Sheffield Street Tree Partnership Strategy

Promoting and enhancing a network of street trees that Sheffield can be proud of

Sheffield Street Tree Partnership

Foreword

We set out to develop an exemplary Street Tree Partnership Strategy for Sheffield that values street trees for the benefits they bring to people, the city and the wider environment.

And we believe this Strategy is just that. As a group we wanted to produce something positive and visionary - for the city to collectively view street trees as an asset, helping us to improve air quality, reduce flood risk, support wildlife and store carbon.

This strategy aims to learn from the past in order to deliver our vision for the future of Sheffield's street trees.

In developing this strategy we have recognised that a partnership approach to positively, actively and sustainably managing our street trees, both now and in the long-term, means we are more likely to achieve our ambitions. Sharing time, expertise and resources means we can deliver so much more.

Of course, our street trees are just a part of all the city's trees and woodlands and so this document fulfils action 29 of Sheffield City Council's Trees & Woodlands Strategy 2018-2033:*'To develop a street tree strategy with partners which will be a 'sub-strategy' of the Trees and Woodlands Strategy'.*

We have also commissioned and collated baseline data so that progress towards our ambitions can be measured and is transparent. For more details about some of the baseline data please also refer to our 'Sheffield Street Tree Inventory Report'[1].

We launched this document as a 'Working Strategy' in 2020, so that we could provide an opportunity for people from across the city and beyond to make comments, share their ideas and make commitments to supporting the proposals.

The public consultation was launched on 16th July 2020 and ran for 12 weeks. This resulted in over 280 responses from individuals and organisations. Many respondents were supportive of the aims of the street tree Working Strategy and the consultation also highlighted the challenges that can be caused by poor street tree management and maintenance. The importance of maintaining a progressive attitude, resolving conflicts and ensuring that a wide range of views are taken into consideration was emphasised. Thank you to all the individuals and organisations who took the time to respond.

We reviewed all the comments provided and identified a number of key themes that we needed to improve or amend in this final strategy, outlined in our 'Consultation Feedback Report'[2]. We accepted a whole range of changes and actions suggested, and transparently documented decisions made in our 'You

[1] Rogers, K., Buckland, A., and Hansford, D. 2019. *i-Tree Eco Stratified Inventory Report*. Treeconomics. Retrieved from: https://www.treeconomics.co.uk/resources/reports/.

[2] SCC. 2021. Street Tree Partnership Working Strategy - Consultation Feedback Report. Presented to Cabinet on 20/01/2021, (Item 12.). Retrieved from: https://democracy.sheffield.gov.uk/ieListDocuments.aspx?CId=123&MId=7552&Ver=4

Said. We Did' report'[3]. The most significant change we have made is to emphasise and further develop Outcome 6 in order to specifically recognise the need for wider education and engagement with people of all ages in looking after our street trees. We have also tried to more clearly recognise some of the challenges that the wrong tree in the wrong place can present.

We have reviewed the membership and terms of reference of the Sheffield Street Tree Partnership, with the aim of involving as many people as possible in the delivery of the strategy. In particular, we wanted to be able to draw on the network of nearly 50 new Street Tree Wardens that began volunteering for the Partnership in autumn 2020. The Partnership's revised Terms of Reference can be found in Appendix 4.

This is now the final version of the Sheffield Street Tree Partnership Strategy. But in terms of delivery, there is much to do, and the action plans in this document remain live. They will be regularly reported against and updated at each Partnership meeting and an annual report published on the Partnership webpages to update on progress. There will be a full review process in 5 years' time.

On a personal note, I would like to thank the organisations and individuals involved in the development of this strategy for their commitment, passion, knowledge and expertise, without which my job would have been much harder.

Liz Ballard

Chair, Sheffield Street Tree Strategy Development Group

[3] SCC. 2021. You Said. We Did Report. Presented to Cabinet on 17/03/2021. Retrieved from: https://democracy.sheffield.gov.uk/ieListDocuments.aspx?CId=123&MId=7554&Ver=4

Introduction

Why street trees are important

Sheffield's trees and woodlands are one of the city's greatest natural assets and contribute to its reputation as one of the greenest cities in the UK. They provide benefits for the people of Sheffield, as well as making urban areas and local neighbourhoods attractive and healthy places to live and work. Trees are a valuable asset and there is strong and growing evidence that exposure to them increases physical and mental health wellbeing[4], as well as supporting the ecology and biodiversity of the city.

Street trees are a crucial part of the city's urban forest and provide numerous benefits including shade and shelter, introducing nature to otherwise barren areas, helping to clean the air and reduce the risk of flooding. Street trees form an important and much loved part of the city's tree stock that we want to improve, maintain and sustain for future generations to enjoy.

Challenges of managing street trees

Street trees live a tough life and they need to be able to cope with drought, compacted soils, road salt and traffic pollution. The choice of street tree species needs to be appropriate for them to thrive in their environment: close to houses, roads and people. Sheffield already benefits from a relatively high diversity of street tree species, with 164 currently identified. This strategy addresses how we can continue to increase street tree diversity to help increase the overall resilience of the street tree stock. In addition, we need to identify trees that can grow to reach an optimum canopy size to contribute the most benefits to the surrounding urban communities.

Street trees are managed somewhat differently from woodland trees. Because they are on the highway network, their value needs to be balanced against the reality that they need to be managed for safety. Street trees can cause problems if they are poorly maintained, for example: creating access issues if they limit pavement widths; branches obscuring sightlines or being too close to roofs, windows, wires, and aerials; leaf fall obscuring pavement obstructions and blocking drains; tree roots undermining foundations of buildings; and limiting parking options. Poor species selection can also affect people with allergies due to pollen.

In Sheffield, the Council acts as the local highway authority. Its duty to maintain the city's highways is delivered through the Streets Ahead citywide highways maintenance contract between the Council and Amey. The Council needs to make sure that the city's roads and pavements are safe and accessible for all members of the public, and that people and property are protected from the dangers of any hazards on the roads or pavements. Street tree management and maintenance form part of the routine programme of the highway maintenance work alongside gritting and snow clearance, street sweeping and litter collection, gully cleaning and grass cutting.

[4] Astell-Burt, T. and Feng, X. 2019. Association of Urban Green Space With Mental Health and General Health Among Adults in Australia. *JAMA Network Open*. Retrieved from: https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2739050.

Rouquette, J.R. and Holt, A.R. 2017. *The benefits to people of trees outside woods*. Report for the Woodland Trust. Natural Capital Solutions. Retrieved from: https://www.woodlandtrust.org.uk/media/1702/benefits-of-trees-outside-woods.pdf.

O'Brien, L., Williams, K. and Stewart, A. 2010. *Urban health and health inequalities and the role of urban forestry in Britain: A review*. Forest Research. Retrieved from: https://www.forestresearch.gov.uk/research/review-urban-forestry-in-urban-health-and-health-inequalities/.

Van den Berg, A.E., Koole S.L., and van der Wulp N.Y. 2003. Environmental preferences and restoration: (How) are they related? *Journal of Environmental Psychology, 23*(2), 135-146. Retrieved from: https://doi.org/10.1016/S0272-4944(02)00111-1.

Amey has contractual responsibility for all trees located within the boundary of the Sheffield adopted highway network. This is a 'wall to wall', all-encompassing responsibility for trees on the highway, whether they are the formally designed planting schemes in the City Centre, the Victorian tree lined suburbs or on one of the many rural roads that lie within the Peak District National Park. Any tree within the highway is managed by and is the responsibility of Amey until 2037 under the Streets Ahead contract. In addition, Amey has responsibility for trees on Other Designated Land (public land considered near to or part of the network) but only from a safety perspective.

When the Streets Ahead contract commenced in August 2012, Amey began recording and inspecting Sheffield's highway trees. This was the first systematic inspection of the highway tree estate since a survey in 2006-07 which had recorded approximately 34,500 individual highway trees. It was known that this was not exhaustive; there were many trees in shelterbelts, clusters and woodlands which are not recorded and it seems that in time '36,000' trees became a shorthand for the highway tree stock as a whole.

The highway network itself is subject to continual change. Roads are added, removed or subject to change through design; trees have died, fallen, been removed and replaced, and additional planting has added trees in some areas.

Therefore, at the time of writing (December 2020) there are approximately 35,500 individual street trees on the highway network for which Amey Streets Ahead has responsibility. This excludes any woodland, tree clusters or trees along the rural network, which whilst not plotted are the responsibility of Amey until contract conclusion in 2037.

Why is there a need for a new Street Tree Strategy?

At the start of the Streets Ahead contract in 2012, a five-year tree management strategy was produced setting out Amey's approach to delivering the street tree management element of the highway maintenance service. This document was published, reviewed each year and updated accordingly. The last five-year tree management strategy published was for 2018-2023. No further updates of this document were published while the new approach to street tree management has been in discussion and development with partners.

Over the last seven years there has been high profile public interest in Sheffield's street trees. A number of the city's residents formed local action groups to protest against the approach to felling and replacing street trees as part of the Streets Ahead contract.

In 2018, Amey, Sheffield City Council and Sheffield Tree Action Groups (STAG) came together through a series of mediated talks to explore and understand the different positions and find a way forward. This started to rebuild trust and confidence and provided a new starting point for the next phase of work. As a result of these talks, a Joint Position Statement was agreed and published in December 2018[5]. All parties agreed that the approach to the future management of the city's street trees should be set out in a new street tree strategy informed by a wide range of stakeholders.

Work began in January 2019 on an approach to assess and retain many of the street trees previously threatened with removal. This was made possible through the efforts of the street tree campaigners, the willingness by Amey to fund additional works outside the contract, and the Council temporarily suspending some elements of the contract without affecting the long term aims of Streets Ahead. Joint inspection work involving Amey, and STAG representatives commenced in January 2019 and continued throughout the summer of 2019. A jointly produced review of lessons learned[6] from the early inspections was published by the Council in December 2019 and this shaped the inspections that restarted in January 2020.

The approach set out in this strategy is rooted in retaining street trees where possible by using a flexible combination of highway engineering solutions, enhanced monitoring and maintenance of street trees, and decisions on the removal and replacement of trees made on a case-by-case basis. This, along with appropriate tree species selection, should enable street trees to be safely retained for longer while still delivering the long-term benefits from the investment to maintain the safety and integrity of the city's highway network

[5] SCC, Amey, STAG SG. 2018. *Joint Position Statement on Mediated Talks between Sheffield City Council, Amey, and the Steering Group for Sheffield Tree Action Groups (STAG SG)*. Retrieved from: https://www.sheffield.gov.uk/home/roads-pavements/managing-street-trees.

[6] SCC, Amey, STAG SG. 2019. *Review of Tree Investigations - Lessons Learned & Actions*. Retrieved from: https://www.sheffield.gov.uk/home/roads-pavements/managing-street-trees.

Partnership approach to developing the Sheffield Street Tree Strategy

This Sheffield Street Tree Partnership Strategy has been developed through true partnership, discussion and dialogue. It is based on a review of current street tree management practices and an independent assessment of Sheffield's street trees in terms of the benefits, or 'ecosystem services', that these trees provide to people living in urban areas. It supplements the Sheffield Trees and Woodlands Strategy 2018-2033 published in December 2018[74].

A partnership group to develop the new street tree strategy was established in August 2019. Membership of the group included representatives from Amey, Sheffield City Council, STAG, The Woodland Trust, tree valuation experts, and a tree officer from a neighbouring local authority. The group was chaired independently by the Chief Executive of Sheffield and Rotherham Wildlife Trust. Please see the original group's terms of reference in **Appendix 1**.

The group developed the high level vision, outcomes and action plans for the management of Sheffield's street trees as well as considering the value of street trees, the decision process for street tree management and species selection, and community involvement. This was developed into a 'Working Strategy'.

The 'Working Strategy' was agreed by all partners and launched for a 12 week public consultation from 16th July 2020. Over 280 people and organisations responded to the consultation. A Consultation Feedback Report[8], presenting our analysis, and a 'You Said, We Did' report[9], documenting how we responded to feedback, have been published. The feedback from the consultation has been taken into consideration in producing this final Strategy. This is now the final Sheffield Street Tree Partnership Strategy, although the action plans remain live and will be regularly updated.

As a result of the consultation, the Partnership also reviewed its terms of reference with the aim of involving as many people as possible in delivering the Strategy. The Partnership's revised terms of reference can be found in **Appendix 4**.

[7] Sheffield City Council. 2018. *Sheffield Trees and Woodlands Strategy 2018-2033.* Retrieved from: https://www.sheffield.gov.uk/home/parks-sport-recreation/trees-woodlands-strategies.

[8] SCC. 2021. Street Tree Partnership Working Strategy - Consultation Feedback Report. Presented to Cabinet on 20/01/2021, (Item 12.). Retrieved from: https://democracy.sheffield.gov.uk/ieListDocuments.aspx?CId=123&MId=7552&Ver=4.

[9] See: SCC. 2021. You Said. We Did Report. Presented to Cabinet on 17/03/2021. Retrieved from: https://democracy.sheffield.gov.uk/ieListDocuments.aspx?CId=123&MId=7553&Ver=4

The Benefits of Trees

Vision

We want to see:

A network of street trees that Sheffield can be proud of: well- maintained and cared for; resistant to the threats of disease and climate change; and delivering many benefits for people and our environment. These benefits include:

- Enhancing Sheffield's 'green city' reputation and contributing to a sense of place
- Improving our physical and mental health and wellbeing
- Cleaning the air that we breathe
- Contributing to offsetting our carbon emissions
- Helping combat the effects of climate change such as flash floods and rising temperatures
- Providing a connection for people to the natural environment on their doorsteps
- Bringing communities together, fostering a sense of belonging, and being part of the heritage and history of an area
- Making the city more attractive to encourage students, visitors, and businesses to come to Sheffield and help boost the local economy
- Supporting and protecting the city's biodiversity and wildlife
- Providing local environmental benefits like shade, natural traffic calming and reducing verge and pavement parking

In support of the Sheffield City Council Trees and Woodlands Strategy 2018-2033, we will promote and enhance Sheffield's street trees
and their long-term benefits for the public, wildlife and the wider environment by:

1. Sustainably and carefully managing and maintaining our street trees in accordance with best practice.
2. Ensuring our street trees are more resilient through the type and age of trees we plant and also how we manage the current street tree stock.
3. Increasing the value and benefits that flow from our street trees.
4. Contributing to a more equal distribution of urban forest across the city.
5. Increasing street tree canopy cover.
6. Involving the wider community of all ages in caring for and valuing street trees.

In the following sections each of the above six bullet points is developed further into an Outcome – the impact we want to see in the future. Each Outcome has measures so that we know what our starting point, or baseline, is as well as our longer term aim. There are action tables to help us move towards our Outcome.

Outcomes, Measures, Actions and Resources

OUTCOME 1

Our street trees are sustainably and carefully managed and maintained in accordance with best practice

We want to ensure that our street trees are looked after as valuable assets for the city. As part of this approach to management, this strategy supports transparency in decision making and community consultation in the decision process. This allows local people the opportunity to understand and if necessary challenge a tree management decision through a clear and open process.

In relation to tree management, Amey currently work to industry standards and contract requirements as summarised in **Appendix 9**. However, there is no independent assessment of compliance to this standard. There is also no requirement to undertake any stakeholder consultation. Both of these issues mean there is a lack of transparency about how our street trees are being managed that can lead to conflict and misunderstanding on all sides.

We agreed that independent accreditation would be a good step forward in ensuring transparency, best practice, and quality of street tree management and monitoring. With the Programme for Endorsement of Forest Certification (PEFC)[10] we are exploring a new accreditation scheme using the 'Trees Outside Forests'[11] international independent certification scheme.

[10] For more information visit: http://ukwas.org.uk/.

[11] For more information visit: https://www.pefc.org/what-we-do/our-collective-impact/our-projects/exploring-certification-solutions-for-trees-outside-forests.

How will we know our street trees are sustainably and carefully managed in accordance with best practice?

The management of Sheffield's Street Trees will meet best practice when independently assessed against internationally recognised criteria.

Baseline Figures

We do not currently have a baseline to work from until the first independent assessment has taken place.

So what are we going to do?

Actions	How will this help?	Who?	By when?	Resources
Work towards an independent accreditation of street trees	Offers a structured approach to assessing compliance with best practice verified by an independent third party	PEFC STAG Amey SCC	In consultation Jan-Mar 2021 with a view to having a certifiable standard by May/Jun 2021	Annual fee estimated £1-2000 (SCC)
Promote and have oversight of the city's approach to street tree management **Please refer to Appendix 5 for Decision process for Sheffield's street trees**	Provides transparency about what the Council and Amey will and won't do when managing trees	SCC, Amey, STAG, SRWT, WdT, other partners	April 2021	
Review, refine and publish decision making process for managing Sheffield's street trees **Please refer to Appendix 5 for Decision process for Sheffield's street trees**	Provides transparency of the decision making process adopted by the Council and Amey for the management of street trees	SCC, Amey	April 2021	
Update contract methods statements and management documents	To ensure Streets Ahead practice is in line with this strategy	Amey	On completion of the Strategy & associated process March 2021	
Consider Planning Reforms and ways to influence planning/development in the city eg through developing a Supplementary Planning Document, reference to Environment Bill	Ensures consistency of practice, by extracting and cross referencing the relevant sections of the working strategy to ensure appropriate species selection, tree pit design, aftercare etc.	Partnership	Summer 2021	
Explore ways to promote existing standards for working in the vicinity of street trees and encourage adherence by all contractors	Outlines requirements for systems to monitor compliance with the specified Industry Standards, with consequences for infringement	Partnership	2022	

Develop an online, user friendly, interactive and live tree map to aid tree management and community reporting	Street tree information is up to date, transparent and accessible to the public	Partnership	2022	Resources for development and hosting to be explored
Identify important existing and future 'Treescapes' in the city to inform tree officers' management and planting decisions	To protect important street 'landscapes' in the city	Partnership	December 2022	Tree Warden, Partners time
Submit application for Tree Cities of the World recognition	By joining a network of internationally recognised frontrunners in urban tree management, SSTP can connect with other cities, share ideas and examples of best practice, celebrate progress made in terms of improving tree stock management practices, and create a positive narrative to reinforce Sheffield's "green city status"	Partnership	December 2021	Partners' time

OUTCOME 2

Our street trees are more resilient through the type and age of trees we plant and how we manage the current street tree stock

If we want our street trees to be more resilient to climate change, threats from pests and diseases etc then we need:

— Existing trees to be in the best possible condition.

— A good age profile of trees across all the street tree stock.

— Diversity of tree species, including species that can thrive in future climates.

We agreed that we must work towards the protection and retention of the existing tree stock we have alongside additional planting and intelligent replacement to improve the age profile and diversity.

How will we know our street trees are more resilient?

There will be an increasing trend over five year intervals in:

— Tree condition scores moving increasingly up the scale from poor to fair to good.

— Creating greater spread in the age profile of the street tree population

Diversity of tree types moving towards a profile of 10% 20% 30%[127] by:

— Reducing the incidence of trees in the Rosaceae family down from 38% to below 30% where it is possible to do so without compromising overall outcomes.

— Maintaining the current profile of <20% of any single genera.

— Aiming to reduce the incidence of over-represented species like Acer pseudoplatanus (11%), Tilia europaea (9%) whilst managing the reduction in Fraxinus excelsior (7%) resulting from Ash dieback. (In practice the need to provide suitable hosts for wildlife displaced by ash dieback may mean that this needs to be relaxed in the short term)

— Manage the number of cultivars planted each year in accordance with good practice

[12] "A broader diversity of trees is needed in our urban landscapes to guard against the possibility of large-scale devastation by both native and introduced insect and disease pests. Urban foresters and municipal arborists should use the following guidelines for tree diversity within their areas of jurisdiction: (1) plant no more than 10% of any species, (2) no more than 20% of any genus, and (3) no more than 30% of any family. Strips or blocks of uniformity (species, cultivars, or clones of proven adaptability) should be scattered throughout the city to achieve spatial as well as biological diversity."

Santamour, F.S. 1999. *Trees for Urban Planting: Diversity, Uniformity, and Common Sense.* Report for the U.S. National Arboretum Agricultural Research Service. Washington, D.C. Retrieved from: https://www.semanticscholar.org/.

Baseline Figures

Please see further more detailed information and charts in **Appendix 3 Baseline Analysis of the Current Sheffield Street Tree Stock**.

Measure	Baseline (August 2019)
Tree condition	Good (15%), Fair (69%), Poor (7%), Senescent (0.5%)
Age classification	New (16%), Young (9%), Semi-mature (17%), Early mature (20%), Mature (38%) 62% of the tree stock is maturing
Diversity of tree type	Areas to monitor Family: Rosaceae (38%) Genera: Acer (17%), Prunus (17%), Tilia (12%) Species: Acer pseudoplatanus (11%), Tilia europaea (9%), Prunus serrulata (8%) Fraxinus excelsior (7%) Percentage cultivars planted in 2018/19 = 71% Percentage cultivars on the network - 19% in 44 cultivars

So what are we going to do?

Actions	How will this help?	Who?	By when?	Resources
Annual review of these measures	So that we can monitor progress	Amey Partners	Yearly	Amey to undertake review through ATMP
Cyclical tree inspection of at least once every 3-5 years – with inspection frequency increasing with worsening condition and risk to record: Age, condition, size, form, risk, presence of wildlife, special feature e.g. rarity, cultural value	To monitor condition, diversity, age, quality etc and inform priorities for tree works	Amey	Ongoing	Amey to undertake inspections with reference to the local community and other stakeholders for input on cultural value
Review the current age profile and consider approaches to increase resilience	To develop proposal for how to improve resilience and age diversity	Partners	2022-3	Partner time, some additional resource for analysis may be needed
Develop a thorough species selection process for replacements and replanting, with reference to best practice. **NB:** Please refer to **species selection process in Appendix 2** and **indication of relative benefits provided by different tree species Appendix 7**	To improve the tree species diversity over time	Amey	Ongoing	Urban Tree Manual[13] Tree Design Advisory Guide[14]
Monitor and report the planting of cultivars on the network with the aim of optimising their use	Cultivars are chosen for good characteristics but lack the natural genetic diversity that can confer resistance to pathogens,	Amey	Ongoing	Amey via the ATMP

[13] Doick, K. and Townsend, H. 2018. *The Right Tree in the Right Place for a Resilient Future*. Forest Research. Retrieved from: https://www.forestresearch.gov.uk/tools-and-resources/urban-tree-manual/.

[14] Hirons, A. and Sjöman, H. 2019. *Tree Species Selection for Green Infrastructure: A Guide for Specifiers.* A report for Trees & Design Action Group. Issue 1.3. Retrieved from: http://www.tdag.org.uk/species-selection-for-green-infrastructure.html.

Support the establishment of a network of local provenance tree nurseries	To help secure a supply of healthy, local provenanced (where appropriate) trees across a range of species	Partnership with SCC Trees & Woodlands and others	2022	

OUTCOME 3

Increase the value and benefits that flow from our street trees

As illustrated so well in the 'Benefits of Trees' image found on page 12 (credit Treeconomics), our urban trees provide many benefits. As part of the strategy development, we considered all the benefits trees provide including:

- Enhancing Sheffield's 'green city' reputation and contributing to a sense of place
- Improving our physical and mental health and wellbeing (see Outcome 4)
- Cleaning the air that we breathe
- Contributing to offsetting our carbon emissions
- Helping combat the effects of climate change such as flash floods and rising temperatures
- Providing a connection for people to the natural environment on their doorsteps (See Outcome 6)
- Bringing communities together, fostering a sense of belonging, and being part of the heritage and history of an area (See Outcome 6)
- Making the city more attractive to encourage students, visitors and businesses to come to Sheffield and help boost the local economy
- Supporting and protecting the city's biodiversity and wildlife (see Outcome 5)
- Providing local environmental benefits like shade, natural traffic calming and reducing verge and pavement parking

We decided to focus on increasing the value of the key benefits below, as we felt they were particularly relevant to street trees[15] because:

- It is well documented that street trees have a particularly important role to play in improving the visual attractiveness of a street.
- Street trees have a specific and positive impact on air quality because they are so near to a major source of air pollution ie traffic fumes[16].
- Storm water alleviation (slowing down rainwater) is critical in helping to keep the city moving in time of high rainfall and flood.

The one exception to this approach is the measure for carbon take up and storage. This is a benefit of all trees, not just street trees. However, due to the climate emergency it was agreed that we should look at every opportunity to help offset our carbon emissions.

[15] Doick, K. and Townsend, H. 2018. *The Right Tree in the Right Place for a Resilient Future*. Forest Research. Retrieved from: https://www.forestresearch.gov.uk/tools-and-resources/urban-tree-manual/.

[16] Ferranti, E., Levine, J., and MacKenzie, R. 2019. *Role of trees & other green infrastructure in urban air quality*. Inst. of Environmental Science magazine. Retrieved from: https://www.the-ies.org/analysis/role-trees-and-other-green.

Greater London Authority. 2019. *Using Green Infrastructure to Protect People from Air Pollution*. Report for Mayor of London. Retrieved from: https://www.london.gov.uk/WHAT-WE-DO/environment/environment-publications/using-green-infrastructure-protect-people-air-pollution.

How will we know we are increasing the value and benefits that flow from our street trees?

There will be an increasing trend averaged over five years across the following indicators:

a) Capital Asset Valuation of Amenity Trees (CAVAT) – please refer to the Sheffield Street Tree Strategy Development Group Report 'i-tree eco stratified inventory report' by Treeconomics for an explanation of CAVAT.

b) Tonnes per year of air pollution removal (ozone, carbon monoxide, nitrogen dioxide, sulphur dioxide and particulates by street trees and financial value of this service).

c) Tonnes per year of carbon stored and sequestered by street trees and financial value of this service.

d) Cubic metres per year of storm water alleviation by street trees and financial value of this service.

Baseline Figures

To estimate the benefits and values that flow from Sheffield's current stock of street trees in 2019, the Group commissioned Treeconomics to undertake an i-Tree Eco Inventory Report. This report was based on the street tree management database used by Amey.

The Sheffield street tree inventory contained 35,274 records. For each tree the data collected includes tree species, stem diameter measured at 1.5m, tree height, tree condition and tree location.

Of this data set, Treeconomics removed 166 records due to incomplete data. Therefore the analysis drew on data from 35,108 trees.

The table below presents the headline figures from the Treeconomics report, with some additional analysis (see '*Methodology' below the table) by Natural Capital Solutions. The benefits of street trees are expressed as a monetary value. For more details on the data, assumptions and
the process used, please refer to the Sheffield Street Tree Strategy Development Group Report '**i-Tree Eco stratified Inventory Report**'[17] by Treeconomics.

[17] Rogers, K., Buckland, A., and Hansford, D. 2019. *i-Tree Eco Stratified Inventory Report*. Treeconomics. Retrieved from: https://www.treeconomics.co.uk/resources/reports/.

Ecosystem service	Predicted Level of service provided each year (Annual physical flows)	Value of service provided each year (Annual monetary flows)	Present financial value*
Capital Asset Valuation of Amenity Trees (CAVAT)			£340,746,149
Tonnes per year of air pollution removal (ozone, carbon monoxide, nitrogen dioxide, sulphur dioxide and particulates by street trees) and financial value of this service	3.0 tonnes (predicted)	£39,198	£1,175,641
Tonnes per year of carbon sequestered (taken up) by street trees and financial value of this service	302 tonnes (predicted)	£74,246	£6,049,720
Cubic metres per year of storm water alleviation by street trees and financial value of this service	10,415m (predicted)	£18,039	£541,032
Total		**£131,483**	**£7,766,393**
	Natural capital stock (2019)	**Total value (£2019 prices)**	
Tonnes of carbon currently stored by street trees and financial value of this service	12,313 tonnes	£3,025,104	

***Methodology**

The CAVAT amenity value is calculated over 80 years, so we have estimated the present value for air pollution regulation, carbon sequestration, and storm water alleviation in 2019 prices over 80 years. This ensures that there is some comparability between these values, although it is not clear from the literature if the CAVAT value is equivalent to a present value.

The present value was calculated for the total monetary flow value across all pollutants due to time constraints. The HM Treasury Green Book (2019) discount rate of 3.5% was used, and the price was assumed constant over the 80-year period. This gives an indication of the present value. Ideally this would have been done for each pollutant individually and using the Defra air quality damage cost guidance (2019) 2% damage cost uplift per year. As a result the actual present value over 80 years is likely to be much higher.

The present value of the ability of the street trees to sequester carbon into the future was calculated by using the Government's non-traded central carbon price estimates (DBEIS 2019) (that had been used to calculate the monetary flow in 2019) for each following year for the next 80 years, and using the discount rate suggested in HM Treasury Green Book (2019) discount rate of 3.5%.

The storm water alleviation present value was also calculated over 80 years using the HM Treasury Green Book (2019) discount rate of 3.5%, and assuming a constant price.

So what are we going to do?

Actions	How will this help?	Who?	By when?	Resources
I-Tree Eco recalculated in spring every year and reported as a five year moving average	So that we can monitor progress	Amey	5-yearly	£1,500 per year (estimated)
Undertake equivalent planting in advance of felling mature trees as part of planned schemes where possible	So that we can continue to increase benefits even as large trees are replaced	Amey	Ongoing	Time to find locations Cost of planting
Identify suitable locations on the network and under plant with hedges	To increase the amount of benefits within any given space	Amey, Tree Wardens	Ongoing	Amey time to find locations Funding for planting
Training Street Tree Wardens to monitor biodiversity supported by street trees	To measure biodiversity, giving an indication of ecosystem health	Amey, SRWT	2021 spring/summer	SRWT staff time & Tree Wardens

OUTCOME 4

Contribute to a more equal distribution of urban forest across the city

There is growing evidence to support the health and wellbeing benefits of being in close proximity to trees including reducing stress and improving the physical, mental and spiritual wellbeing of individuals and communities. Trees also have an important role to play in improving air quality. The city's street trees have the capacity to remove three tonnes of air-borne pollutants each year including fine particles[18] (particulate matter less than 2.5 microns also known as $PM_{2.5}$) which can affect a person's lungs and heart. Leaf area is an important measure for the contribution trees make to improving air quality as the larger the canopy, the greater the amount of air pollution that can be captured in the canopy of the tree.

Across Sheffield, there are disparities in the leaf area of street trees measured in each ward. Stannington has the largest leaf area, followed by Firth Park and Fulwood. East Ecclesfield, Walkley, Birley, Park and Arbourthorne and Broomhill and Sharrow Vale have the smallest leaf areas. Unsurprisingly, the total air-borne pollution removal potential is lower in these wards than other parts of the city with larger leaf areas.

To understand where existing or new street trees could have the most impact in terms of promoting health and wellbeing, we need to better understand the relationship between the presence of trees, in particular trees with larger leaf areas, and health outcomes of people living in different parts of the city. This could help us to pinpoint areas where it would be beneficial to maintain leaf area or to introduce new planting. The choice of species is also important as this affects the level of air-borne pollutants a tree can hold in its canopy.

How will we know we are contributing to a more equal distribution of urban forest across the city?

A greater number of new street trees will have been planted in areas of lower canopy cover across the city that also have poorer air quality and lower Indices of Living Environment and/or Health Deprivation (IMD) rankings (baseline 2019).

[18] Rogers, K., Buckland, A., and Hansford, D. 2019. *i-Tree Eco Stratified Inventory Report*. Treeconomics. Retrieved from: https://www.treeconomics.co.uk/resources/reports/.

Baseline Figures

As an initial assessment, Natural Capital Solutions reviewed canopy cover against indices of multiple deprivation and air quality data across the city (see **Appendix 8**) and the following are the top five wards with the lowest IMD ranking[19] (most deprived) respective to low street tree canopy cover (% canopy cover is the percentage of the total network covered in that ward) and higher air pollution ($PM_{2.5}$):

Rank	Ward	Deprivation	Canopy cover	Average $PM_{2.5}$
1	Manor Castle	4/28	4%	7.17 ug/m3
2	Darnall	6/28	4%	7.99 ug/m3*
3	Woodhouse	10/28	4%	7.62 ug/m3
4	Richmond	11/28	4%	7.35 ug/m3
5	Walkley	13/28	2%	7.22 ug/m3

* Darnall has the highest level of pollution across all 28 wards, particularly at M1 Jn34.

Overall the trend is not necessarily that more deprived wards have the lowest canopy cover. The most deprived ward (Firth Park) has the highest canopy cover of all wards in Sheffield (19%).

However, taken together it seems that the most affluent wards do have a consistently high canopy cover (see below).

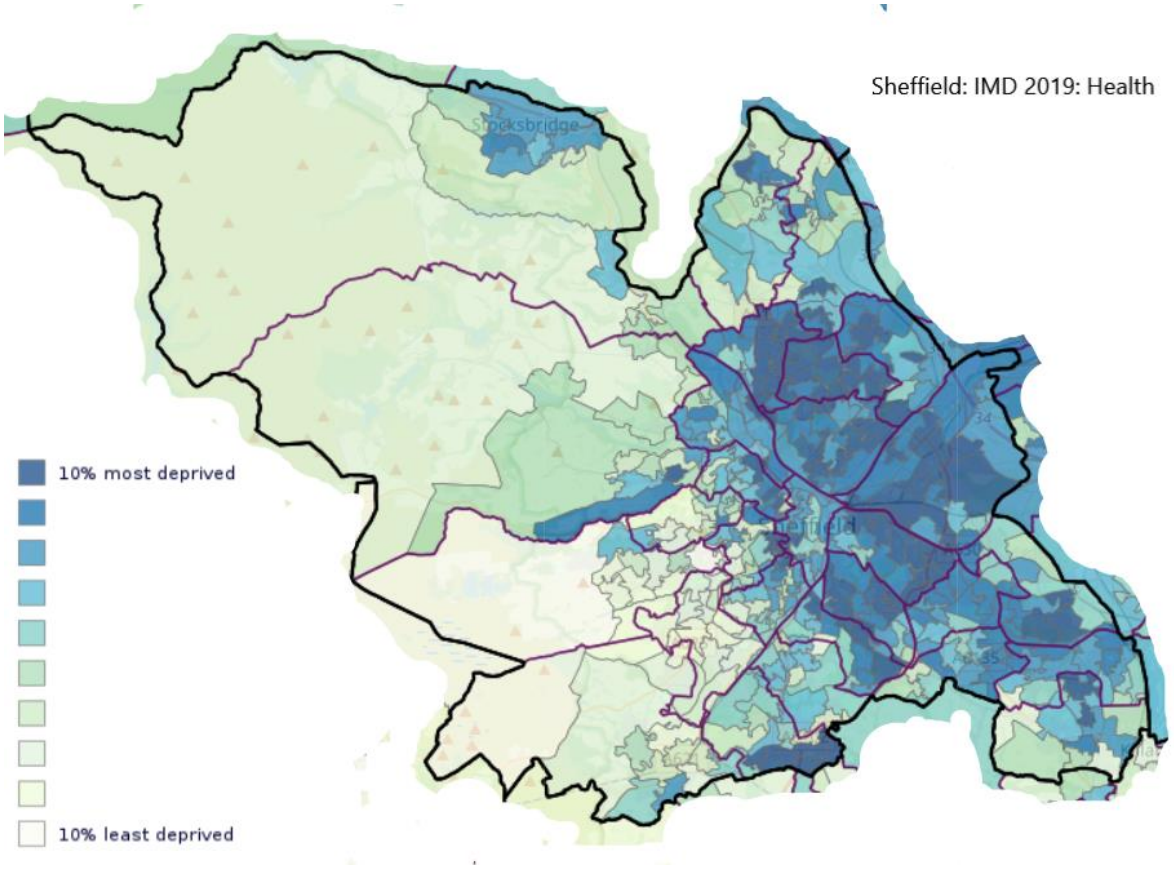
The most deprived and the above and below average wards for deprivation all have similar mean canopy covers. The areas with average deprivation have a lower canopy cover than the most deprived wards of Sheffield.

Ward characteristic	Mean canopy cover	Canopy area
Most deprived	6%	277,030m2
Above average deprivation	7%	226,396m2
Average deprivation	5%	188,302m2
Below average deprivation	8%	383,893m2
Affluent wards (Ecclesall, Dore & Totley, Crookes, Fulwood)	12%	462,333m2

Patterns of deprivation across larger areas can be complex, with wide variations within a single ward, but the following map of Health deprivation[20] shows that in general, deprivation is higher in the East of the city.

[19] A ranking of 1/28 being the most deprived ward in Sheffield, and 28/28 being the least.

[20] The University of Sheffield. 2019. *English Indices of Deprivation.* Retrieved from: https://imd2019.group.shef.ac.uk/.


Sheffield: IMD 2019: Health
10% most deprived
10% least deprived

So what are we going to do?

Actions	How will this help?	Who?	By when?	Resources
Analyse the distribution of all trees across the city in relation to air quality, Living Environment and Health Deprivation Indices	To better understand the relationship between canopy cover in the city and air quality and the potential for targeted planting	Partnership	2022-23	Partners' time, some additional resource may be needed
Use above mapping analysis to target additional planting in areas of low canopy cover, poor air quality and lower Living environment and Health Deprivation Indices, including through community funded planting – see **Appendix 8**	So that we can target planting where it can provide the most benefits	Amey, Partnership	Yearly	Partners' time, including Street Tree Wardens
Develop measures that will lead to a more even distribution of trees across the city eg through redistribution, community funded planting	To ensure that areas with high levels of deprivation and low canopy cover do not fall behind	Partnership	2022	Partners' time
Influence others to consider additional planting in local centres, district centres, and the City centre	To reflect the changing role of urban centres.	Partnership	Ongoing	Partners' time

OUTCOME	5

Increase street tree canopy cover

Tree cover in Sheffield is 18.4% overall, and 21.6% in the urban area[21]. Street trees form a small but important part of the whole tree canopy that covers the city. Canopy cover is an indication of whether the whole biomass of our street trees is increasing over time. More tree biomass generally equates to more benefits and value flowing from our street trees. In particular, this should benefit biodiversity, providing more habitats for bats, birds, insects and other wildlife.

Street trees are only part of the total tree cover in the city; trees in public parks and private gardens, housing land and natural woodlands are by far the greater part of the city's trees. Nevertheless, street trees by definition deliver benefits where people are, and also form valuable wildlife corridors, so their contribution is important.

We recognise that there might be variations in canopy cover from one year to the next depending on particular management issues that might arise. Therefore, we intend to measure canopy cover averaged over a 5-year period. Our aim is to see an increasing trend in average canopy cover over a rolling 5-year period.

How will we know we are increasing street tree canopy cover?

There will be an increasing trend in average canopy cover over a 5-yearly rolling period using the i-Tree canopy calculations.

Baseline Figures

The current street tree canopy cover* as a percentage of the total road network** is 7% (1,537,954m^2)

* Street tree canopy cover was calculated using the plotted highway assets from the Confirm asset management database.

**The total network is the area of grass, paths and roads combined.

[21] Sheffield City Council. 2018. *Sheffield Trees and Woodlands Strategy 2018-2033.* p. 9. Retrieved from: https://www.sheffield.gov.uk/home/parks-sport-recreation/trees-woodlands-strategies.

So what are we going to do?

Actions	How will this help?	Who?	By when?	Resources
Calculate canopy cover annually in spring/early summer	We can extrapolate that street tree biomass is increasing over a period of years	Amey	May/June 2021 next calculation	Amey time
Explore ways to monitor biodiversity across our street trees	So that we can better understand the value of our street trees for wildlife and target conservation effort	SRWT, Partnership	2022 onwards	Partners' and Tree Wardens' time
Explore ways to enhance biodiversity and bio-abundance across our street trees See **Outcome 3** and **Outcome 5** actions	So that we can better support wildlife	SRWT, Partnership	2022 onwards	Partners' and Tree Wardens' time

OUTCOME	6

The wider community of all ages is involved in caring for and valuing street trees

By involving more people, we hope to increase the resources (funds and time) available to care for our street trees. There is also an opportunity to improve our shared understanding and raise public awareness of the benefits and challenges that come from managing street trees.

Better communication could help to ensure we work together across the city to improve our street trees and not repeat the mistakes of our past.

How will we know the wider community is involved in caring for and valuing street trees?

There will be more people of all ages actively and positively engaged with the Council, Amey and other partners to help look after and care for our street trees.

Baseline Figures

The following is not a complete list of current community engagement in tree planting and management but provides an indication of levels of activity:

— Sheffield City Council community tree scheme – Council Officers supporting tree planting projects at schools and with community projects across the city.

— STAG's involvement in tree inspections and making Amey aware of any maintenance or contract related issues, potentially exploring nurseries for local provenance.

— Sheffield and Rotherham Wildlife Trust has regular community volunteer days and conservation volunteers who help look after trees and woodlands on their Nature Reserves and partner sites.

— Individuals and 'Friends of...' groups occasionally undertake tree planting.

— Green City Heritage supports several sites in the city and is forming links with the landowners to create management plans.

So what are we going to do?

Actions	How will this help?	Who?	By when?	Resources
Continue to develop the Sheffield Street Tree Partnership to take forward this Strategy Please refer to the Terms of Reference in **Appendix 4**	To oversee delivery of the actions in the Sheffield Street Tree Strategy To work in partnership to contribute and secure skills, resources and funds to deliver the actions in the strategy To develop and evolve the strategy over time in response to the needs of the people of Sheffield, the climate and ecological emergency To encourage and direct donations with reference to this strategy – including funds for new tree planting and to support the retention of existing trees.	SCC, Amey, SRWT, WdT, others	Dec 2021 & ongoing	Partners' time
Promote the new process that allows residents and community groups to fund additional street tree planting (See Appendix 11)	To provide additional tree planting	SCC, Amey, STAG, SRWT, WdT, other partners	March 2021 onwards	Partners time, social media, web pages
Support the Street Tree Warden scheme (or similar) for Sheffield Please refer to **Appendix 6 proposal for a Sheffield Street Tree Warden scheme**	To provide a structured approach, as part of a national scheme, to engage local people in looking after street trees To develop opportunities for community groups and schools to engage in tree planting and care.	SRWT, Amey, STAG	January 2021	Support from Amey to help with co-ordination and training
Develop an engagement and outreach programme to encourage children, young people, families, and adults to learn about and value their local trees	To help children & young people find out more and care for their local trees	SRWT, Amey, WdTrust, SCC outreach subgroup	2022-3	Resources to be identified

Arrange an annual celebration to raise awareness among residents of the value and benefits of street trees, and acknowledge the volunteers who support the management and maintenance of street trees	To create a positive narrative around street trees, and raise awareness of tree benefits and management good practice To meet one of the five standards of the 'Tree Cities of the World' designation	Partnership	End of 2021 (TCotW application deadline at end of Dec 2021)	Resources to be identified

Going Forwards

Going forwards

The Sheffield Street Tree Strategy Development Group set out to:

> Develop an exemplary Sheffield Street Tree Partnership Strategy that values street trees for the benefits they bring to people, the city and the wider environment.

The drafting, consultation and completion of this Strategy, and its adoption by all partners involved in its development, is the result of the work undertaken by the group since August 2019. It completes this task.

The next steps are to:

- Refresh and expand the Partnership as set out in **Appendix 4.**
- Deliver the actions as set out in this strategy
- Update the actions as needed, to deliver to the Strategy Vision and Outcomes
- Regularly report on completed actions and progress as well as the overall success of the Strategy in delivering to our shared Vision and Outcomes for the city's street trees.
- Plan for a complete review of the Strategy in approximately 5 years' time.

The Strategy now needs support from the many people and organisations that came forward as part of the consultation process, to ensure that Sheffield truly has a network of street trees we can be proud of.

Appendices

Appendix 1 - Sheffield Street Tree Strategy Development Group Terms of Reference

PLEASE NOTE THAT THIS IS FOR REFERENCE ONLY. THESE TERMS OF REFERENCE REFER TO THE ESTABLISHMENT OF THE INITIAL DEVELOPMENT GROUP

Developing a Partnership Sheffield City Street Tree Strategy Steering Group Terms of reference

Through the life of the project, the Steering Group will:

- Work to the agreed scope as set out in the *Developing Sheffield's Street Tree Strategy Project Set Up Sheet*
- Steer and guide the programme of development to ensure outputs and priorities are delivered on time as planned in the project set up
- Attend a majority of the Steering Group meetings, and deliver any agreed tasks or actions in a timely manner as requested
- Support and assist partners in carrying out their agreed tasks
- Offer time, skills, knowledge, networks and expertise to enable the efficient and effective development and delivery of the Partnership's work
- Submit any relevant information, data or evidence in a timely manner to help support the process
- Champion the Street Tree Strategy as it develops, at a local, sub-regional and regional level, to ensure that maximum benefit is achieved for the people and environment of Sheffield
- Work together to resolve conflicts that may arise and to manage risks and realise opportunities
- Disclose any conflict of interest and maintain high professional standards and integrity at all times
- Raise any concerns and complaints about the process with the Chair in the first instance so as to provide an opportunity to reconcile issues within the Steering Group prior to any public statements
- Accept that when a consensus cannot be reached the Chair will make a decision that they believe to be in the best interest of the project aims
- Seek opportunities for additional funds and resources to the Strategy as it develops.

We recognise and support the role of the Chair, Liz Ballard, Sheffield and Rotherham Wildlife Trust, who will:

- Oversee the development and delivery of the Strategy
- Lead and co-ordinate the Steering Group, preparing the agenda and subjects to be worked on as set out in the scope
- Impartially and objectively direct the meetings, workshops etc, ensuring that all views are heard
- Foster consensus-based decision-making amongst the Steering Group wherever possible
- Promote a professional and respectful culture
- Ensure that Group members have the appropriate expertise to contribute effectively to the Group
- Summarise and confirm key decisions and actions, clarifying with individuals any allocated key tasks and the agreed timelines for completion
- Ensure that resources are used efficiently to further the development of the Strategy
- Ensure that any Strategy publicity is approved collectively by the Steering Group prior to release and signed off by the Chair.

Ways of working

- Attendance, should wherever possible, be in person. It is accepted that occasionally group members may be unable to attend in person and conference call facilities will be provided where practicable
- If the person who normally represents an organisation cannot attend, they should send their alternative in their place
- People will be free to respectfully express their personal and organisational views during group meetings and workshops
- Meetings may not be captured through detailed minutes but through decision and action notes, workshop papers etc, that will be circulated shortly after the meeting
- Sharing of Steering Group papers, discussions held and the work of the group beyond the immediate individuals involved must first be agreed with the Chair
- Group members identified by the Chair to have breached these terms of reference and ways of working will have their involvement reviewed. The Chair will be the decision-maker about continued membership of the group.

Each Steering Group Partner confirms their commitment to these Terms of Reference:

Organisation	Name	Signed
Sheffield and Rotherham Wildlife Trust (SRWT)	Liz Ballard (Chair)	
Amey	Darren Butt	
	Tree Inspector (currently Andrew Greenwood)	
Sheffield City Council (SCC)	Mick Crofts	
	Karen Ramsay	
STAG	Paul Selby	
	Deepa Shetty	
	Christine King	
The Woodland Trust	Joe Coles	
Independent Advisers	Dr Alison Holt	
	Glen Gorner	

Appendix 2: Factors to consider when selecting tree species in Sheffield

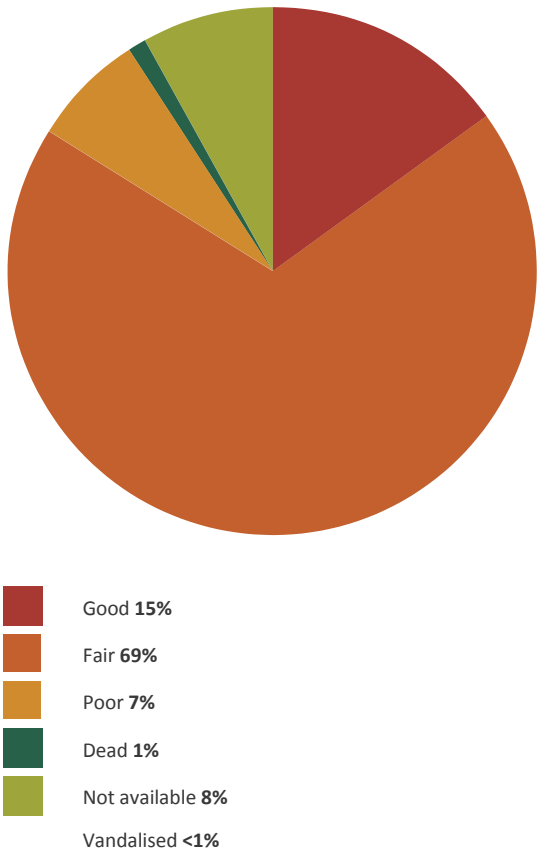
This appendix is a guide to the thought process used when selecting the species of replacement tree, after an existing street tree has been removed. It tries to take into account various factors that influence the choice, whilst at the same time aiming to maximise future canopy cover and meet the Strategy aims of increasing resilience.

1. Could the replacement be placed elsewhere in the city, to meet our objective of equalising canopy cover across the city? Refer back to canopy cover targets etc.
2. If still planting in the same location, are there any constraints preventing the use of the old tree pit? For example:
    a) Proximity to buildings, gardens, garden trees, other street trees, signs, street lights or junction sight lines
    b) Unfavourable site conditions (exposed, windy, dry, wet, waterlogged, shaded, compacted, busy footfall)
    c) Subsidence having led to previous tree being felled
3. Are there specific considerations on species selection? For example:
    a) Tree disease risk in that location/area
    b) Consideration relating to National Parks, Conservation Areas, Important Landscapes, Memorial Trees, Veteran Trees,
    Woodland
    c) Strong community preference/residents' views
    d) Specific species selected by SCC or others
    e) Amenity value
4. Can species diversity be increased, whilst meeting constraints of Step 3? If so, reduce species options list
5. Rank remaining species on the list according to their ability to deliver one or all of the following:
    a) Air quality improvements (especially in high air pollution streets)
    b) Carbon take up (sequestration)
    c) Storm water attenuation (if localised flooding is a problem)
    d) Wildlife friendly
    e) Ability to cope with climate change

    Please refer to table in **Appendix 7** Indication of Relative Benefits Provide by Different Tree Species
6. Do site conditions or location constraints cross a specific threshold to mean that only species on specific sub-lists can be used? (eg Fastigiate sub-list or Small Species sub-list).
7. Of the remaining trees on the list (or sub-list), pick the largest canopy, longest lived, and preferably native tree species, that can be sourced locally or in the UK wherever possible.

Appendix 3: Baseline analysis of the current Sheffield street tree stock (as at August 2019)

Tree condition scores



Current position, August 2019.

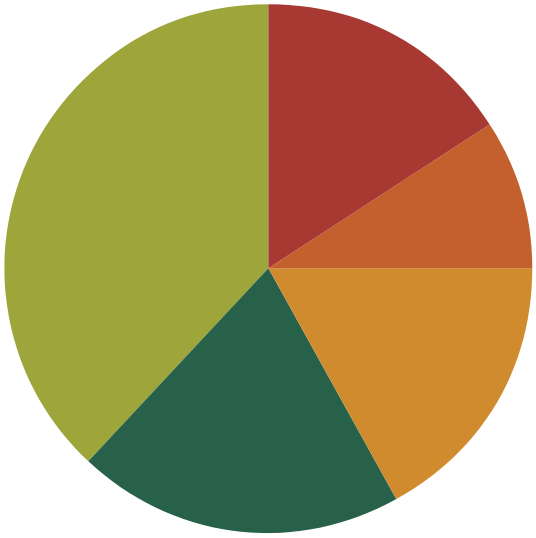
Categories used are: **Good**, **Fair**, **Poor**, **Senescent**, **Dead**, **Vandalised**.

These categories draw on the standard survey technique in the British Standard *5837 Trees in relation to design, demolition and construction*.

This describes the current condition profile or 'baseline'.

The majority of the highway trees are fair or 'OK', neither outstandingly good nor especially poor specimens.

Age classification

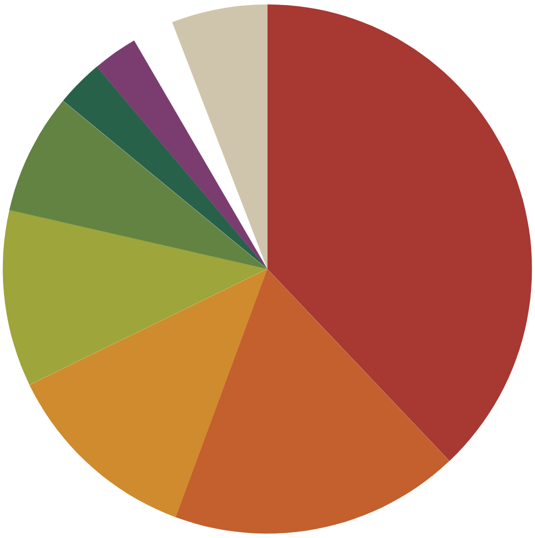


Current position, August 2019

Approximately two thirds of the tree stock are currently maturing trees (62%), i.e. not yet mature

- New planting **16%**
- Young **9%**
- Semi mature **17%**
- Early mature **20%**
- Mature **38%**

Street trees by family



Current Species Diversity Position as of August 2019

If we refer to the 10% 20% 30% guide[2213] when we select trees to plant then:

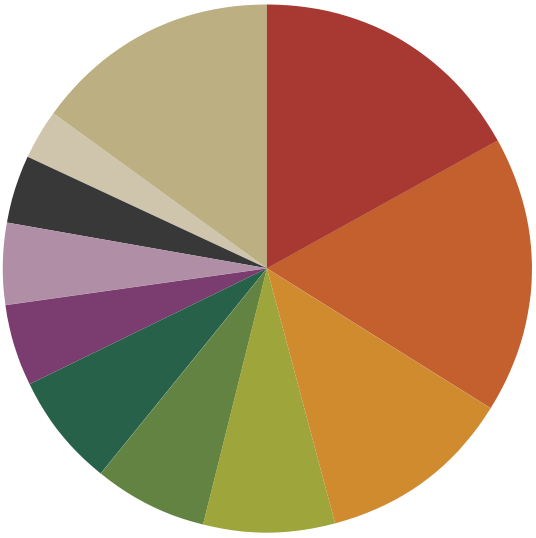
Family – over 30%: Rosaceae are 38%

Four families (Rosaceae, Sapindaceae, Malvaceae and Oleaceae) make up 75% of all street trees

[22] "A broader diversity of trees is needed in our urban landscapes to guard against the possibility of large-scale devastation by both native and introduced insect and disease pests. Urban foresters and municipal arborists should use the following guidelines for tree diversity within their areas of jurisdiction: (1) plant no more than 10% of any species, (2) no more than 20% of any genus, and (3) no more than 30% of any family. Strips or blocks of uniformity (species, cultivars, or clones of proven adaptability) should be scattered throughout the city to achieve spatial as well as biological diversity."

Santamour, F.S. 1999. *Trees for Urban Planting: Diversity, Uniformity, and Common Sense.* Report for the U.S. National Arboretum Agricultural Research Service. Washington, D.C. Retrieved from: https://www.seattletreescoalition.org/.

Top 10 tree genera



Genus – all below 20%: Acer (17%), Prunus (17%),Tilia (12%)

Top 10 Genera make up **85%** of all trees. **Top 5** Genera make up **61%** of all trees. **160** individual species or cultivars from 144 species

57 different Genera

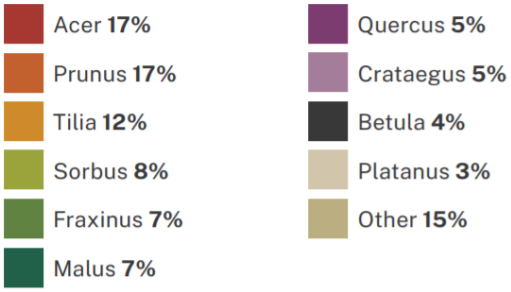
Species – one over 10%: Acer pseudoplatanus (11%), Tilia europaea (9%), Prunus serrulata (8%)

Therefore, we need to aim to:

— Aim to reduce the incidence of trees in the family Rosaceae where it is possible to do so without compromising overall outcomes

— Maintain approach to genera

— Aim to reduce the incidence of over-represented species like Acer pseudoplatanus (11%), Tilia europaea (9%) whilst managing the reduction in Fraxinus excelsior (7%) resulting from Ash dieback. (In practice the need to provide suitable hosts for wildlife displaced by ash dieback may mean that this needs to be relaxed in the short term)



Appendix 4: Sheffield Street Tree Partnership - Terms of Reference

Purpose

1. To oversee delivery of the actions in the Sheffield Street Tree Strategy
2. To work in partnership to contribute and secure skills, resources and funds to deliver the actions in the strategy
3. To develop and evolve the strategy over time in response to the needs of the people of Sheffield, the climate and ecological emergency
4. To encourage and direct donations with reference to this strategy – including funds for new tree planting and to support the retention of existing trees.

Structure

To support delivery through collaboration and ensure input from a wide range of stakeholders, the Sheffield Street Tree Partnership comprises the following groups:

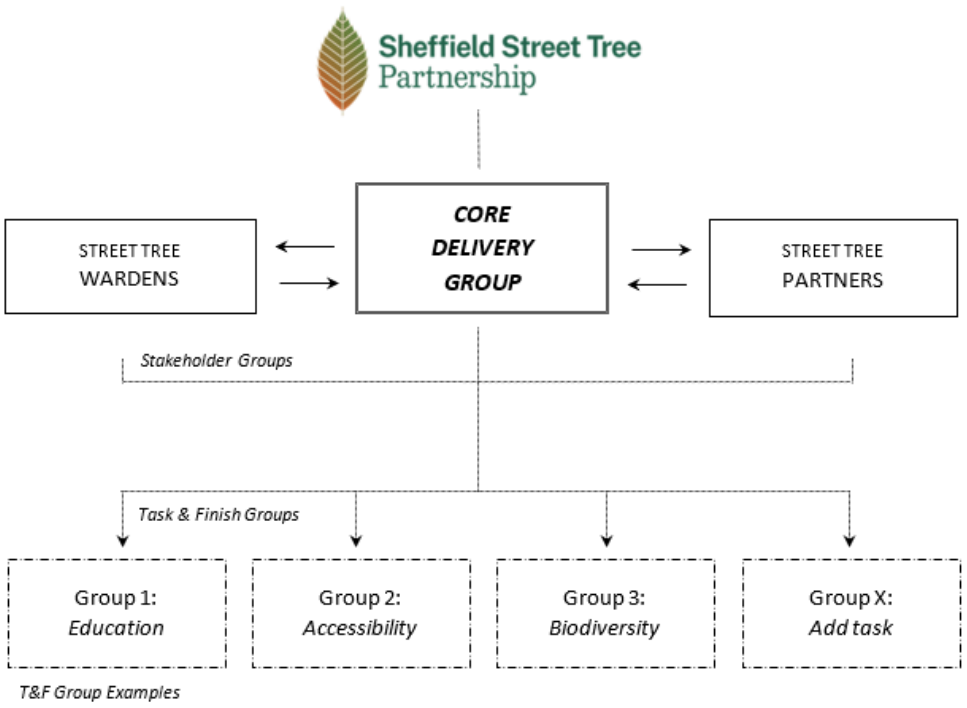
- *Core Delivery Group* - Responsible for overseeing and driving delivery of the actions in the strategy, the core delivery group has an independent, elected chair and representatives from the main organisations involved in the management and maintenance of Sheffield's street trees

- *Street Tree Partners* - A wider group of partners interested in engaging with and supporting the delivery of the actions in the strategy, and able to offer expertise, ideas, and resources

- *Street Tree Wardens* - The group of volunteers assigned to different parts of Sheffield who have committed to help care for the street trees and/or be the eyes and ears for their 'patch'. See **Appendix 6** for more information.

To address specific issues or develop particular areas of work, Task & Finish Groups will be set up by the Core Delivery Group as required. Task & Finish Groups will include representatives from across the three partnership groups and will be set clear objectives, linking directly to the strategy outcomes and actions. Once objectives have been met, the Task & Finish Groups will be dissolved.

The structure shall be reviewed at the end of year one of the strategy and on an ad hoc basis thereafter.



Membership and Representation

Any group or organisation that can positively contribute to the delivery of the Street Tree Strategy can become a Street Tree Partner.

Groups and organisations may nominate one person to act as their key representative on the partnership.

Street Tree Partners and Street Tree Wardens may be invited to join a Task & Finish Group.

Core Delivery Group decisions will be achieved, wherever possible, by consensus. This will include decisions around membership and progression of the strategy. Where consensus cannot be achieved the Chair will consider a vote or hold the final decision making responsibility.

Core Delivery Group Members: Sheffield City Council, Amey, STAG, Sheffield and Rotherham Wildlife Trust, Woodland Trust and Street Tree Warden reps.

Leadership

The Core Delivery Group will elect a Chair each year who will set the agenda, direct and guide the work of the Partnership. They will also represent the Partnership in a formal capacity when appropriate.

The Chair may respond to external queries on behalf of the Partnership, and in doing so will make every attempt to consult with the other partnership groups, if time allows.

Meetings

The Core Delivery Group will meet at least four times a year and proposals for engaging the wider Partnership will be developed.

Secretariat support will be provided by SCC.

Communications

Any press statements will be agreed in advance by the Core Delivery Group.

Securing Resources

The Partnership will not be an independent body constituted in its own right at this time.

The Partnership will actively seek funds and resources to support the delivery of the strategy. Funds will be held in a restricted account by the most appropriate organisation in relation to the grant funder e.g. SCC, SRWT, local residents group etc.

Any funds held on behalf of the Partnership will be fully accounted for and must be distributed in accordance with the priorities of the strategy as agreed by the Partnership and relevant funders.

Transparency

Minutes and actions logs will be taken at all Core Delivery Group meetings. All papers, presentations, financial information and minutes will be available online to the public.

Appendix 5: Decision process for Sheffield's street trees

The decision process for the management and maintenance of Sheffield's street trees was reviewed as part of the consultation on the Sheffield Street Tree Partnership Working Strategy. Feedback from the consultation included a call for decision making processes and decisions taken to be made transparent, and for public feedback loops to be established. In response, operational aspects of the decision process, including things like timescales, method of consultation, and publication of decisions were developed and tested by Amey and Sheffield City Council with input and guidance from the Sheffield Street Tree Partnership.

Streets Ahead

As the Highway Authority, Sheffield City Council has a statutory duty to maintain the city's highway network[1]. The Council's legal duty of care is to make sure that the city's roads and pavements are safe and accessible for all members of the public, and that people and property are protected from any danger caused by hazards on the highway. This duty is delivered through the Streets Ahead[2] highways maintenance contract between the Council and Amey. The management and maintenance of Sheffield's street trees take account of the long-term improvement of the quality of the city's street tree stock and the Council's statutory duty. This makes sure that all identified tree-related risks to people and property are reduced or eliminated so that everyone can safely enjoy the benefits and ecosystem services provided by a healthy tree canopy.

Principles

The following principles guide the management and maintenance of Sheffield's street trees.

1. Removal and replacement of a street tree is considered on a case-by-case basis.

2. Before a decision is made about the removal and replacement of a street tree, an inspection of the tree for safety and condition will be carried out by the Streets Ahead team of qualified tree inspectors.

3. Street trees are typically removed and replaced for the following reasons:

- ❑ **If a street tree is immediately dangerous because it is dead, dying or has structural defects.** The street tree will be removed from the highway to prevent the tree or its branches falling and injuring people or damaging property. In these instances, or during storm and high wind events, no consultation takes place as the primary duty is to keep members of the public and property safe.
- ❑ **If the street tree is dead.** In some low risk or rural areas, stems of dead trees may be retained at a suitable height for their wildlife habitat value. Otherwise, in most circumstances, dead trees will be removed.
- ❑ **If a street tree is in rapid decline or assessed as having less than five years' safe useful life expectancy (SULE) on the highway**. If environmentally valuable trees are undergoing a gradual decline, if safe to do so, they may have their crown size reduced and retained in the landscape for as long as possible.
- ❑ **Significant disease**. If a street tree is host to a disease that cannot be remedied and will result in its death over a short period, it is likely to transfer to and harm adjacent trees. The Streets Ahead team is instructed to sterilise tools and chainsaws after working on these kinds of trees to prevent the infection from spreading.
- ❑ **Structurally unsafe.** A street tree may become structurally unsafe for various reasons. Damage to the supporting root system, root decay caused by certain fungi as well as regrowth from previous topping wounds are all examples that can lead to a tree becoming unsafe. In all circumstances Streets Ahead will consider whether a tree can be made sufficiently safe through pruning. Removal of the tree would only be recommended if pruning cannot make the tree safe for retention.
- ❑ **A dangerous obstruction to the carriageway**. Street trees can cause an obstruction to the safety of vehicles on the carriageway. In most cases this can be remedied through pruning the obstructing branches. In some circumstances when trees reach a certain size, their trunk or buttress roots may naturally begin to obstruct the carriageway. When this happens a road safety audit would be carried out to establish whether the tree can be retained or needs to be replaced.

- ❑ **Is causing significant damage to the highway**. Where a street tree is causing significant damage to the highway infrastructure, it will be subject to a cost/benefit analysis to establish whether the tree should be replaced or whether engineering solutions are reasonably practicable.
- ❑ **Is causing damage to third party property.** Streets Ahead will act to prevent damage to third party property. If a resident believes that a highway tree is adversely affecting their property, they should discuss this with their home insurer in the first instance so that they can undertake an inspection and gather relevant evidence. This will be evaluated by the Streets Ahead team before tree removal is considered.

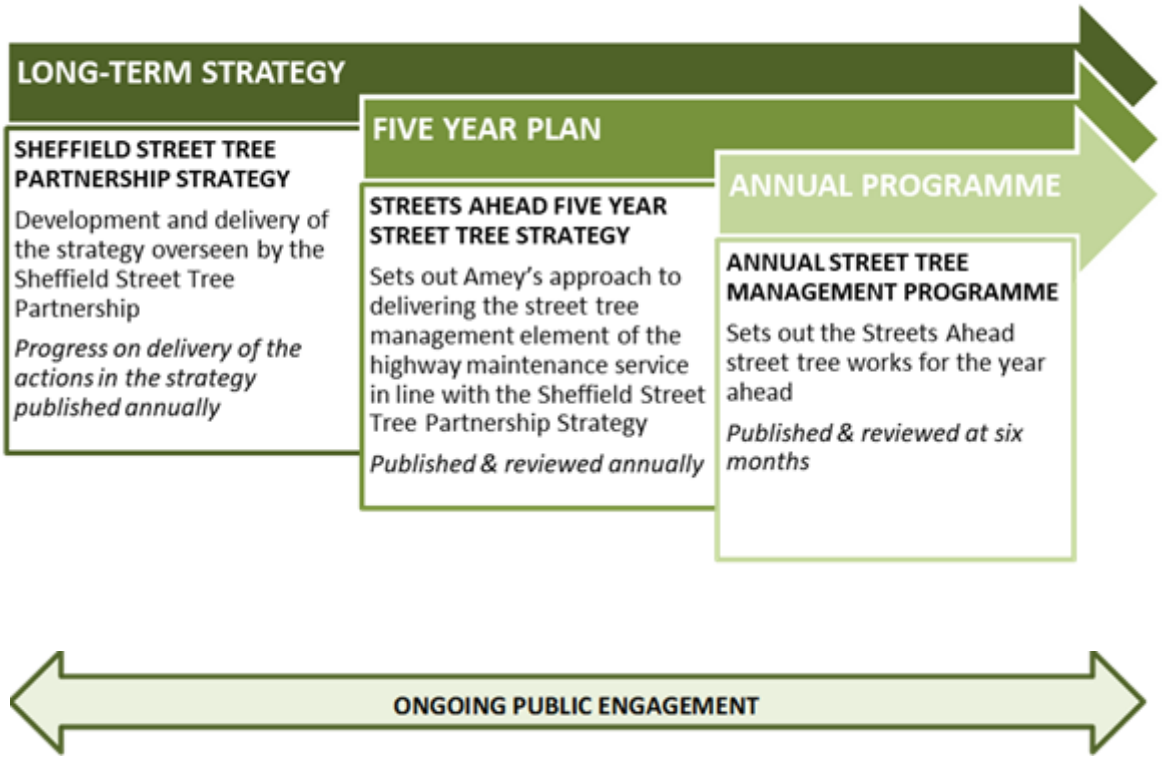
4 Any street tree removed will be replaced on at least a 1:1 basis (depending on the circumstances) with a suitable species for the location in as close to the original site as possible unless there are good reasons to do otherwise. The replacement species may be different from the species of tree that has been removed. This helps the city's street trees to become more resilient to threats from climate change, pests, and diseases, and helps to provide more diverse habitats for wildlife.

5 Integration of green infrastructure, including retaining or introducing street trees, to be considered in the design of all highways and other development schemes in the city.

Amey/Council framework for street tree management and maintenance

Figure 1 sets out the Amey/Council framework for the management and maintenance of the city's street trees in line with the Streets Ahead contractual obligations.

Figure 1: **Framework for the management and maintenance of Sheffield City Council's street trees**



The annual street tree management programme will include recommendations for specific streets trees or groups of street trees based on the assessment process below where the relevant information is known at the start of the programme year. There will be an opportunity at this point for individuals and organisations to provide their views on the proposed annual programme. If further or additional decisions are needed during the year, these will be made by following the decision process below with opportunities for individuals and organisations to provide their views.

Public engagement

Outcome six of the Sheffield Street Tree Strategy is that the wider community of all ages is involved in caring for and valuing street trees. Opportunities for public engagement have been created to improve shared understanding of the benefits and challenges that come from managing street trees including the establishment of the Sheffield Street Tree Partnership; promoting a way for residents and community groups to provide additional tree planting; and by setting up the Street Tree Warden Scheme. These arrangements involve residents and stakeholders in taking care of Sheffield's street trees as well as providing an ongoing way of gathering views on the Sheffield Street Tree Partnership Strategy, the Streets Ahead Five Year Street Tree Strategy, and the Annual Street Tree Management Programme. To help the public understand how street trees are maintained and managed, and to help provide answers to some of the most common street tree related questions, the Council and Amey have published *Guidelines for the Management of Sheffield City Council's Street Trees*.

Assessment of a street tree

If a street tree is assessed as immediately dangerous to life and/or property, Amey must attend and make the tree safe as an urgent defect (within one hour during the day and within two hours during the night). The street tree will be removed from the highway to prevent the tree or its branches falling and injuring people or damaging property. In these instances, or during storm and high wind events, no consultation takes place as the primary duty is to keep members of the public and property safe. There is no consultation and Amey does not need the approval of the Council prior to removing the tree, however Amey must notify the Council of the removal as soon as is reasonably practical.

Street tree condition-impact matrix (STCIM)

For trees that are not determined as immediately dangerous to life and/or property, the street tree condition-impact matrix (figure 2) is used as a guide by Amey to help assess:

- ❑ The likely impact or extent of damage to people or property by a street tree
- ❑ Whether the likely impact or extent of damage can be remediated or mitigated, either through arboricultural or engineering means
- ❑ The likelihood of repetitive repairs within a five-year period
- ❑ The safe useful life expectancy (SULE) of the tree
- ❑ Options for retaining the tree and carrying out a risk assessment on each option
- ❑ Relative costs of repair compared to all the benefits that flow from the tree.

The first step in assessing a street tree is for a qualified tree inspector to conduct a thorough inspection to gather information about the tree quality, overall condition and SULE. Based on this information, the street tree is given a condition score from 5 to 1 (horizontal axis of the matrix). This is the arboricultural input into the assessment. The Streets Ahead team who inspect street trees are experienced and qualified in tree assessments and are required to hold at least a minimum level of relevant arboriculture qualifications, e.g., Lantra[3] Professional Tree Inspection (PTI), level 3 or higher qualification in arboriculture.

For the street tree being assessed, the matrix generates a score from 1-30:

- **A score <6 (denoted by the red squares).** Street tree is dead or in poor condition and unsafe. Recommendation is to remove and replace. This represents most of the tree replacements that are carried out.
- **A score between 6-14 (denoted by yellow and orange squares).** Street tree is in poor, fair or good condition but may be causing significant direct or indirect damage to highway infrastructure or third-party structures, e.g., subsidence, root pressure. Assessment of this damage is carried out in line with guidance in the Code of Practice for Well-Managed Highway Infrastructure[4]. Recommendation may be enhanced inspection frequency, detailed investigation, or cost benefit analysis with a risk-assessed solution. This provides scope to find out if the likely impact or extent of damage can be remediated or mitigated through either arboricultural or engineering means.
- **A score 15+ (denoted by green squares).** Tree is retained.

The score for a street tree derived from the matrix is used for guidance only to aid decision-making and to plan next steps. It is not prescriptive and in some cases street trees will fall between scores. Only through a considered assessment and open dialogue with all involved, including affected parties, can a decision or resolution be found, whether that is tree retention and repairs to structures or tree removal and replacement.

Figure 2: **Street tree condition-impact matrix (STCIM)**

DIAGRAM AS IN WORKING STRATEGY

Amey decision process

Figure 3 summarises the process used by Amey to reach a recommendation for a street tree based on its condition-impact score. For each street tree under authority approval or for a request to remove and replace a tree, Amey provides the Council's Head of Highways Maintenance (or their nominated deputy) with the following information:

- Fell job number
- Site name
- Site code
- Existing tree species
- Tree position
- Asset number
- Job notes/Justification
- x & y coordinates of existing tree
- Height (m)
- Mean crown spread (m)
- Stem diameter at 1.5m (cm)
- Life stage
- safe useful life expectancy (years)
- Condition grade
- CAVAT valuation (£)
- Street tree condition-impact matrix score

Figure 3: Amey decision flowchart

DIAGRAM AS IN WORKING STRATEGY

Council decision process

Figure 4 summarises the process used by the Council to review the evidence supporting an Amey recommendation to remove and replace a street tree, including the public consultation process using Citizen Space and the interactive Sheffield street tree map.

Figure 4: Council decision flowchart

TO BE ADDED

On receiving the Amey recommendation, the Council's Head of Highways Maintenance (or their nominated deputy) has the following options:

Council response	What happens next
1 Council not satisfied with the evidence supporting the Amey recommendation to remove and replace a tree. Council returns to Amey with reasons and a request for more information.	Amey provides more information to the Council in support of the recommendation. Council considers new information to determine if evidence is satisfactory.
2 Council satisfied with the evidence supporting the Amey recommendation to remove and replace a tree. Council considers the recommendation and alternatives to removal and replacement. Council rejects the recommendation to remove and replace tree.	Council instructs Amey to undertake the alternative solution and the recommendation to remove and replace the street tree is dismissed. In cases where Amey recommend removal and replacement as essential and the Council disagrees, a view would be sought from a third-party independent tree surveyor and/or further evidence would be examined.

3 Council satisfied with the evidence supporting the Amey recommendation to remove and replace a tree or trees.

Council considers the recommendation and alternatives to removal and replacement.

Council accepts the recommendation to remove and replace the tree.

Council opens a public consultation on Citizen Space on the recommendation to remove and replace the street tree. Amey posts a notification on the street tree informing the public of the consultation and letters are sent to residents living in the vicinity of the tree under consultation. The consultation runs for three weeks. The feedback from people living near the tree under consultation, or who are directly affected by it, will have greater influence on the final decision than people living in a different part of Sheffield, in another part of the UK, or abroad.

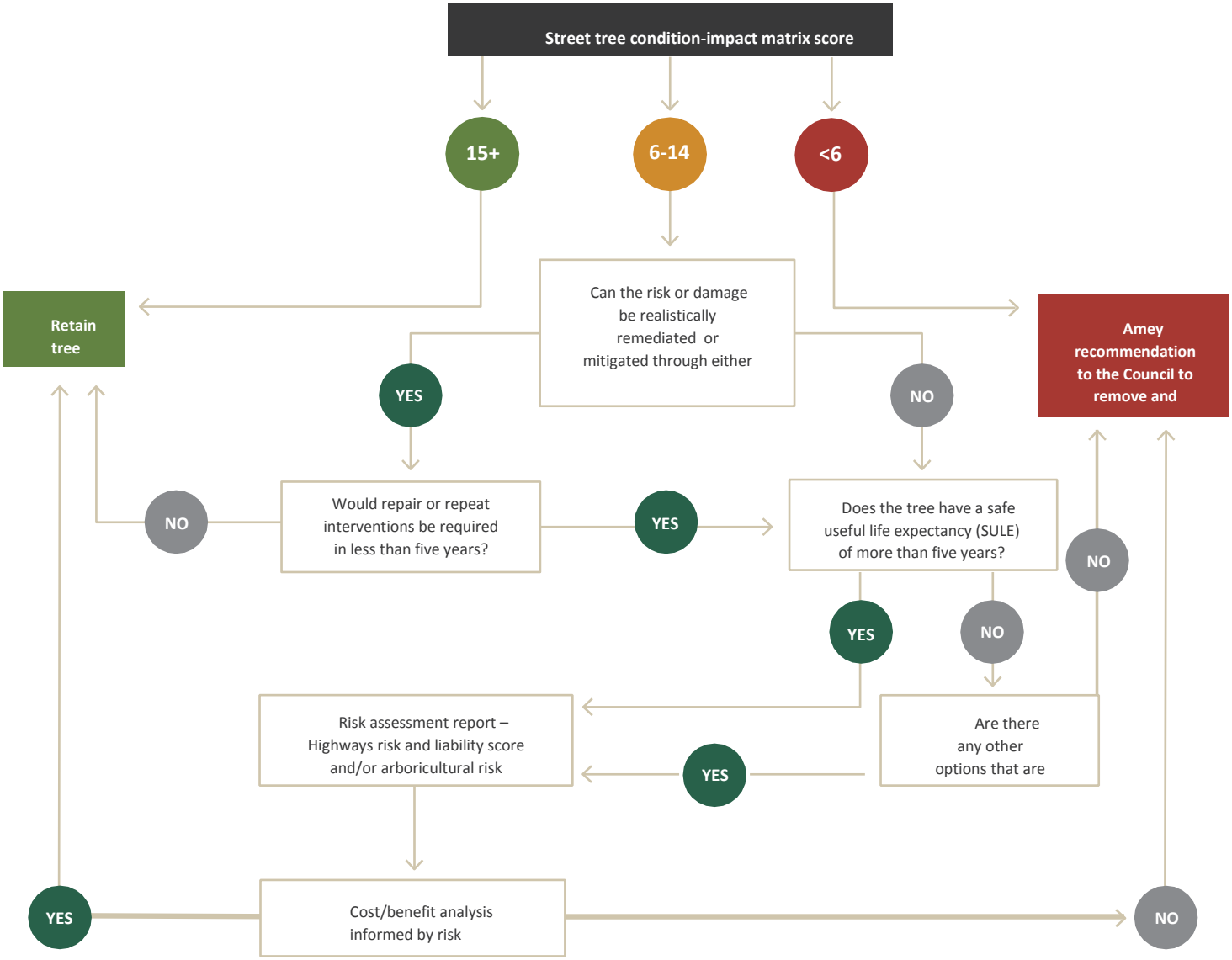
Once the consultation closes, the Council has 10 working days to consider the recommendation, the consultation feedback, and to seek a view from the Sheffield Street Tree Partnership on possible alternatives to removal and replacement, or specific conditions for carrying out removal and replacement.

Following the consultation:

- If the decision taken is not to remove and replace the street tree, this is published on the Council website. The Council instructs Amey to undertake an alternative solution. Amey programmes and delivers the work.

- If the decision taken is to remove and replace the street tree, this is published on the Council website. A tree will not be removed until the decision has been published. The Council instructs Amey to programme the work. Amey publishes the date for replacement, removes the street tree, procures the replacement tree which is planted in the following planting season, and the inventory is updated.

Figure 3 - Amey decision flowchart:



Appendix 6: Street Tree Warden Scheme

Background

The Tree Warden Scheme[23] is a national initiative co-ordinated by The Tree Council. There are many Tree Warden Networks with Tree Warden Co-ordinators right across the UK helping local tree enthusiasts to get involved and care for the trees in their area. Tree Warden Volunteers are
usually people who love trees and are willing to offer some of their time to help care for their local trees and woods, work with the local community, and/or be the eyes, ears and voice for the trees down their street. Tree Warden Schemes are usually co-ordinated by the local council or a local community organisation. Tree Warden activities and projects are often autonomous, and tailor-made to benefit the local area and community.
Every year, The Tree Council invites Tree Wardens to Regional Forums where they can come together to network, share ideas and be inspired by presentations, workshops and the outdoor site visits and mini-training sessions.

Sheffield Street Tree Warden Scheme

The Street Tree Warden Scheme is part of the Sheffield Street Tree Partnership. Investment would be needed to co-ordinate the scheme on behalf of the partnership and the direct involvement of Streets Ahead representatives would be critical for the scheme to work. Streets Ahead and SRWT could help co-ordinate the Street Tree Wardens by:

— Co-ordinating and leading the volunteer network

— Allocating ‘patches’ of a manageable size to volunteers

— Providing opportunities for volunteers to meet up, share experiences and training, promote their activities etc

— To ensure that all volunteers are sufficiently knowledgeable and equipped to be able to spot signs of disease, danger or damage to trees.

Wardens would need specific training, support and direction to ensure their activities are valued and of value in taking forward the Sheffield Street Tree Strategy.

Activities a Street Tree Warden might undertake in Sheffield could include:

— Championing their local tree and woods

— Planting and caring for trees, setting up tree nurseries

— Monitoring trees in a ‘patch’

— Liaising between neighbours, the community, Streets Ahead and the Partnership

— Eyes and ears on the ground to report in any tree issues or concerns such as any signs of disease, danger, or damage to the tree e.g. identifying Ash dieback

— Undertaking and supporting other volunteers to carry out surveys of all types to improve our understanding of our street trees

— Getting together with other like-minded people for training and sharing ideas

[23] For more information visit: https://www.treecouncil. org.uk/Take-Part/Tree-Wardens

— Coordinating any watering of young saplings in their first three years during long dry spells or the weeding of tree pits for new plantings, and/or placement of weed retardant mats

— Supporting the partnership on tree related projects and public events as they arise

Appendix 7: Indication of relative benefits provide by different tree species

Extract from: O'Sullivan, O.S., Holt, A.R., Warren, P.H., and Evans, K.L. 2017. Optimising UK urban road verge contributions to biodiversity and ecosystem services with cost effective management. *Journal of Environmental Management*. vol 191 (April). p162-171. Retrieved from: https://www.sciencedirect.com/science/article/pii/S0301479716310556.

Table 1 Relative value of tree species commonly planted in urban areas of Britain and Europe for key ecosystem services including biodiversity value. Scores are assigned from previously published datasets and for each performance measure (except drought tolerance and winter hardiness) are allocated into three approximately equal sized groups, albeit with some adjustments to the size of each group to take tied ranks into account, with +, ++ and +++ respectively indicating low, medium and high performance. For drought tolerance and winter hardiness +, ++ and +++ respectively indicate problematic or not very suitable species, suitable and very suitable species.

Air quality regulation is assessed by tree species' net contribution to volatile organic compound (VOC) emissions (data from Donovan et al. 2005[24]) and effectiveness in capturing PM (data from Sæbø et al. 2012[25]). Drought tolerance and winter hardiness are linked to climate change resilience, but note that high performance in drought tolerance trades-off against water uptake rates and thus flood alleviation (data from Roloff et al. 2009[26]). Biodiversity value incorporates data from Alexander et al. (2006[27]) on value for mycorrhizal fungi, foliage invertebrates (richness and biomass), leaf litter communities, pollinators, provision of fruits and seeds and epiphyte communities (data on value for rotten wood communities are excluded as rotten trees are removed from road verges). Performance in sequestering carbon is a function of growth rate (McHugh et al. 2015[28]) and wood density (Tree Functional Attributes and Ecological Database 2016) whereby faster growth rates and high wood densities are advantageous. Only a few species are currently used for planting in urban verges in the UK, and these include many that score poorly for biodiversity or ecosystem service values - those approved for use in Sheffield (UK) are marked with a * for use in narrow verges and tree pits and ** for use only in wider grass verges – the majority (60%) of which are not native to the UK.

Species name		Native Distribution	Air quality		Drought tolerance	Winter Hardiness	Biodiversity value	Growth rates	Wood density
			PM	VOCs					
*Acer campestre***	**Field maple**	Europe, N. Africa and W. Asia	++	+	+++	+++	++	+	+++
Acer platanoides	**Norway maple**	Europe and W. Asia (not UK)	+	+	++	+++		+++	++
Acer pseudoplatanus	**Sycamore**	Europe and W. Asia (not UK)	+	+++	+	+++	+++	+	+++
Aesculus hippocastanum	**Horse chestnut**	Europe (not UK)	++		+	++	+	+	++
Alnus cordata#	**Italian alder**	Europe (not UK)		++	++	++		+++	+
Alnus glutinosa	**Alder**	Europe, N. Africa and W. Asia		+	+	++	++	++	+
Alnus incana	**Grey alder**	Northern temperate (not UK)		++	+++	+++			+
*Betula ermanii**	**Erman's birch**	E. Asia							++
*Betula pendula***	**Silver birch**	Europe and W. Asia	+++	+	++	+++	+++	+++	++
*Carpinus betulus***	**Common hornbeam**	Europe and W. Asia	++		++	+++	+	+	+++
Castanea sativa	**Sweet Chestnut**	Europe and Asia Minor (not UK)			++	++	+		++
*Catalpa bignonioides***	**Indian Bean Tree**	N. America			+	+			+
*Cedrus atlantica***	**Atlas Cedar**	N. Africa			+++	+			+
Chamaecyparis lawsoniana	**Lawson cypress**	N. America		+					+
*Corylus colurna**	**Hazel**	Europe and W. Asia		++	++	++	++	++	++
*Crataegus laevigata**	**Midland Hawthorn**	Europe			+	+++	+++	+++	+++
*Crataegus monogyna***	**Common hawthorn**	Europe, N. Africa and W. Asia		+	++	+++	+++	+	+++

[24] Donovan, R.G., Stewart, H.E., Owen, S., and MacKenzie, A.R. 2005. Development and Application of an Urban Tree Air Quality Score for Photochemical Pollution Episodes Using the Birmingham, United Kingdom, Area as a Case Study. Environmental Science and Technology. 39(17):6730-8. American Chemical Society. Retrieved from: https://www.researchgate.net/.

[25] Sæbø, A., Popek, R., Nawrot, B., and Hanslin, H.M. 2012. Plant species differences in particulate matter accumulation on leaf surfaces. Science of The Total Environment. 427-428:347-54. Elsevier. Retrieved from: https://www.researchgate.net/.

[26] Roloff, A., Korn, S., and Gillner, S. 2009. The Climate-Species-Matrix to select tree species for urban habitats considering climate change. Urban Forestry & Urban Greening. 8(4):295-308. Elsevier. Retrieved from: https://www.researchgate.net/.

[27] Alexander, K., Butler, J., and Green, T. 2006. The value of different tree and shrub species to wildlife. British Wildlife. 18:18-28.

[28] McHugh, N., Edmondson, J.L., Gaston, K.J., Leake, J.R., and O'Sullivan, O.S. 2015.
Modelling short-rotation coppice and tree planting for urban carbon management – a citywide analysis.
Journal of Applied Ecology. 52:1237-1245.

Appendix 8: Air pollution data (particulate matter)

Table comparing Canopy cover, IMD score, IMD rank, deprivation description and $PM_{2.5}$ air pollution level by Sheffield ward.

Top wards for low canopy cover, high PM pollution and low IMD and are in bold

Sheffield Ward	**Index of Multiple Deprivation (IMD)**	**IMD Ward Rank** (1 = most deprived)	**IMD description**	**Canopy Cover** (% of ward road network)[29]	**Canopy Area (m²)**	**Average $PM_{2.5}$**[30] (ug/m3) level by ward
Firth Park	52.28	1	Most Deprived	19%	114,621	6.92
Southey	51.06	2	Most Deprived	4%	29,270	6.48
Burngreave	50.69	3	Most Deprived	4%	39,992	7.01
Manor Castle	**47.71**	**4**	**Most Deprived**	**4%**	**34,129**	**7.17**
Arbourthorne	42.33	5	Most Deprived	4%	19911	7.11
Darnall	**41.79**	**6**	**Most Deprived**	**3%**	**39,107**	**7.99**
Shiregreen and Brightside	41.54	7	Above Average	12%	78,902	7.04
Gleadless Valley	36.49	8	Above Average	6%	35,659	7.09
Beauchief and Greenhill	32.51	9	Above Average	9%	64,217	6.26
Woodhouse	**29.91**	**10**	**Above Average**	**4%**	**23,160**	**7.62**
Richmond	**29.27**	**11**	**Above Average**	**4%**	**24,457**	**7.35**
Birley	24.75	12	Average	2%	15,117	6.95
Walkley	**23.50**	**13**	**Average**	**2%**	**13,913**	**7.22**
Nether Edge	23.01	14	Average	14%	74,877	6.9
Central	22.61	15	Average	5%	59,418	7.05
Mosborough	21.74	16	Average	3%	18,263	6.94
East Ecclesfield	19.85	17	Average	1%	6,713	7.01
Hillsborough	19.71	18	Below Average	6%	32,332	5.88
West Ecclesfield	19.07	19	Below Average	7%	41,352	6.32
Beighton	18.87	20	Below Average	4%	22,261	6.94
Stocksbridge and Upper Don	18.52	21	Below Average	7%	65,870	5.11
Stannington	15.08	22	Below Average	18%	222,078	5.15
Broomhill	14.33	23	Least Deprived	5%	19,615	6.68
Graves Park	13.29	24	Least Deprived	10%	63,951	6.82
Dore and Totley	7.81	25	Least Deprived	12%	97,978	5.2
Crookes	7.23	26	Least Deprived	14%	58,873	6.2
Fulwood	5.08	27	Least Deprived	15%	103,404	5.16
Ecclesall	4.56	28	Least Deprived	17%	118,512	6.22

[29] Ward assignment in the contract asset database is by road so trees assigned to a ward may be outside the ward boundary."

[30] PM2.5 is fine particulate matter < 2.5 µm diameter

Appendix 9: British standards and Codes of Practice pertaining to Management of Trees and the Streets Ahead contract

The Streets Ahead Contract, Part G – The Services 31. Obligation To Provide The Service And Performance Standards

31.1 Standard of Service

The Service Provider shall provide the Service continuously throughout the Term:

31.1.1 in accordance with Good Industry Practice;

31.1.2 in order to comply fully with Schedule 2 (Output Specification);

31.1.3 in accordance with Highway Standards;

31.1.4 in accordance with Schedule 3 (Method Statements);

Highway Tree Replacement Policy

Contains advice on: selection, aesthetics, ease of maintenance, tolerance to difficult conditions, due regard to disease prevalence, planting considerations.

Well-managed Highway Infrastructure – A Code of Practice

"The Code is designed to promote the adoption of an integrated asset management approach to highway infrastructure based on the establishment of local levels of service through risk-based assessment."

National Tree Safety Group (NTSG)

Common sense risk management of trees - Guidance based on a set of basic principles developed by the NTSG for considering and managing tree safety in the public interest[HI1]. The document provides guidance (for inspecting and maintaining trees) that is reasonable and proportionate to the low risk from trees, the benefits of trees, and the health and safety obligations of those responsible for trees.

Forestry Commission (Highway tree management: Operations note 51[31])

Examples of good practice tree and highway management with respect to trees growing within the curtilage of the highway.

SCC Highway Tree Design Guide

"aims to provide a set of guidelines and details for tree planting within the adopted highway and adjacent land where tree planting may affect the highway and for the various situations and conditions that are likely to be encountered."

Contains general guidance, specifications and recommended species for Sheffield.

British Standards

BS3998:2010: Tree work – Recommendations

This standard gives general recommendations for tree work. It gives guidance on and explains the principles for the management options for established trees (including soil care and tree felling). It defines and describes the various operations involved in the practical aspects of tree management and maintenance including, but not limited to, Safety and Planning; Crown Management (e.g., pruning and related work); Treatment of wounds and other injuries; Management of the rooting environment; Management of decay; Felling; Stump management.

BS8545:2014: Trees: from nursery to independence in the landscape – Recommendations

This Standard "gives recommendations for transplanting young trees successfully from the nursery, through to achieving their eventual independence in the landscape".

[31] For more info, visit https://www.gov.uk/government/publications/highway-tree-management-operations-note-51

Included are clauses on: Site evaluation and constraints; Species selection; Nursery production and procurement; Handling and storage; Planting; Post-planting management and maintenance.

BS5837:2012: Trees in relation to design, demolition and construction – Recommendations

The scope of this standard includes recommendations and guidance on the relationship between trees and the processes of design, demolition and construction.

It provides a set of principles and procedures to "achieve a harmonious and sustainable relationship between trees and structures" including the protection of trees and their rooting environment.

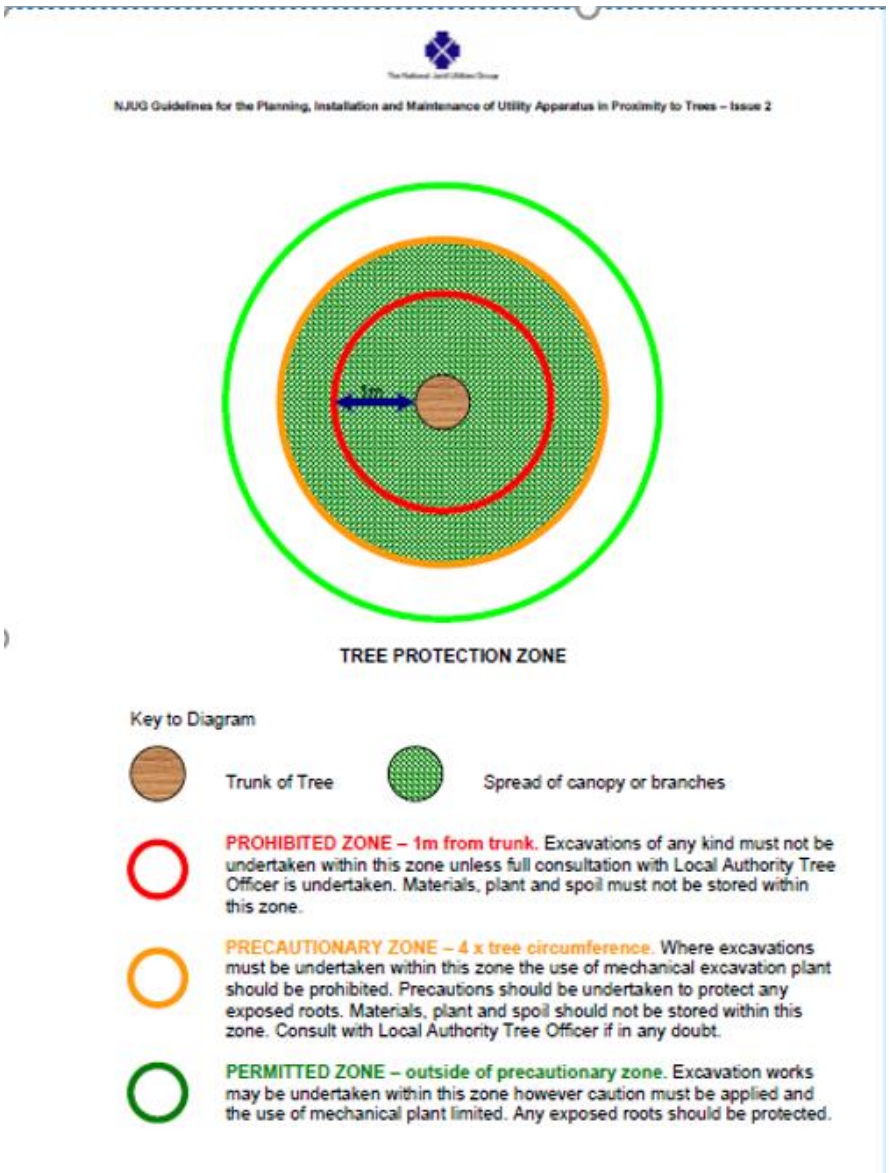
BS8596: Surveying for bats in trees and woodland – Guide

Gives guidance on surveying for bats in individual trees and in woodland – including scoping, roost and activity surveys, and record keeping.

Street Works UK

NJUG Volume 4 (2007): Guidelines for the Planning, Installation and Maintenance of Utility Apparatus in Proximity to Trees.

The guidance proposes a 'zonal' approach to working near trees and outlines how to avoid damage to above ground and below ground parts of a tree. A handy 'Operatives' Handout' is also included:



NJUG Guidelines for the Planning, Installation and Maintenance of Utility Apparatus in Proximity to Trees – Issue 2

DAMAGE TO TREES
Tree roots keep a tree healthy and upright. Most roots are found in the top 600mm of soil and often grow out further than the tree's height. The majority of these roots are very fine; even close to a tree few will be thicker than a pencil. Most street tree roots grow under the footway but may also extend under the carriageway. If roots are damaged the tree may suffer irreversible harm and eventually die.

PROTECTING ROOTS - DO'S and DON'TS
There are three designated zones around a tree each of which has its own criteria for working practices.

THE PROHIBITED ZONE

Don't excavate within this zone.

Don't use any form of mechanical plant within this zone

Don't store materials, plant or equipment within this zone.

Don't move plant or vehicles within this zone.

Don't lean materials against, or chain plant to, the trunk.

Do contact the local authority tree officer or owner of the tree if excavation within this zone is unavoidable.

Do protect any exposed roots uncovered within this zone with dry sacking.

Do backfill with a suitable inert granular and top soil material mix as soon as possible on completion of works.

Do notify the local authority tree officer or the tree's owner of any damage.

THE PRECAUTIONARY ZONE

Don't excavate with machinery. Where excavation is unavoidable within this zone excavate only by hand or use trenchless techniques.

Don't cut roots over 25mm in diameter, unless advice has been sought from the local authority tree officer.

Don't repeatedly move / use heavy mechanical plant except on hard standing.

Don't store spoil or building material, including chemicals and fuels, within this zone.

Do prune roots which have to be removed using a sharp tool (e.g. secateurs or handsaw). Make a clean cut and leave as small a wound as possible.

Do backfill the trench with an inert granular material and top soil mix. Compact the backfill with care around the retained roots. On non highway sites backfill only with excavated soil.

Do protect any exposed roots with dry sacking ensuring this is removed before backfilling.

Do notify the local authority tree officer or the tree's owner of any damage.

THE PERMITTED ZONE

Don't cut roots over 25mm in diameter, unless advice has been sought from the local authority tree officer.

Do use caution if it is absolutely necessary to operate mechanical plant within this zone.

Do prune roots which have to be removed using a sharp tool (e.g. secateurs or handsaw). Make a clean cut and leave as small a wound as possible.

Do protect any exposed roots with dry sacking ensuring this is removed before backfilling.

Do notify the local authority tree officer or the tree's owner of any damage.

The Trees and Design Action Group (TDAG):

- **Trees in a Hard Landscape**
  Practical challenges and solutions to integrating trees in 21st century streets, civic spaces and surface car parks, detailing process, design and technical options.

- **Trees in the Townscape: A Guide for Decision Makers**
  Sets out 12 principles of urban forestry and good practice at the policy level.

- **Tree Species Selection for Green Infrastructure: A Guide for Specifiers**
  Provides extensive guidance on selecting appropriate species for a range of contrasting planting

Examples of application of guidance:

Activity	Potential Problems	Implications	Prevention	Guidance
Use of construction and grounds maintenance plant/machinery	Mechanical damage to stems and branches (e.g., abrasion, breakage) from impact by plant/machinery	Potential initiation of long-term decay.	Effective planning and liaison with tree officer. Toolbox talks; Pre-works access facilitation pruning to provide sufficient clearance. Where accidental damage has occurred, Arbs. to undertake remedial works.	BS5837; NJUG; BS3998; Well-managed Highway Infrastructure COP (WMHI)
Vehicle movement and plant use. Material storage within the precautionary area (as per NJUG).	Compaction of soil.	Asphyxiation of roots – potentially leading to tree death.	Prevent all vehicle movement, plant use or material storage within the Root Protection Area (RPA) or Precautionary Zone; Toolbox talks.	BS5837; NJUG; BS3998; WMHI
Trenching, mechanical digging, soil stripping/sub-surface excavation	Root severance	Potential tree failure; initiation of long-term decay; tree's dynamics and growth affected.	Effective planning and liaison with tree officer – excavation should be by hand-dig or pneumatic device (e.g. Air Spade); Toolbox talks.	BS5837; NJUG; BS3998: WMHI
Erection/Removal of lighting columns	Mechanical damage to stems and branches; soil compaction; root severance	Potential tree failure; initiation of long-term decay; tree's dynamics and growth affected.	Effective planning and liaison with tree officer – excavation should be by hand-dig or pneumatic device (e.g. Air Spade); Toolbox talks.	NJUG; BS5837; BS3998; WMHI
Resurfacing and reinstatement of footways	Mechanical damage to roots by the laying of material (e.g. asphalt) over roots	Initiation of long-term decay; dysfunction of roots tree's dynamics and growth affected.	Where asphalt is used, the recommendation is for a buffer of sharp sand* between the asphalt and the roots. Asphalt should not be laid immediately up to the stem of a tree. *builders' sand should not be used because of its high salt content, which is toxic to tree roots.	BS5837; NJUG
Tree selection	Damage to infrastructure; disbenefits of species inappropriate for location e.g. excessive shading, toxicity of certain species,	Potential claims; expensive future problems e.g. repairs to infrastructure; public displeasure	Effective planning and consideration of species by suitably qualified and experienced Inspectors/Tree Officers	BS8545; TDAG; WMHI
Tree planting and aftercare	All parts of tree susceptible during operations and by vandalism; damage to underground apparatus	Tree death; financial cost of replacement; expense of damage to underground apparatus	Effective planning of each stage of planting and aftercare; use of tree protection; appropriate training of tree maintenance personnel	BS8545; BS3998; BS5837; NJUG; TDAG; WMHI

Maintenance of mature trees	Public safety, injury to operatives or members of public; damage to structures, infrastructure, vehicles; tree damage; disturbance of bats or nesting birds	Long-term decay associated with poor technique; potential claims; prosecution (disturbing bats or nesting birds)	Effective planning of each stage of operations; appropriate training of tree maintenance personnel	BS3998; BS8596 WMHI
Surveying/Inspection	Failure to recognise significant defects or signs and symptoms of ill health which could lead to partial or whole tree failure, spread of disease.	Increased risk to public safety and infrastructure; loss of trees to disease; prosecution;	Inspections/surveys undertaken by suitably qualified and experienced personnel; Continuous Professional Development.	NTSG; BS8596; WMHI

Appendix 10: Case Studies

Case Study 1 – Lime on a quiet suburban street – Ostensibly high visible damage, but actually a relatively simple solution to retain a tree

The kerb line was significantly displaced and pavement significantly humped and cracked. Ostensibly, the tree was therefore causing significant damage.

Using the Street Tree Condition Impact matrix, it was originally assessed as:

Condition Score	Impact of Tree	Result
4 - Remaining life expectancy of 20 to 40 years and in Fair condition	**4** - Moderate Damage being caused and Moderate cost to remediate	**4 x 3 = 12** - Cost benefit analysis and risk assessment needed

A more detailed investigation of the damage was therefore carried out in order to feed into the risk assessment and cost benefit calculations. This identified that there were multiple layers of thick tarmac, which had been laid on top of each other, over many years. Once they had all been removed, it was clear that a single layer of tarmac could be used to create a flat pavement surface. Similarly, with some very minor root pruning, the old kerb stones could be put back in, to create a perfectly straight kerb line.

As a result, the repairs were carried out in situation and the Street Tree Condition Impact matrix was reassessed as:

Condition Score	Impact of Tree	Result
4 - Remaining life expectancy of 20 to 40 years and in Fair condition	**5** - Minor Damage being caused and Low cost to remediate	**4 x 5 = 20** - Retain tree

The tree was recommended for retention by Streets Ahead, a recommendation that the Council agreed with.

Photos: STAG Joint Investigation Team

1. Before work showing humped tarmac and displaced kerb
2. Complete, flat tarmac on footway
3. Thick tarmac humped around tree removed
4. New kerb and tree pit

Case Study 2 – Sycamore on a busy road – Deciding to fell as a result of the unacceptable risks

The tree was leaning into a busy road with the trunk encroaching into the carriageway from a height of about two metres above the ground. There was damage on the trunk from previously being hit by a high sided vehicle.

Using the Street Tree Condition Impact matrix, it was originally assessed as:

Condition Score	Impact of Tree	Result
3 - Remaining life expectancy of 10 to 20 years, and in Fair condition	**1** - Unacceptable Impact being caused on road users and Unacceptable cost to remediate	**3 x 1 = 3** - Remove and Replace

Therefore the recommendation by Streets Ahead was to fell the tree.

The Public Engagement exercise following this initial recommendation did include a few questions for clarity. For example, what were the alternative solutions that could be used to retain the tree? Streets Ahead outlined that theoretically the road could be narrowed with a build out and 'Give Way' traffic calming solution.
But ultimately the encroachment into the road was obvious, and the theoretical solution was not practical on the busy road. The damage caused by the previous vehicle strike was also obvious evidence of the risk posed by the tree.

Streets Ahead therefore continued to recommend felling the tree to the Council, who agreed with the recommendation, and the tree was felled.

Photos: Google Street View

Case Study 3 – Huntingdon Elm on a suburban road junction – Taking into account special circumstances

The tree was causing significant damage to the road surface with roots visibly above tarmac in the carriageway. Initial survey suggested it would be impossible to repair the road surface properly, using standard solutions, without severing several significant roots.

Using the Street Tree Condition Impact matrix, it was originally assessed as:

Condition Score	Impact of Tree	Result
2 - Remaining life expectancy of 5 to 10 years, and in Poor condition	**1** - Unacceptable Damage being caused and Unacceptable cost to remediate	**2 x 1 = 3** - Remove and Replace

Therefore, the initial recommendation by Streets Ahead was to fell the tree.

The Public Engagement exercise following this initial recommendation highlighted the rarity of the tree, as well as it being host to a colony of the Biodiversity Action Plan (BAP) protected White-letter Hairstreak butterfly. Streets Ahead therefore explored whether more expensive non-standard solutions could be used, given the special nature of this tree, and the wildlife it was host to. This included deeper hand excavation of cobbles underneath the old tarmac, and careful hand pruning of some of the roots. It also included lifting the kerb line, to allow for the new road surface to be ramped over the remaining roots in the road, and re-grading of the slope of the pavement, to take into account the higher kerb line.

This solution, to retain the tree, was recommended by Streets Ahead to the Council. However it was done with the caveat that further problematic roots might be discovered during the excavation, and that depending on the severity of the root pruning needed, the tree might become unstable, and still need to be felled. The Council accepted the recommendation to carry out the excavation, and to try to implement the more expensive solution, noting the importance of the tree.

The engineering work was carried out, ultimately at relatively low cost, even though it was a non-standard solution. Some sensitive canopy pruning was also conducted.

Using the Street Tree Condition Impact matrix, it was re-assessed as:

Condition Score	Impact of Tree	Result
2 - Remaining life expectancy of 5 to 10 years, and in Fair condition	**5** - Minor Damage being caused and Low cost to remediate	**2 x 5 = 10** - Retain with enhanced inspection regime

Sheffield Council accepted this assessment and the tree is now being monitored by Streets Ahead more regularly.

Case Study 3 – continued

Photos: STAG Joint Investigation Team

1. Tree condemned because it was damaging, with rooting above the tarmac in the carriageway; completely unable to work round it without severing roots.
2. Roots growing up through old cobbles and breaking through worn tarmac.
3. Kerb trough ready to reinstall ramped kerb.
4. New tree pit.
5. Kerb refitted.
6. Pavement tarmac redone.

Appendix 11: Community Funded Street Tree Planting – 'How to' Guide

Strategy aims

Sheffield Street Tree Strategy aims to deliver several outcomes in relation to the diversity and distribution of street trees across Sheffield. Community funded street tree planting specifically aims to satisfy:

- ❑ Outcome 4 - Contribute to a more equal distribution of urban forest across the city
- ❑ Outcome 5 - Increasing tree canopy
- ❑ Outcome 6 – Engaging the wider community of all ages to get involved in caring for and valuing street trees

The following provides the gateway and process for community groups or individual residents to consider funding the planting of additional street trees, in specific locations where feasible, or across Sheffield, to promote greater distribution of the tree population. The following outlines the approach and process to progress from initial enquiry, through to application, the planting of the trees, and subsequent maintenance provision.

All enquiries will be referred to the guidelines to ensure the enquirer has considered the following key points:

- ❑ The suitability of the location;
- ❑ The appropriate species for the location, noting the aim of increasing species diversity and maximising canopy cover;
- ❑ The potential costs involved; and
- ❑ Evidence of wider community support.

These are key requirements which, if fully thought through by those making the enquiry, will speed up the process of progressing to formal application and the licencing agreement with Sheffield City Council.

Process overview

DIAGRAM TO BE ADDED

Key process steps

Steps	Description
1	**Initial Enquiry to Streets Ahead: Request for additional trees:** This could be defined in two (2) categories a. A request for a tree at a specific location, if deemed suitable, but no funding offered. This potential location would be considered if within the current tree replacement programme, the existing tree location or locality is unsuitable ; or alternatively, if it meets the criteria of the Sheffield Street Tree Strategy, the new location could be considered from the additional planting pool held by Street Ahead. b. The enquiry is seeking additional trees, funded by the community / resident, therefore looking to put in place a licence agreement with SCC. The initial review will include whether it meets the current guidelines, suitability of location, species choice and evidencing wider community support for the additional tree (s)
2	**Investigation** Streets Ahead to undertake an initial investigation on site, visual assessment only at this stage, to consider the local environmental factors, canopy cover from existing highway trees or neighbour properties, suitability of location to install a tree and construct the required tree pit, utilities, width of the footway, proximity to properties etc. All these factors are crucial to achieving our aim of ensuring right location / right tree, for successful establishment. Feedback will be provided to the enquirer on the location and species requested whether deemed appropriate for consideration and taking forward, or the reason for the request to be declined. Alternatives may be provided, locations in the locality if identified or species appropriate for the location if suitable to sustain a street tree.
3	**Application to Sheffield City Council** Application made to SCC for the additional tree (s), with supporting evidence from neighbouring properties of the proposal, Sheffield City Council to confirm costs to the funder at this time, leading to the application being accepted by all parties, licence agreement and instruction to Streets Ahead, Amey to progress the planting in the next available planting season (November to March).
4	**Establishment Phase** To ensure successful establishment over the first 3 years the funder / community will be responsible for the watering of the tree and weeding if required. Following successful establishment, Streets Ahead will become responsible for the tree and any future maintenance including the replacement should it be replaced during the remaining term of the contract.

5	**Tree Fails to Establish** a. Should this be due to poor nursery stock, replacement will be funded by Streets Ahead b. Should the tree be damaged, vandalised or fail because of lack of aftercare within the first three years, the tree will not be replaced by Streets Ahead and will be subsequently removed. Any replacement would need to be funded by the community, or through a funding pot set aside to cover the cost by another.

Promoting the opportunity

The application route will be published on the Sheffield City Council web pages, specifically under the Streets Ahead section about street trees. Guidance will be provided on the process, including:

- ❑ Supporting documentation required with the application;
- ❑ Useful hints about factors influencing whether trees may or may not be accepted;
- ❑ What to look out for (i.e., overhead lines, signs of underground services, street furniture, lines of sight, shading from existing trees, and the general street scene).

It will also provide, as a guide only, the estimated cost to the community funder based on whether the chosen location is within a grass verge or paved surface. These will vary depending upon location and the species selected, cost will also include commuted and license fee.

If the location is considered susceptible to vandalism from local knowledge, Street Ahead may advise to add a protective tree guard to minimise the risk of damage, though this would attract additional costs.

Initial feedback on enquiry

At the initial enquiry stage, Street Ahead will assess the viability of the location, visual assessment at this stage only, this may include a discussion with the local tree warden who can provide valuable local knowledge of the site and species selection suitability, our aim to maximise resilience and canopy cover.

Community support

To ensure successful establishment it is critical that the wider community, particularly residents close to the chosen location, support the additional tree planting. Therefore, the applicant will be required to provide evidence through letters of support from those directly affected.

Gift Aid

Should the community seek to fund additional streets collectively through a charity organisation this may attract gift aid therefore maximising the value of the money donated to be invested in future trees.

Greater distribution of street trees

A key outcome of the Strategy is to promote a more equal distribution of street trees and their benefits across the city. Therefore, the Sheffield Street Tree Partnership and wider community will be looking for funding and opportunities to focus planting and education within communities where street trees don't feature significantly in the locality. Streets Ahead has a commitment to plant a further 200 additional street trees over the coming years, and it is proposed that this pool of additional trees will be used to support this aim, looking at requests from residents whose circumstances preclude them from funding the tree, but have the nearby support required to aid successful establishment, and meet the aims of the overarching strategy.

Glossary & Acronyms

Glossary and Acronyms

Amenity tree	Allowed to occupy a site and to serve its surroundings in a useful manner which culminates in the aid, protection, and comfort of humans[32].
ATMP	Annual Tree Management Programme sets out the Streets Ahead street tree works for the year ahead
Avoided runoff	Amount of water held in the tree canopy and re-evaporated after a rainfall event.
BS or British Standard	A series of professional standards covering a variety of works e.g. on trees. Please refer **Appendix 9** for more details.
Canopy cover	Area of leaves, branches and stems of trees covering the ground when viewed from above; commonly expressed as a percentage of total ground area, e.g. at 50% canopy cover, half of the total ground area is covered by the vertical projection of tree crowns.
Carbon sequestration	Annual removal of carbon dioxide from the air by plants.
Carbon storage	Amount of carbon bound up in the above-ground and below-ground parts of woody vegetation.
Capital Asset Valuation of Amenity Trees (CAVAT)	A valuation method developed in the UK to express a tree's relative contribution to public amenity and its prominence in the urban landscape.
Council of Tree and Landscape Appraisers (CTLA)	A method for assigning a monetary value to the amenity value of trees.
Cultivar	A tree or plant variety that has been produced in cultivation by selective breeding. They usually have no or low genetic diversity, with individuals of any particular cultivar usually being clones of one another.
Ecosystem services	Benefits provided by ecosystems that contribute to making human life both possible and worth living, e.g. products such as food and water, regulation of floods, soil erosion and disease outbreaks, and non-material benefits such as recreational and spiritual benefits in natural areas.
Epicormic	Of a shoot or branch, growing from a previously dormant bud on the trunk or a limb of a tree.
Epicormic growth	Epicormic growth is a plant response to damage or stress; the growth of new shoots from epicormic buds that lie dormant beneath the bark.

[32] Coder, K. 2017. *What is A Tree?* University of Georgia, Daniel B Warnell School of Forestry & Natural Resources. p. 3. Retrieved from: https://www.warnell.uga.edu/sites/default/files/publications/WSFNR-17-35%20Coder.pdf.

i-Tree Eco	A suite of open source, peer-reviewed and continuously improved software tools to help assess and manage urban tree populations and the benefits they can provide.
Indices of multiple deprivation (IMD)	The official measure of relative deprivation for small areas in England, and the most widely used of the Indices of Deprivation. Deprivation is measured in a broad way to encompass a wide range of aspects of an individual's living conditions; these are Income, Employment, Education, Skills and Training, Health and Disability, Crime, Barriers to Housing and Services, and Living Environment.
Landscape: National Park	Areas of relatively undeveloped and scenic landscape that are designated under the National Parks and Access to the Countryside Act 1949.
Landscape: Conservation Area	Conservation areas exist to manage and protect the special architectural and historic interest of a place - in other words, the features that make it unique.
Landscape: Important Landscape	Important landscapes are landscapes or features that aren't in national parks, or conservation areas, or memorials, or veteran, or woodland, but still deserve special consideration; for example, some historic avenues.
Landscape: Memorial Trees	Memorial trees celebrate or commemorate people or events. Typically in Sheffield, they commemorate those people of the area that fought in the two World Wars.
Landscape: Veteran Trees	Ancient trees are veteran trees, but not all veteran trees are old enough to be ancient. Veteran trees are survivors that have developed some of the features found on ancient trees. However, veteran trees are usually only in their second or mature stage of life.
Landscape: Woodland	Woodland is used in British woodland management to mean tree-covered areas which arose naturally and which are then managed, while forest is usually used in the British Isles to describe plantations, usually more extensive, or hunting Forests, which are a land use with a legal definition and may not be wooded at all.
Moving Average	A moving average is commonly used with time series data to smooth out short-term fluctuations and highlight longer-term trends or cycles.

ODL	Other Designated Land (ODL) – Land outside the highway network which Amey is required to maintain in line with the Streets Ahead contract. Comprises land parcels identified in Schedule 20 of the contract. This effectively means land that is not a road, path or verge but a swathe of land that is incidental to the highway.
PEFC	Programme for the Endorsement of Forest Certification.
Remaining life expectancy (RLE)	Life expectancy of a tree, in years
Replacement cost	Value based on the physical resource itself, e.g. the cost of having to replace a tree with a similar tree, using the CTLA methodology guidance from the Royal Institution of Chartered Surveyors.
Safe useful life expectancy (SULE)[33]	Life expectancy of a tree, modified first by its age, health, condition, safety and location then by economics, effects on better trees and sustained amenity.
SCC	Sheffield City Council
Shelterbelt	A barrier of trees and shrubs that provides protection (as for crops) from wind and storm and lessens erosion.
SRWT	Sheffield and Rotherham Wildlife Trust
STAG	Sheffield Tree Action Groups
Street tree	A tree located next to or within a public road; a tree on land forming or adjacent to a highway which affects, in some way, those using that highway.
TDAG	Tree and Design Action Group
TOF	Trees Outside Forests
Tree warden	Volunteers who love trees and are willing to offer some of their time to help care for their local trees and woods, work with the local community, and/or be the eyes, ears and voice for the trees down their street.
UKWAS	United Kingdom Woodland Assurance Scheme
Urban forest	Trees, woodlands, shrubs, hedges, open grass, green space and wetland in and around urban areas.
WdT	The Woodland Trust

[33] A classification for trees developed by Jeremy Barrell of Barrell Tree Consultancy, published in 1993, consisting of five categories: from SULE more than 40 years to less than 5 years, as well as young or small trees

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