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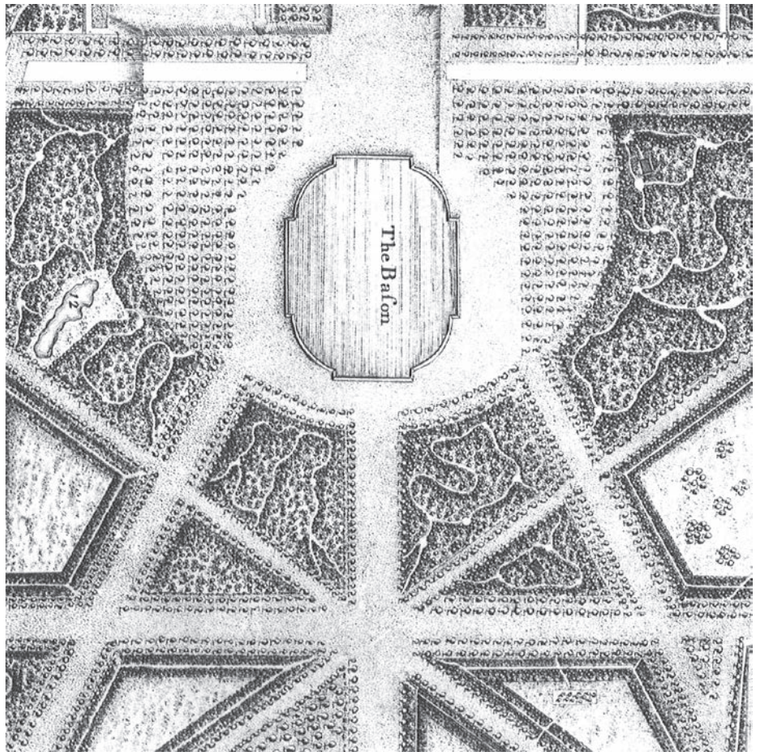
Kensington Gardens Tree Strategy

Version 6.0; FINAL

Prepared by LUC in association with The Royal Parks
19.06.2020



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Project Team

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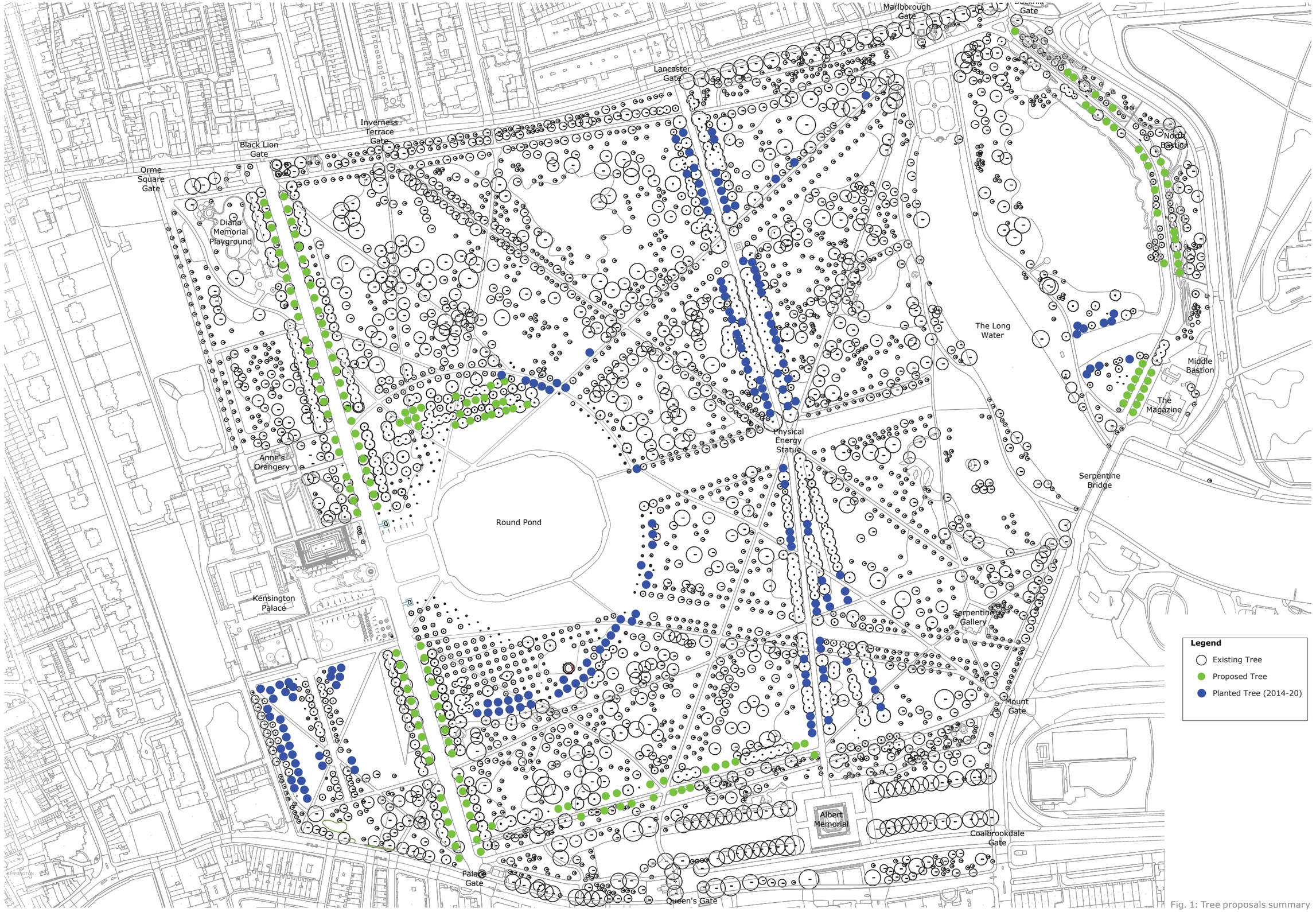


Fig. 1: Tree proposals summary

1 Executive Summary

This report is an update and refinement of the 2014 Tree Strategy for Kensington Gardens which focused on providing specific proposals for tree planting in selected areas and avenues within the Gardens. The Action Plan has been developed in conjunction with the TRP team with the objectives of ensuring suitable succession - mainly in avenues - which will reinforce the outlines of the historic Bridgeman plan, providing landscape and ecological enhancement as well as arboricultural interest.

The plantings that took place between 2014-20 (as shown in fig. 1) represent just under half (171) of the original 2014 proposals and have been a success in ensuring the continuity of the tree avenues in Kensington Gardens.

The remaining proposed planting is concentrated in specific locations, with revised distributions, densities and species (as shown in fig. 1). Overall it is proposed to plant a further 163 trees - which could reasonably be undertaken over the next 5 years at about 40 to 50 trees per year, allowing for the additional workload of establishing the plantings. Particular attention has been paid to the proposed replanting of the Broad Walk and several options have been put forward for consideration.

The tree species proposed are particular to the locations of the constituent avenues and have been carefully considered to achieve a suitable balance of historical integrity, ecological enhancement, landscape diversity and arboricultural interest. In future years the review will focus on other tree avenues and may become increasingly subject to change and updates following any tree losses that were not predicted. However, as planned, the Action Plan indicates the following numbers in relation to existing populations.

	% of total population 2010 survey	% of trees in avenues of 2010 survey	% of trees in 2014 Action Plan	% of trees in 2020 Action Plan
Lime	39.6	26	27.8	7.7
Sweet Chestnut	5.7	3	13.2	1.7
Horse Chestnut	11.9	3	-	-
Plane	9	6.5	12.8	-
Oak	7.2	0.5	28.5	57.3
Indian H. Chestnut	-	-	-	7.1
Elm	-	-	-	4.1
Other	26.6	6.6	17.7	8.2

The Action Plan represents roughly 10.7% of the 2010 tree population. Some planting - as in the Great Bow - was essentially like-for-like replacement; but the majority of planting proposed here is to fill existing gaps and to provide succession or reinforce weakened patterns in the Bridgeman layout.

Planes along Lancaster Gate Walk

The view from Buckhill Axis

Planted Limes on The Great Bow

Planted London Planes on Lancaster Gate Walk

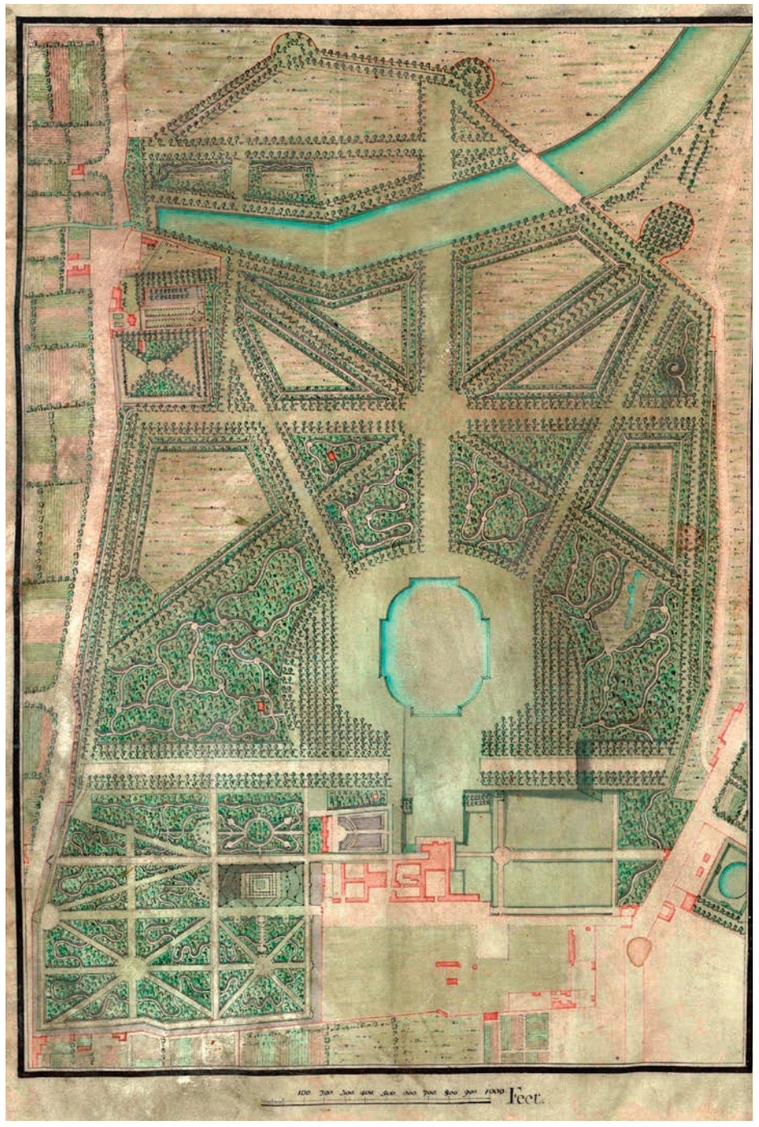


Fig. 2: The 1733 Charles Bridgeman plan is an 'as built' drawing of the completed layout

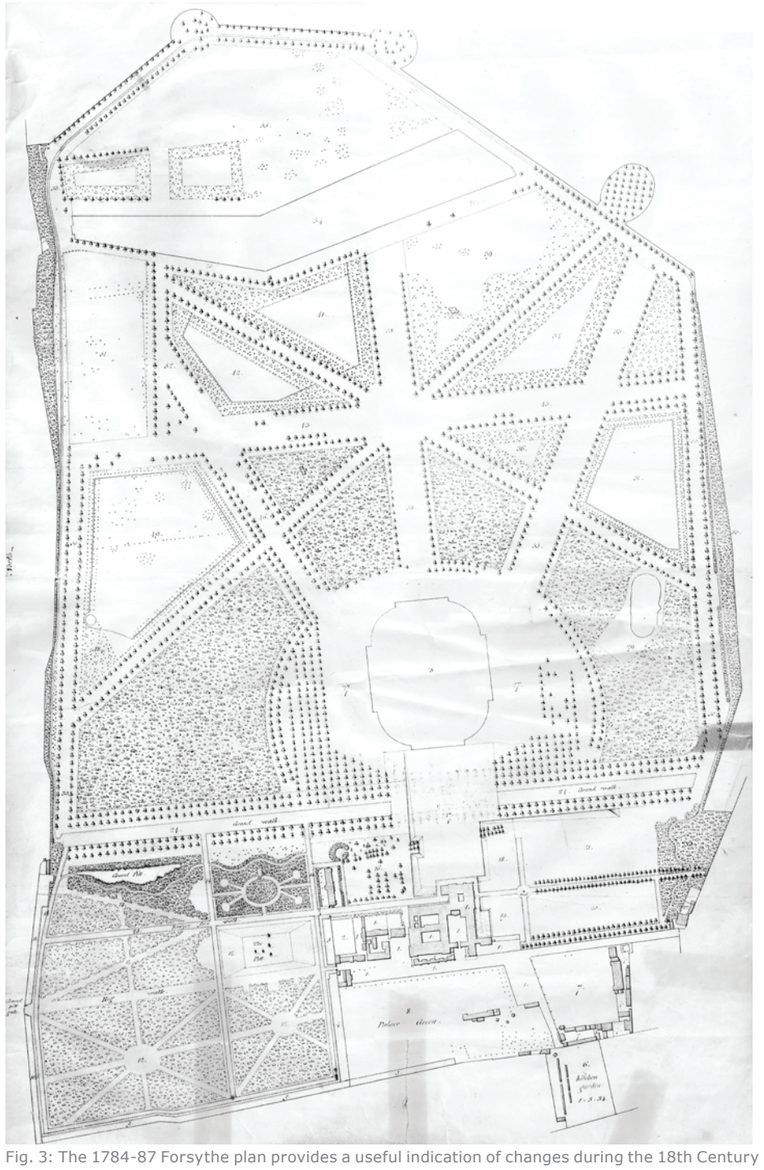


Fig. 3: The 1784-87 Forsythe plan provides a useful indication of changes during the 18th Century

Fig. 4: The 1870 OS plan records changes such as the Albert Memorial, under construction at this time

2 Introduction and Purpose

The Kensington Gardens Avenue Tree Strategy is an ever evolving document with an aim of planning, undertaking, monitoring and reviewing work on the vast number of tree avenues within the park. With the overall aim of reinforcing an appropriate pattern and diversity of trees in the gardens for the foreseeable future with a strong regard of the rich historical context.

The updated 2020 version of the Kensington Gardens Avenue Tree Strategy looks back at the 6 intervening years since the last report and reviews the completed tree planting works in order to inform the next phases. Since the last report a number of new considerations have come to light, particularly with the spread of tree diseases and new biosecurity measures put in place to control them. The 2010 and 2014 reports learned from the losses of Elms and this report now looks to safe guard tree stock and canopy cover through careful selection of species, clonal varieties, and approach to planting.

This objectives of this update are to;

1. Update the previous issue (2014) to report on the completed avenues including the as-planted layout, species, changes form original proposals and include any lessons learnt.
2. Update future options for the Broad Walk to reduce from 4 to 2.
3. Update future proposals for all other outstanding avenues to review and include revised recommendations on tree species and layout etc.
4. Update the park-wide avenues masterplan.
5. Provide detailed setting out plans for the updated proposals.

Since 2014 The Great Bow, Dial Walk, The Dials - West Row, Lancaster Walk and Great Bayswatwer Avenue have all received infill tree planting and can be marked off as successfully completed in this report. A number of other avenues have received minor works but are still ongoing and the proposals require review due to the additional tree loses or new circumstances that have come to light. The availability of topographical mapping is also a important factor in updating the proposals to review spacings and alignment of trees to give accurate grid coordinates when planting.

As identified through the Historical Surveys (LUC 1982), the various editions of the Kensington Gardens Management Plan and the 2010 Tree Strategy, the pattern of tree planting still reflects substantially that laid out by Charles Bridgeman in the period 1726-33 (fig. 2). The 1784-87 Forsythe plan (fig. 3) is used as a historical reference point. There are some later adaptations and additions (such as the loss of the Bayswater House enclosure and the secondary alignment of Lancaster Walk in response to the siting up the Albert Memorial, shown on the 1870 OS, fig. 4); but the main structural avenues defining the Quarters are of Bridgeman, albeit in second or third generation of trees.

The 2014 study and its resultant Action Plan responded directly to policies and recommendations which were formed in the Kensington Gardens Management Plan and actions identified in the Kensington Gardens Operations Plan, both of which were used in the latest Green Flag submission.

The evidence for original species in these respective avenues is thin. Accounts suggest that Lime and Elm were major components and Sweet Chestnut was also significant. However the potential planting palette of native forest trees is more limited at the present time. This is due to the loss of Elm (to Dutch Elm Disease since 1970s), the increasing loss of Horse Chestnut (to bleeding canker: *Pseudomonas syringae* and leaf miner: *Cameraria ohridella*) and the limitations on planting Ash (due to *Chalara fraxinea*) (although it does not appear to have been a significant component in Bridgeman). There are now also threats to Plane (canker stain: *Ceratocystis fimbriata*) and Oak (Oak processionary moth: Thaumetopoea processionea and acute oak decline). Nevertheless the balance between visually strong assemblies and arboricultural diversity is one of the characteristics of Kensington Gardens which has public appreciation and acclaim.

The study has essentially been a team effort – and much the stronger for it. The feed-in and debate with different team members has been important in generating ideas, reviewing possibilities and coming to rounded recommendations. However the context remains dynamic; change may arrive unexpectedly in avenues and quarters outside the core of this study. In any case there will still be a need to take account of such other "lateral" changes and occurrences which may then affect management priorities for the whole.

Thus the recommendations put forward here are not necessarily the whole story… and they may become more in need of update and review in the later years as progress is made with the current priorities. It has become evident that our trees are becoming more and more at risk and therefore the review of this document will becoming increasingly important.

As part of this study it was deemed important to set down a traceable logic of the way in which the recommendations were shaped. Outwardly this is "justification"; but more importantly it attempts to show the process so that others can follow and even challenge what is planned here with best intent.

The study seeks to maintain an overall perspective of the historic pattern, with a current population of some 3,200 trees and with a reasonable age distribution; good diversity and balance of formal and informal layout – which attracts and largely satisfies.

There is a particular qualification to make about the accuracy of the base plans as represented in Arbortrack. The canopies shown on the base survey (and by interpretation, the trunk positions of individual trees) were extrapolated from aerial photography (c. 2006). More detailed positional examination in the current studies has shown that the transposition, while confirming the generalities of pattern and distribution, is variably inaccurate – in some cases, like the North Feathers – being up to 7m out of position. It has been necessary to readjust the positions / alignments in key avenues although such "correction" is still mostly only by pacing rather than by measured surveying. Recent topographic surveys have helped this considerably and over time the base plan is becoming more accurate.

Field verification also threw up a few surprises. It confirmed for example that spacing of trees – even within the same avenue of apparently similar planting vintage – may vary considerably. Planting at 11.5m centres is fairly typical although variations run from 9m up to 15m; and in some cases the original spacing has been thinned (as for the Norway Maples on the Broad Walk) to give a 23m spacing of alternate trees.

These variations in spacing probably reflect, in part, incremental replacement planting in various historical phases, plus elements of "fitting in" to accommodate other additions including paths and artefacts.

In the main the alignments seem to have stayed substantially "in line" of the original rows even though spacing along the rows has been varied – as described above. However there are variations even here and a couple of curiosities now show up: the first of these is the alignment of Great Bayswater Walk when compared to the south-eastern corridor of Mount Walk. In practice these two "rides" might be assumed to be symmetrically balanced in relation to the central axis of Front Walk and forming the patte d'oie from the East front of the Palace; but they are at slightly different angles.

There is a further "complication" at Great Bayswater Walk in that the southern inner row (sweet chestnut replanted c.1990s) has leap-frogged into the ride so that the Speke Monument – which was centrally placed in the ride according to 1870 OS – is no longer in the centre but slightly to the south of the axis. The puzzle of alignment to the spire of St Mary Abbott's in Kensington is also confirmed here – being on the axis of Budge's Walk – the footpath on the northern side of the ride rather than in the central axis of the ride itself. Curiously, Speke, the statue of Queen Victoria in front of the Palace and the church spire form their own "ley-line" within the ride.

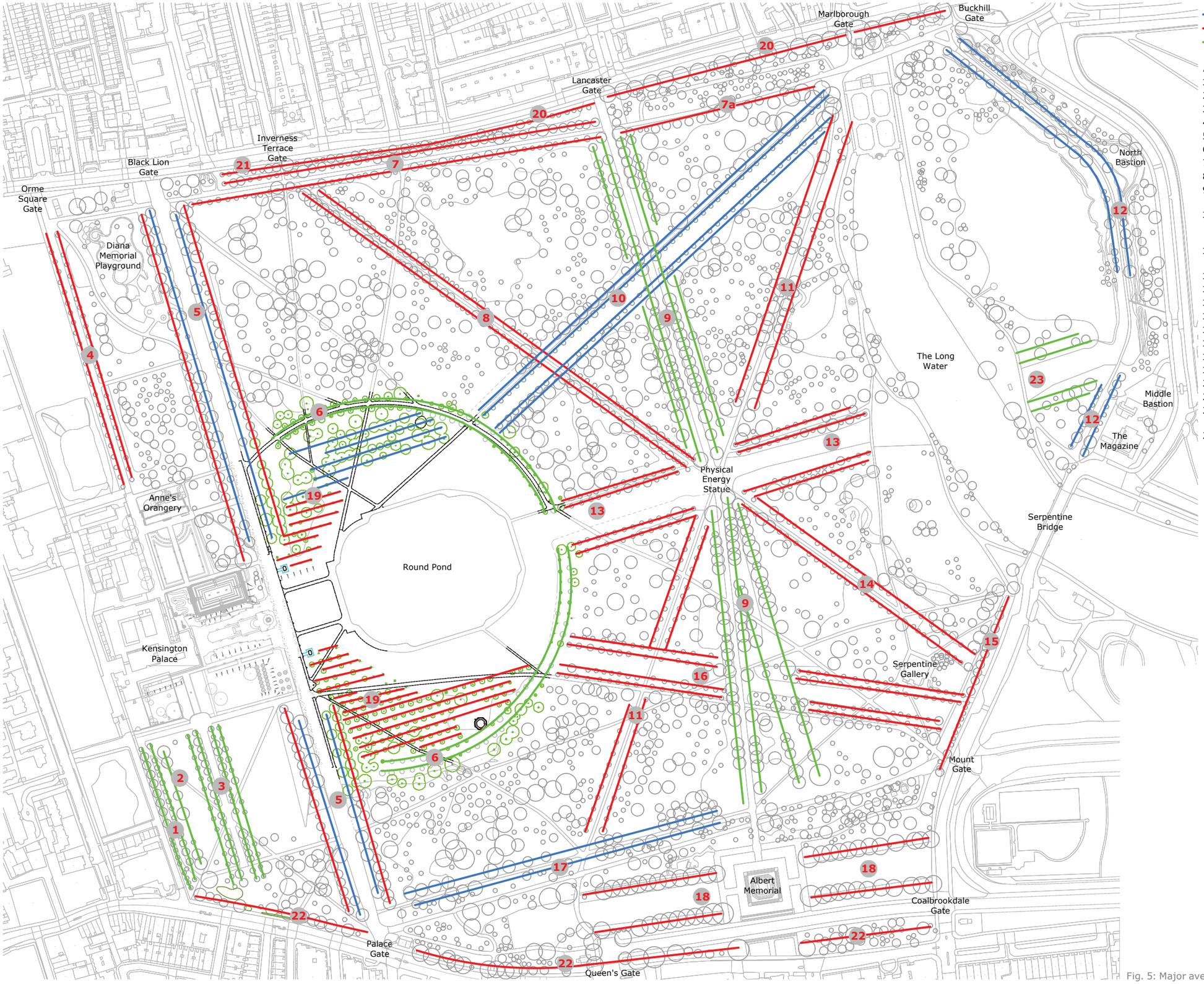


Fig. 5: Major avenues showing those included in the study

3 Methodology

This study followed on from the 2014 work which used the TRP survey plans from Arbortrack with updates to these via on site checks and adjustments to correct with any further losses/additions. There was quite a range of positional variation and occasional error in the original survey some of which required correction and adjustment even to complete the fieldwork (for example the southern inner row of trees forming Great Bayswater Walk was not shown on true alignment; similarly, the spacing and curvatures of The Great Bow did not tally with what was being seen in the field). Where such correction has been made it has mostly been done by pacing. In some cases (such as Dial Walk) incremental measurements were made along lines and between rows to create a more accurate picture of the existing layout.

Since 2014 a number of the avenues have been surveyed professionally and these topographical results are now integrated into the base plan, making this more accurate.

In 2014 LUC did the fieldwork to check presence and general condition of each of the avenues identified in the brief. A ninth avenue at Buck Hill was subsequently added in discussion with the team (these are shown in fig. 5). The design process followed a similar methodology for both studies as shown in fig. 6, with LUC tabling initial ideas and outline proposals for team discussion and the process was much assisted by doing a joint walkover to review each avenue in context as well as seeing these as a part of the wider set within Kensington Gardens.

Having estimated an initial planting programme - to get a general scale to the whole operation - the gaps in individual avenues were recorded; strategic fellings or anticipated losses [if any] were assessed and initial planting options set out for further discussion with the team. However, as the proposals for one avenue might then have influence on the species or timings for another avenue, and for the landscape image/effect of the Gardens as a whole, this became an iterative process, also taking into account choices in layout and density.

By way of example it had previously been identified that the inner rows of Maples along the Broad Walk had been deteriorating and had suffered significant squirrel damage such that several had already been removed. However this was partly disguised by some of these damaged trees being the alternates which were removed to allow for the wider crowns of the maples to "make space" from the late 1990s. A number of options have been considered e.g. retaining and simply interplanting with Maples in the available gaps to make up a more complete pattern of alternates; or the possibility of removing all Maples in one clearance and then having - spatially - a free hand to replant a full and symmetrically balanced avenue with a different species. Such matters were the subject of team discussion. But of course a decision here - on species - could also influence appropriate choice of species in another avenue to avoid over concentration on one species.

Thus team debate also helped to clarify priorities and to develop the Action Plan set out on the following pages.

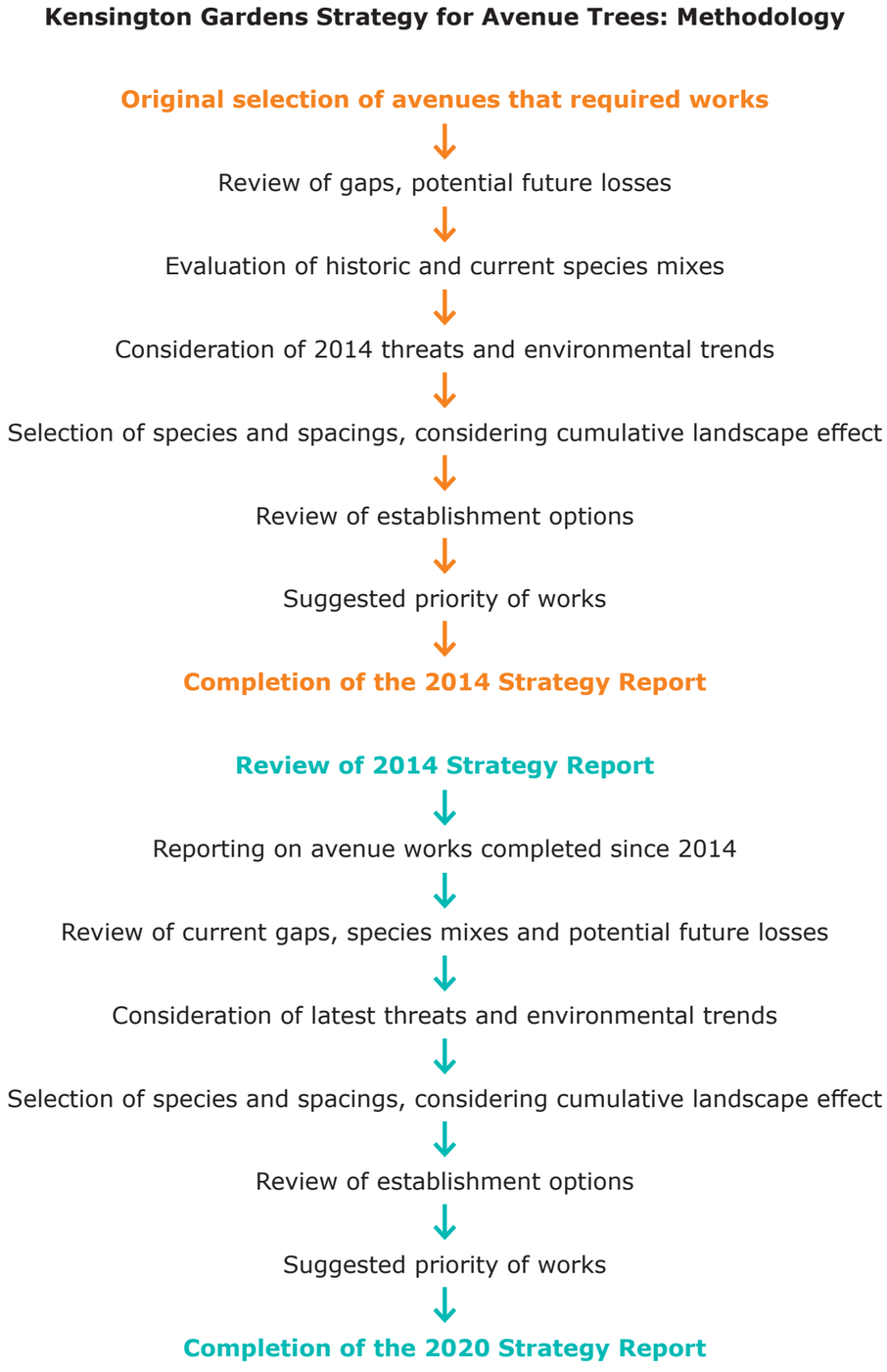


Fig. 6: Assessment logic flow chart

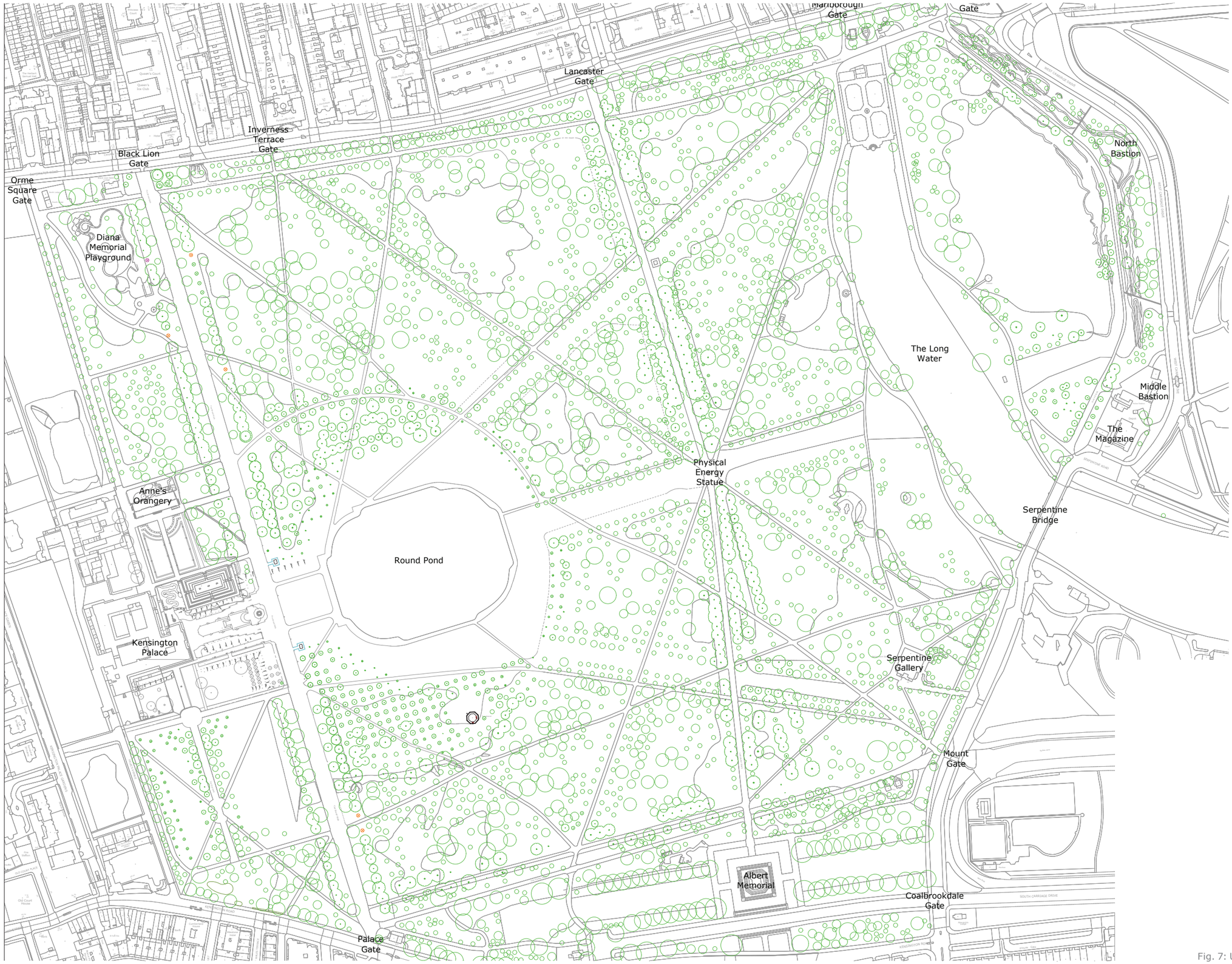


Fig. 7: Updated existing layout

4 Baseline and Principles

The baseline survey was undertaken by LUC using TRPs 2008 base plan (itself extracted from aerial photography of 2006) and updating locally for recent gains and losses. It was acknowledged that positional survey of individual trees was not particularly accurate although the overall distribution and pattern were acceptable for those purposes. These inaccuracies have been updated in the passed 6 years with topographical surveys undertaken on specific areas. All the avenues in this report can now be mapped accurately with pin point grid reference coordinates for existing and proposed tree planting.

To understand the general distribution of trees, the 2010 study summarised the following:

- Overall tree population: 3178 trees
- No. of trees in avenues: 1568 trees (46% of all trees)

With the following breakdown of tree species`:

Lime	1358	(39.6%)	884 in avenues	(26%)
Sweet Chestnut	195	(5.7%)	108 in avenues	(3%)
Horse Chestnut	408	(11.9%)	106 in avenues	(3%)
Plane	307	(9%)	224 in avenues	(6.5%)
Oak	246	(7.2%)	18 in avenues	(0.05%)
Other trees including ornamentals and exotics (includes Maples, Hornbeam, Indian Horse Chestnut, Liriodendron)	913	(26.6%)	228 in avenues	6.6%)

Since 2014 there have been some additions such as the Feathers on the Palace / Round Pond frontage, some trees in the front Quarters and the infill planting representing perhaps 70 trees and partly offset by a few losses – perhaps a net increase of 50 trees in this period.

At the outset of this study it was estimated that between 250 and 350 trees would be needed (depending on which options are adopted) in order to address the nine target avenues over the next 10 years. These numbers were provisional and have then been tested through the present study; but they indicate a population increase of roughly 7% to 10%, partly offset by a smaller number of removals and losses.

In theory, the recent changes (losses and additions) have been recorded in Arbortrack; in practice not all have yet been updated, however with the topographical surveys now available, accurate planning can be undertaken as required.

The action plan for this phase of planting is targeted at the next 10 years (say 2020 - 2030) and is based upon the following principles:

1. Over-riding priority to conserve existing trees for **longevity**, as long as possible;

2. Secure new planting which will retain / reinforce the **heritage pattern** (predominately Bridgeman);

3. Plant only where there is **suitable space** to enable successful establishment (wide spacing or open run of spaces);

4. Remove trees **judiciously** (with appropriate notifications) to enable "sets" of trees to establish as similar age groups;

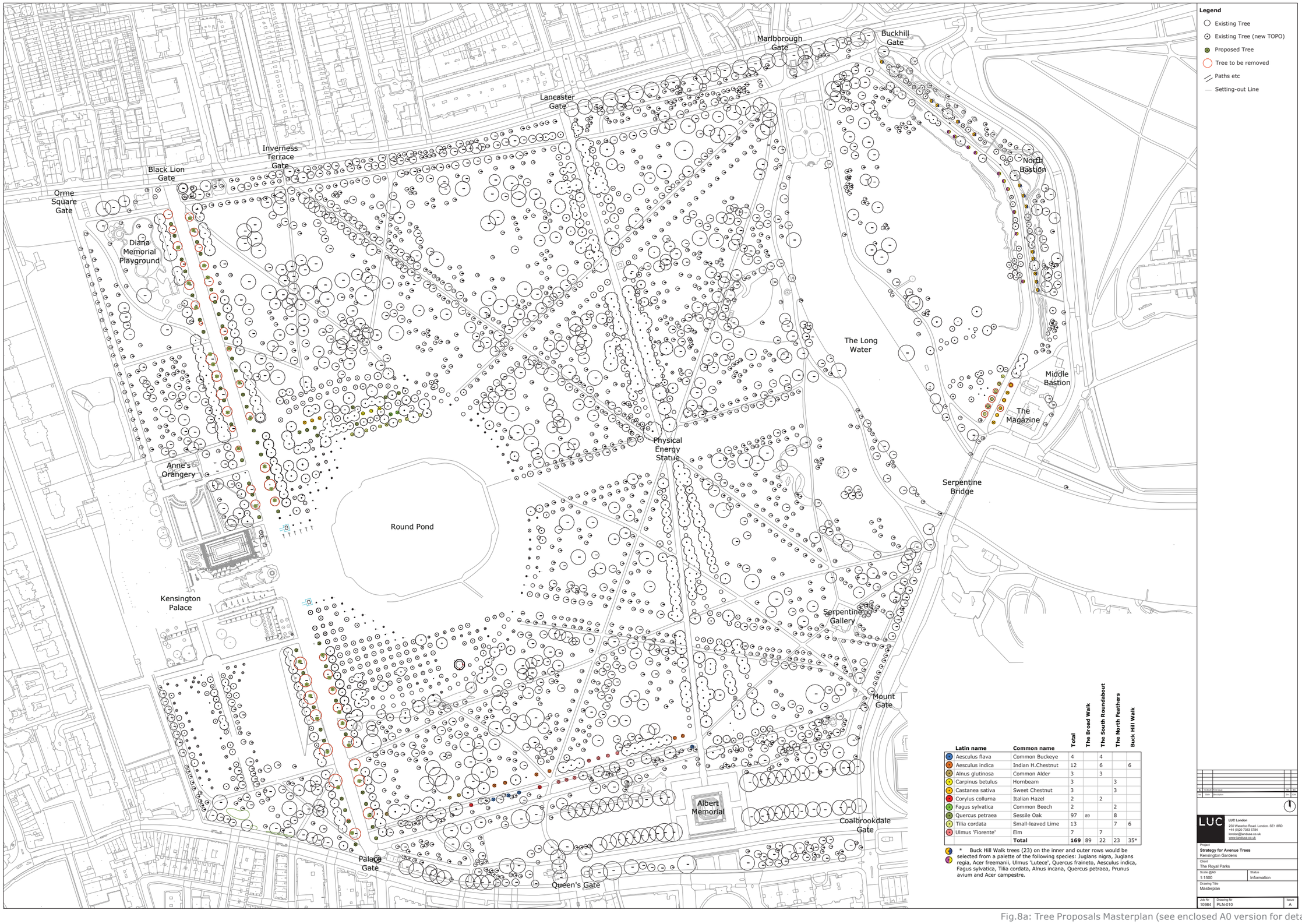
5. Select **species** (Predominately UK Natives) which are appropriate to the Bridgeman setting for tree avenues;

6. In line with the TRP Biosecurity Policy, consider and review risks of existing and potentially incoming **diseases** which may limit or restrict use of some species. (eg currently Horse Chestnut, Ash should not be planted);

7. Later avenue additions and adaptations may use other trees, including "**exotics**" in short runs – usually in runs of 3 to 5 trees of same species;

8. While respecting the limited palette of forest trees for the Bridgeman avenues, seek to provide a **diversity of species** elsewhere which enhance ecological value and arboricultural interest and have the ability to cope with the **changing climate. Extending Provenance** to 2 to 5 degrees of latitude further south should see trees better adapted to global warming;

9. Acknowledge that at any stage the proposals will need to take into account unforeseeable factors that will lead to changes or adaptations – including unexpected losses to storm, disease etc. – which in turn may influence scope and priority.



Latin name	Common name	Total	The Broad Walk		The South Roundabout	The North Feathers	Buck Hill Walk
Aesculus flava	Common Buckeye	4			4		
Aesculus indica	Indian H.Chestnut	12			6		6
Alnus glutinosa	Common Alder	3			3		
Carpinus betulus	Hornbeam	3				3	
Castanea sativa	Sweet Chestnut	3				3	
Corylus colluma	Italian Hazel	2			2		
Fagus sylvatica	Common Beech	2				2	
Quercus petraea	Sessile Oak	97		89		8	
Tilia cordata	Small-leaved Lime	13				7	6
Ulmus 'Fiorente'	Elm	7			7		
	Total	**169**		89	22	23	35*

* Buck Hill Walk trees (23) on the inner and outer rows would be selected from a palette of the following species: Juglans nigra, Juglans regia, Acer freemanii, Ulmus 'Lutece', Quercus fraineto, Aesculus indica, Fagus sylvatica, Tilia cordata, Alnus incana, Quercus petraea, Prunus avium and Acer campestre.

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Project
Strategy for Avenue Trees
Kensington Gardens

Client
The Royal Parks

Scale @A0: 1:1500
Status: Information

Drawing Title
Masterplan

Job Nr: 10984
Drawing Nr: PLN-010
Issue: A

Fig.8a: Tree Proposals Masterplan (see enclosed A0 version for detail)

5 Proposals

As indicated in the Flow Chart Methodology, the process of refining the proposals for the 9 selected avenues and appendages has been essentially iterative. The prescription for one avenue depends in part on what is happening in the other avenues – particularly in relation to species choices but also influenced by priority and timings as well as overall landscape effect.

There are of course continuing uncertainties over the health of key species – Horse Chestnut, Plane and to a lesser extent, Oak (Refer to the 'Annual Update on Tree Diseases and Disorders and Review of Arboricultural Resources' by TRP in the appendices). Incoming disease and losses could easily cause a shift in the possibilities and priorities. However, the current proposals provide a realistic sequence for planning these renewals on existing evidence.

An assessment has therefore been made of each of the constituent avenues in the study – to determine existing populations in each row, overall condition, existing gaps and likelihood of early losses which could influence choices and priorities for replanting.

The overview is also made in the context of the historical pattern – generally as indicated by the Bridgeman plans (1733-34), the Forsythe plans (1784 - 1787), the latter showing the Bridgeman layout at about 50 years maturity, and showing some evidence of tree losses in particular avenues. A further check has then been made against the O.S. 1870 edition at 1:2500 scale which is fairly accurate in its depiction of trees (including separate symbols for recently planted or young trees). Together, review of these plans gives some indication of change bearing in mind that we are now nearly 300 years from Bridgeman's original plantings and there are few (if any) survivors from that period, most trees being of second, third and sometimes fourth generation.

The Tree Proposals Masterplan (fig. 8a and LUC drawing 10851_010) provides an overview of the proposed trees whilst the table (fig. 8b) summarises the planting numbers.

Latin name	Common name	Total	The Broad Walk	The South Roundabout	The North Feathers	Buck Hill Walk
Aesculus flava	Common Buckeye	4		4		
Aesculus indica	Indian H.Chestnut	12		6		6
Alnus glutinosa	Common Alder	3		3		
Carpinus betulus	Hornbeam	3			3	
Castanea sativa	Sweet Chestnut	3			3	
Corylus collurna	Italian Hazel	2		2		
Fagus sylvatica	Common Beech	2			2	
Quercus petraea	Sessile Oak	97	89		8	
Tilia cordata	Small-leaved Lime	13			7	6
Ulmus 'Fiorente'	Elm	7		7		
	Total	**169**	89	22	23	35*

* Buck Hill Walk trees (23) on the inner and outer rows would be selected from a palette of the following species: Juglans nigra, Juglans regia, Acer freemanii, Ulmus 'Lutece', Quercus fraineto, Aesculus indica, Fagus sylvatica, Tilia cordata, Alnus incana, Quercus petraea, Prunus avium and Acer campestre.

Fig. 8b: Table summarising planting numbers

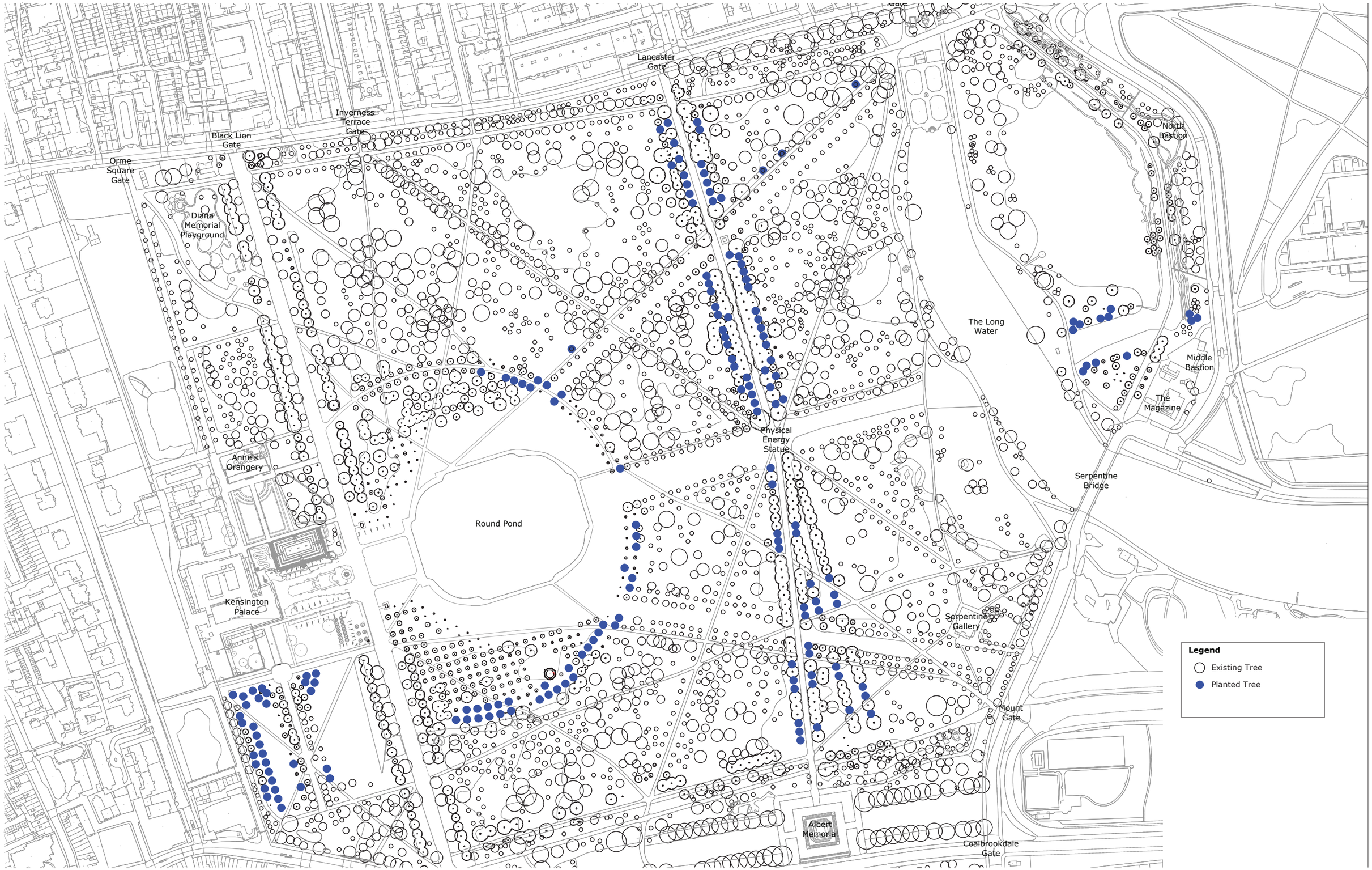


Fig.9a: Tree Planting Summary Plan

6 Plantings - 2014 to 2020

The following pages provide an overview and summary of the avenue tree planting that took place between 2014-20. Approximately half of all the proposed tree planting set out in the 2014 strategy took place and with the exception of the Broad Walk all Priority 1 avenues set out in the 2014 strategy were completed. The drawing on the opposite page gives an overview of the plantings.

The below tables outline when specific tree planting took place and the number of trees planted. It also shows the range of species in each different avenue.

Year	Avenues	No. trees
2014-15	Great Bayswater Walk (SW) The Great Bow	5 42
2015-16	Dial Walk The Dials - West Row	13 7
2016-17	Lancaster Walk (North) Lancaster Walk (South & Spline)	50 33
2018/19	Buck Hill Axis	13

Latin name	Common name	Total	The Great Bow	Dial Walk	The Dials - West	Lancaster Gate Walk	Great Bayswater Avenue	Buck Hill Axis
Castanea sativa	Sweet Chestnut	16		12				4
Fagus sylvatica	Common Beech	3						2
Juglans nigra	Black Walnut	2					2	
Morus nigra	Mulberry	7			7			
Ulmus 'Lutece'	Elm	12			12			
Platanus × acerifolia	London Plane	54				54		
Quercus luccombe	Luccombe Oak	2					2	
Tilia cordata	Small-leaved Lime	75	41			30		4
	Total	**171**	41	12	19	84	4	10

Fig.9b: Tree pe Summary

7 The Great Bow

Replanting of The Great Bow was completed in the planting season of 2014/15 following the submission of a Section 211 notification to the Planning Department of the London Borough of Westminster in August 2014. Since then the trees have been establishing well with no recorded failures. A proven clonal variety of *Tilia x europaea,* known as *'Pallida',* was picked from Barcham's nursery stock with a history of being a reliable, long lasting tree with good form and structure. The original re-planting of these Limes, following Bridgeman's plan, was undertaken in the 1990s with mixed success and some subsequent replacements. Over time the clonal variety and planting detail proved to be problematic, resulting in weakened forms, and epicormic growth and therefore the requirement for replacement with good stock.

The majority of replacements (30) were in the southern arc with a further 12 in the northern arc close to the intersection with Budge's Walk. The setting out for this northern arc is firmly established by the alignment of The Great Bow pathway; but in the southern arc there is no constructed path – just the grass ride - the previous alignments was locally "flattened". LUC therefore suggested this area was surveyed so that accurate GPS co-ordinates could be provided for the setting out.

The intention was to retain the southern arc as a grass ride rather than continue the constructed gravel-finish path. Two maturing Limes with low canopies, on-line and at each end of the southern arc mask the entry into the grass ride; as suggested these have been crown-lifted to improve visibility. In the longer term it may well prove preferable to remove these two trees to give room for the adjacent "arc" trees to develop.

Details

- Name: The Great Bow
- Location: Surround the Round Pond and connecting to the Broad Walk
- Thumbnail history – as shown on
  - Bridgeman 1733: Double row of trees in, 840m long
  - Forsythe 1784 & OS 1870: present

- Existing numbers surviving in this avenue:

	Established	Newly Planted	Gaps	Total
Outer	38	22	3	60
Inner	39	19	1	58

- Reason for work: Some poorly formed stock will start to split and fail.
- Strategy: Replacement of 41 poorly formed specimens
- Method:
  - Species - *Tilia x europaea 'Pallida'*
  - Layout/density/spacing: Trees set out using grid reference coordinates for accuracy
  - Removals: 41 – directly replaced
  - Date undertaken: 2014/15
- Considerations for future continuation / management:
  - Replacements have exposed some of the conserved trees in the southern arc to be "out-of-line". They may need local adjustment / transplanting. Trees in northern arc can mostly be replaced "on station".
  - Crown lift two existing mature limes at South West end of arc and Front Walk to improve visibility at start of grass arc.
  - Monitor for signs of fungal infection.

- Establishment:
  - All 42 of the planted trees have established well

One of the poorly formed trees, before removal

The northern arc of the Great Bow with Lime trees establishing well

New planting against the sprawling stem of an existing tree

Fig.10a: The 1784 Forsythe plan shows an inner avenue of elm trees

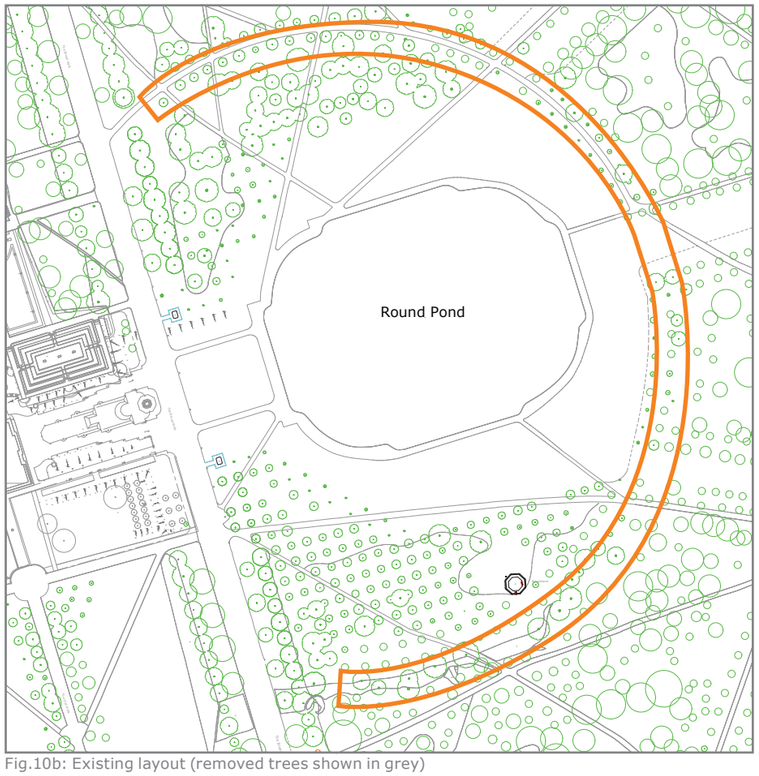


Fig.10b: Existing layout (removed trees shown in grey)

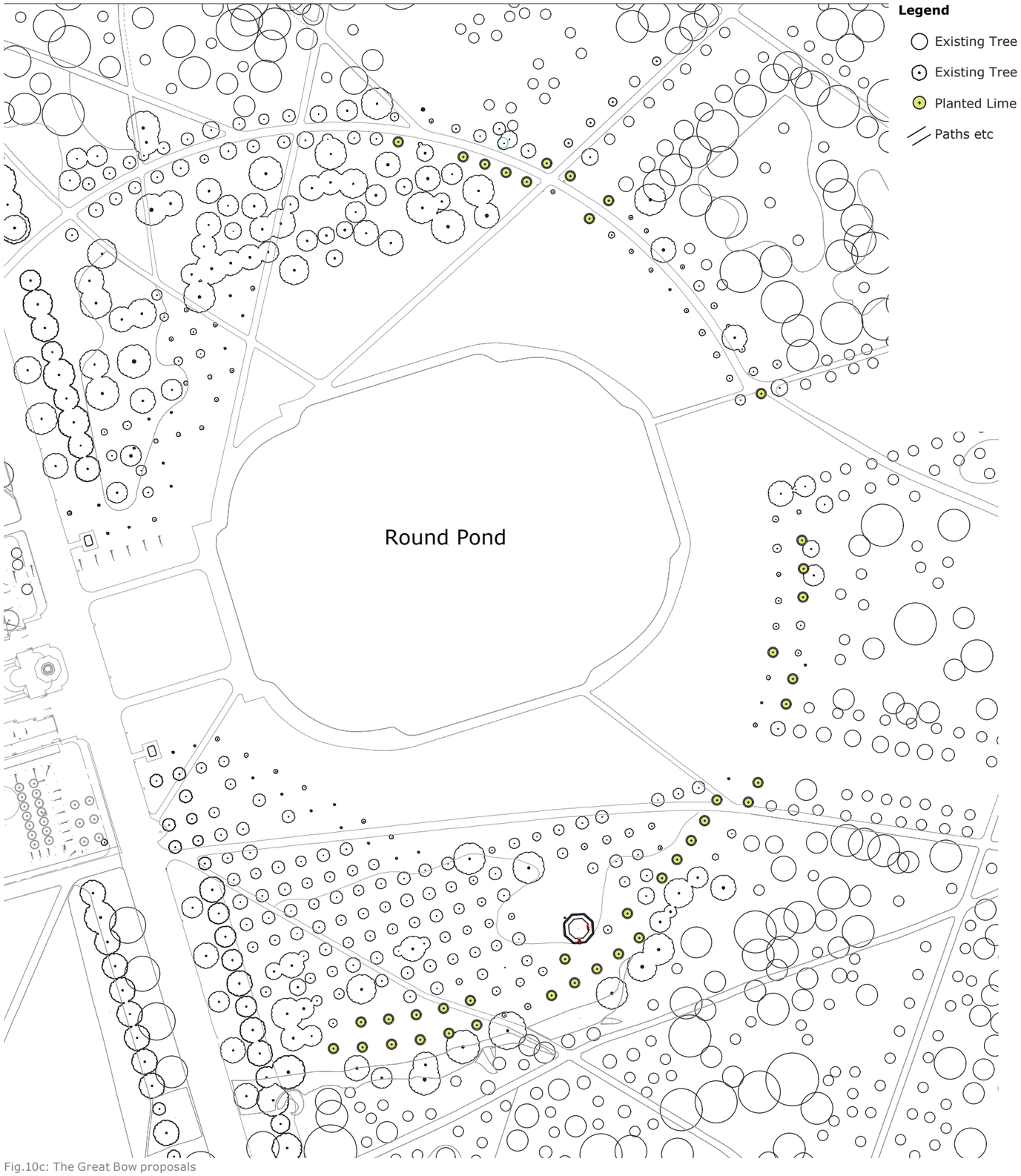


Fig.10c: The Great Bow proposals

8 Dial Walk

Dial Walk is a strategically important avenue due to it's close proximity to the Palace and the framed view it provides onto the Palace's southern facade. The plantings were proposed to strengthen and infill the existing avenue but also provide an options for removal of the inner row of Lireodendron which will eventually outgrow the space.

The four missing Sweet Chestnuts (with some spacing adjustments to avoid paths) and a further 10 Sweet Chestnut (5 on each side) forming the "antlers" near the Alcove (cross) path were planted in the 2015/16 planting season. After consideration of numerous options the proposal here was to retain – for the time being – the inner rows of Liriodendron but to thin them to retain the axial view to the southern elevation of the Palace. A single gap in the middle section of the eastern row of Lireodendron is still to be planted.

As part of the works the option to remove the top pair of Liriodendron trees was used to create more of an opening and feeling of space in this area. The kerb lines were also adjusted to reflect the original layout and further enhance this entrance way to the Palace.

It was identified that the proposed works required a archeaological watching brief due to their intrusive nature including removal of mature trees, planting trees and realignment of kerb lines. For detailed recorded information from the watching brief refer to *'Kensington Gardens, Dial Walk, Royal Borough of Kensington and Chelsea: Archaeological Watching Brief Report'* prepared by AOC Archaeology Group in October 2017.

In due course (probably 20-25 years hence) when the more recently planted Sweet Chestnuts have attained good volume and scale, it may then be appropriate to remove the *Liriodendron* avenue entirely rather than to have an ever increasing workload of side trimming to maintain the axial vista of the Palace's South elevation.

Details

- Name: Dial Walk
- Location: Central axis to South elevation of Palace – 4 rows of trees
- Thumbnail history – as shown on
  - Bridgeman 1733: inner rows only (possibly surviving hedge?)
  - Forsythe 1784: inner rows - elms
  - OS 1870: inner rows – elms still in tight corridor
- Existing numbers surviving in this avenue:

	Established	Newly Planted	Gaps	Total
Liriodendron West	17	-	0	17
Liriodendron East	18	1	0	18
Sweet Chestnut West	12	2	0	14
Sweet Chestnut East	12	3	0	15
Antlers West	0	5	0	5
Antlers East	0	5	0	5

- Reason for work: All are young and will fill out canopies in next 25 years. Liriodendron need to be routinely trimmed to maintain axial view to Palace elevation. Eventually they may all be removed when Sweet Chestnut have attained canopy volume to hold the scale of view.
- Strategy: Remove top two Liriodendron; replant 5 Sweet Chestnut as "antlers" to each side of axis. Gap planting (adjusted spacing) to complete pattern – 1 Liriodendron and 4 Sweet Chestnut.
- Method:
  - Species - *Castanea sativa*
  - Layout/density/spacing: Trees set out using grid reference
  - Removals: 2 *Liriodendron* (Complete) and 1 *Paulownia* (Proposed: sponsored tree, to be replaced elsewhere).
  - Also side trim *Liriodendron* for axial view as routine maintenance
  - Date undertaken: 2016/17
- Management: ongoing pruning of the inner canopy of the Lireodendron is required to ensure the view onto the Palace is kept open
- Considerations for future continuation / management: Possible future removal of Liriodendron avenue to allow the outer row of Sweet Chestnuts to mature and attain specimen stature.
- Establishment:
  - Trees have established well
  - Annual monitoring

Tree work has already been carried out to slightly reduce the crown and open up the view

The outer rows of Sweet Chestnut have established well

View towards the Palace - the Liriodendrons begin to encroach, narrowing the avenue

Fig.11a: The 1784 Forsythe plan shows an inner avenue of elm trees

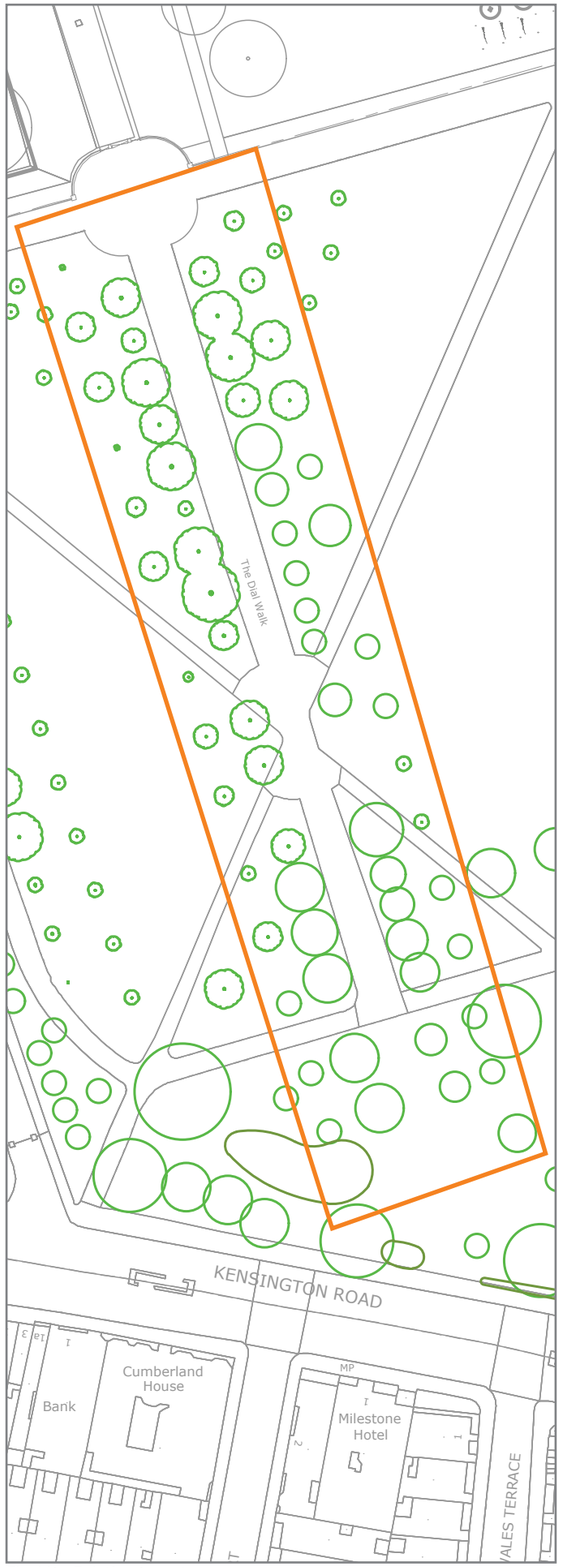


Fig.11b: Existing layout

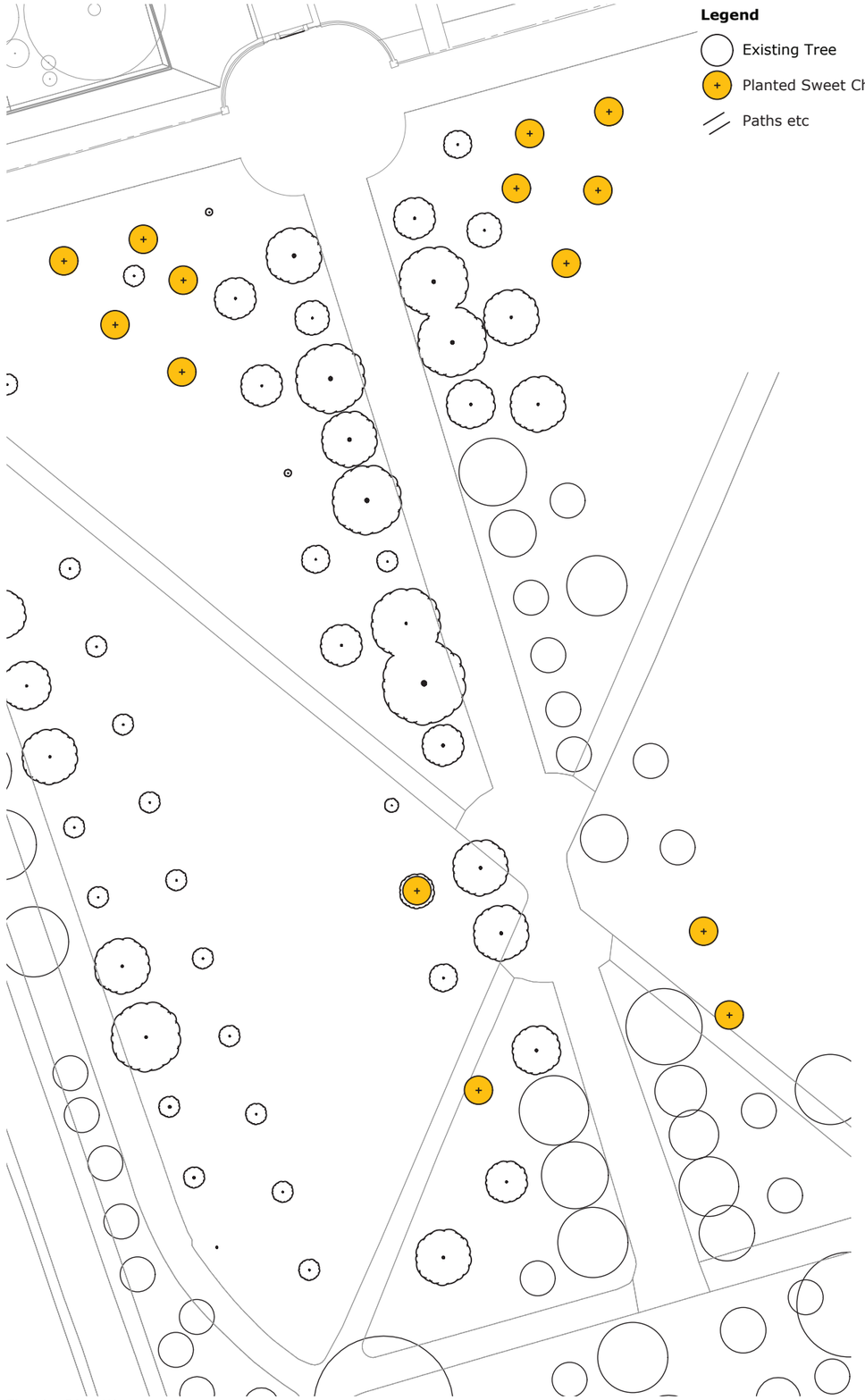


Fig.11c: Dials Walk proposals

9 The Dials – West Row

The single row of Horse Chestnut was important in providing some screening against the large mass of the Royal Kensington Hotel, immediately outside the gardens. However the line suffered some losses; and the remaining six Horse Chestnuts were deemed to have a short life expectancy and were subsequently felled in 2015/16.

The row is not in itself a historical Bridgeman line so the proposals themselves do not sit strictly in line with historical context but with a blank canvas it was deemed an opportunity to test new so-called disease resistant Elm varieties being developed in Holland which may well be used in more high-profile and historically accurate areas of the park in the future. Replanting took place with one of the Resista group of Elms, scientifically known as *Ulmus 'Lutece',* which were supplied by Hilliers at 20-25cm girth.

Replanting of 7 White Mulberries (*Morus alba*) was also completed following the losses of a number of trees along Mulberry Walk.

Details

- Name: Dials West
- Location: Single row to West of Dial Walk; East of Mulberry Walk
- Thumbnail history – as shown on
  - Bridgeman 1733: not shown as row of trees
  - Forsythe 1784: not shown as row of trees
  - OS 1870: not shown as row of trees
- Existing numbers surviving in this avenue:

	Established	Newly Planted	Gaps	Total
Outer Black Mulberry	18	0	0	18
Middle White Mulberry	6	7	0	13
Inner Elm	0	12	0	12

- Issues / risks: Uncertainty over disease resistance of Elm
- Strategy: Fill gaps and replace losses as and when
- Method:
  - Species - *Morus alba,* including *1 Morus a. 'platanifolia'; Morus nigra*; and *Ulmus 'Lutece'.*
  - layout/density/spacing: preference to gap in-fill existing line (6 trees) as opposed to replanting offset line (10 trees)
  - setting out is designed for future in-filling (additional 6 trees) to create consistent spacing
  - removals: All horse-chestnuts to allow for new row of trees
  - Date undertaken: 2016/17
- Considerations for future continuation / management: Fill gaps as and when Horse Chestnuts have to be removed. Replace one mulberry at North end of East line on Mulberry Walk.
- Establishment: Learning from previous tree planting success and failure, all tree pits increased in diameter with existing soil enriched with compost to improve the chances of success and promote healthy growth in the trees early years.

Horse Chestnut is part of the Dials West row - beyond that is the Mulberry Avenue

Gaps in the row increase the visual dominance of the adjacent hotel

The existing Horse Chestnuts are in variable condition

The Row of Mulberries with newly planted trees slowly catching up

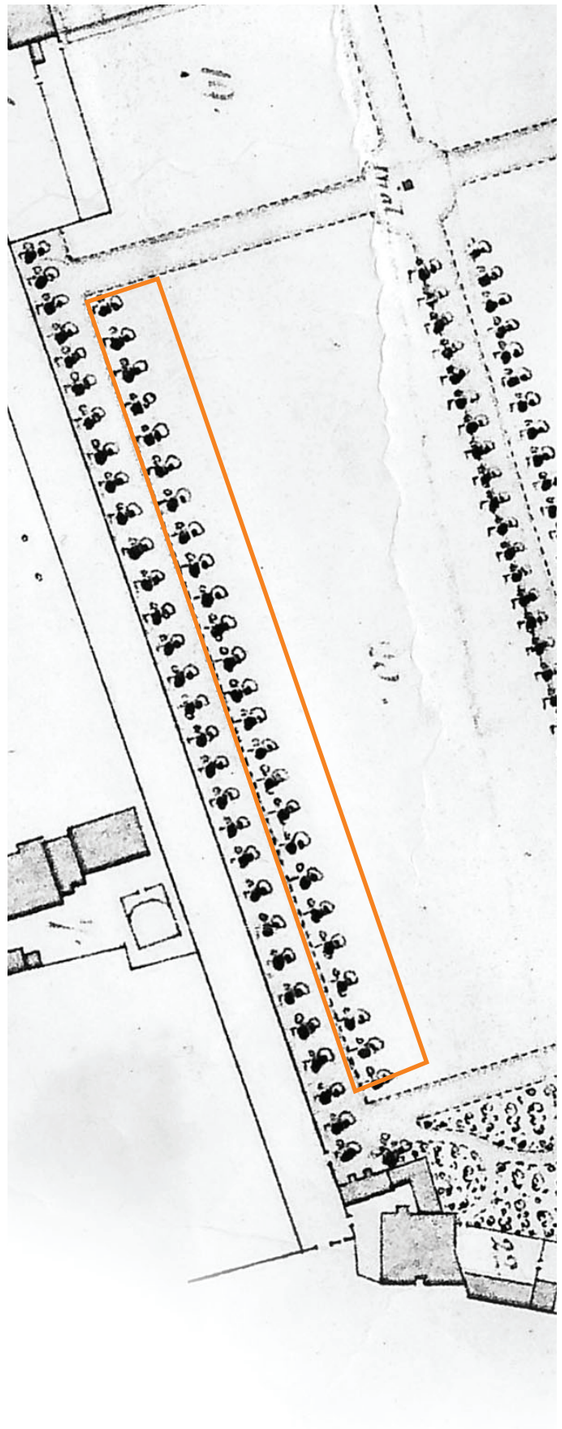


Fig.12a: The 1784 Forsythe plan shows that the row did not exist at this time

Fig.12b: Existing layout

Fig.12c: The Dials West Row proposals

10 Lancaster Walk

Until the later 1990s this was the most impressive of the avenues in the Gardens, being strongly mature, with few gaps and forming one of the set pieces focussing on Physical Energy at the centre, the Albert Memorial to the South, and with the curiosity of the original southern leg of the avenue (pre Albert alignment) intersecting as the "spliced" line. These are tall and mainly well-formed trees which have great presence in the Gardens, albeit that they have suffered a number of losses in recent years as a combination of Anthracnose and soil exhaustion have taken their toll.

The avenues were replanted in the early 1860s, replacing the Bridgeman trees [probably Elms] with Planes, with outer rows of Limes in the northern sector and deliberately replanting the original [spliced] line as more than just a memory. This is a cross avenue so the species sometimes [but not always] give way to the "patte d'oie" avenues where they intersect.

These are still fine trees forming an impressive set piece - despite the occasional remaining gap - and every effort should be made to conserve the present population and to continue to interplant where possible in runs with planes and limes respectively for succession. As the original spacing (average 10.5m) is relatively tight there is no point in single gap planting because of poor light / space in establishment; better to replant in runs of minimum 2 or preferably 3 trees.

The replanting works for Lancaster Walk were completed late in the planting season of 2016/17. This includes: 22 x 12-14cm girth container stock of Limes and 14 x 16-18cm girth rootballed Planes to the Northern section and 22 x Planes to the Southern sections including the 'splice'. Similarly to the The Great Bow the clonal variety *Tilia x europaea 'Pallida'* (Lime) from Barchams was used for it's good structure and *Platanus X hispanica 'Louisa Lead'* (Plane) from Hilliers. Their first summer was particularly hot and dry and a number of the Plane trees suffered considerably and the planting season of 2019/20 has seen 15 replacements. To improve establishment success rootball trees have been selected a year before planting and put into containers to increase rooting mass. Planting earlier in the season will also be done where possible to give the roots longer to bed in.

Clonal tree selection has clear benefits for formal avenue planting within public parks. Especially for a group or line of trees which will have the same growth habits as the parent plant. This therefore allows you to clearly map their future management along a timeline and perhaps also crucially estimate their remaining contribution which would allow for identifying a date when replacement planting might take place to ensure minimal gaps in the canopy.

Further planting to the outer rows to infill gaps has been undertaken in recent years as trees have been lost. The continual monitoring of tree health and suitability for retention allows for early decisions on when trees are needed to be replaced. This also allows for replacement species selection, stock to be reserved, plantings to be prioritised and along with many other considerations that need to be taken into account.

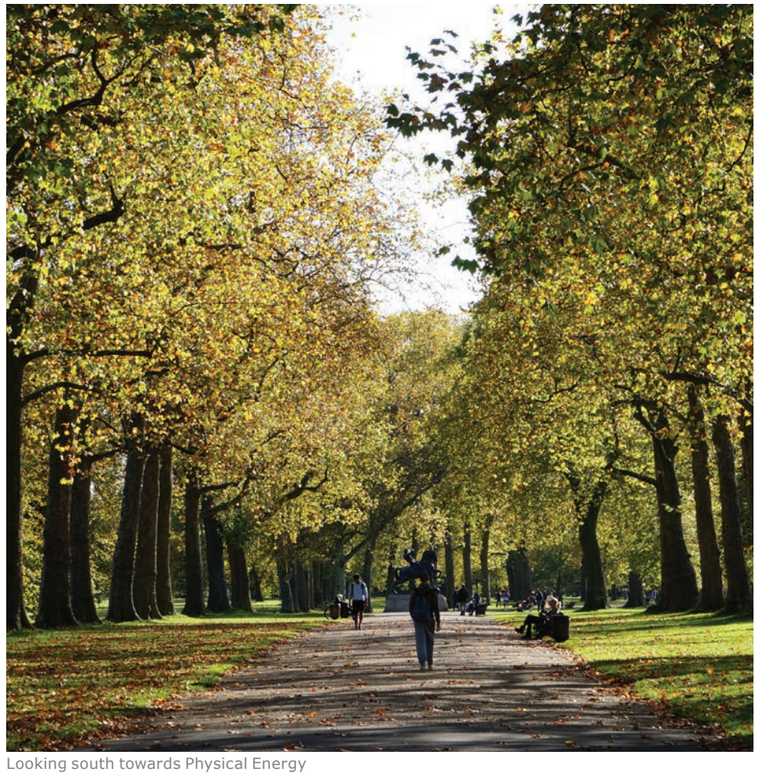
Details (North)

- Name: Lancaster Walk (North)
- Location: Northern run of main cross avenue to North side of Physical Energy composed of inner rows of planes and outer rows of limes
- Thumbnail history – as shown on
  - Bridgeman 1733: Shown as double avenue except at North East leg where truncated by boundary of Bayswater House Garden
  - Forsythe 1784: ditto but showing many losses on inner rows
  - OS 1870: Avenue (and new alignment further South to Albert) is shown well filled – as in Mann 1846, indicating that the planes were replanting c. 1820 and extended / realigned c. 1862 for Albert Memorial
- Existing numbers surviving in this avenue:

	Established	Newly Planted	Gaps	Total
Plane E	22	9	0	31
Plane W	18	13	0	31
Lime E	15	16	0	31
Lime W	18	13	0	31

- Issues / risks: Plane increasingly affected by Anthracnose and further losses may be anticipated over next 10-20 years.
- Strategy: Subject to current monitoring trials, retain existing populations by management techniques, mulching etc. and replant gap runs where possible using plane: Ditto gap planting outer rows with lime as and when available in runs of min 2 trees.
- Method:
  - Species - *Tilia x europaea 'Pallida'* and *Platanus X hispanica 'Louisa Lead'*
  - Layout/density/spacing: Gap planting
  - Species: plane (inner rows); lime (outer rows)
  - Removals: only where essential for health and safety or advanced disease
  - Date: Undertaken 2016/17
  - Irrigation: From 2020 'Tree Gators' have been installed as watering aids. The use of compost teas and mulching have been included in routine maintenance of establishing trees
- Considerations for future continuation / management: Continue monitoring / feedback and seek to maintain plus gap planting.
- Establishment:
  - There were some initial loses due to planting late in the season and the hot dry spring and summer, however improved planting specifications and husbandry have seen establishment improved
  - Frequent monitoring is in place especially during drought along with the use of 'Tree Gators' to improve irrigation

Looking north towards Lancaster Gate entrance



Looking south towards Physical Energy

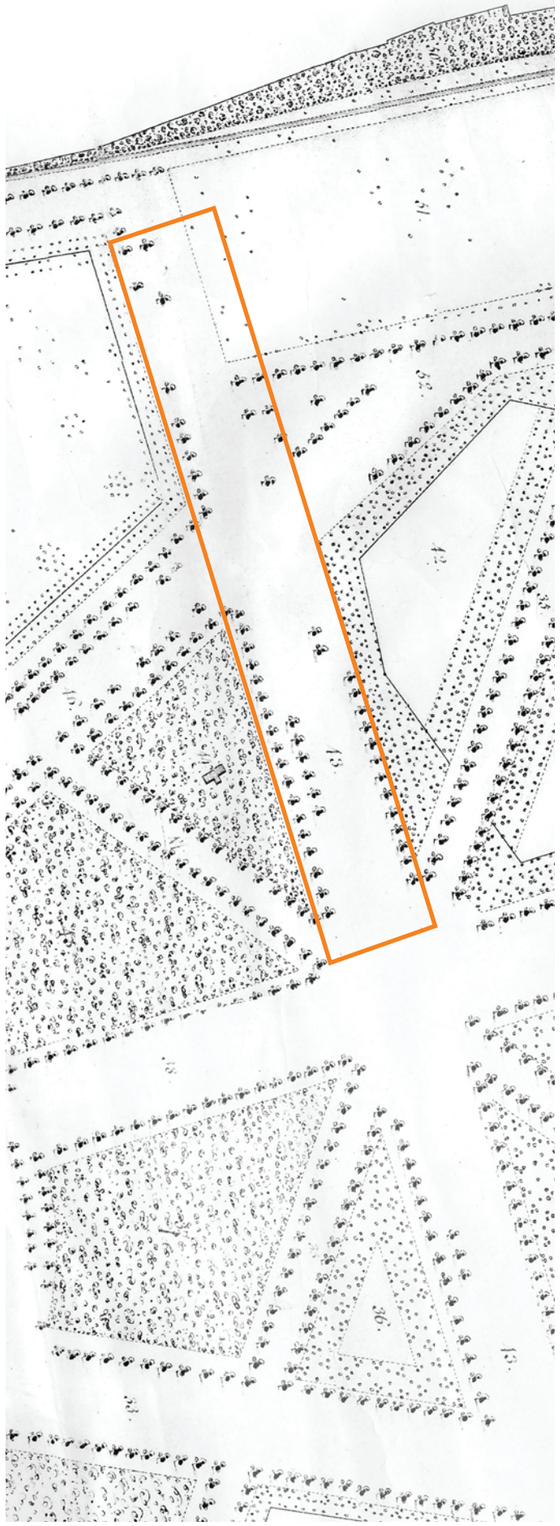


Fig.13a: The 1784 Forsythe plan shows the Bayswater House Garden

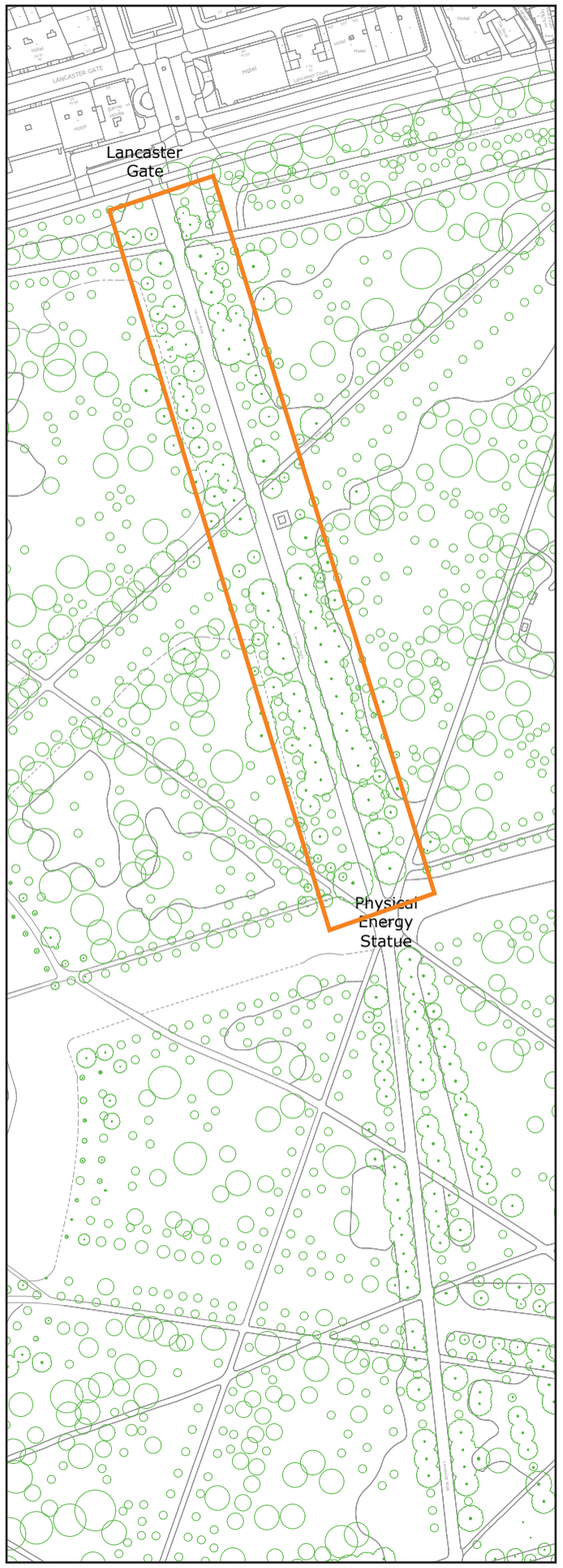


Fig.13b: Previous layout (North Avenue)

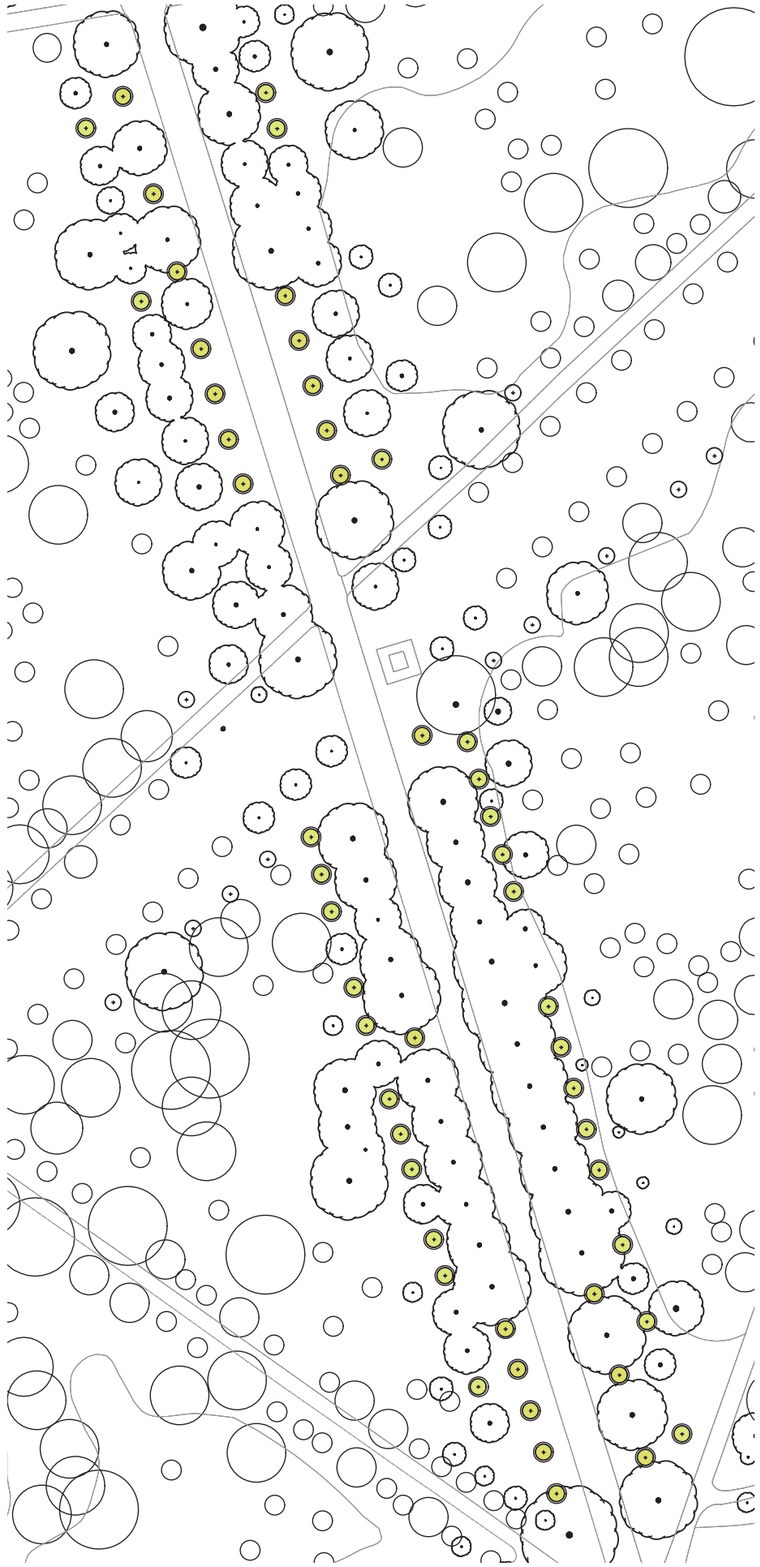


Fig.13c: Lancaster Gate Walk (North) with new plantings

Legend (North Avenue)

- Existing Tree
- Planted Lime Tree (30no.)
- Planted Plane Tree (22no.)
- Paths etc

Details (South Avenue)

- Name: Lancaster Walk (South)
- Location: Cross avenue from Physical Energy south towards Albert Memorial
- Thumbnail history – as shown on
  - Bridgeman 1733: Double Avenue on original alignment (see "splice avenue")
  - Forsythe 1784: ditto; much of inner avenue lost
  - OS 1870: Avenue shown on Albert alignment as "mature" but with gaps: no outer rows.
- Existing numbers surviving in this avenue:

	Established	Newly Planted	Gaps	Total
East	19	9	0	28
West	21	11	0	32

- Issues / risks: Recent deterioration / losses indicate further potential losses. However monitoring
- Strategy: Retain existing set as long as possible, informed by monitoring processes and management procedures. Gap plant as and when possible but only with runs of 2+ gaps (not singly).
- Options
  - Species: Pseudoplatanus X hispanica 'Louisa Lead'
  - layout/density/spacing: as existing
  - removals: only as critically essential
  - Date undertaken: 2016/17
- Considerations for future continuation / management: informed by monitoring results

Details (South Spline)

- Name: Lancaster Walk – South Splice
- Location: original (pre Albert) alignment to South of Physical Energy
- Thumbnail history – as shown on
  - Bridgeman 1733: shown as double avenue
  - Forsythe 1784: shown as double avenue with substantial gaps
  - OS 1870: old alignment here retained; trees possible replaced 1830-40
- Existing numbers surviving in this avenue:

	Established	Newly Planted	Gaps	Total
East	20	6	0	26
West	13	6	0	19

- Issues / risks: recent deterioration and losses
- Strategy: retaining as veterans and occasional gap planting as spaces allow to continue the "memory" of this avenue as part of Bridgeman's layout
- Method:
  - Species: Pseudoplatanus X hispanica 'Louisa Lead'
  - layout/density/spacing: as existing
  - removals: only as critically essential
  - Date undertaken: 2016/17
- Considerations for future continuation / management: retain old trees through improved management / mulching etc.
- Establishment:
  - There were some initial loses due to planting late in the season and the hot dry spring and summer, however improved planting specifications and husbandry have seen establishment improved
  - Frequent monitoring is in place especially during drought along with the use of 'Tree Gators' to improve irrigation

Looking south down South Avenue towards Albert Memorial

Row of four newly planted plane trees

Looking south between the South Avenue and the Spline

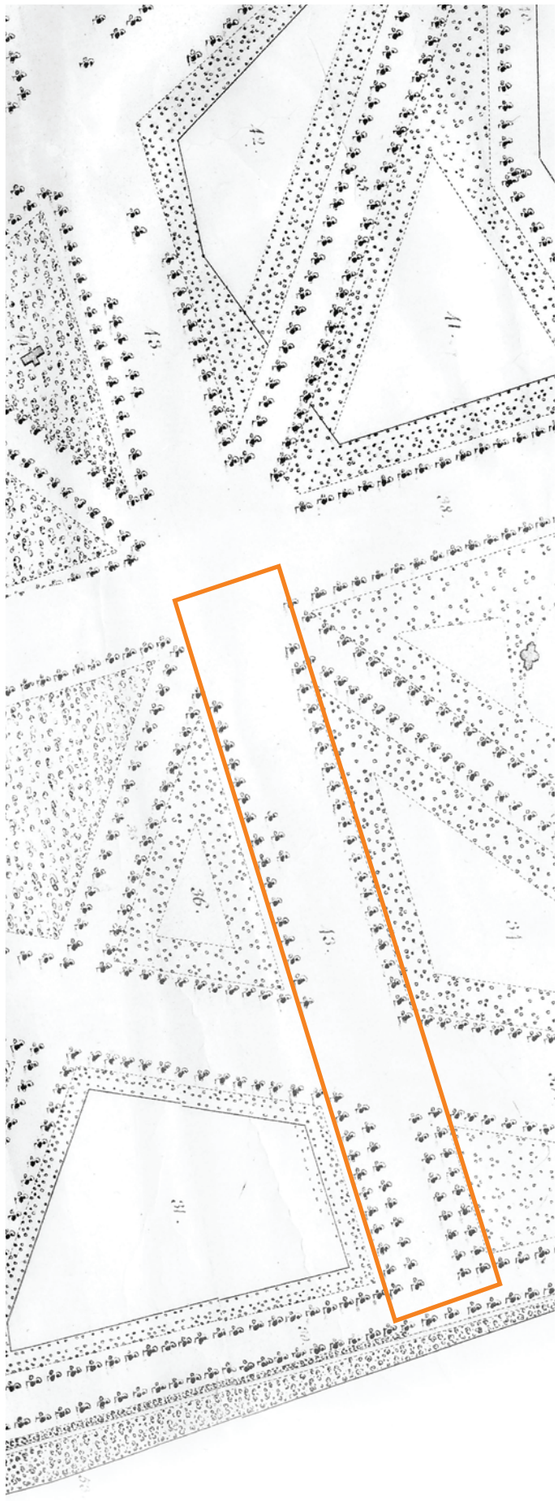


Fig.14a: The 1784 Forsythe plan shows the pre-Albert Memorial layout

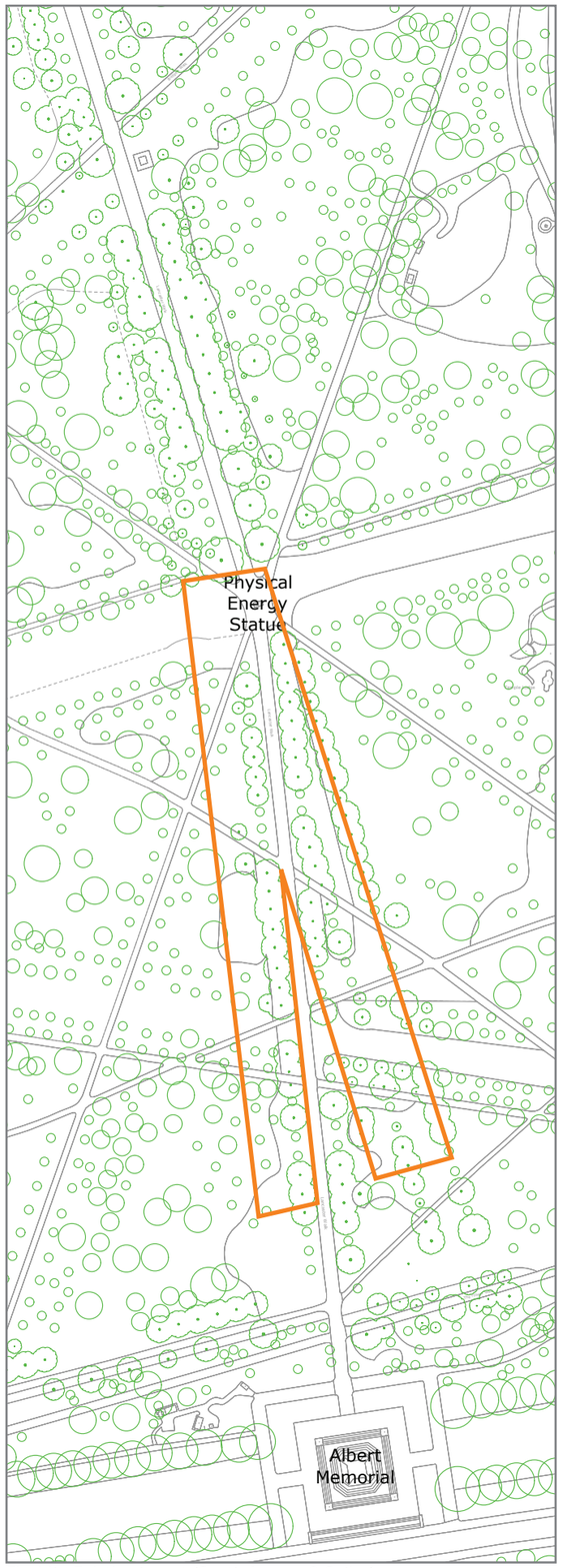


Fig.14b: Existing layout (South Avenue & Splice)

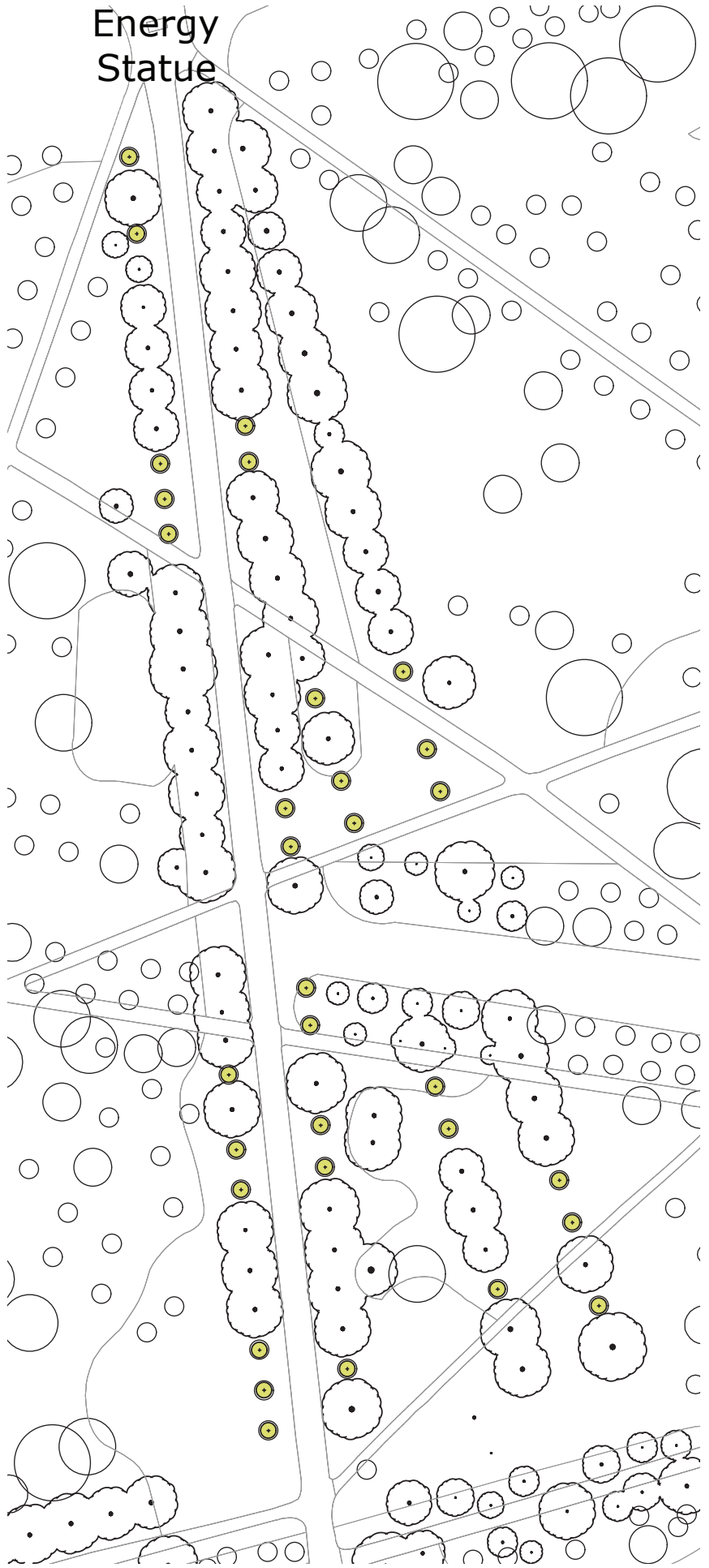


Fig.14c: Lancaster Gate Walk (South Avenue & Spline) proposals

11 Buck Hill Axis

An avenue of great importance but perhaps easily overlooked due to its informal groupings in the seemingly open parkland setting. It's not until you come into alignment with the Front Walk on the opposing side of the Long Water that the axis is explained. Planting took place in the planting season of 2018/19 with some minor additions still required.

The planting had to restore the historic pattern of small groups of "parkland" trees to provide long term succession for the frame of Front Walk as it follows the Palace axis eastward up the slope of Buck Hill. It was previously provided by two small groups of veteran and noble limes which sit informally on the flanks of the meadow but, when seen from the main Gardens, still echo the Front Walk "frame" at Buck Hill. Fortunately there was space - without significant intrusion - to plant up to ten trees within the meadow in carefully defined positions to continue this effect for when the mature limes eventually disappear.

Efforts to create a focal point at the eastern end of the Front Walk framing lines were considered and a clump of Liquidamber were planted to provide striking autumn colour. It is proposed to add further trees to this group to increase the density of planting.

Details

- Name: Buck Hill Axis
- Location: Forming a continuation of the Front Walk on the eastern side of the Long Water.
- Thumbnail history – as shown on:
  - Bridgeman 1733: Front Walk framing lines.
  - Forsythe 1784: Informal / parkland framing lines at Front Walk
  - OS 1870: Ditto; showing a few gaps as original stock ages.
- Existing numbers surviving in this avenue:

	Established	Newly Planted	Gaps	Total
North	4	6	0	10
South	6	4	0	10

- Issues / risks: Minimal risks involved and potential to stagger future plantings to allow for succession groups. Planting shade giving trees within the acid grassland has significant impact on the health and diversity of the sward and all future plantings must be done judiciously
- Strategy: Mixed species planting in clumps using tried and tested cultivers of Lime sp and Plane sp.
- Method:
  - Species: *Tilia x europaea 'Pallida'; Castanea sativa; Fagus sylvatica;* and *Liquidamber styraciflua*.
  - Layout/density/spacing: as existing
  - Removals: none required
  - Date undertaken: 2018/19
- Considerations for future continuation / management: The informal layout allows for more relaxed successional plantings and giving a multi-generational feeling. Future infill planting should be carefully considered at 5-10 year intervals to ensure continuity of planting.
- Establishment:
  - Planting struggled in the first year due to severe drought during Spring. Long-term replacements may be required.

Looking across Long Water from Front Walk

Group of Liquidamber adding focal point to eastern end of Buckhill Axi

The trees framing Front Walk are of all of a similar age

Fig.15a: The 1784 Forsythe plan shows the presence of the Bastions

Fig.15b: Layout before proposals

Fig.15c: Buckhill Axis as planted 2019

12 Great Bayswater Avenue

Great Baywater Avenue is fundamental to the Bridgeman layout due to its alignment with The Palace and forms the 'left toe' of the patte d'oie (goose foot). This avenue is shown in Bridgeman (1733) and in Forsythe (1787) as 4 rows of trees framing a grass ride and mirroring the Mount Walk to the South, with Front Walk forming the central axis of the "patte d'oie" and focused on the palace. The inner rows have been comprehensively replanted with Sweet Chestnut from late 1990s and are all but complete; The outer lines appear to be now fading components of second and some third generation replantings using mixed species - Horse Chestnut, plane, oak, lime in short runs but with many gaps. The northern (outer) row was identified as having 40% gaps and the southern row having 54% gaps, some of which could have been replanted.

The fieldwork and review also flagged up 4 minor anomalies which had not previously been registered:

- the angles set by the two diagonal rides - Mount Walk and Great Bayswater Walk - are not exactly the same, leaving slightly different proportions for the Quarters they frame.
- at Great Bayswater Walk, the positioning of the Speke monument is not, as indicated in OS 1870, centrally placed but is now towards the southern side of the ride. This appears to indicate that the replanting of the southern row of Sweet Chestnut has in effect "leap-frogged" its original line into the ride.
- the impressive spire of St Mary Abbott's (lying behind and to the West of the Palace) sits on an axis defined by the northern side footpath of Budge's Walk, although it is also widely seen from the Great Bayswater Ride.
- a sight line from Speke to the spire passes directly through the statue of Queen Victoria.

For the replanting, and given that the inner rows of young Sweet Chestnut set a strong formality for the ride, it is appropriate to perpetuate variety on the outer rows. The experience of walking along Bridge's Walk is the more interesting because of the varieties in canopy and form.

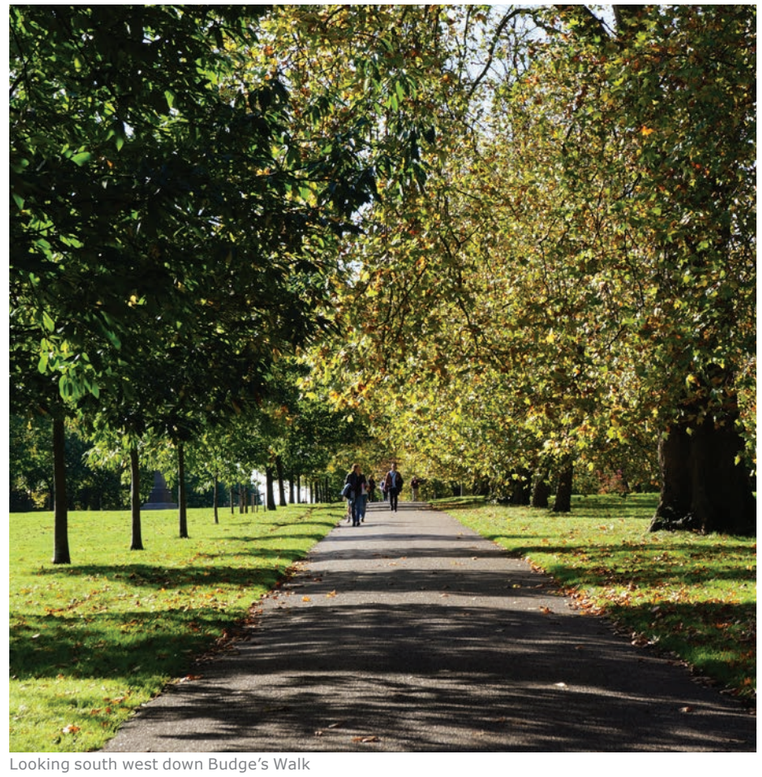
Planting took place, along what's known as Budge's Walk, in the 2014/15 planting season and although a large number of plantings were considered in the 2014 strategy, this was reduced to only 4 trees on review of the current conditions on site. With considerable gaps in the canopy maintained for several years a diverse grassland habitat has formed to the north-eastern end of the southern row, future planting would need to consider this established habitat to ensure it is allowed to continue to flourish. Opportunities further south along the southern row were scant as the existing canopies would overshadow any new trees.

Details

- Name: Great Bayswater Walk
- Location: main North East axis of patte d'oie
- Thumbnail history – as shown on
  - Bridgeman 1733: originally as a double row of trees by Bridgeman but axis truncated at East end of enclosure of Bayswater House Garden
  - Forsythe 1784: shows some losses on inner avenues at East end: also report of "new planting" 1830
  - OS 1870: North side rows appear fairly complete; South row with extensive gaps: Speke sited centrally in axis.
- Existing numbers surviving in this avenue: (includes pairs at Great Bow)

	Established	Newly Planted	Gaps	Total
North	30	4	13	34
Mid North	44	-	1	44
Mid South	41	-	0	41
South	17	0	18	17

- Issues / risks: aging Horse Chestnut are 41% of mature outer rows. Long grassland habitat at risk of being overshadowed on the south row.
- Strategy: Infill planting to any available gaps in the Northern avenues
- Method:
  - Species: *Juglans nigra*; *Quercus turneri 'Pseudoturneri'*; and *Quercus frainetto*
  - Layout/density/spacing: gap planting in runs – as available
  - species: oak and lime, occasional Sweet Chestnut; not HC; not plane.
  - Removals: plane (inner rows); only as and when necessary
  - Date undertaken: 2014/15
- Considerations for future continuation / management: Inner rows (all young) to be kept to full population; outer rows managed for longevity, allowing mix species but in runs of 5/6
- The South avenue requires planting to complete the Bridgeman layout and consideration should be taken on to establish tree within the already dense canopy to allow for successional plantings.
- Establishment:
  - The trees are establishing well



Looking south west down Budge's Walk

Looking south west towards Speke and St Mary Abbott's

Looking north east the outer row is clearly missing beyond the Sweet Chestnuts

Fig.16a: The 1784 Forsythe plan shows the avenue truncated by Bayswater House Garden

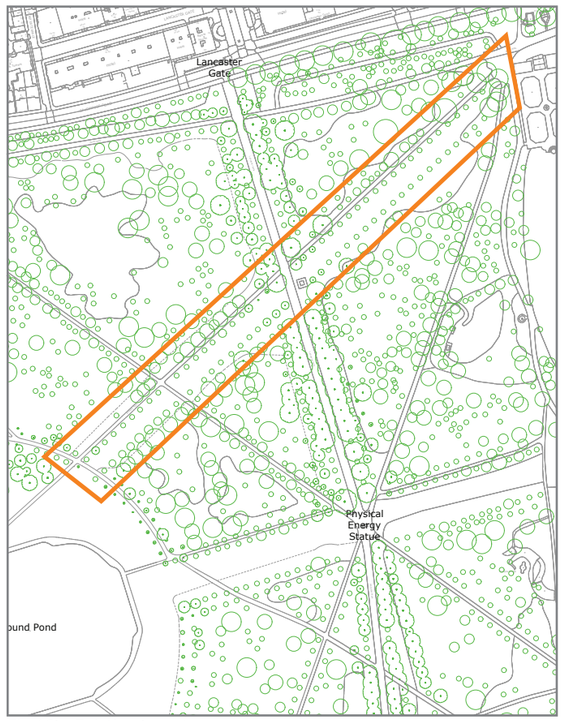


Fig.16b: Existing layout

Fig.16c: Great Bayswater Avenue proposals

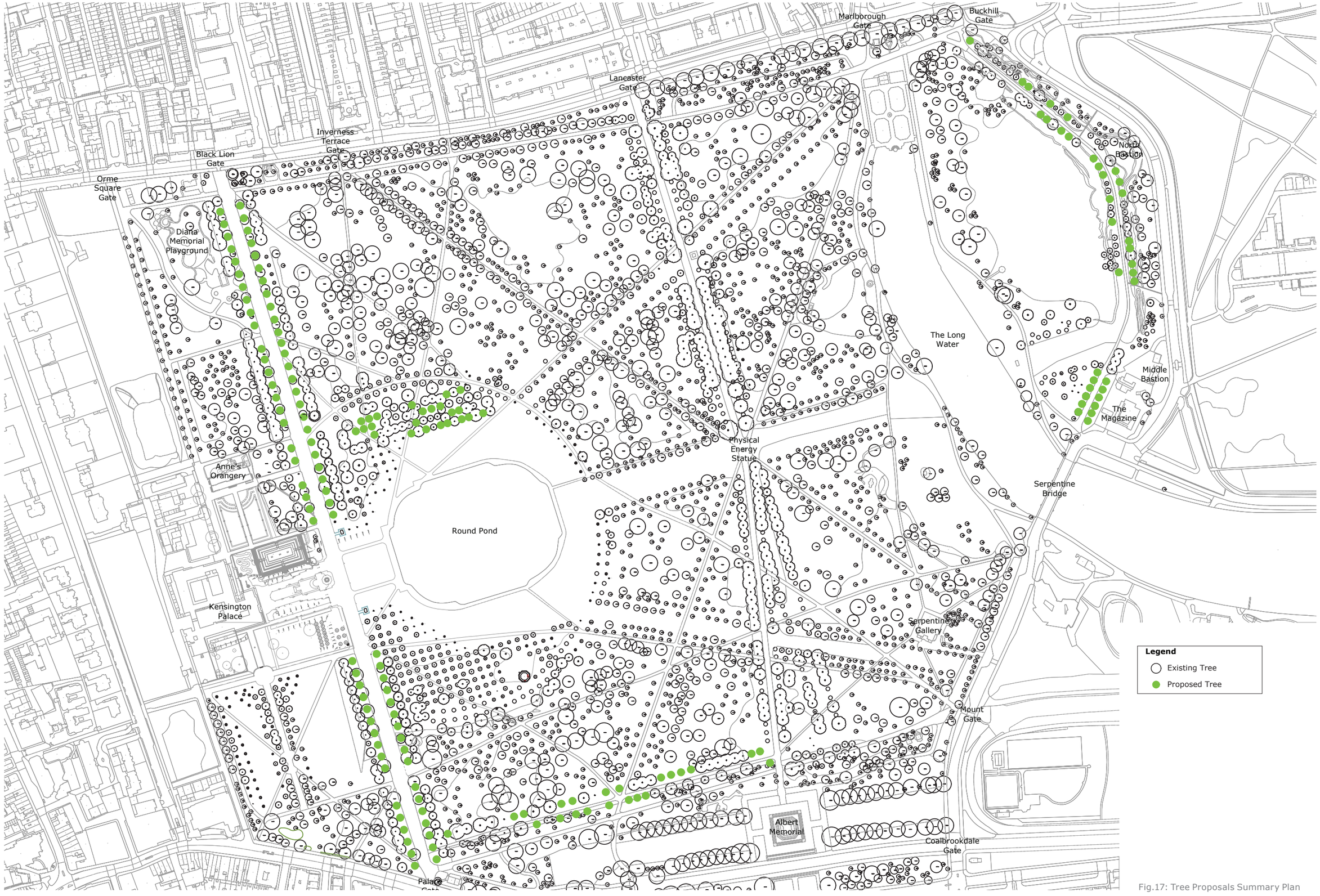


Fig.17: Tree Proposals Summary Plan

13 Proposals - 2020 onwards

There is some flexibility around the actual timings for the planting of the trees identified here but in principle it is envisaged that around 50 trees per year is still a manageable target, allowing for the ongoing requirements for aftercare in early establishment. This also takes into account the potential tree removals and ground remediation works.

The team agreed the provisional phasing of avenue implementation, shown here with an indicative timescale:

Timescale	Avenues	No. trees
Provisionally 2021-22	Buck Hill Walk The South Rounabout	32 (6) 22
Provisionally 2022-24	Broadwalk Phase 1	64
Provisionally 2024-28	Broadwalk Phase 2 North Feathers;	25 23
Provisionally 2028-30	Great Bayswater The Great Bow	32 4

The following chapters provide a summary of the proposals for each avenue with a details section, historical context, existing layout plan and proposals plans indicating suggested species. Detailed setting out plans follow on in Appendix 1.

Since the Tree Strategy began a number of lessons have been learnt and some of the action plan points can be expanded upon to improve efficiencies and ensure that successes are understood so similar approaches can be used.

Topographical Surveys
The 2014 report relied on Ordnance Survey mapping, satellite imagery and measuring distances on site with tape measures. This worked in order to strategically place trees but it isn't adequate in order to get the correct alignments and spacings of existing avenues and trees. So subsequent to the 2014 report topographical surveys were taken of all the relevant avenues in order to accurately plot the trees. This allows trees to be positioned on site using grid coordinates.

Archaeology
Kensington Gardens has a rich history much of which is still embedded in the landscape. It is important to conserve and record these features and therefore appropriate watching briefs by qualified archaeologists should be commissioned prior to significant tree removals or plantings to ensure due care and diligence is observed.

Pests and Diseases
It has become apparent since 2014 that some tree species have deteriorated faster than anticipated, such as squirrel damage to the Maples on the Broadwalk, which is why the Broadwalk tree replacement strategy has been reviewed. Review of the TRP Annual Update on Tree Diseases and Disorders produced by Ian Rodger TRP Arboricultural Manager shows the cost of the diseases in the park. Refer to Appendix 3 for the full report.

Biosecurity
This cost has led to the development of the TRP Biosecurity policy which is in place to prevent the introduction of further diseases into the park. It is notable that there aren't any cases of Chalara fraxinea (Ash Dieback) recorded yet and there are recommendations for ensuring that new trees are purchased from biosecure locations.

Ordering Stock
The Biosecurity policy does limit the sources for plants however it has now been seen as a big advantage to pre-order stock which helps to mitigate any reduction in supply generally. Pre-ordering stock in advance of planting enables proper preparation of the trees prior to planting. It has been found that lifting and containerising a year prior to planting enables the trees to put on root mass (fibrous roots) and speeding up successful establishment. Pre-ordering well in advance also enables stock to be grown on to a suitable size for planting directly into final positions. This could be particularly useful for phased avenue planting where consistency of tree size is important. There are marginal cost increases with this approach but this is significantly outweighed by the greater establishment success, and ease of handling when in the park particularly if there are unforeseen delays.

Climate Change
Climate change is a real consideration when choosing tree species suitable for coping in the dramatically changing weather conditions. It is now also starting to play a significant factor in the health of existing trees with longer drier summers causing stress to many species. Milder, wetter weather also means many pests and diseases survive through winter. Notably the squirrels no longer hibernate and cause damage to trees through eating the buds and young stems from growing tips of Maples.

Plant Selection
Clonal selection has now also been highlighted as key, for a consistent tree avenue appearance. The Great Bow was previously planted with poor stock and has subsequently been replanted due to the relatively short anticipated life expectancy with excessive epicormic basal growth. There are however some risks associated with using single clonal selections for tree avenues, in that due to a reduced gene pool the trees may be at risk from pests and disease.

Husbandry
A number of techniques are being trailed in the park including the use of 'Tree Gators' for irrigation, compost teas for feeding and mulching. These are all to aid establishment during the trees early years.

Other forms of best practise in tree management include management of the ground which the trees grow in, it is evident that trees struggle with highly compacted ground caused by frequent foot or vehicle traffic. Measures to prevent further ground compaction include: deterring excessive movement through rooting zones or alleviating movement by protecting the soil. Desire lines should be monitored and if necessary measures should be put in place to ensure the compaction doesn't damage soil structure and health.

There is also a broad range of literature that has become available in recent years including the British Standard *'BS 8545:2014 Trees: from nursery to independence in the landscape - Recommendations'.*

14 The Broad Walk

This is the largest of the avenues in Kensington Gardens - 4 rows of trees (Norway Maple as inner rows; Limes as outer rows), 930m in length and nearly 60m width between the outer rows. It was originally laid out as part of Bridgeman's plan when the Gardens were extended eastward into (then) Hyde Park with 4 rows of elms planted in matching pairs. The last survivors were eventually felled in 1954 and replaced with 224 maples/limes in 1955. The limes are still more or less complete (4 gaps) but the maples have been thinned - roughly to the surviving alternate spacing after some earlier losses; and with subsequent losses over the last few years they now have a population of 46 trees in total against the original 112.

The options considered as part of this study range from complete removal of the inner rows, to allow comprehensive replanting at even spacing and with an alternative species, to simple gap planting to make good the slightly eroded pattern of alternate maples within the continuing context of limes which are in good order.

Although it was previously anticipated that the maples would probably need to be removed in the short to medium term, as they were suffering significant squirrel damage - and indeed several trees were removed, further reducing the surviving pattern - opinion was in favour of the medium-term retention of the what is a well-established if incomplete pattern of trees. However due to the additional threats this is now put into question once again.

The two options that are presented here are variations on the options being considered in 2014 and take a bolder approach in prioritising the original Bridgeman layout and selection of tree species. The view on this is taken in light of the importance of the avenue planting in the overall setting of the park, loss of visual enjoyment through damage caused to the trees by squirrels, the rate of the existing tree losses and life expectancy being less than originally calculated in 2014. These factors taken into consideration warranted a review of the 2014 options.

An ultimate 'Bridgeman' layout was considered and drawn out based on the exact spacing on the Forsythe plan. This saw a significant increase in tree numbers with planting centres of 10-12m. It is assumed that this layout was originally installed with smaller trees and to allow for thinning of alternate plants as they reached maturity. This theory rings true with the irregular alternate spacing to the north of the Board Walk found today. With more mature trees available at the present time it is possible to plant the avenue at its final spacing which still give grandeur to the setting without the need for future thinning.

Despite Elm being the original tree of choice in the Bridgeman layout the so-called new disease resistant cultivars have not been in existence long enough to be proven resistant against Dutch Elm Disease in the long term (50+ years) and therefore the risk was deemed too high. Trials of new cultivar Elm trees are on-going within the park in less high-profile areas and if successful maybe a feasible tree of choice for future plantings.

A team selection process took place that identified potential options and scored them on historical and locational appropriateness, strength as an avenue tree, ecological value, availability, ease of establishment and origin. On this occasion Sessile Oak was deemed the most suitable tree species and was the final choice. As an English native that grows to a large and grand stature with a more regular canopy than Pedunculate Oak it stood out amongst the rest. It also has high ecological value and is readily available. One downside being that it doesn't establish well when planted as large stock, smaller stock would be selected and with improved husbandry within the park establishment and growth in subsequent years would make up for this.

Although Sessile Oak are susceptible to Oak Processionary Moth (OPM) and OPM management of this pest was deemed inexpensive and the future of OPM control shows great promise. However strict management guidelines would need to be in place to ensure the risk is controlled.

Other options were considered and ruled out including:

- Limes and Plane were ruled out, as already having high representation in Kensington Gardens.
- Horse Chestnut and Sweet Chestnut were both ruled out due to present disease problems.
- Indian Horse Chestnut was considered but supply problems and developing and final canopy shape (noting other avenues in Kensington Gardens) dismissed it.

Details

- Name: The Broad Walk
- Location: 4 rows of trees from Black Lion Gate to Palace Gate with a 130m gap to the eastern frontage of the Palace / Round Pond axis
- Thumbnail history – as shown on
  - Bridgeman 1733: 4 rows of trees in matching pairs
  - Forsythe 1784: 4 rows of trees
  - OS 1870: 4 rows of trees (Elms removed in 1954)
- Existing numbers surviving in this avenue:

	Existing	Gaps	% surviving	Spacing (m)
Inner row, west	24	6	80% of thinned trees	approx 12m thinned to 24m
Inner row, east	22	9	70% of thinned trees	approx 12m thinned to 24m

- Issues / risks: A Section 211 agreement would be required for removal of trees. Squirrel damage, gaps and eventual degradation, currently majority of trees are in reasonable condition with 10 to 25 years expected life
- Strategy: infill gaps to provide a future generation of trees
- Option 1 and 2:
  - Layout/density/spacing: setting out is designed for precise spacing in pairs at approx 16m spacing with future in-filling
  - Species: Sessile Oak (*Quercus petraea*)
  - Removals: Option 1: 2 phases of removals to provide planting spaces, Option 2 North and South removed separately
  - Timings: can proceed but continue to review existing trees
- Priority: 1
- Considerations for future continuation / management:
  - retain maples whilst in good condition, consider crown reduction to aid establishment of new adjacent trees.
  - Gapping up of Limes (currently 4 spaces)
- Total new trees phase 1: Option 1 - 64 Option 2 - 64
- Total new trees phase 2: Option 1 - 26, Option 2 - 26

The Maples generally appear to provide a consistent avenue when view longitudinally

Maples provide good autumn colour

Some trees are in poor condition with less than 10 years expected life

Some gaps are more obvious

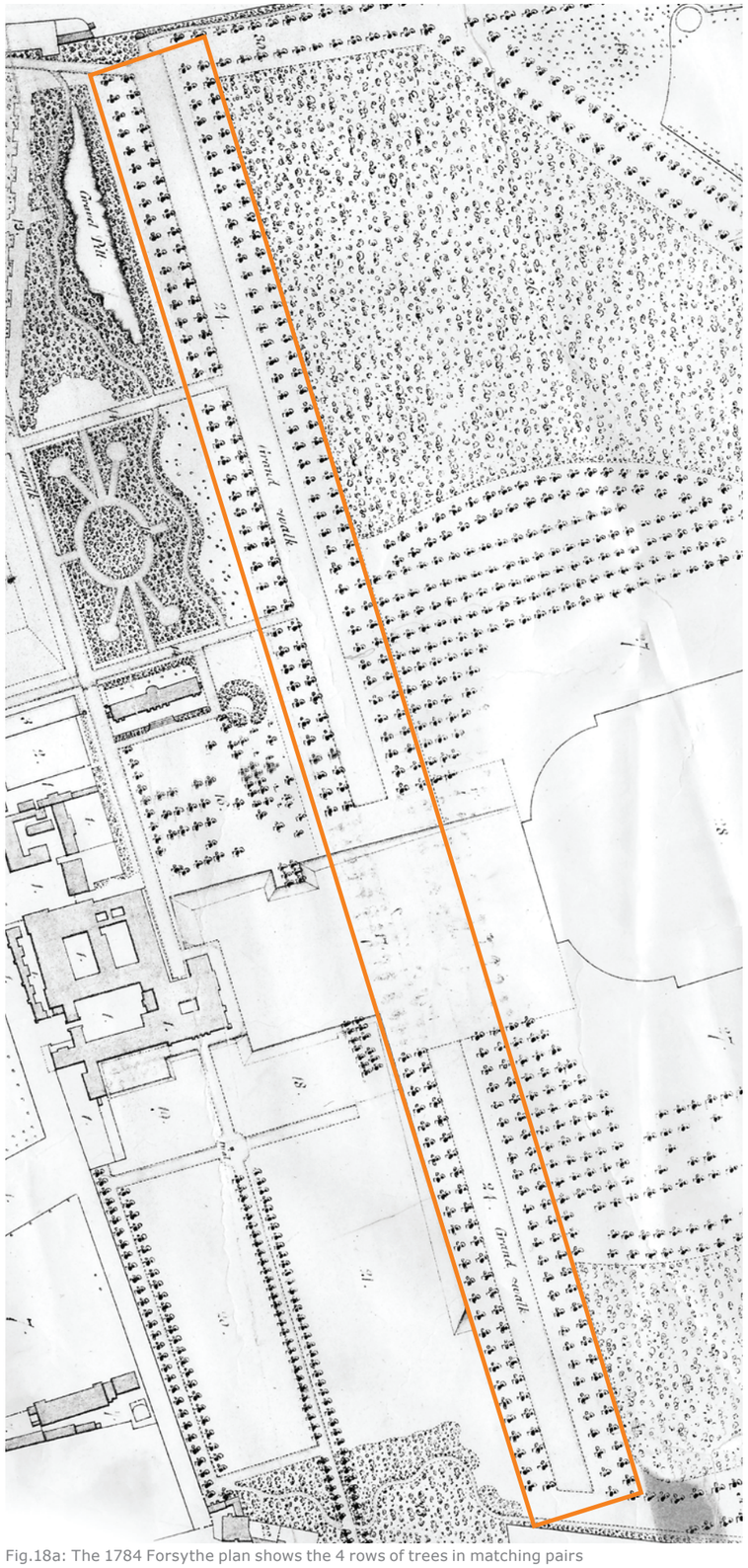


Fig.18a: The 1784 Forsythe plan shows the 4 rows of trees in matching pairs

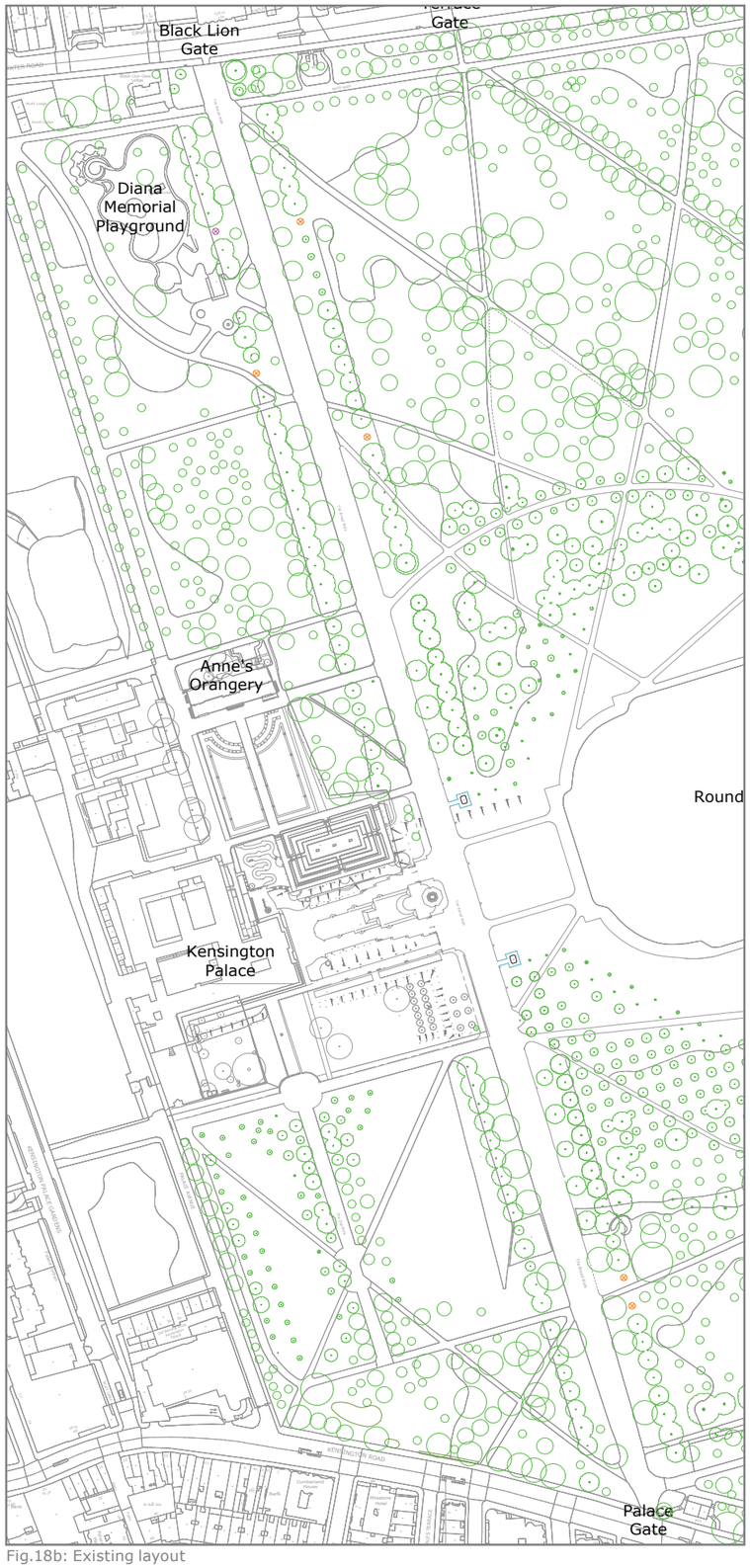


Fig.18b: Existing layout

The Broad Walk - Option 01

Preferred Option

This option proposes to restore the Bridgeman layout but with phased removal of maples. Work would be undertaken in two phases, Phase 1 proposes to remove the sections of alternating maples where the pattern is weakest and has largest area of infill tree planting required. In the instance of the Broad Walk tree losses are heaviest towards the middle sections. The significant losses in this area is something that should be reviewed, as it would be sensible in to ascertain the reasons for losses in this contained area. It is worth noting that the outer avenue of Lime trees does not show the same pattern of losses toward the middle sections and is still relatively complete along the whole length.

Phase 2 would be undertaken following establishment of the Phase 1 planting, this would be monitored but is assumed to be around 5 years after completion of Phase 1. In order for the second phase trees to be planted the nursery would grow on stock from the same source maintaining a consistency of size. The transplant success of Oaks decreases the larger the tree and therefore it is deemed that anything beyond a tree of 20-25cm girth is not advisable. Similarly to the Plane tree plantings on Lancaster Walk it would be advisable here to containerise transplanted stock a year prior to planting to increase root mass and chances of establishment success.

The strength of this proposal is the retention of sections of avenues at the entrance to the park keeping the existing mature trees in place and minimising the visual impact to visitors upon entering the park. Conversely it reduces the views out of the park particularly at the southern end where whole sale removal of the trees would open up views considerably onto the surrounding street and building facades.

Another potential benefit of phasing removals and planting is the opportunity to improve ground conditions in sections. Evidence suggests that the East side of the middle sections (yellow hatch) of tree planting has suffered from significant ground compaction. The centre of the site suffers from high levels of foot traffic tracking back and forth between the palace and the pond this is also exacerbated by the running track which runs along the edge of the avenue. Ground decompaction work could involve tilling soil to get air back into it and incorporating organic matter to help the soil keep its structure.

It would also be worth considering looking at experiments in reducing the stress on trees and subsequent increased susceptibility to pest and diseases on trees. These might include the use incorporating biochar into the ground which has been utilised at Regents Park Rose Garden but also more obvious methods such as mulching the ground or fencing off the rooting zones seasonally to reduce compaction from foot traffic.

Under planting the trees with long flowering bulb mixes may reduce the foot traffic within the root protection areas. Certain bulb suppliers are promoting 'Oak Processionary Moth Mixes' which attract the natural predators of the moth. These could be tested for effectiveness.

Fig.20a: **Option 3** - Phased removal of Maples and planting of Oaks

The Broad Walk - Option 02

This option takes a similar approach to Option 1 however it doesn't consider the landscape and visual impact of the removals and instead splits the avenue into the pre-existing north and south sections. Coincidently this option sees an equivalent amount of planting and removals as Option 1 in both phases, however the removals would be more noticeable to visitors to the park at both a landscape and intimate scale.

The benefit of this approach is that the avenue is already clearly separated into north and south sections and would mean that establishment and growth rate of planted trees would be consistent in each phase. This approach does leave gaps to the northern section during phase one which would increase if the current rate of tree loss continues. Factors in removing trees might be adjusted to retain trees longer than would usually be allowed to retain the look of the avenue up until the second phase is implemented.

Fig.20b: **Option 4** - Phased removal of Maples and planting of Oaks

15 The South Roundabout

So named on Forsythe's plans of 1784 and 1787, this was the framing avenue from the Bridgeman layout forming the southern boundary of the Gardens (until the Albert Memorial territories were brought in from Hyde Park in 1872) The South Roundabout formed a shaded walk linking the lower Broad Walk to the Mount and the South Bastion, close to the later position of Mount Gate. The present avenue of Horse Chestnuts appears to be a mid-nineteenth and early twentieth century replanting of Bridgeman's frame. It has suffered considerable losses, more particularly in the southern row which abuts the Flower Garden fence line and now reinforced with later tree planting at the back of the Flower Walk Borders. To the East side of the intersection with Lancaster Walk, the last of the Chestnuts was felled recently although several stump holes make can be recognised. Nevertheless the lack of continuing pattern in this section (near the historical position of the Mount) is not itself obvious due to the presence of adjacent tree groups.

Spacing in the avenue appears to have been at 11.5m centres and there is one run of trees in the northern row, just to the East of its intersection with Hornbeam Walk, where this spacing still exists; it can also be detected in numerous tree bole holes where trees have been removed. However the more usual surviving spacing is as alternates at 23m, as at the western end. Survivors in the southern line are more erratic but the boundary is visually reinforced by other planting in the Flower Walk, and the few Horse Chestnuts remain as veterans - as long as they may survive.

Accordingly the strategy here is not one of urgency but it is to perpetuate the historic alignment by a combination of conserving the surviving stock for as long as possible and replanting judiciously with alternative species as space and condition allow. The ground here is damper than elsewhere and so, unusually for an avenue, could support and sustain alders and other Aesculus species (flava, indica) as well as providing arboricultural and ecological interest. Overall there is currently scope to replant some 20 trees to reinforce the rows [mainly the northern one] and retaining basic pattern rather than consolidated restoration.

As this avenue is considered low-profile, trials of using disease resistant Elms has been deemed low risk. Some Elm planting has already taken place in the northern row using resista variety cultivars *Ulmus 'Rebona'* and *Ulmus 'Fiorenti'*.

Details

- Name: South Roundabout (West to East as far as Albert Memorial)
- Location: South boundary, immediately North of Flower Walk
- Thumbnail history – as shown on
  - Bridgeman 1733: main South boundary avenue leading from Broad Walk to Mount Gate
  - Forsythe 1784: Full avenue (no apparent losses)
  - OS 1870: evidence of 50% losses in South row; some recent replacements in North row
- Existing numbers surviving in this avenue: (originally spaced at 11.5m centres = total of 38 up to intersection of Lancaster Walk, generally thinned to alternates (23m)

	Existing	Gaps	% surviving	Spacing
North	19	12	48	23m
South	12	3	30	

- Note: The southern line is affected by proximity of south Flower Walk fence and boundary planting which effectively forms the belt within which occasional avenue trees survive.
- Issues / risks: HC – anticipated losses in next 5 to 25 years
- Strategy: gap planting to continue North line; occasional gaps in South line. Retain all as long as possible.
- Options
  - Layout/density/spacing: 13-15m spacing on North line; as and where on South line
  - Species: necessarily avoid Horse Chestnut: Indian Horse Chestnut, Alder, Buckeye and Hop Hornbeam suggested for diversity. Disease resistant Elms *Ulmus 'Fiorenti' and Ulmus 'Rebona'*
  - Removals: none required but ongoing monitoring of the existing stock as trees reach the end of the their life expectancy
  - Timings: can proceed soon
- Priority: 3
- Considerations for future continuation / management: maintain old HC if possible.
- New trees: 15.

Horse Chestnuts along the north row

Trees along the south row stand amongst south Flower Walk planting

Fig.21a: The 1784 Forsythe plan shows a full avenue

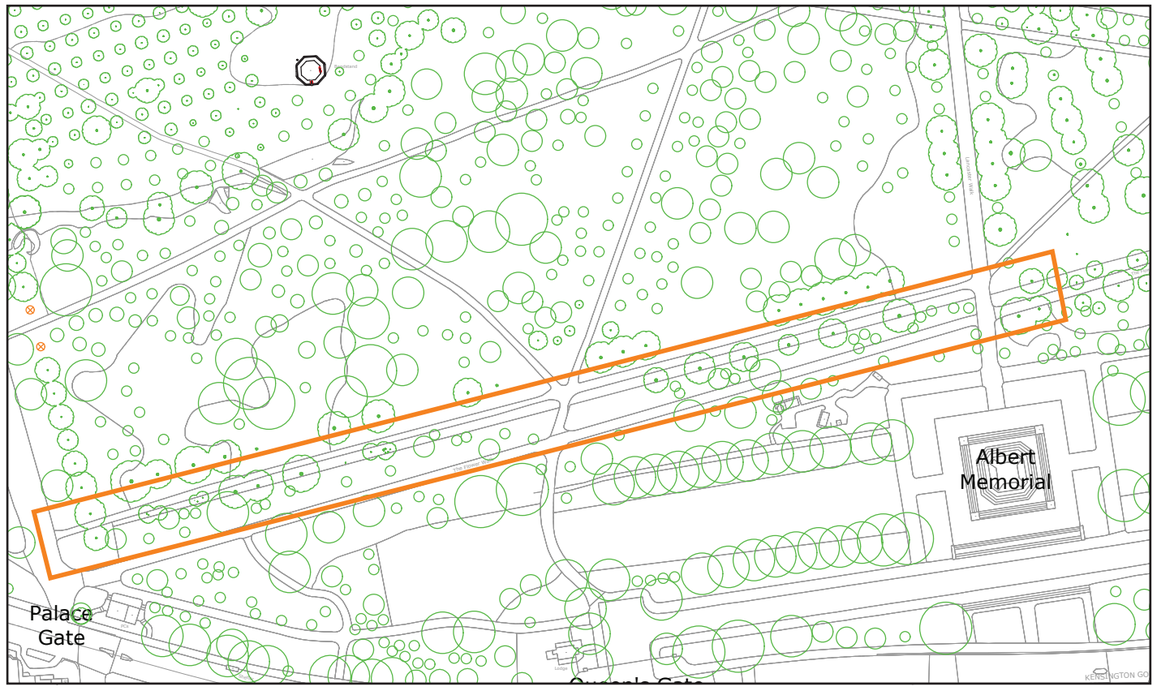


Fig.21b: Existing layout

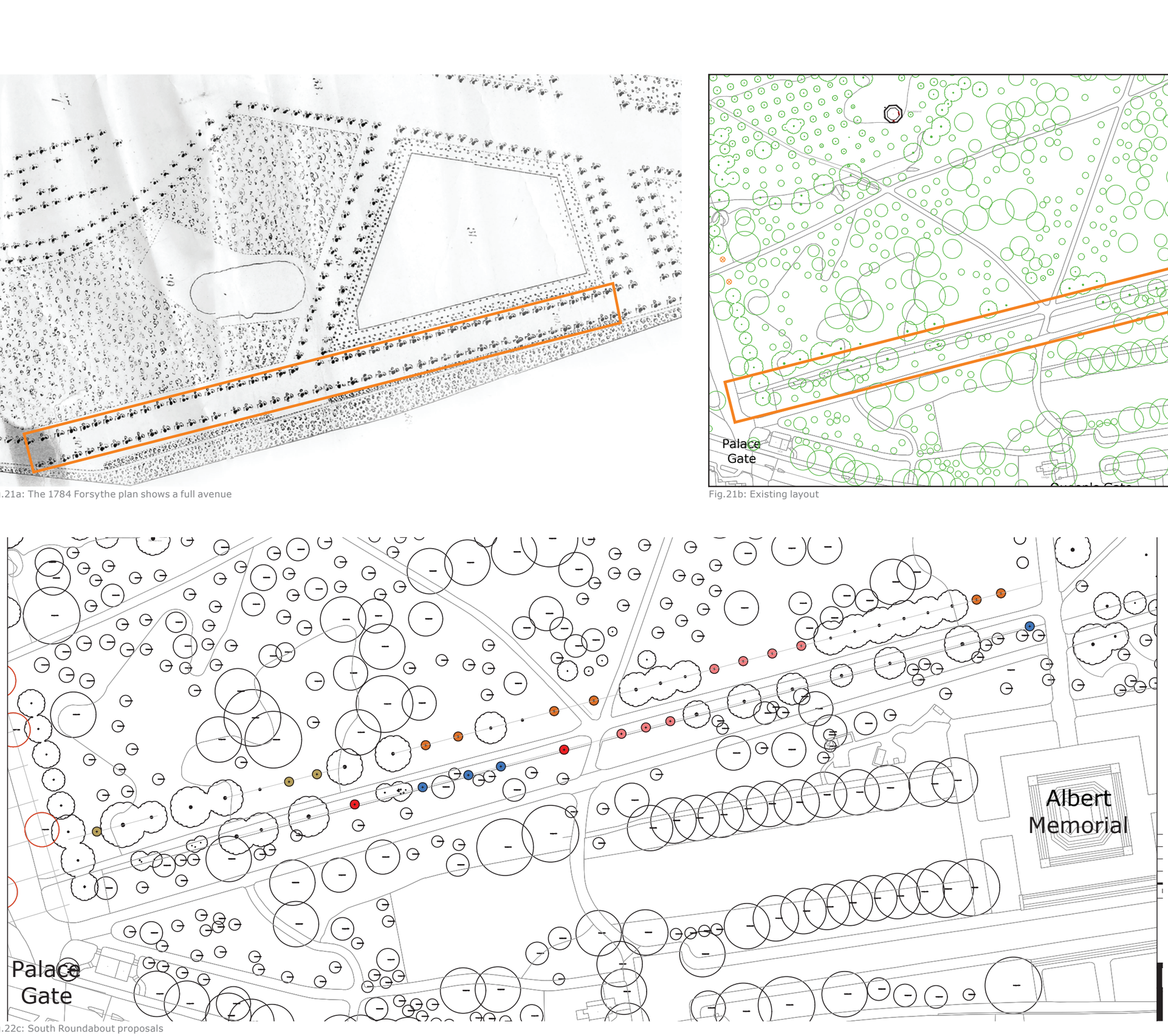


Fig.22c: South Roundabout proposals

16 Buck Hill Walk

An avenue is shown on the historic plans from Bridgeman etc. following the eastern boundary of the Gardens from Westbourne Gate to Magazine Gate via the North and Middle Bastions. This had all but disappeared by the early twentieth century but incremental planting has occurred in mixed species and in short runs along either side of the path. In its present form it is hardly an avenue as it is discontinuous tree lined walk, but there is an echo of its former completeness; and the expression of the North Bastion and a short section of (in-filled) ha-ha are reminders that this was part of the Bridgeman layout, not just a latter day appendage from Hyde Park.

It is therefore reasonable to consider supplementing the planting to make the avenue at least more present, but not necessarily emphatically complete. It is proposed to continue planting here, recognising the mixed age structure and species variation, and continuing in similar manner. There is also benefit to clear canopy line reinforcing the boundary on the eastern extent of Kensington Gardens.

It is also important to recognise the elevated aspect of this avenue and the vistas out across the park. This is a remote area of the park and thought needs to go into keeping sight lines and vistas open. It is already densely wooded close to Buck Hill Gate and the avenue pattern has gaps in that would benefit from fill. Views across the park opposite North Bastion offer chance to open up the avenue. Increasing the gap between trees retains the avenue feel and creates a sense of place within the park as a whole which might otherwise be lost in this relatively low profile area.

Down towards Buck Hill Axis and the Middle Bastion there is the opportunity to create the 'Big Reveal' by increasing the density of avenue planting before reaching the Buck Hill Axis and views across the long water towards the palace.

The informal nature of this area of the site allows for a slightly different approach to species selection and spacings. The outer avenue towards the boundary with Hyde Park would benefit from creating a denser tree line to reinforce the boundary and create a clear definition at the edge Kensington Gardens. Therefore views east would be closed up except where the Bastion Wall foundation are located to enable park users to look onto this area. The inner row would be more open to allow views across to the Albert Memorial, Henry Moore Statue and the long ranging vista across Kensington Gardens towards the Palace.

The outer row is proposed to be planted with mixed non-native and more ornamental species of different sizes, with species being planted in short runs. The inner row is proposed to be planted with native parkland trees that reach a decent size mature stature.

Towards Lower Dog Gate small groups of trees are proposed to help define the entrance and species such as Crab Apple, Hawthorn and Cherry would be selected.

Strategic fells on the two rows of Horse chestnuts on the run down to Magazine Gate are already considered for trees unlikely to reach their life expectancy and new runs of Small-leafed Lime on the inner row and Indian Horse Chestnut on the outer row are proposed.

Details

- Name: Buck Hill Walk
- Location: Trees flanking existing roadway / path from Westbourne Gate to Magazine Gate at near eastern perimeter framework.
- Thumbnail history – as shown on:
  - Bridgeman 1733: Formal avenue punctuated at North and Middle Bastions
  - Forsythe 1784: Ditto but with some losses in southern leg
  - OS 1870: Ditto; showing a few gaps as original stock ages.
- Existing numbers surviving in this avenue:

	Existing	Gaps	% surviving	Spacing
West	26	17	60	Varied
East	35	15	70	Varied

- Issues / risks: Mainly relatively recent (30 yrs) planting, of mixed species
- Strategy: This is no longer an emphatic Bridgeman avenue although it conveniently reflects the memory. Some gap planting (mixed species in short runs), would help reconstruct - but not trying to be wholly formal.
- Options
  - Layout/density/spacing: gap planting,
  - Species: *Fagus sylvatica, Juglans regia, Juglans nigra, Acer freemanii, Ulmus 'Lutece', Quercus frainetto, Aesculus indica and Tilia cordata,*
  - Timings: Available but not urgent
- Priority: 3
- New trees: 31 in avenue

At the south end the avenue is still well-formed

Large gaps in this avenue and bare patches of ground showing recently removed trees

Fig.22a: The 1784 Forsythe plan shows the presence of the Bastions

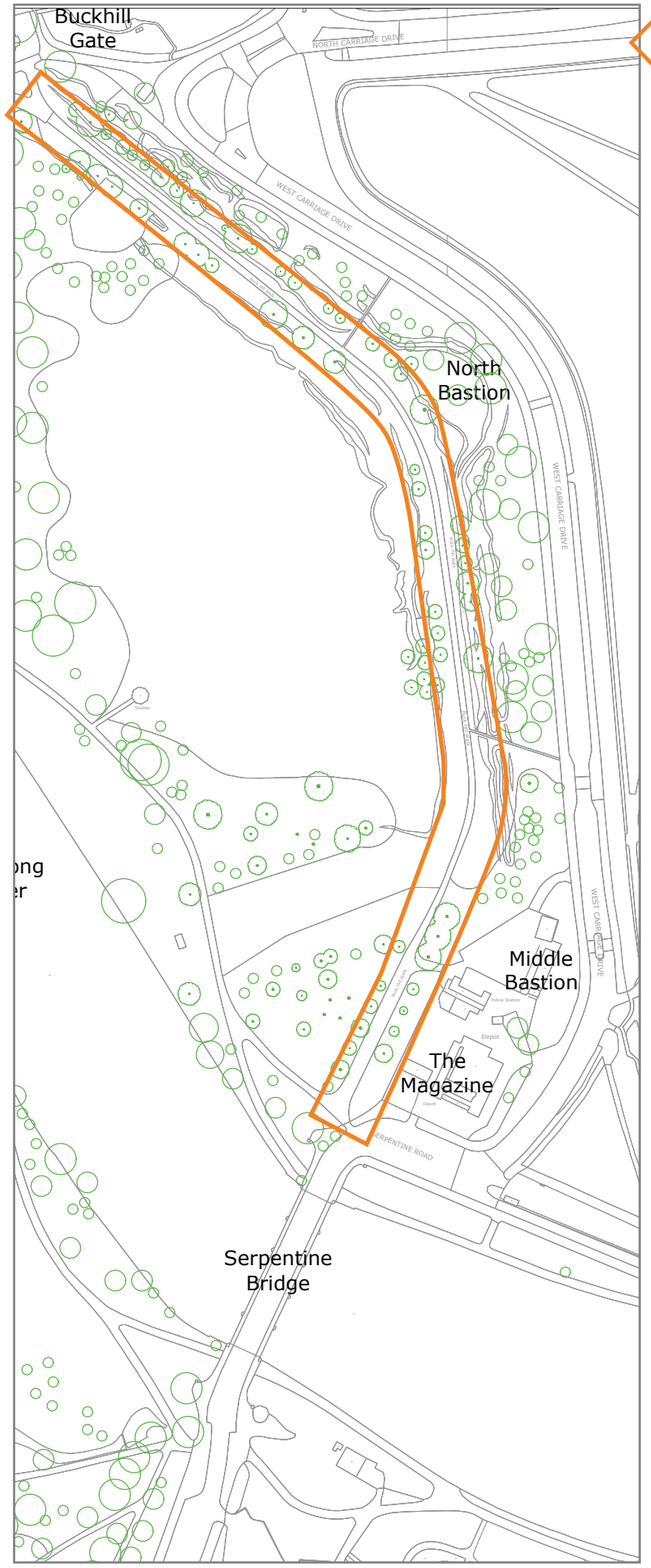


Fig.22b: Existing layout

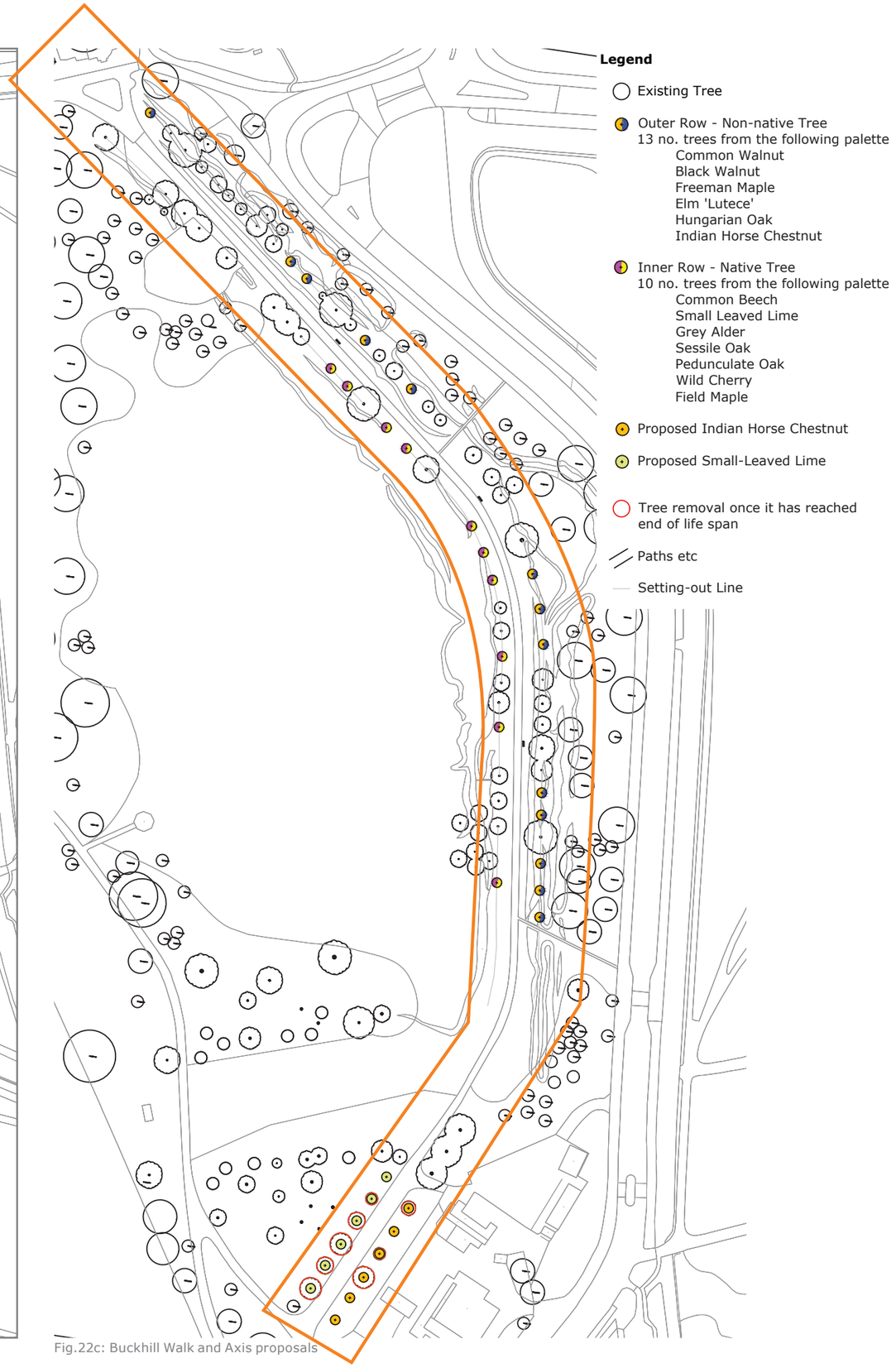


Fig.22c: Buckhill Walk and Axis proposals

17 The North Feathers

This is a group of some 50 mainly mature trees which stand in formation - mostly aligned, but appearing - because of gaps and age differences - as informal parkland to the North side of the Round Pond. They reflect a similar more complete and more recently planted grid formation of lime trees across the South side of the Round Pond, and bear similarity to the layout shown on Bridgeman's plans. They are however second (and some third) generation, many having been replanted in the latter part of the nineteenth century and now providing a pleasant parkland feel with formal echoes of alignment, a predominance of oak (60%) but with Horse Chestnut, Plane, Sweet Chestnut, Poplar and Lime present.

There are a number of gaps approximating to the original grid which could be planted, but there is no great urgency to do so. Therefore discretion should be used in the timing of these plantings. There is however an opportunity to reinforce the southern row along the outer face. Stump hole evidence suggests that Bridgeman's southern row possibly lay some 6m South of the now incomplete but mature "line". Again it is proposed to perpetuate the mix but retaining a majority of Oak, including Quercus petraea, with Beech, Sweet Chestnut, Lime and Hornbeam.

Details

- Name: North Feathers
- Location: North side of Round Pond
- Thumbnail history – as shown on:
  - Bridgeman 1733: Shown as formal East / West lines and tying into the "slips" at Broad Walk
  - Forsythe 1784: Still largely intact although South Feathers appear to have suffered c. 40% losses
  - OS 1870: still shown as formal lines, though interplanting may have commenced c. 1990
- Existing numbers surviving in this avenue: Mixed species

	Existing	Gaps	% surviving
Group combined	52	16	70
Front row	-	7	-

- Issues / risks: Predominately oak with 5 Horse Chestnut, 10 lime etc; reasonably well diversified
- Strategy: Conserve, despite loss of some lines; several candidates for veteran tree status (oak, sweet chestnut)
- Options
  - layout/density/spacing: a) some infill (16 possible without losing parkland feel but also b) option of restore front (s) line. (7 possible)
  - species: Oak, hornbeam, beech, sweet chestnut
  - removals: none
  - timings: available but not urgent
- Priority: 3
- Considerations for future continuation / management:
- New trees: 23 (assuming front row also planted).

The grid alignment is not obvious from all angles

The majority of trees within the North Feathers are of the same age class

The North Feathers provide a good edge to the Round Pond

Species include Oak and Lime

Fig.23a: The 1784 Forsythe plan shows the North Feathers as a formal grid

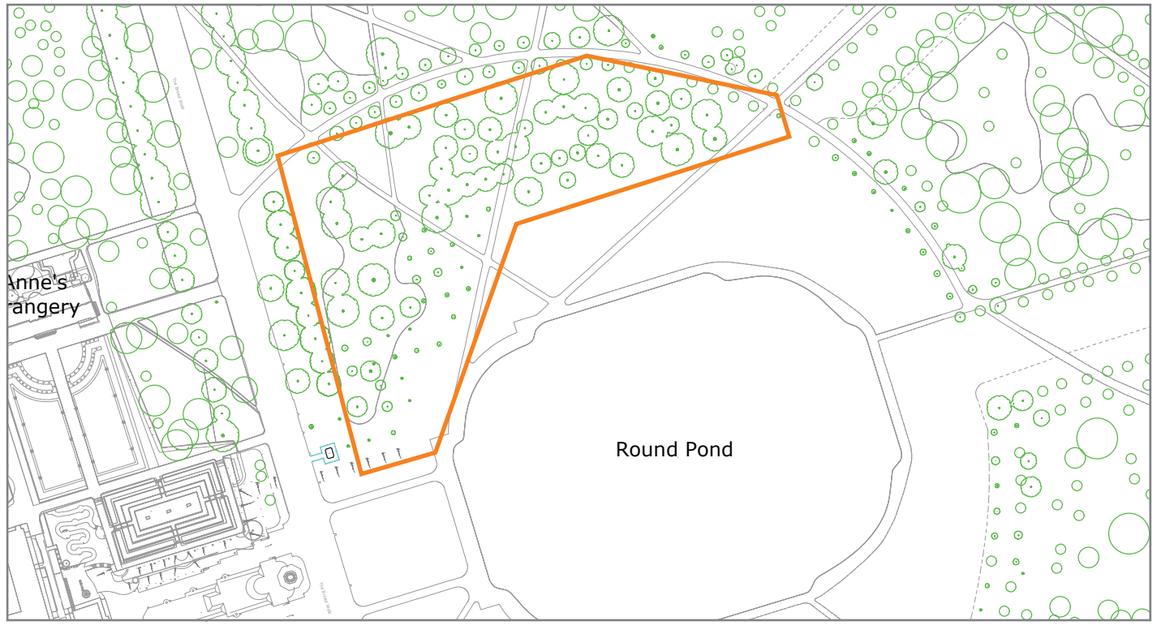


Fig.23b: Existing layout

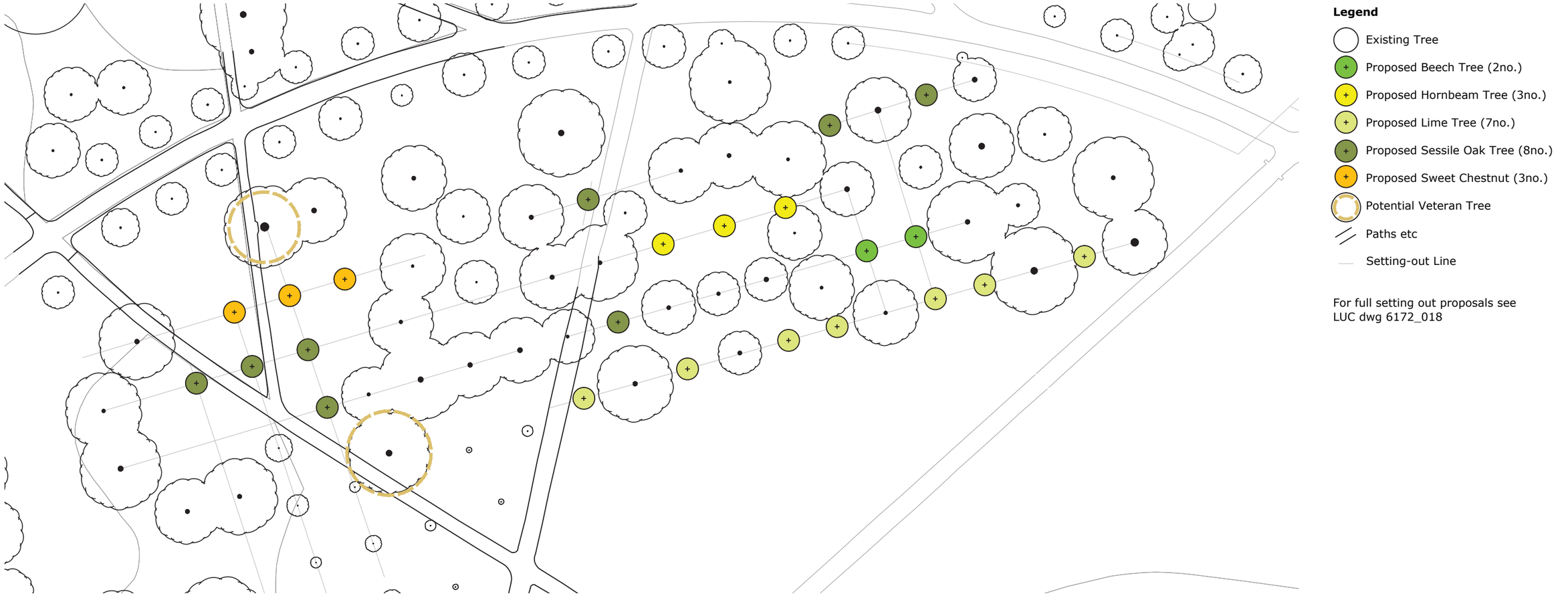


Fig.23c: The North Feathers proposals

18 Commentary on the Quarters

This is an overview of the Quarters and the possibilities/need for tree planting in some of these areas. Generally there is only very limited need at the present time as priority lies foremost with the structural elements of the avenues. Furthermore there is now significant natural regeneration in those Quarters which are held in meadow management, and indeed there will be need for some selection and control to prevent some of the "meadows" reverting entirely to woodland. Reference should be made to the 2010 report and to figures 7a and 7b respectively.

Roughly half the area of the Gardens is managed as "meadow" with an early topping in March and cropping off in September (and occasionally in October if needed). The pattern has generally worked well and has helped to enhance the ecological diversity and value of the Gardens as a whole. However there are some areas where strong regeneration - notably in the Chestnut Quarter and pockets in the Colt Quarter - that need a careful balance of selection/recruitment of a modest number of seedlings to grow on with deliberate control and removal to prevent full succession to bosquet in place of the delightful agrostis dominated meadow flora.

There is some limited scope to increase the extent of recruitment in the two "Basin Wilderness Quarters", lying to North and South of Front Walk, and again in Old Pond Wood. While there is need to limit the extent of regeneration, these areas, sitting in contrast to the openness which surrounds the Round Pond plain could have more of a "bosquet" feel although reversion to wilderness woodland - as originally indicated by Bridgeman - would not suit the current intensity of access and use.

There is also some scope to increase modestly and beneficially the network of mown paths through and small glades within the meadow Quarters (as recently adapted in Coombes Quarter), inviting access across meadow areas and providing smaller scale open areas to sit within the longer grass areas.

Reference is made to the Fir Quarter which was located as a small triangle of land at the upper end of Inverness Gate Walk towards the Queensgate boundary. It was shown on Forsythe's plan and in nineteenth century illustrations with a small but lofty clump of Scots pine. It would be possible to establish a small clump - say 6 Scot's pine and possibly a couple of Metasequoia or alternative species within this Quarter.

Similarly, also reflecting mid nineteenth century illustrations of a view towards John Rennie's bridge, it would be possible to plant a small picturesque clump of conifers in the Queen's Temple Quarter. The view (fig. 24, c. 1840) shows the bridge (constructed in 1823) and a clump of trees including Scots Pine and a Fir. The planting of the conifers could be included in a project to open up more of the view from the Temple towards the bridge.

The 2014 report made some initial identifications of veteran trees in the Gardens and this led to a more detailed separate document specifically for the management of veteran trees (figure 27). These mainly occupy locations within the Quarters as trees in the avenues have been more subject to consideration for replacement and renewal whereas trees in Quarters have had both space and setting to grow old more gracefully. Such trees are considerable assets both in visual and ecological terms. Their futures need to be safeguarded where possible by monitoring and prescriptive management. TRP have already started the process and indeed further detailed surveys, scheduling and prescriptive management might be incorporated into the Arbortrack system.

Integration of the parkland and quarters trees into the tree strategy should not just be about replacement planting and maintaining the historic layout but should consider all the factors already mentioned in this report to ensure that existing trees are a high priority and appropriate measures are taken early on to improve their chances of attaining there full life expectancy and beyond towards joining the ranks of veteran trees. An action plan should be prioritised to best manage the large tree population in Kensington Gardens this is something that will no doubt emerge in the coming years.

Fig.24: View of the Queen's Quarter, c. 1840

Fig.25: The Quarters

19 Sources and References

The following key references were used in the compilation of this report:

Key Documents

- Historical Survey of Kensington Gardens, LUC 1982;
- Kensington Gardens Tree Strategy, LUC 2010;
- Kensington Gardens Management Plan (2016); https://www.royalparks.org.uk/__data/assets/pdf_file/0006/41766/Kensington-Gardens-Management-Plan-16-26.pdf
- Kensington Gardens Operations Plan (submitted for Green Flag Award)
- 2020 Annual Update on Tree Diseases and Disorders produced by Ian Rodger TRP Arboricultural Manager
- Biosecurity Strategy - The Royal Parks

Key Plans

- Charles Bridgeman, 1733;
- Forsythe 1784 - 1987;
- Ordnance Survey 1st Edition, 1870

Appendix 1: Setting Out Plans

Appendix 2: Alternative Broadwalk Options

The Broad Walk - Option 03

The **third option** remains, as 2014, infilling the now 18 gaps formed by the missing maples to complete the "alternates" spacing, but with the variation being replacing the Maples for Oaks, which would mitigate the ongoing damage caused by squirrels to the growing tips of the trees. However this continues to deny the faithful restoration to the Bridge man spacing and would continue the current spacing into perpetuity. It is still the least destructive and allows for continued enjoyment of the Maples which are in maturity and provide a largely healthy and full canopy with wonderful autumn colour.

The issue with this approach is that there is a short remaining life expectancy for these trees and numbers are reducing rapidly with further scheduled works (see highlighted trees) planned for 2020.

Oak was chosen as the most suitable species following a team selection process that identified potential options and scored them on historical and locational appropriateness, strength as an avenue tree, ecological value, availability and ease of establishment. It is however susceptible to Oak Prosecessionary Moth (OPM) and consequently strict management guidelines would need to be in place to ensure the risk is controlled.

Fig.19a: **Option 1** - Oaks: - temporary infill of Maple gaps with new Oaks (temporary solution)

The Broad Walk - Option 04

With the problem of the irregular spacing remaining, a second option was tested in 2014. Focusing on the more 'refined' option as it has the short term benefit of retaining the existing tree canopy whilst also starting a more faithful restoration of the Bridgman spacing with matching pairs in the existing gaps with selective removal of weaker maples and those detracting from the avenue setting.

The number of "gaps" which can be taken up in this manner straight away has increased since 2014; some are currently compromised by the retention of maturing maples, but overall the resultant pattern would be a positive and early investment in the next generation of trees and would still allow for a more complete pattern of oaks to replace the maples as further gaps develop in future years for succession.

As noted earlier, this is not a strict Bridgeman layout but proposes a spacing that fits in with the modern day path network and allows for trees to grow to their ultimate height and spread without conflict with neighbouring trees.

Where this proposal has long term uncertainty is when all the plantings of Oak would be undertaken. With a number of the existing Maples still in good health it might mean removals could be continuing for 20 years or more and would see trees of varying maturity which detracts from the consistent and orderly lines usually expected from formal avenues.

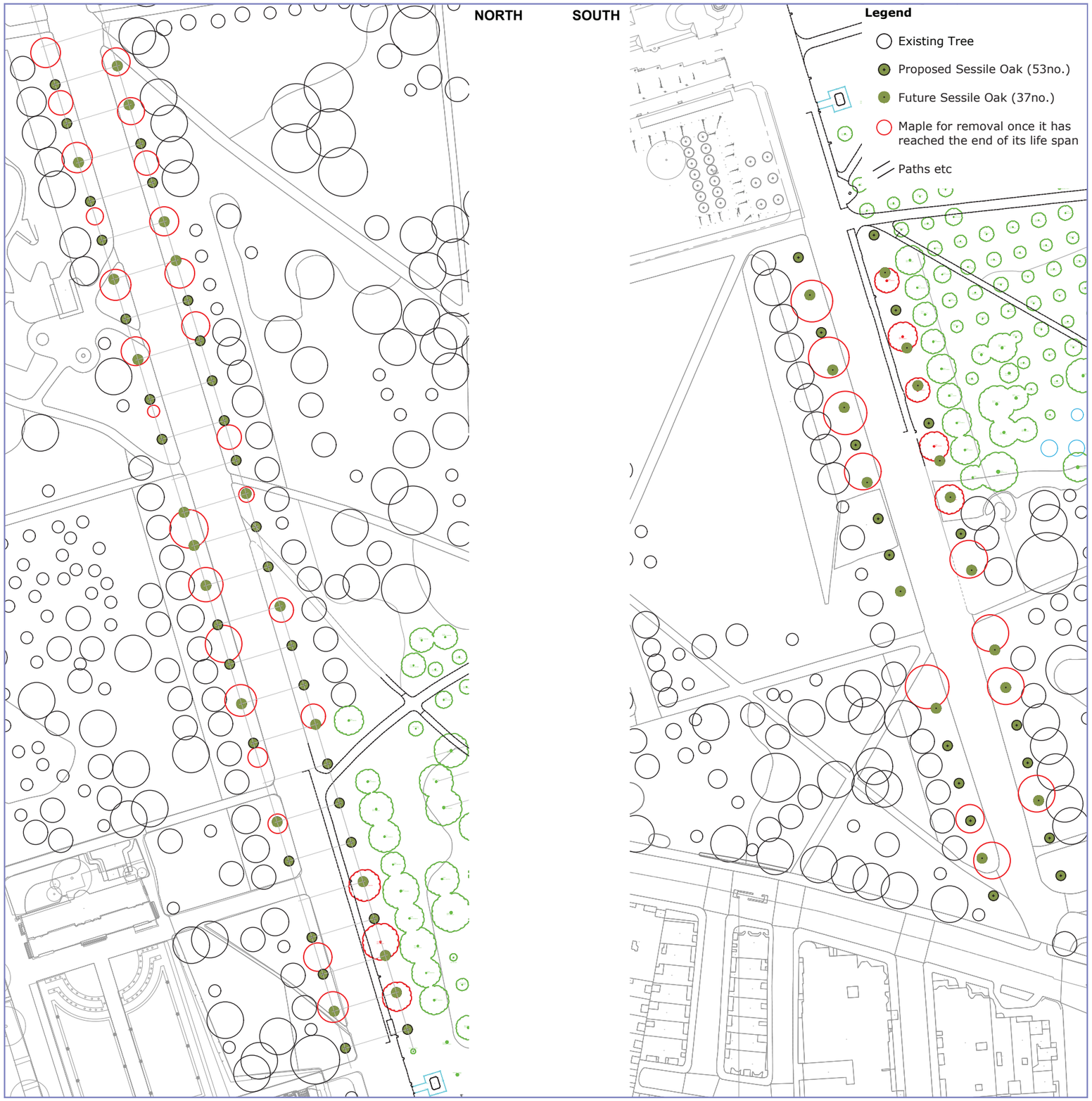


Fig.19b: **Option 2 - Oaks**: long-term effect, after Maples have been replaced - creates a well-spaced avenue

Appendix 3: Annual Update on Tree Diseases and Disorders and Review of Arboricultural Resources

EXECUTIVE COMMITTEE

Date of meeting: 9th March 2020

Subject: Annual Update on Tree Diseases and Disorders and Review of Arboricultural Resources.

Prepared by: Ian Rodger

Presented by: Ian Rodger

Issue: To update Ex Com on the status of the various tree diseases and disorders currently affecting The Royal Parks. This report is given to Ex Com for information.

Recommendation: Ex Com are recommended to:

- **Note the contents of the update on each of the key pests and diseases affecting the parks and note the continued need for effective controls and vigilance regarding these and other future potential pests and diseases.**

Options: No alternatives to consider.

Background and current status of the seven main pest and diseases:

1. Horse Chestnut Bleeding Canker.

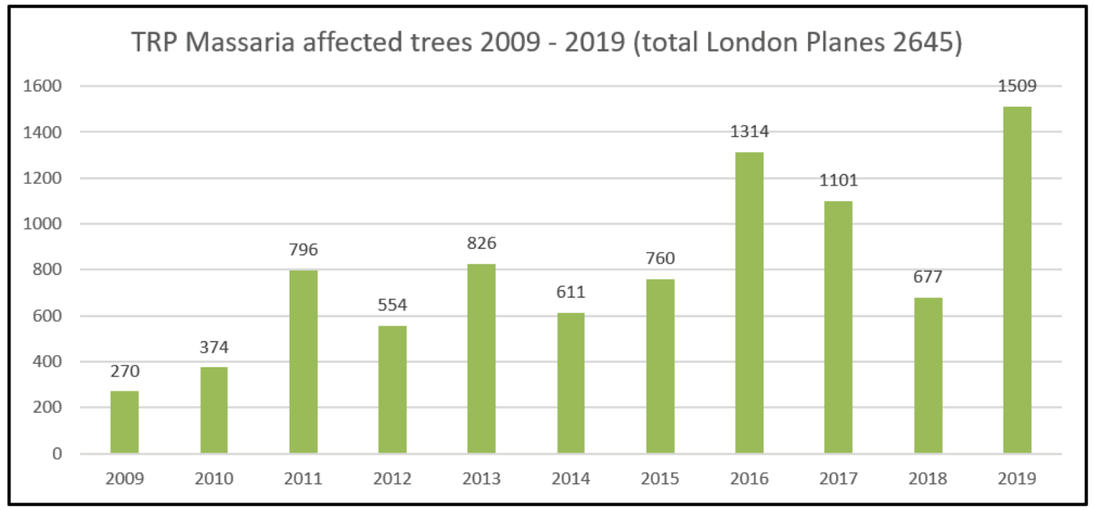
A bacterial disease which kills strips of bark and cambium causing the trees to rapidly decline and allowing decay fungi to weaken the main structural branches and trunk. It is widespread across all the parks affecting around 80% of the population.
2019 was not a good year for Horse Chestnuts with the hot weather accelerating the decline of trees infected with nearly 26 trees removed or monolithed in Hyde but mostly Kensington Gardens at a cost of £18,500. The decline of Chestnut avenue in Bushy continues with the loss of six mature trees in 2019. In Richmond Park 12 Horse Chestnuts were felled or had intervention works carried out to remove or reduce heavily cankered and cracked limbs, approximate cost £7900.

2. Massaria.

A fungal disease which causes the death and decay of limbs on London Plane; these limbs can break off suddenly within a few months of infection. This disease is a particular problem in the major avenues of Green Park and The Mall, Hyde Park and Kensington Gardens. Inspections are carried out every 8 to 10 weeks from March through to December with contractors removing dead and dying branches almost continually across the parks during peak season.

2019 has been the worst recorded year for numbers of trees affected and overall cost. 57.5% of the population were affected (although some of these trees were deadwooded more than once) with management in 2019 costing £225,395: a large

increase over the £86,120 spent in 2018. The hot summers over the last two years have most likely contributed to the very large increase in Massaria numbers.



A research project initiated in 2013 into various treatments using mulch and compost tea to mitigate Massaria in Kensington Gardens is showing good results. Laboratory soil tests show strong rises in beneficial fungi and soil micro-organisms after the last six years of improving the soil around the test samples against their controls. This is visually evident with reduced numbers of Massaria affected dead branches and improved canopy density in mulched trees over the control subjects.

3. Oak Processionary Moth (OPM).

An imported insect pest which can rapidly defoliate Oak trees. The later stages of the larvae are covered in and shed poisonous irritating hairs which pose a threat to human and animal health.

Central parks.
2019's targeted double application of BT (a biological control) to Oaks in Hyde, Kensington Gardens, Regent's Park and Greenwich was successful but this year we decided to rest a few areas which led to an increase in nest removals. Targeted application has allowed us to reduce the impact on non-target species and protect biodiversity in sensitive areas; costs for spraying this year were £14,500.
Nest removal costs for 2019 in the central parks and Greenwich are slightly up at £21,407 (2018 costs £20,254).

2019 nest removals.

Hyde Park	106 nests removed
Kensington Gardens	96 nests removed
Brompton cemetery	8 nests removed
Green/St James	13 nests removed
Greenwich	97 nests removed
Regent's	62 nests removed

Richmond and Bushy.
The control programme in 2019 started with Natural England consented targeted spraying with BT in high footfall areas of both parks and some areas that had previously been heavily infested. This was followed by surveying for nests by volunteer surveyors and staff and a programme of manual nest removal in both parks. Both the surveying and implementation of the nest removal programme were again gruelling this year due to periods of high temperatures during the operational period.
2019 saw a large increase in nest numbers removed in Richmond and Bushy Parks compared to 2018. The reason for this is possibly linked to the hot and dry weather conditions during the peak moth emergence period in August 2018, enabling large numbers of moths to survive and lay eggs which overwintered and hatched in April 2019. This put additional strain on the volunteer surveyors who recorded an increase in the number of infested trees, and for the contractor nest removal teams who worked full-time in both parks from July to mid-August.

Richmond Park	2013	3543 nests removed
	2014	8000 nests removed
	2015	10,200 nests removed
	2016	9002 nests removed
	2017	9609 nests removed
	2018	6200 nests removed
	2019	8928 nests removed
Bushy Park	2013	202 nests removed
	2014	700 nests removed
	2015	1233 nests removed
	2016	1446 nests removed
	2017	750 nests removed
	2018	650 nests removed
	2019	1244 nests removed

4. Acute Oak decline (AOD).

A poorly understood syndrome causing a rapid decline; trees develop symptoms over 1-5 years and sometimes have very high levels of mortality. Symptoms include extensive bleeding from longitudinal splits in the bark and often extensive dieback in the crown.
AOD continues to have a significant resource requirement in Richmond Park with hundreds of symptomatic trees requiring monitoring in different areas. While some trees appear to go into remission, others require intervention in the form of deadwooding, monolithing and sometimes felling. Oak in some areas, particularly the population around the heavily used car park and playground at Kingston Gate, have been strongly symptomatic for several years, with high levels of intervention required. In 2019 there was also an increase in oak showing symptoms of AOD in Conduit Wood, to the west of Holly Lodge. It is likely that the very hot and dry

conditions of the summers of 2018 and 2019 further stressed these trees and caused an acceleration in their decline.

Numbers of affected trees in Bushy Park has remained relatively stable. Approximately £5550 has been spent on AOD mitigation works to date with more expected as part of the winter tree works programme.

The Royal Parks continue to facilitate research on AOD carried out by both Forest Research and Rothamsted Research. Research into the role of environmental factors in the syndrome, including soil properties, is ongoing on the symptomatic population of Oak at Sheen Wood in Richmond Park.

5. Ink stain disease (Phytophthora) of Sweet Chestnut.

This fungal pathogen kills the fine roots giving symptoms of diminishing leaf size, chlorosis and gradual die back and is currently only a problem on Sweet Chestnuts in Greenwich Park.
This is a very difficult disease to diagnose and counteract but to help slow down the spread park management have agreed to alter mowing regimes to allow more meadow type growth in identified infected areas.
We are entering the third year of a five-year mitigation study to identify methods of increasing beneficial host-specific fungi and bacterial communities. Soil assessments have been made prior to the application of high-grade hardwood wood chip and Bio char (activated charcoal) and subsequent laboratory samples will be able to identify drops in pathogen inoculums against rises in beneficial organisms. We are working with Padua University in trialling a new phosphite stem injection which will treat the more critically affected trees and is showing some promise.

Six mature trees are to be felled/monolithed this winter. A recent condition survey of all the Chestnuts indicated that around 40% have canopy decline symptoms of varying degrees.

6. Oriental Chestnut Gall Wasp, host Sweet Chestnut.

Oriental Chestnut Gall Wasp (OCGW) was first discovered in Richmond, Bushy, Hyde, KG and Greenwich in 2016.
OCGW is currently considered a low impact pest of Sweet Chestnut, causing abnormal growths on buds leaves and petioles. However, in high numbers the galls can weaken Sweet Chestnuts and make them more vulnerable to other more virulent pests and diseases (see next disease).
There seems to be an exponential increase in this pest in the parks currently affected with 2019 showing a huge surge in numbers in Hyde, KG, Richmond and Greenwich parks with some trees showing extreme infestations with around 50% foliage failing to develop. In Richmond Park in 2019 there was a significant increase in the levels of infestation of OCGW.
The possible long-term impacts of this on the health of the trees is of concern, with foliage loss and micro wounding affecting vitality and the possible link with increasing the vulnerability of the trees to Sweet Chestnut Blight.

7. Sweet Chestnut blight, *Cryphonectria parasitica*.

Sweet Chestnut blight is a fungal bark and cambial disease which is usually fatal to European and North American sweet chestnut trees. It devastated Chestnut forests in eastern USA during the first half of the 20th century, killing an estimated 3.5 billion trees after it was accidentally introduced from Asia.
Although losses have not been on the same scale in Europe, Sweet Chestnut blight has spread steadily throughout much of Europe, and tree losses have been regionally significant.
C. parasitica was first discovered on five trees in Hyde Park in December 2019 and confirmed in Greenwich Park on three trees in January 2020. It is thought that the infection entered on planted stock which had a latent infection that was triggered by the past few years very hot summers. No destruction notice has been issued as the Forestry commission would like to use the Hyde trees as a study into a biological control which is used in Europe with good success.
There are currently no cost implications regarding Sweet Chestnut blight, all the surveys and laboratory work carried out by the Forestry Commission were free. Future costs are speculative but will need to cover further research as well as any sanitation fellings and on-site arisings destruction.

8. Chalara Ash dieback and other future pests and disorders.

Ash die back is still presently considered a disease of the countryside with our closest outbreak Hampstead Heath. Although we have no infected trees the risk of Chalara infection in Regents Park is now high and the team are monitoring accordingly. There is no control available and once the disease reaches TRP it will eventually devastate the Ash population (thought to be around 6% of total tree cover).

There have been no reported outbreaks in the UK of any of the other possible future tree problems such as Canker Stain of Plane (currently central France), Emerald Ash borer Beetle (currently in Russia) or Xylella fastidiosa (southern Italy and Spain).

TRP continues to contribute to the London Tree Officers Association's survey for Canker Stain of Plane as part of an EU disease free region designation.

Conclusions:

Vital need for TRP to continue the focus on pest and disease management, research and bio security.

Financial implications: