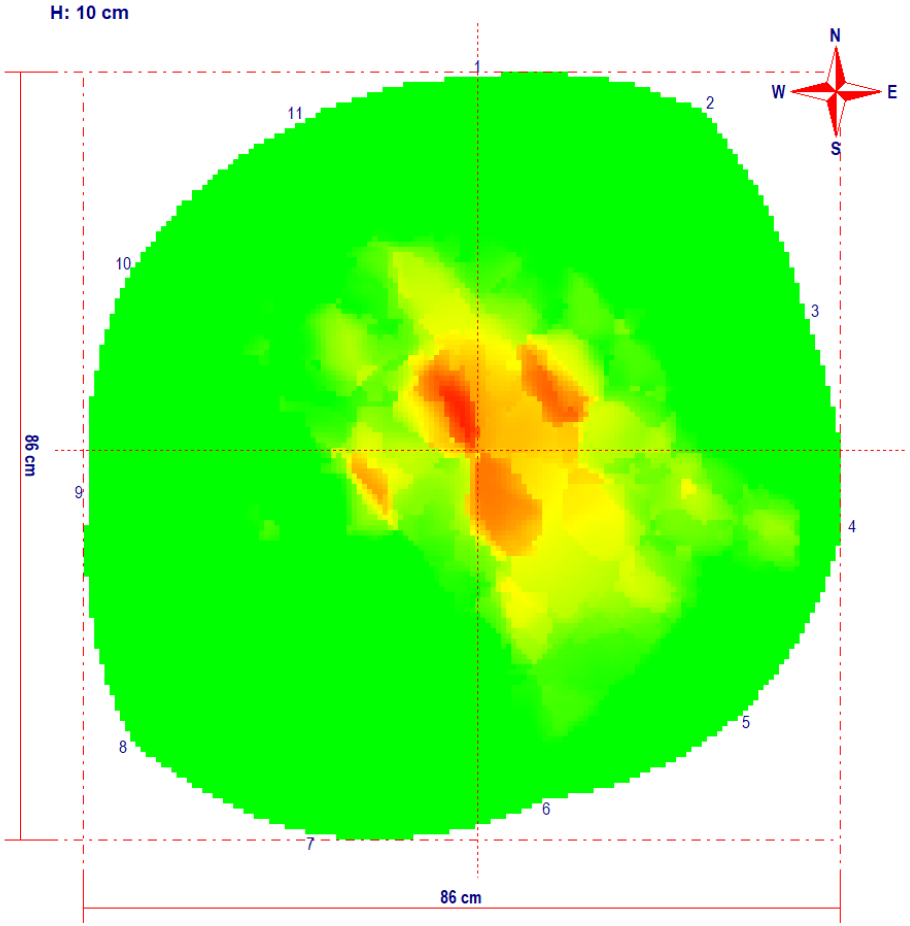


T181 Red Oak - Impulse tomography test at 10cm above ground level

Project: Atkins A3
Location: RHS Wisley

Tree: T181
Tree species: Quercus

Date: 06/11/2019
North: 0°

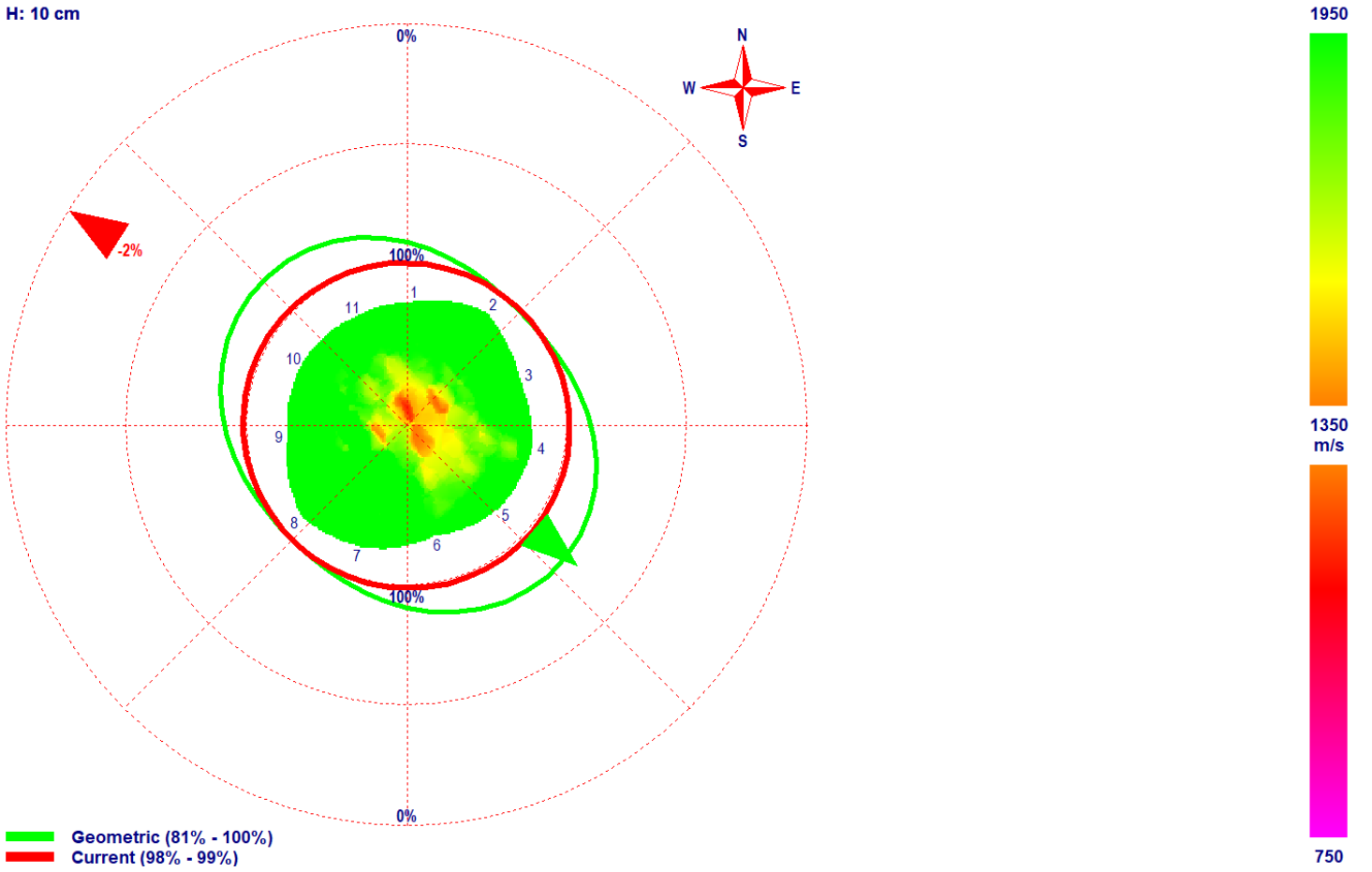


T181 Red Oak – Mechanical strength loss at 10cm above ground level.

Project: Atkins A3
Location: RHS Wisley

Tree: T181
Tree species: Quercus

Date: 06/11/2019
North: 0°

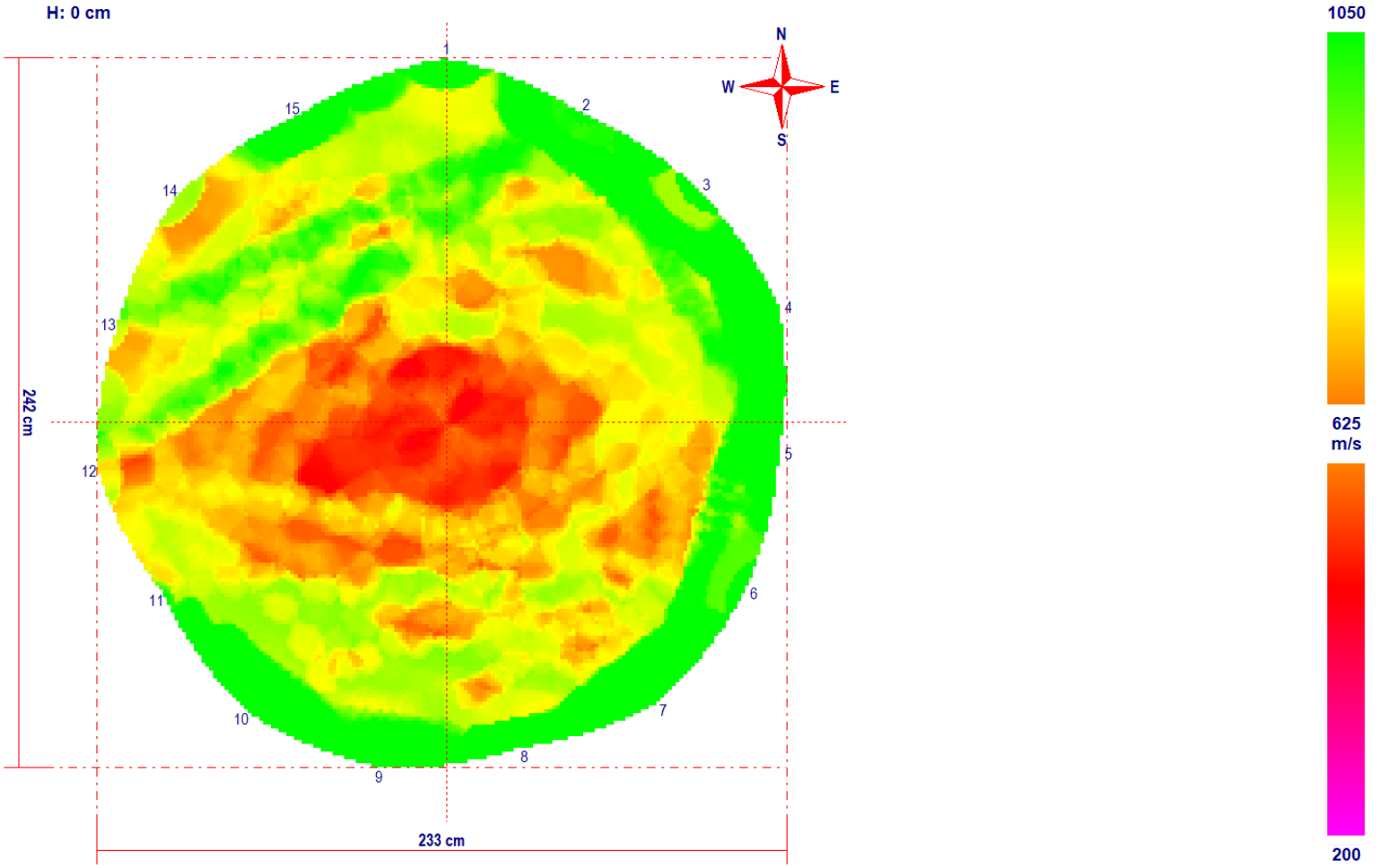


T183 Giant Redwood – Impulse tomography test at 5cm above ground level

Project: Atkins
Location: RHS Wisley

Tree:
Tree species: Sequoiadendron

Date: 06/11/2019
North: 0°

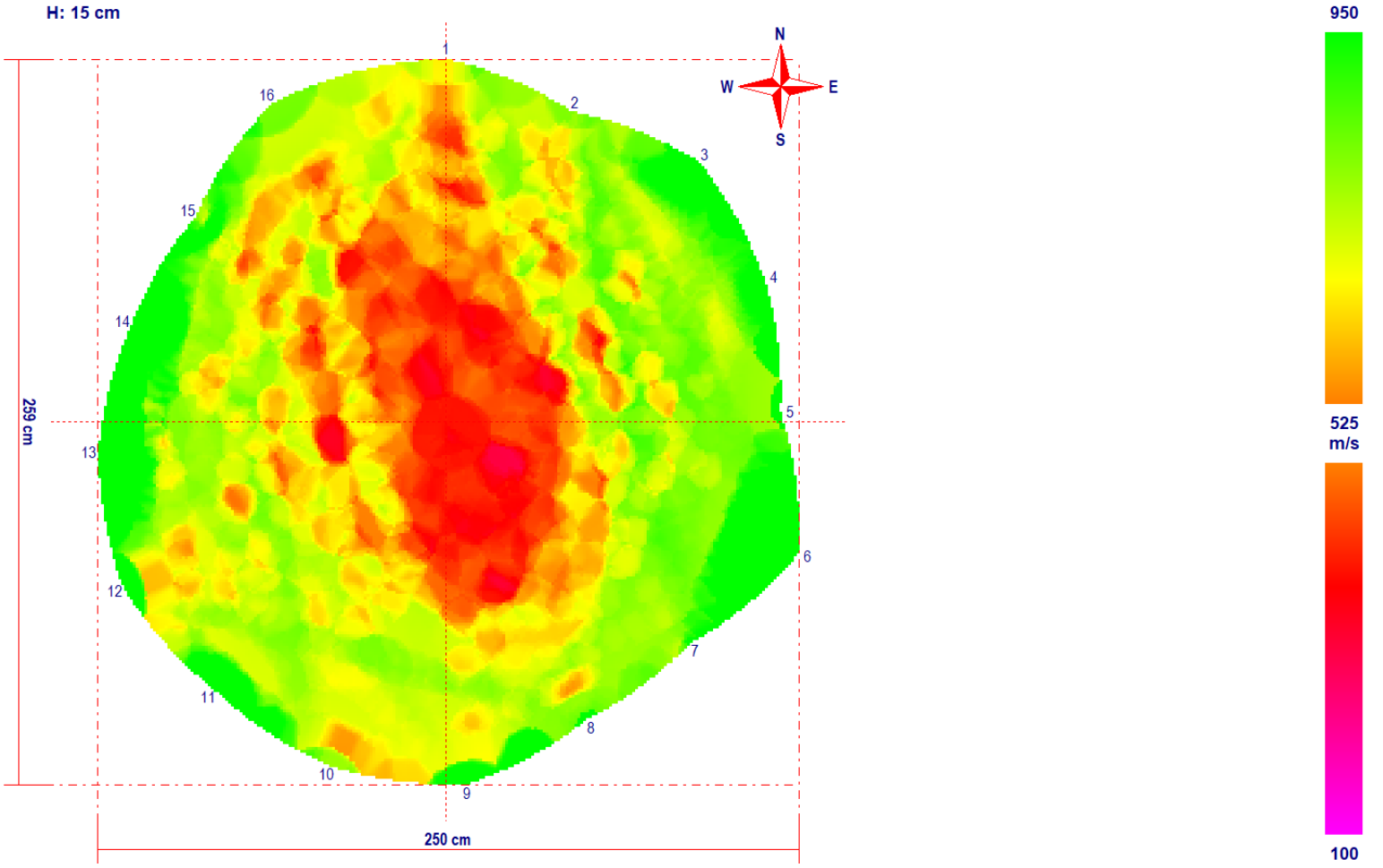


T184 Giant Redwood – Impulse tomography test at 15cm above ground level

Project: Atkins A3
Location: RHS Wisley

Tree: T184
Tree species: Sequoiadendron

Date: 06/11/2019
North: 0°

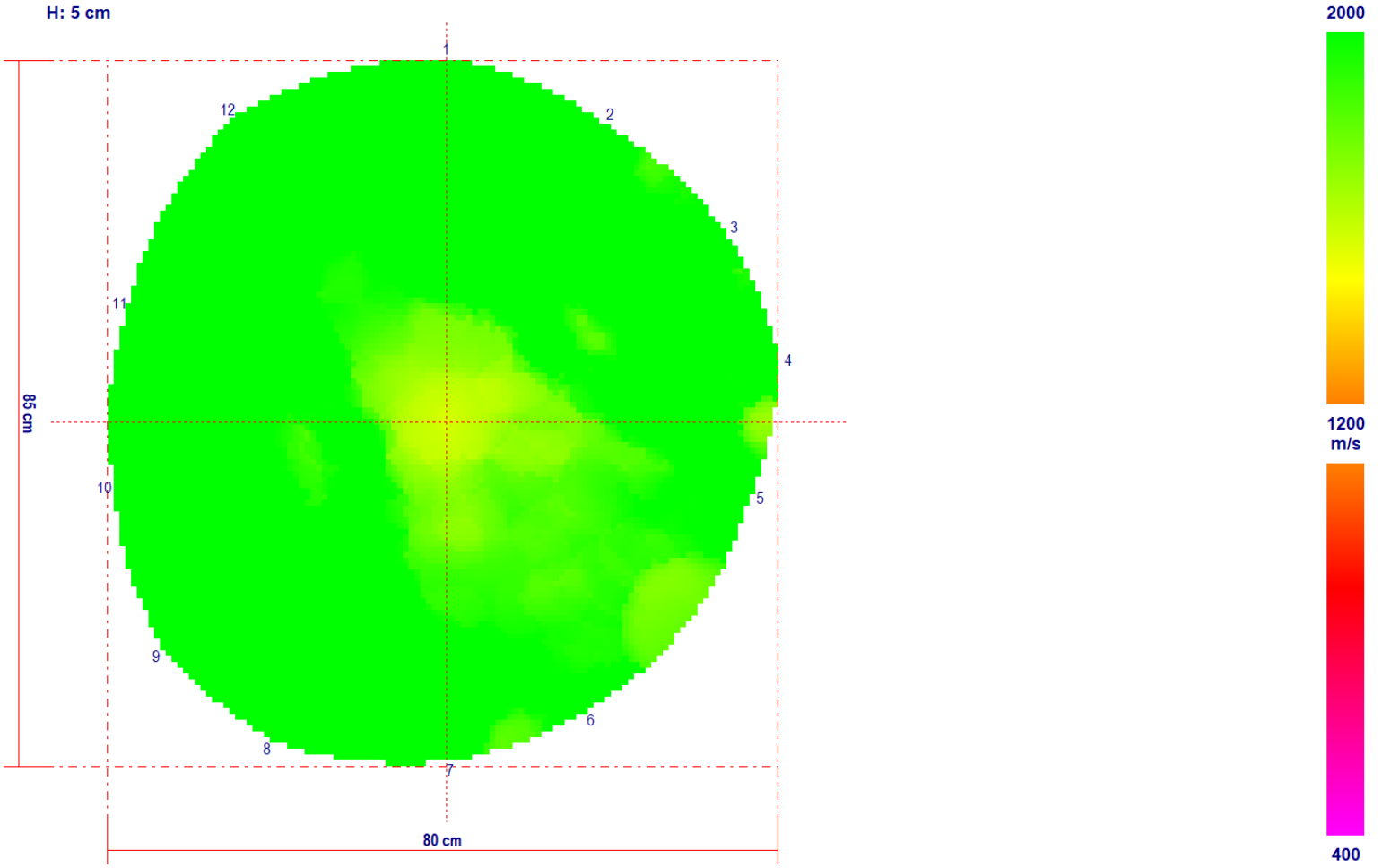


T185 Turkey Oak – Impulse tomography test at 5cm above ground level

Project: RHS Wisley
Location:

Tree: Turkey Oak
Tree species: Quercus

Date: 05/11/2019

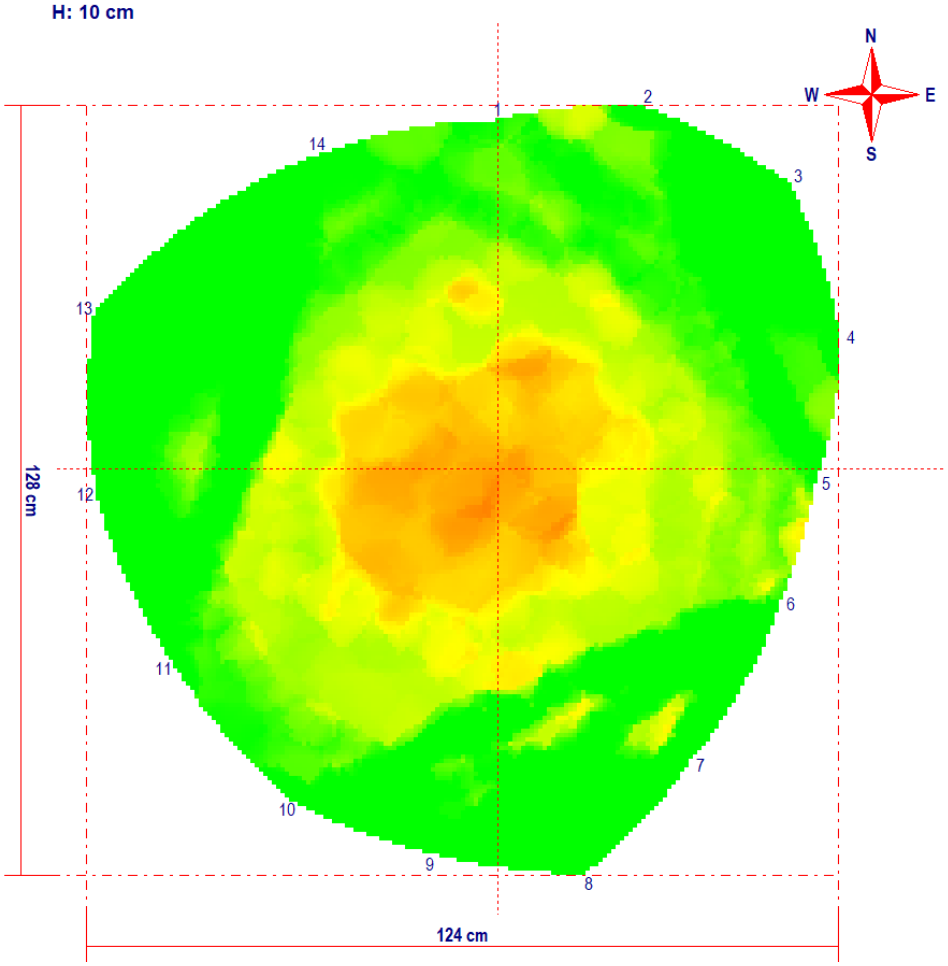


T192 Populus x generosa ‘Beupre’ – Impulse tomography test at 10cm above ground level

Project: Atkins A3
Location: Wisley

Tree: T192
Tree species: Populus

Date: 05/11/2019
North: 0°

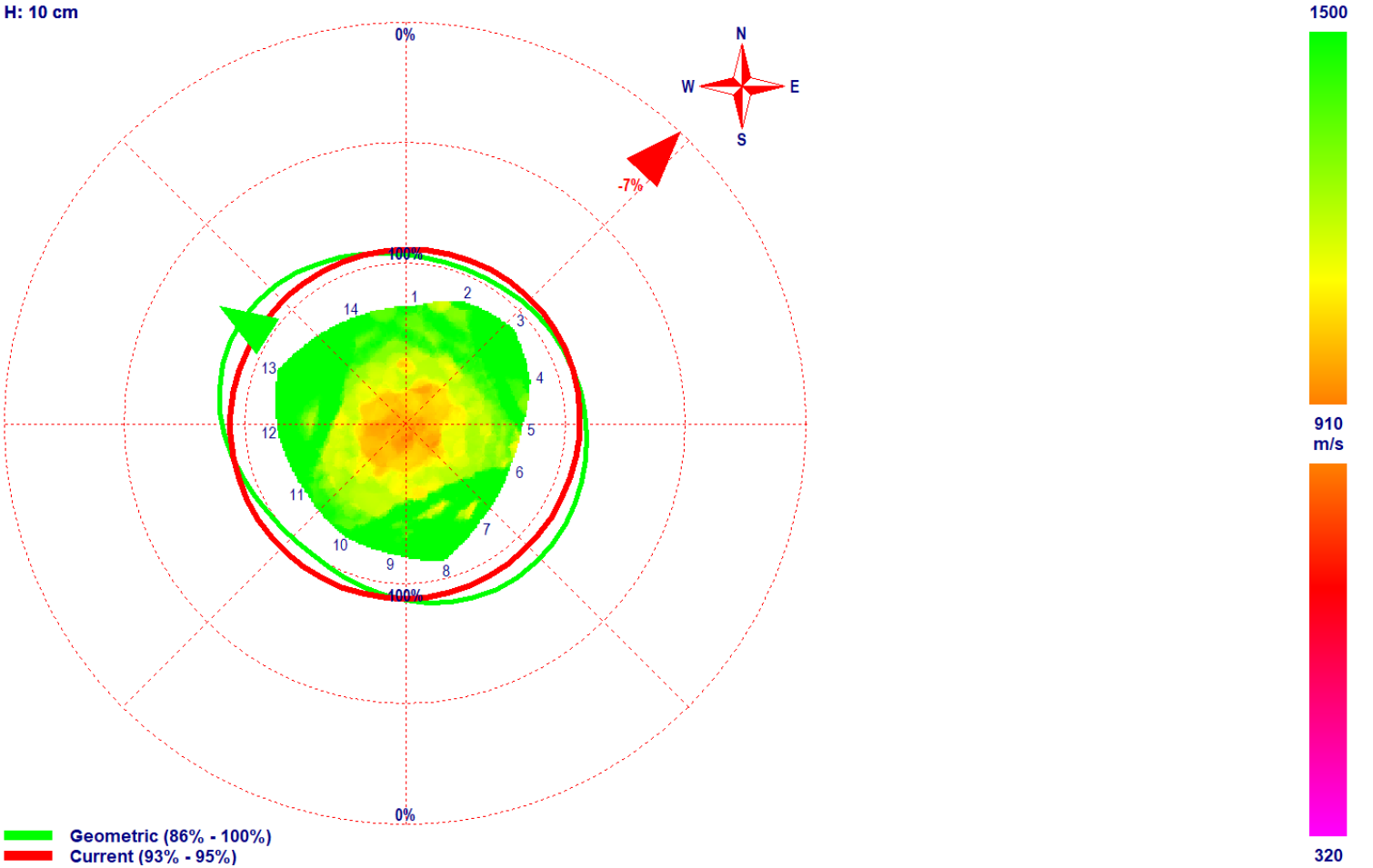


T192 Populus x generosa ‘Beupre’ – Mechanical strength loss at 10cm above ground level.

Project: Atkins A3
Location: Wisley

Tree: T192
Tree species: Populus

Date: 05/11/2019
North: 0°

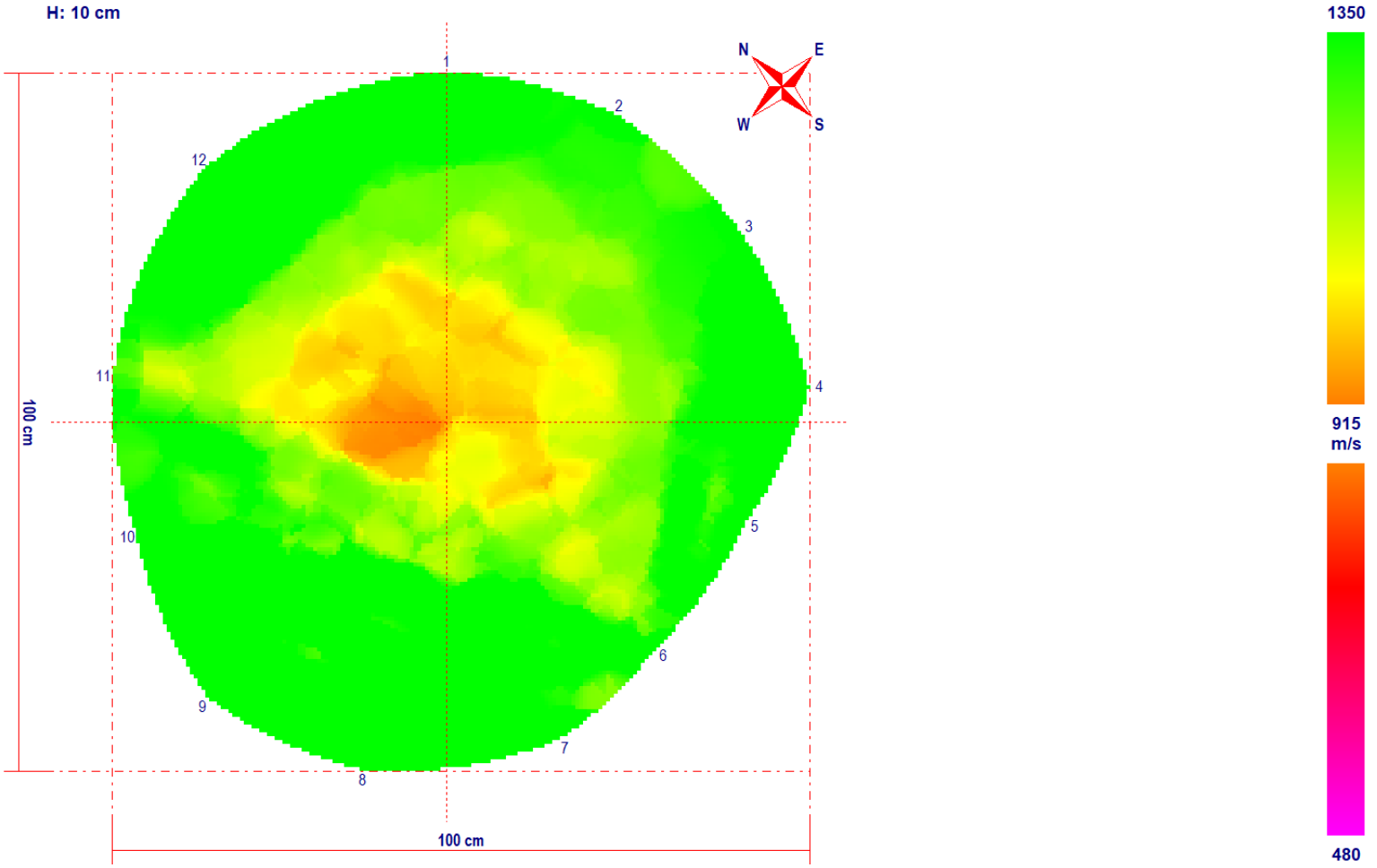


T197 Hybrid Black Poplar – Impulse tomography test at 10cm above ground level

Project: Atkins A3
Location: RHS Wisley

Tree: T197
Tree species: Populus

Date: 05/11/2019
North: 315

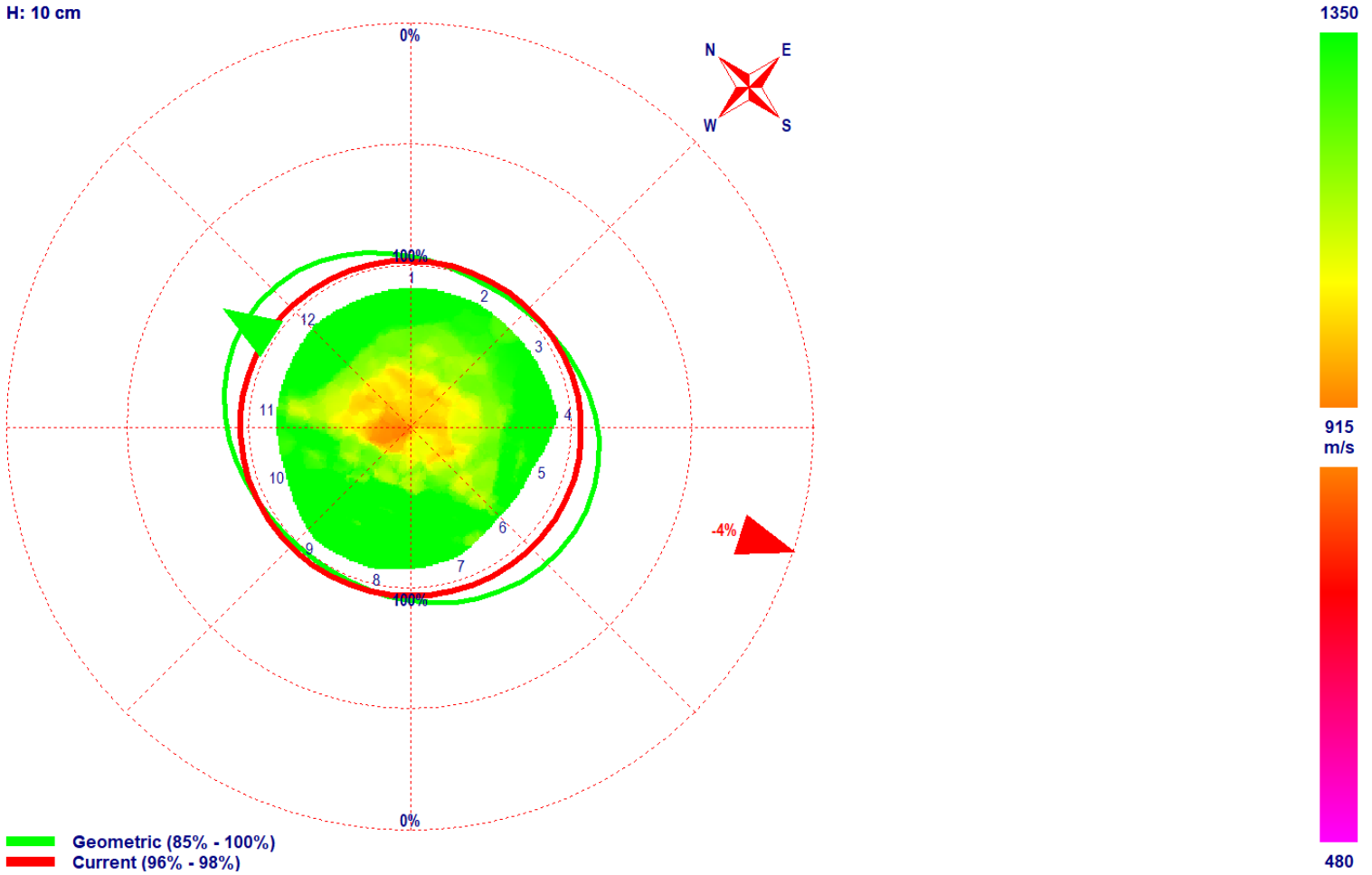


T197 Poplar – Mechanical strength loss at 10cm above ground level.

Project: Atkins A3
Location: RHS Wisley

Tree: T197
Tree species: Populus

Date: 05/11/2019
North: 315



Consideration of Arbotom Impulse Tomography Results

T176 Norway Maple
The Impulse Tomography test shows there to be no significant defects associated with the main stem at 10cm above ground level.

T181 Red Oak
The Impulse Tomography test records low velocities at the centre of the stem at 10cm above ground level, indicative of a localised defect, such as decay or cracking. The strength loss associated with the central defect is 2%, which is not currently significant.

T183 Giant Redwood
The Impulse Tomography test at 5cm above ground level shows a large area of low velocities in the central zone of the stem. This species is extremely difficult to test using impulse tomography owing to extensive bark inclusions common to the growth pattern of the species. These inclusions are not necessarily decay or disruption to the structural integrity of the wood but are represented as such through the interpretation of impulse tomography. Resistance drilling may possibly provide more conclusive results.

T184 Giant Redwood
The Impulse Tomography test at 15cm above ground level shows a large area of low velocities in the central zone of the stem.

This species is extremely difficult to test using impulse tomography owing to extensive bark inclusions common to the growth pattern of the species. These inclusions are not necessarily decay or disruption to the structural integrity of the wood but are represented as such through the interpretation of impulse tomography. Resistance drilling may possibly provide more conclusive results.

T185 Turkey Oak
The Impulse Tomography test shows there to be no significant defects associated with the main stem at 5cm above ground level.

T192 Populus x generosa ‘Beupre’
The Impulse Tomography test at 15cm above ground level shows a low velocities in the central zone of the stem indicative of central decay or a possibly defect, such as an internal crack. The strength loss associated with the central decay/ defect is 7%, which is not currently significant. This genera of trees do not have dense wood and are poor at defending against decay. As such, if the tree is retained ongoing monitoring of the structural integrity of the stem base would be recommended.

T197 Hybrid Black Poplar
The Impulse Tomography test at 15cm above ground level shows a low velocities in the central zone of the stem indicative of central decay or possibly a defects, such as internal cracking. The strength loss associated with the central decay/ defect is 4%, which is not currently significant. This genera of trees do not have dense wood and are poor at defending against decay. As such, if this tree is retained ongoing monitoring of the structural integrity of the stem base would be recommended.

Appendix 3: Limitations of Tree Condition Report

Limitations of the Tree Survey

The survey was based on visual observations and aids as detailed within the report.

A climbing inspection was not carried out.

No below ground inspections were carried out.

All observations were made from within the boundaries of the property, or from public land unless otherwise stated. Trees within neighbouring property are inspected as closely as is reasonably possible from within the boundaries of the property or from public land.

This report focuses on the physiological and structural condition of the tree as identified within this report.

Findings of the Survey and the Report

The recommendations in this tree report are valid for one year.

Independent data, where provided, has not been checked unless otherwise stated. This may affect the validity of the report and the client should satisfy themselves that any independent data provided is valid.

The tree/trees in question are evaluated using both visual tree assessment and stress wave tomography.

The information pertaining to the 'Arbotom'© Stress wave ('impulse') Tomography correlates to those details as provided by the manufacturers.

Displayed information and interpretation of the Impulse Tomography

Defects within the wood, not necessarily detrimental to structural integrity of the tree, may show up as areas of decay. Such areas as included bark, crack or stress fractures may appear on the read out as decayed areas.

Such areas can only be verified by boring into the tree. This is only considered having discussed with the owner of the tree and maybe deemed necessary before felling the tree.

Timing of the Survey and the Report

Such considerations/ recommendations will become invalid if changes occur to the site as considered that affect the condition of the tree, the site as evaluated, or the hazards as identified at the time of the survey.

If there are any such alterations, it is recommended that a new tree survey/report is undertaken.

Assessment of 'Targets' as considered

'Targets' are considered as those things, people and property that could be hit by the trees failing, whether such failure is partial or total.

These Targets are identified from an evaluation of the site at the time of the survey.

Changes to the site from the time of the survey may affect the targets as considered within the report and will require review or re-appraisal of the report.

Consideration of the Trees in Relation to Subsidence/ Heave

The report does not consider an assessment of the risk of Subsidence or Heave to any properties, built structures or drainage whether within the bounds of the site considered or adjacent to the site.

It is considered prudent to consider the effects of heave on any property if trees are removed.

Such considerations would be considered within a specific report.

Consideration of the Trees in relation to direct damage

The report does not consider direct damage related to tree root growth in relation to any structures whether within the bounds of the site considered or adjacent to the site.

Direct damage in this instance is considered to be where the roots of a tree have physical contact with a structure.

Trees in relation to other Properties

Works as recommended may affect third party property owners and /or third-party trees. Considerations of these affects are not dealt with within this report.

This report/survey does not comment on possible effects of trees on neighbouring properties, including in relation to subsidence or heave, or with regard to possible hazards presented by trees surveyed.

Third party owners that maybe affected by recommended works and should be informed by the client, so that the relevant parties may seek their own advice as to possible effects of the recommendations given within this report.

Damage to, or possibility of damage to, any other structure that is not referred to within the report is not considered unless otherwise specified. This includes both neighbouring structures and any other structure on the property.

Trees subject to statutory controls

If the trees are covered by a Tree Preservation Order or are located in a conservation area it will be necessary to consult the local authority before any pruning works, other than certain exemptions, can be carried out.

The works specified above are necessary for reasonable management and should be acceptable to the local authority. However, the local authority may take an alternative point of view and have the option to refuse consent.

Trees are subject to changes outside man’s control

Trees are living organisms subject to changes outside man’s control. Trees and environment alter with the seasons it is as well to inspect trees whilst in full leaf and when out of leaf.

If there are any harsh or unexpected weather conditions, or heavy storms it is also prudent to inspect trees.

Changes to ground water conditions will affect the root growth of a tree. Such changes are not always the result of man’s influence and others factors may be involved.

Limitations of use of copyright

Appendix D. Bibliography

Biddle, G. 1998. Tree Root Damage to Buildings: Causes, diagnosis and remedy. Willowmead Publishing.

Mitchell, A. 1974. Trees of Britain & Northern Europe.

Matheny, N.P., and J.R. Clark. 1994. A photographic Guide to the Evaluation of Hazard Trees in Urban Area. International Society of Arboriculture. Champaign, IL. 85pp.

Smiley, E.T., B.R. Fraedrich, and N. Hendrickson. 2002. Tree Risk management. Bartlett Tree Expert Co., Charlotte, NC. 44pp.

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Birmingham
B1 1TF

DO NOT SCALE

Millimetres 100 10 0

RHS GARDEN WISLEY

T197 HYBRID BLACK POPLAR
T192 POPULUS X GENEROSA 'BEUPRE'
T185 TURKEY OAK
T184 GIANT REDWOOD
T183 GIANT REDWOOD
T181 RED OAK
T176 NORWAY MAPLE

A3 SOUTHBOUND OFF-SLIP TO OCKHAM PARK JUNCTION

LONDON

GUILDFORD & PORTSMOUTH

A3 OCKHAM PARK JUNCTION

A3 SOUTHBOUND OFF-SLIP TO OCKHAM PARK JUNCTION

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SECTION LOCATIONS
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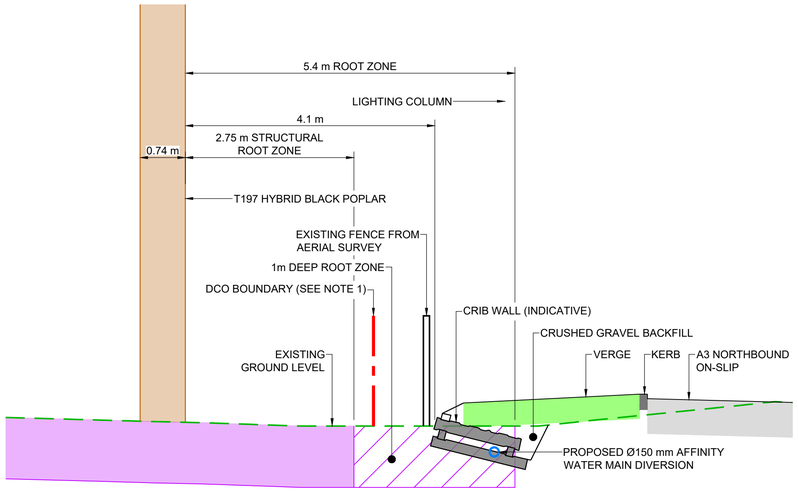

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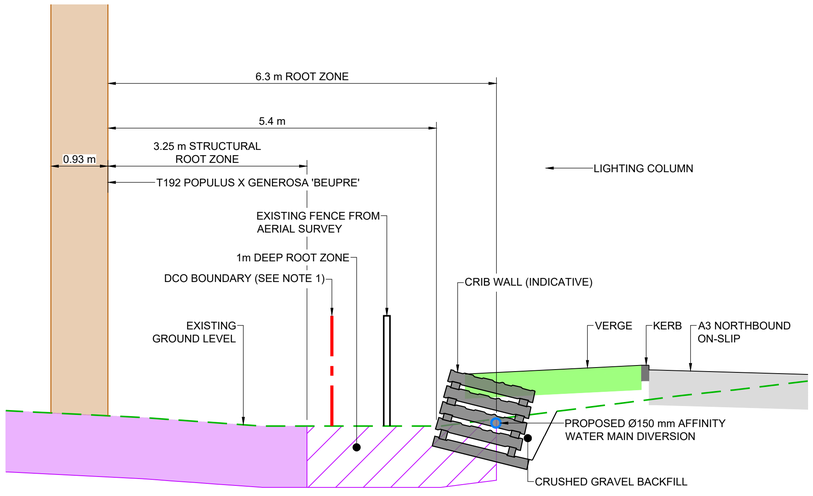

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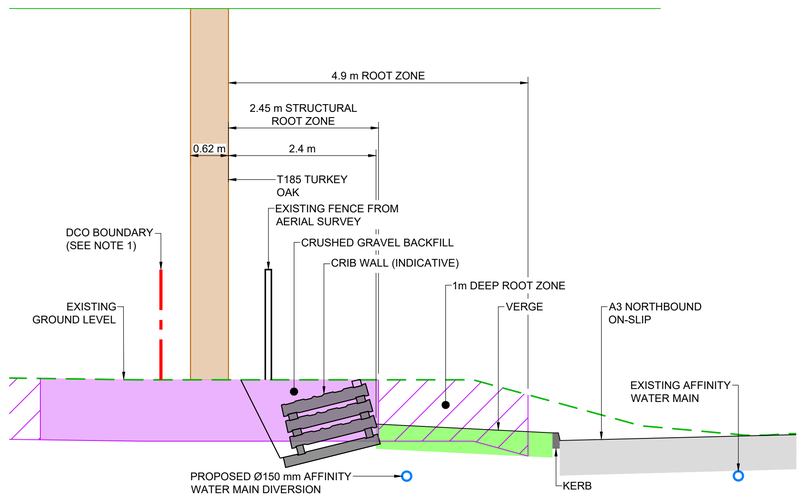

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NOTES:

1. DEVELOPMENT CONSENT ORDER (DCO) BOUNDARY IS BASED ON ORDNANCE SURVEY (OS) MAPPING. tHERE IS A KNOWN DISCREPANCY BETWEEN THE OS MAPPING AND THE TOPOGRAPHICAL DATA CREATED FROM AN AERIAL SURVEY.
2. CRIB WALL DESIGN TO BE CONFIRMED

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
None

Maintenance / Cleaning
None

Use
None

Decommissioning / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
First Draft	S0	P01.1	---	---	---	---	---

Drawing Suitability: WORK IN PROGRESS
Status: S0

Project Title: M25 junction 10/A3 Wisley interchange

Drawing Title: SECTIONS THROUGH AREAS OF CONFLICT BETWEEN TREE ROOTS AND RETAINING WALL AT RHS WISLEY BOUNDARY

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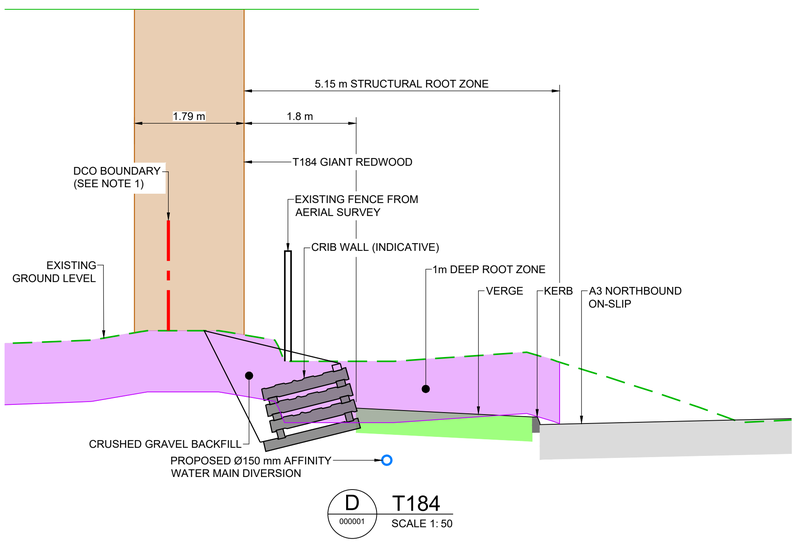
Client: Working on behalf of highways england

Drawing Number
Project: HE551522 - Originator: ATK - Volume: ELS -
Location: A3_L1_ML - Type: DR - Role: LL - Number: 000001

Original Size: A1 | Scale: AS SHOWN | Project Ref. No: 5158141 | Sheet: 1 of 2 | Rev: P01.1

DO NOT SCALE

Millimetres 100 10 0



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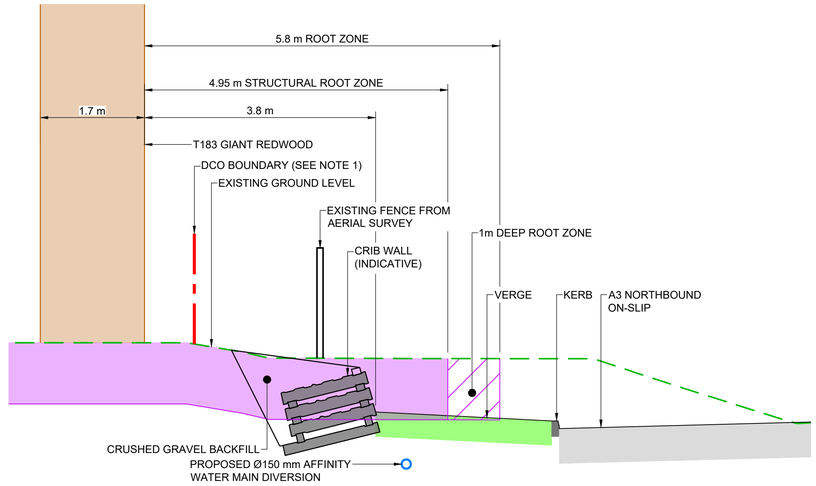

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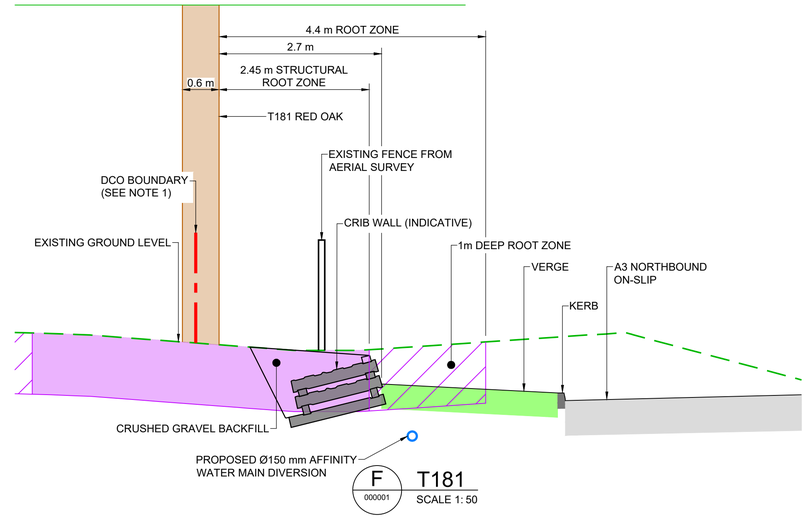

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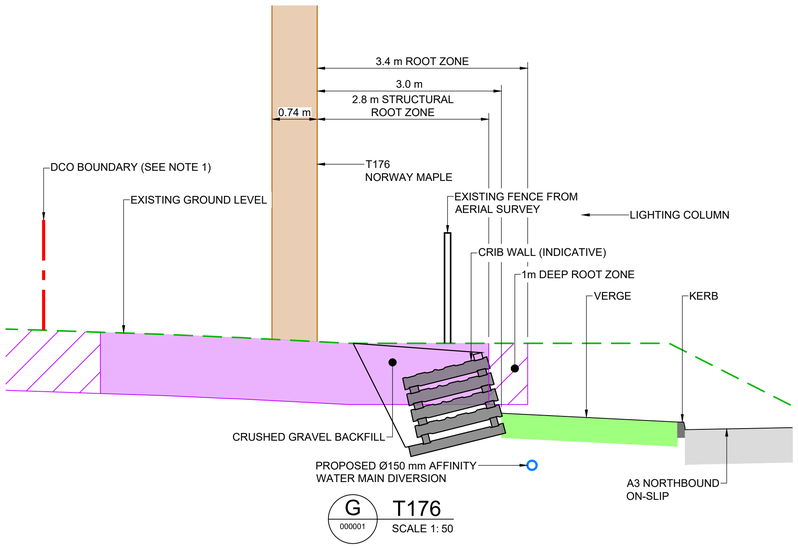

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NOTES:

1. DEVELOPMENT CONSENT ORDER (DCO) BOUNDARY IS BASED ON ORDNANCE SURVEY (OS) MAPPING. tHERE IS A KNOWN DISCREPANCY BETWEEN THE OS MAPPING AND THE TOPOGRAPHICAL DATA CREATED FROM AN AERIAL SURVEY.
2. CRIB WALL DESIGN TO BE CONFIRMED

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

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Maintenance / Cleaning
None

Use
None

Decommissioning / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
First Draft	S0	P01.1	---	---	---	---	---

Drawing Suitability: WORK IN PROGRESS
Status: S0

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Client: Working on behalf of highways england

Project Title: M25 junction 10/A3 Wisley interchange

Drawing Title: SECTIONS THROUGH AREAS OF CONFLICT BETWEEN TREE ROOTS AND RETAINING WALL AT RHS WISLEY BOUNDARY

Drawing Number
Project | Originator | Volume | Location | Type | Role | Number
HE551522 - ATK - ELS - A3_L1_ML - DR - LL - 000002

Original Size: A1 | Scale: 1:50 | Project Ref. No: 5158141 | Sheet: 2 of 2 | Rev: P01.1

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