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# Hunsbury Hill Fort

# West Hunsbury Country Park

Northamptonshire

Tree Health & Safety Report 2018

**16<sup>th</sup> April 2018**

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## 1.0 Introduction

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### 1.1 Purpose of this Document:

This report was commissioned to do the following:

- To assess the health and safety of all trees within the Iron Age Hill fort area of West Hunsbury Country Park. Please see plan.
- To recommend remedial works to be carried out following a Tree Safety Inspection.

### 1.2 Scope of the Report and Survey

The scope of the Tree Safety Report is to offer guidance on the management of trees that have the potential to impact members of the public and staff. In doing so it provides the landowner with a defensible risk management system that shows:

- A clear audit trail.
- A tree risk assessment.
- A clear management system to detail what action should be taken to reduce the risk and remove the hazard.

The general principles of the tree risk survey have been defined by the National Tree Safety Guidelines document 'Common Sense Risk Management for Trees' this publication is available to download from the Forestry Commission website.

[https://www.forestry.gov.uk/pdf/FCMS024.pdf/\\$FILE/FCMS024.pdf](https://www.forestry.gov.uk/pdf/FCMS024.pdf/$FILE/FCMS024.pdf)

1.3 Woodland and individual tree information is also included to ascertain health and safety issues and historical evidence regarding the woodland as a whole.

1.4 An internet link has also been provided which will open a custom-made google map with all details included in the report in an easy accessible format. A google account is needed to be able to open the link and once opened can also be edited. The link is below.

[https://drive.google.com/open?id=1-A9iNjr\\_JMi8A0guWfWra8B0cAE7UEHk&usp=sharing](https://drive.google.com/open?id=1-A9iNjr_JMi8A0guWfWra8B0cAE7UEHk&usp=sharing)

### 1.5 Concise Summary

The full appraisal of the tree safety inspection is found in the Tree and Group data in Appendix 1.

### 1.6 Birds, Bats and Habitats

The Wildlife and Countryside Act 1981 (amended by the Countryside and Right of Way Act 2000) provides statutory protection to birds and other protected species that may inhabit trees.

It is essential to check for nesting birds, bat roosts, badgers and hibernating animals such as hedgehogs under trees before pruning or removing trees as negligent disturbance is an offence under the EC Habitat Directive 1992 and CROW Act 2000.

In general, autumn tree work, in September, October and November is least disruptive to bats and birds.

## 1.7 Survey Details

- The survey took place during the month of April 2018
- The survey was conducted by Rebecca Peace. LANTRA accredited Professional Tree Inspector and Arboriculturalist.
- Inspection was made at ground level using Visual Tree Assessment methods. Visual Tree Assessment techniques (VTA<sup>1</sup>) are generally non-invasive (unless open cavities are present which can be probed from ground level).
- Trees requiring felling or other works have been marked with a small metal tag for identification.
- All trees within the hill fort area have been inspected for tree health and safety. All groups / woodlands have been inspected and trees have been identified individually for any remedial works. A series of recommendations has been proposed, and formulated into a data table.
- Weather Conditions on 16<sup>th</sup> to the 19<sup>th</sup> of April: Mainly sunny most days with temperatures rising by Tuesday.

(1) DoE publication "The Body Language of trees a handbook of failure analysis" by Claus Mattheck and Helge Breloer

## 1.8 Validity

Plants are biological organisms and change with time. This assessment remains valid for 36 months from the date of inspection, or until a major storm is experienced, after which time a re- inspection is recommended. This report can be used in conjunction with trained volunteer surveying.

## 2.0 Site Description, History and Treescape

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- 2.1** Hunsbury Iron Age Hill Fort has a lot of history, an obvious statement, but all events will have left scars and a legacy. The trees come into the landscape a lot later and this is where an understanding of the history is important. The earliest construction was probably between the 7th and 4th centuries BC. It involved the creation of the deep surrounding ditch that still exists today as well as an internal bank or rampart.
- 2.2** More changes were made to the to the bank in the inner circle area in the later Iron Age possibly around the 3rd or 2nd Century BC. Next came the Romans and not much is known about what they actually did there but the Anglo Saxons were also in residence at one point as archaeological finds have been discovered.
- 2.3** Interestingly the area was used for executions. In 1631 a lady called Mrs Lucas was burned at the stake within the Hill fort for apparently poisoning her husband. If this area was used once for this it is quite probable that other punishments took place here. At this point there is evidence of a tree cover of some sort, possibly Elm. The large oaks on site today are not the first trees to appear and the ages of the trees vary only slightly meaning that some are possibly the offspring of the older oaks. The area was predominantly farmland and the wool trade was an important part of Northampton's history. Horses were also bought and sold in the area. Understanding that the soil properties would be more beneficial to livestock rather than crops the trees would have been left to grow as the ditches and banks would not lend themselves to crop planting. Trees were encouraged to grow to act and as shelter for livestock and a source of firewood.

- 2.4 In 1880 the area was mined for Iron ore and Hunsbury Hill Iron Ore company was formed and with it came a railway. The mining did enter into the central area of the hill fort but at this point more planting seems to have taken place. Elm would have been predominant at this point in time too. There did seem to be an archaeological or historical society that petitioned for the protection of the fort but was overruled. It could be possible that an agreement was made to protect the fort by planting trees as a barrier to the mining.
- 2.5 In 1921 the quarries were closed and returned again to agriculture. In 1930 the railway closed and the area became silent, all commercial activity ceased.
- 2.6 In 1970 the area then became a country park although a little different to what we see now. Starting at the same time, vast housing developments were underway to mainly house people from Birmingham and London. With this came recreation and so Hunsbury was part of a larger scheme to accommodate this large influx of people. It is evident that this is about the same time the lower shrub planting came about. The area needed protection, the sheep had disappeared and so more shrubs and lower trees became part of the landscape.
- 2.7 Near to the hill fort is evidence of a ash coppiced hedgerow. Ash was used for hedgelaying and although the line the trees is now out grown it remains a lasting remnant of field boundaries in place for centuries.
- 2.8 Today the larger trees are a huge part of the scenery. Large dominant oaks surround the open field where the tribes lived and whose dwellings were razed to the ground executions took place, sheep grazed and iron ore was quarried. It is now a quiet sanctuary for dog walkers and nature lovers.
- 2.9 Around the perimeter of the fort there are compartments of later planted mixed woodlands. These are made up of various species planted around 20 - 30 years ago by the council or other stakeholders for reasons unknown. More information about these areas is found in **appendix 2**.

### **3.0 Status of the Trees**

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- 3.1 The hill fort is a County Wildlife Site (last surveyed in 2011) and a Scheduled Monument and is protected by law. The trees are also under a Conservation order again protected by law.

### **4.0 Tree Descriptions and General Recommendations**

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- 4.1 Full details of all individual trees surveyed are recorded in the tables in **Appendix 1**. A full explanation of the tables can be found at **Appendix 4**. Please refer also to the Tree Position Plan at **Appendix 3** for tree locations.

## 5.0 Discussions & Recommended Works on Hazardous Trees and other Works

**5.1 The Risks:** The trees have been surveyed with practicality and common sense in mind. This is a medium target area with 24 hour access to the general public. Within the survey the hazards have been identified, the associated risks have been evaluated and work recommendations provided to control the risk. For instance, a “Fell” recommendation has been put onto damaged, dead or diseased trees that will impact onto the path if they fall. If they are dead or in decline and leaning away from the path or are small and the associated risk is very minor, then no recommendation has been given. Deadwood and standing deadwood is an integral part of the woodland ecology.

**5.2 Animal Damage:** Historical rabbit and squirrel damage on sycamore and ash is endemic throughout the area. Both species have been decimated in earlier years and are still being damaged by the large population. This causes some of the trees to have misshapen crowns, open cavities at the base and overall weak formation in the tree. There is little that can be done to alleviate the problem and a number of fells throughout the woodland have been recommended. *See photograph. 1.*

**5.3 The Oaks:** As mentioned in Chapter two, the oaks are a large part of the landscape. These trees must be protected at all costs being the main species to also safeguard the hill fort. There are problems with rabbits undermining the areas between the roots and the ground and there are many examples of exposed roots throughout the ditches and the banks. Although this is also a natural occurrence, the borrowing from the rabbits could weaken the stability of the trees.

Some of the highly populated areas have other excavations around the rabbit holes which indicates rabbiting has taken place at some point in time or foxes in the area have dug for prey. No recommendations can be given apart from a rabbit eradication program, fencing or to remove lower shrubs and trees (not the oaks), fill the holes and grass over. (Impractical because of the scale).

**5.4 Bacterial Canker on Cherry:** On trees Numbering **660 to 665** there is a high instance of bacterial canker. All these trees are wild cherry and have been infected at some point with the one of two pathogens that cause this disease. As it is a bacteria you will find that once an area is infected it will show in many of the *prunus* species in the area. There is no cure and all dangerous trees must be removed. The trees pinpointed for removal are on a steep bank going towards a path in to the central area. All others in this group must be monitored at least annually.

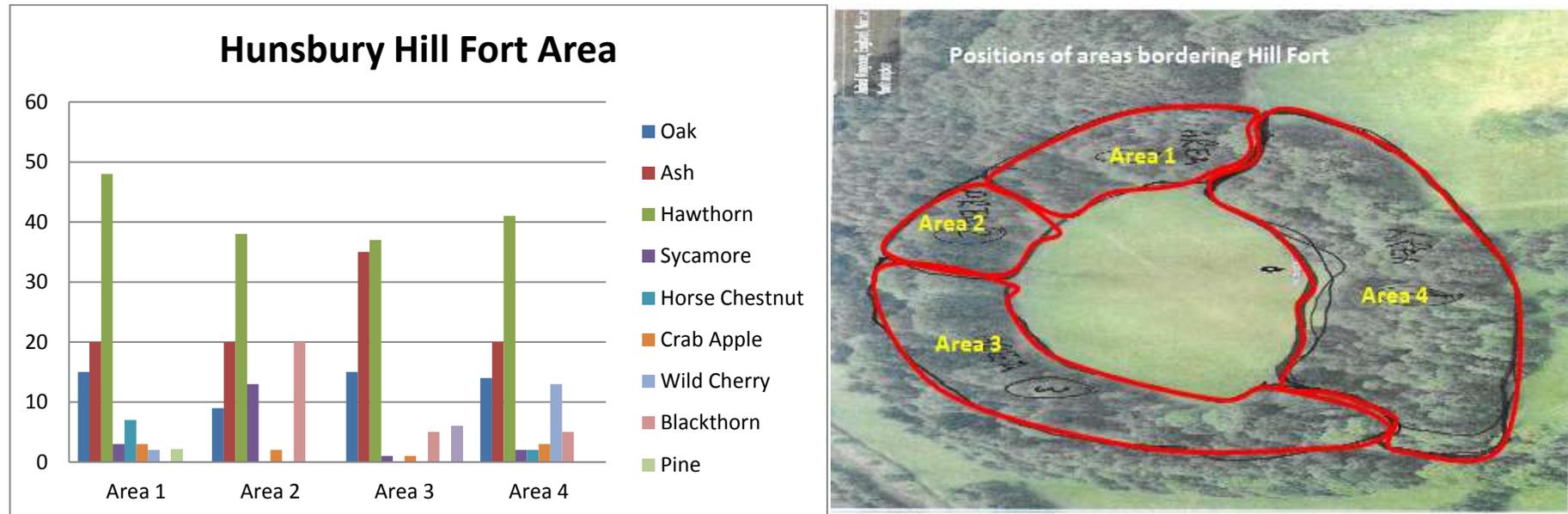


Photograph.1. Historical  
Animal Damage



Photograph.2. Rabbit  
holes on the Hill Fort

**5.5 Volunteer Input:** The following information is the result of a woodland survey conducted by volunteers of the Friends of the West Hunsbury Parks. The object of the survey was to determine the percentage of species within a areas surrounding the hillfort. This information can used to define areas where there is a need or not for future planting, whether it be for introducing native species or to encourage wildlife into the area. The two principal species of tree are ash and oak with a principal understory species of hawthorn.



All further tree recommendations and notes are self-explanatory in **Appendix 2**.

**5.6** Other tree pruning works and fells have been recommended for reasons of safety and to ensure the long-term health of the trees and to benefit the long-term development of adjacent trees, as detailed at **Appendix 1**.

**5.7** Where a full detailed inspection of trees was inhibited by restricted access or by the presence of ivy, epicormic shoots and understory vegetation, as detailed at Appendix 1, a concise inspection was carried out and a judgement made on what could be seen.

- 5.8** On undertaking the recommended works, the arborist/tree surgeon must without delay report any defects that become apparent while climbing or working on the tree/s in question. Those defects must be reported immediately to the relevant manager or supervisor to enable the appropriate remedial action.



Photograph.3. The Landscape from the central Area

# Appendices

## Appendix 1: Tree & Tree Group Data and Recommendations for Hunsbury Hill Fort Survey

Tree No.	Species	Age	DBH (cm)	Height (m)	Condition	Recommendations	Notes	Priority
625	Oak	Mature	60	17	Fair	None	Deadwood present throughout the crown. Nice specimen. Slight root girdle.	Low
626	Oak	Mature	52	16	Poor, Fair	None	Noted as leaning towards path. Severed Ivy dead within crown. Deadwood in crown.	Low
627	Oak	Over Mature	120	18	Fair	None	Large specimen tree. Marker tree for Drivers road, Approx. 200 - 250 years old.	Low
628	Oak	Over Mature	85	16	Poor, Fair	None	Large amount of Ivy with in crown. Trunk checked no obvious signs of decay or cavities. Do not remove Ivy.	Low
629	Sycamore	Mature	38,40,39	22	Poor, Fair	Monitor - Decay at base with historic snapped out limb.	Part of an old coppice. All stems will have same roots.	Low
630	Sycamore	Mature	39.38	20	Poor, Fair	Remove limb over smaller pathway and all hung up branches.	Decay and cavity in limb over smaller pathway. Hung up branches	Medium
631	Oak	Over Mature	105	18	Poor, Fair	Forth lateral branch over path to remove. Large crack underside.	Exposed roots with erosion on bank. Stable at the moment. Animal damage and borrowing at base could cause extra destabilising. Deadwood in crown normal amount, no issue.	High
632	Oak	Mature	65	21	Poor, Fair	Monitor	On highly eroded bank with extensive animal hollowing throughout base. No signs of decay but will become unstable.	Low
635	Ash	Over Mature	110	19	Very Poor, Poor	Monitor - Losing limbs. No swing making. In perfect position for swing, evidence of old ones.	Lighting damage on South side with burnt off limbs. Woodpeckers and ecologically important. Reduced crown because of damage. Rope on lateral limb used as swing.	Low
634	Oak	Late Mature	90	18	Poor	Monitor	Fire damage at base. Hollowing of base but with good wound wood. Mallet tested and areas of decay present. Woodpeckers in areas of deadwood in crown.	Low

Tree No.	Species	Age	DBH (cm)	Height (m)	Condition	Recommendations	Notes	Priority
635	Oak	Late Mature	87	18	Poor, Fair	Monitor - Compaction an issue, as with many trees in this area.	Compaction with walkers and bikes. Slight fire damage on South side. Under slight stress with main stem epicormic growth.	Low
636	Ash	Late Mature	81	19	Fair	Monitor	Slight compaction bit good buttress roots. Good stabilising tree. Old historic vandalism, no issue. Slight deadwood.	Low
637	Oak	Late Mature	100	18	Poor, Fair	Monitor	Large amount of Ivy with in the crown. Ecologically important but difficult to make visual assessment. Low target area for pedestrians.	Low
638	Oak	Over Mature	112	19	Fair	Monitor	Good specimen Oak. On bank with slight hollowing at base, no issues. Low target area.	Low
639	Oak	Late Mature	96	18	Poor, Fair	Move dog waste bin from underneath large lateral branch only by a few metres.	Large heavy limb, liable to drop. Medium target, high risk. Branch is heavy and will eventually fall onto dog bin. Remove deadwood from crown only over Drivers path.	Medium
640	Ash	Over Mature	60,66	22	Poor, Fair	Make safe limb over hanging small path in gully.	Reduce to damaged area. Damage is evident from rear of tree.	High
641	Oak	Mature	52	18	Fair	Remove deadwood over path.	Large amount of deadwood over busy area.	Medium
642	Oak	Mature	60	17	Fair	Remove deadwood over path	Variable amount of deadwood over busy area.	Medium
643	Ash	Over Mature	69	16	Very Poor	Fell	Not on remit but just so noted. Dangerous tree on entrance to Hill Fort area. One stem already fallen remaining will fall and it cracking through exposed dead heart wood.	High
644	Ash	Over Mature	45,46, 42,33, 63	18	Poor	Monitor	Multiple stems. Old Ash coppice. Decay at base with historic leaf litter build up. As coppice, stems are not as strong as should be.	Low
645	Oak	Mature	84	18	Fair	Remove deadwood over path only	Fair specimen with major issues. Just deadwood throughout crown.	Medium

Tree No.	Species	Age	DBH (cm)	Height (m)	Condition	Recommendations	Notes	Priority
646	Oak	Veteran	142	18	Poor	Remove lower deadwood over path only.	Veteran tree. Important. Approx 200 -250 years old. Hollow at base going through stem to at least 3m. Wire fencing wrapped around base now enveloped into tree. Could remove some of the wire where heavy and able to remove but will leave jagged edges. Long and careful job.	Medium
647	Oak	Over Mature	105	17	Fair	Remove deadwood over path only	Large oak, nice specimen. Previous snapped out limbs. Slight hollowing at rear base.	Medium
648	Cherry	Early Mature	33	15	Poor	Monitor	Large canker at rear. Mallet sounded and decay is not extensive. Still a weak tree but will need monitoring. Behind towards playing field are two sycamore with extensive historic animal damage. Both checked but will need monitoring.	Low
649	Oak	Mature	68	17	Poor	Monitor	A number of woodpecker holes throughout the main stem indicating hollowing and decay. Crown is reduced over path.	Low
650	Oak	Mature	74	18	Poor, Fair	Monitor	Woodpecker holes as previous T649. Only minor deadwood.	Low
651	Maple spp.	Semi Mature	32	14	Poor	Remove hung up branches throughout crown. Remove all deadwood. Monitor after works.	Next to a busy pathway used by school. Large cavity at rear mallet tested, sound wood. Historical rabbit and squirrel damage.	High
0	Triangulation station	Veteran	7331	1	Dead	Ordinance Survey marker for mapping only	Marker	Low
652	Oak	Late Mature	82	17	Poor, Fair	Monitor	Woodpecker holes in main stem. Slight hollowing in main stem ascertained through sounding. Can't be seen but can be heard. Low target.	Low
653	Oak	Late Mature	100	17	Poor, Fair	Monitor. Remove deadwood over path.	Large tree with exposed roots. Showing signs of epicormic stress.	Medium

Tree No.	Species	Age	DBH (cm)	Height (m)	Condition	Recommendations	Notes	Priority
654	Ash	Semi Mature	30,29,22	17	Poor	Monolith dead stem at 2m and leave for habitat.	Dead stem over path in gully. Medium target.	Medium
655	Dead	Semi Mature	26	12	Dead	Monolith to 3 - 4m and leave for habitat.	Dead tree over main path.	Medium
656	Ash	Semi Mature	29	16	Dead	Fell to ground and leave as habitat	Standing deadwood. Too near to path and playing field. Will leave as habitat on ground.	High
657	Oak	Late Mature	105	19	Poor, Fair	Remove deadwood crown over main path. Check third lateral limb over path while in crown to check for suspected crack.	Seems to be a unobvious weakness in limb over path to be checked.	Medium
658	Goat willow	Mature	46	17	Very Poor	Fell and leave as habitat pile	In major decline mainly dead. Over path junction with entrance to school and playing field.	High
659	Cherry	Mature	32	16	Dead	Fell to ground and reinstated root plate if possible.	<i>Ganoderma spp.</i> This is a fungi situated at the base of the tree causing root rot and eventual fall.	High
660 - 665	Cherry	Mature	35	17	Very Poor, Poor	Fell numbers 604 and 605, Monitor after works.	All trees in this group are suffering from bacterial canker. Large areas of decay causing large lesions on main stems. Will need monitoring after works. Timber will be left as habitat.	High
666	Oak	Late Mature	96	17	Fair	Remove deadwood over path. Remove rope and nailed seat in tree.	Seat and rope, old. To be removed as could encourage more building. Exposed roots on steep bank on entrance to Hill Fort.	Medium
667	Ash	Early Mature	42	16	Very Poor	Fell to one metre	Dieback in tree and dangerous	Low
668	Pine	Mature	51	15	Poor	Monitor	Snapped out crown and weak stem at top. Could snap out rest of crown in high winds.	Low
669	Oak	Mature	66	19	Poor	Remove deadwood over path and bike area only.	Tree in decline. Major amount of deadwood in lower crown. Epicormic stress on main stem. Lower damage to base, good wound wood forming. Tagged on rear upside down.	High

Tree No.	Species	Age	DBH (cm)	Height (m)	Condition	Recommendations	Notes	Priority
670	Oak	Late Mature	105	19	Fair	Monitor.	Ivy clad with an abundance of wildlife. Nests in tree. Small cavities at base, no issues.	Low
671	Oak	Mature	67	19	Fair	Monitor	On bank with major exposed lifted roots. Small cavities at base no issue. Slightly reduced crown. Interesting tree.	Low
672	Oak	Mature	74	17	Poor, Fair	Monitor	Slight deadwood in crown but minor. Ivy clad with nesting birds.	Low



Photograph.4. Tree 646



Photograph.5. Exposed roots on mature oak

## Appendix 2: Group and Woodland Areas Information

Tree No.	Species	Age	Ave DBH (cm)	Ave Height (m)	Ave Condition	Recommendations	Notes	Priority
G1	Oak, Birch, Sycamore, Ash	Semi Mature	22	18	Poor, Fair	Remove dead and dying and diseased. Will need marking up before work commences. Management plan needed for this area.	Historical animal damage on lower stems of sycamore.	Low, Medium
G2	Coppiced hornbeam, Ash, Birch, Sycamore, Pine, Larch, Cherry, Alder, Understory of Elder.	Early Mature	33	18	Poor, Fair	Monitor	Standing deadwood with in area. Left for ecology purposes. Deadwood within crowns. Trees are slightly scrappy. Squirrel damage with slight compaction issues.	Low
G3	Ash, Oak, Wild Cherry, Sycamore with an understory of mainly Hawthorn	semi mature to mature	30	16	Poor, Fair	None - Could be part of a larger scale management program.	Smaller planted area limited shrub layer. Contains an historical boundary marker. Trees are not notable.	Low



### Appendix 3: Tree and Tree Group Position Plan

Not all numbers included on printed plan please see: [https://drive.google.com/open?id=1-A9iNjr\\_JMi8A0guWfWra8B0cAE7UEHk&usp=sharing](https://drive.google.com/open?id=1-A9iNjr_JMi8A0guWfWra8B0cAE7UEHk&usp=sharing)



## Appendix 4: Key to tree Data

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### Number:

Trees are recorded as **T1, T2** etc., and Groups as **G1** etc. Areas where notes are needed are marking in yellow

### Species:

The English name of the tree species.

### DBH:

The diameter of the tree at 1.2 metres above ground level was measured using a girth tape (DBH tape). The measurement is recorded in centimetres. Where the tree has an obvious main stem this stem was measured and recorded in the DBH column. In some instances where the tree has more than one stem **the** DBH was measured just above the root flare – this is indicated by ‘ms’ (for multiple stem) in the DBH column. In some cases, dense ivy on the stem of the tree meant that the measured diameter is larger than the true diameter. In these instances, a reduction of the DBH to account for the ivy was made by the surveyor.

### Age:

The tree was ascribed to one of three age classes as follows:

Young	= the first third of the estimated life expectancy
Semi-Mature	= the second third of the estimated life expectancy
Mature	= the last third of the estimated life expectancy
Over-Mature	= Over Mature. In slow decline
Veteran	= Veteran (or near veteran status) - “Veteran” trees have no precise definition, but are trees considered to be of biological, aesthetic or wildlife interest, because of their age or trees in the ancient stage of their lives or trees that are old relative to others of the same species. Special measures, such as increasing the tree protective zone distances and selective surgery could significantly increase their useful life expectancies.

*There may be some overlapping with the above categories.*

### Condition:

- EXCELLENT: tree is without any visible symptoms
- GOOD: no apparent problem with
- FAIR: minor problems with
- POOR: major problems with
- DEAD

### Physiological Health:

This refers to the evident health of the tree and if any apparent diseases, pests or damaged areas are present within the tree. Abiotic and biotic factors are both recorded.

### Recommendations:

Prescriptions for remedial actions to alleviate problems or defects within the tree.

Recommendations to fell are normally to ground level unless specified.

## Appendix 5: Estimated Time Scales

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It is strongly emphasised that these categories and figures are only guidelines which are applicable under normal circumstances only. The occurrence of extreme weather and other events beyond ones control do occur and so would have to take priority over recommended work.

### **Urgent**

Target completion - within 24hrs

- Making safe of storm damaged trees in adverse weather conditions
- Large limbs snapped and hung up over high vehicular and pedestrian flow
- Trees that pose imminent danger to people or property

### **High Priority**

Target completion – within 2 months

- Dead, dying, diseased and dangerous in high pedestrian and traffic flow areas
- Tree branches below 2.5mtrs over high pedestrian flow footpaths
- Tree branches below 5.2mtrs over high traffic flow roads
- Tree branches causing damage to property
- Trees with root plate movement

### **Medium Priority**

Target completion – within 2 years

- As High Priority but without causing damage to person or property and in low risk areas
- Snapped limbs/branches on public open space with low pedestrian access

### **Low Priority**

Target Completion – 2 years+

- All other general tree maintenance work that is causing no risk of harm to persons or property.

## Appendix 5: Glossary of Terms & Abbreviations

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- **Compression fork/Co-dominant stem.** Can be a failure point at a fork between two branches or limbs, which, as they grow, press against each other, causing a build-up of stresses similar to the effect you would get if a wedge were hammered into the fork. Increased end-loading as the limbs grow can lead to the fork failing.
- **Cracked bark.** Another indicator of structural weakness in the wood. It can be on the surface of reaction growth that has grown rapidly or it can show a shearing failure point, where the load on a branch/limb becomes too great and causes the grain of the wood to separate and fail.
- **Deadwood.** Twigs or branches in the crown of the tree which have died off. This can indicate the tree's inability to transport fluid and/or nutrients to its extremities signifying that the tree is under stress or has failing systems. It can also take place naturally when a branch affects a process known as "self-pruning". This occurs when the energy needed to sustain the live branch outweighs the energy it produces
- **Decay.** This can be minor, such as on the surface of a shallow wound, or severe, with large sections of the trees structure being decayed. It is a problem that can progress to the point where the tree collapses.
- **Epicormic growth.** This can sometimes indicate a problem within the tree's systems. Epicormic growth is produced by the tree to gain a greater ability to photosynthesize when it is in need of extra resources. Some trees, such as Lime, produce epicormic growth, particularly from the base, as part of their natural growth habit.
- **Lean.** A lean does not necessarily mean inherent instability but when a tree's stem loses structural integrity, it can become a hazard, especially if the weakness is on the side to which the tree is leaning.
- **Loosened bark.** This indicates a problem under the surface in either the wood or the inner layers of bark (cambium). Bark can fall away from decaying wood behind it, or can start to die off due to a range of reasons (bacterial infections etc). The bark can then no longer transport fluid or nutrients around the tree.
- **Mechanical Damage.** Damage caused by non-biological means i.e. vehicle impact or damage caused by animals trying to eat bark. Damage of this kind can penetrate into the structure and is more often found on the surface of the tree.

- **Reaction wood/growth.** Where weakness or decay within a tree occurs, the tree will grow material to compensate for it. It is often seen as 'cable' like structures with patches of uneven bark which indicate irregular growth patterns. Another form of reaction growth can be seen as 'bulges' on a trees structure. Large amounts of reaction growth indicate advanced decay or weakness within the tree structure.
- **Weak unions.** The unions between the stem (trunk) and structural limbs or branches sometimes develop weakly, and as the tree ages can become unstable. This can be exacerbated when the tree is affected by other problems. Also, certain tree species are prone to developing weak unions.

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