



**BIRLEY FIELDS
MANCHESTER
ARBORICULTURAL IMPACT ASSESSMENT
DECEMBER 2023**

TEP
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Document Control

Document Title	Arboricultural Impact Assessment
Prepared for	Vital Energi
Prepared by	The Environment Partnership (TEP) Ltd
Document Ref.	10100.001
Date	December 2023
Author	Angus Blankenstein
Checked	Heather Eilbeck
Approved	Robin Grimes

Amendment History					
Version	Date	Modified by	Approved by	Reason(s) for issue	Status
0.1	19/10/2023	AAB	HEE	Checking	Draft
1.0	21/12/2023	AAB	RMG	Approval	Issue

Arboricultural Impact Assessment

1.0 Scope

- 1.1. TEP has been commissioned by Vital Energi to conduct an arboricultural survey of land at Birley Fields Campus and to make an assessment in accordance with BS 5837:2012 Trees in relation to design, demolition and construction - Recommendations.
- 1.2. This report has been produced to support a planning application. It describes the findings of field and desktop surveys; the effects that granting planning permission would have on arboriculture; and measures that are and/or should be incorporated in the proposed development.
- 1.3. A judgement has been made in consideration of the survey findings, desktop search results and the nature of the proposed development that a full report style Arboricultural Impact Assessment (AIA) would not be proportionate. This document presents the content of an AIA in a condensed format, which is considered appropriate for relatively simple sites and/or development in relation to trees.

Survey

- 1.4. The survey was undertaken in August 2023 in accordance with BS 5837 by a qualified arboriculturist. The survey method is included at Appendix B.
- 1.5. A topographical survey was used to record the position of trees and vegetation (drawing reference: 18H081). Where trees were not shown on the topographical survey, their locations were estimated.
- 1.6. Trees on private land outside the application boundary, and at inaccessible locations were surveyed insofar as was practicable. Whilst reasonable effort has been made to ensure the accuracy and comprehensiveness of such records, it cannot be guaranteed.

Limitation

- 1.7. This report relates to a specific development proposal and should not be interpreted as advice in any other circumstance.
- 1.8. This report constitutes a valid basis for the evaluation of impacts on trees resulting from the proposed development for a period not exceeding 2 years from the survey date. After this, it would be necessary to review baseline data and conclusions to ensure reliability.
- 1.9. Where the recommendations of this report have been followed, any future deterioration in tree condition shall not be attributable to the development.



Arboricultural Impact Assessment

2.0 Baseline

2.1. This drawing presents an overview of the existing trees within influencing distance of the proposed development. It also summarises the results of desktop searches for any designations, legal and regulatory restrictions or special status of relevance to arboriculture.

Application Site

2.2. The site comprises 4 areas within the Manchester Metropolitan University Birley campus to the south of Manchester City Centre

Survey results

- 2.3. 59 individual trees and 8 groups of trees were recorded within influencing distance of the application site.
- 2.3. The north-western area comprises large ash and lime trees in an overgrown triangular area of ground bordered by Royce Road to the west. There are some smaller ornamental trees planted towards the eastern edge (T1-T12, G1, G2).
- 2.4. The northern area, bordered by Stretford Road to the north and Bonsall Street to the south, is characterised by large silver maples towards the southern edge (T13-T22) of this area with smaller ornamental trees to the north (T25-T28).
- 2.5. The north-eastern area comprises a group of large amenity trees of mixed species forming a large area of well-established tree cover in open space between two buildings and includes 2 large high quality trees (T31 and T38).
- 2.6. The southernmost area is adjacent to the energy centre and parking and comprises small trees in a screening group with 2 larger ornamental trees next to the access roads (T56, T58, G4, G5).
- 2.7. Trees have been categorised in accordance with BS 5837 to describe their arboricultural, landscape or cultural qualities: A (high quality), B (moderate quality) C (low quality) and U (unsuitable for retention). The categorisation of tree quality allows a weighting to be given to each tree within the context of proposed development but is not prescriptive. Hedgerows are not categorised.
- 2.8. The majority of trees within all survey parcels are moderate quality with occasional high quality specimens; usually large, prominent examples of their species. There are also some areas where small, low-quality trees are present, usually in groups.
- 2.9. A Root Protection Area (RPA) has been calculated in accordance with BS 5837. This is based on each tree's stem diameter at 1.5 metres and has been adjusted where necessary to most accurately represent the likely spread of roots in consideration of prevailing conditions. The RPA represents the minimum area around each tree that must be left undisturbed to ensure its survival.
- 2.10. Feature locations, their quality categories, canopy spreads and root protection areas are shown opposite. All arboricultural information recorded during the survey is presented at Appendix A.

Desktop Searches

- 2.11. Manchester City Council confirmed that no trees on or adjacent to the site are protected by Tree Preservation Order or within a Conservation Area.
- 2.12. Natural England's Ancient Woodland Inventory (Provisional) for England contains no records for the site.
- 2.13. There are no veteran trees which could be affected by development of the site.
- 2.14. The site is within Manchester City of Trees Community Forest.
- 2.15. There are no mapped Habitats of Principal Importance (Hedgerow, Deciduous Woodland, Wood Pasture and Parkland, and Traditional Orchard) on the site. Observations made during the site survey support this.
- 2.16. No assessment of the presence of protected species has been made during the production of this report. Features of possible interest that were observed incidentally during the tree survey are recorded in Appendix A.
- 2.17. Works to and around trees have the capacity to affect protected species, particularly including birds, bats, great crested newts, badgers, dormice, otters and water voles. Contractors should be familiar with the locations and sensitivities of any protected species that are present and take reasonable avoidance measures or comply with the requirements of any licence agreement in accordance with the advice of an ecologist.

KEY

[This drawing must be reproduced in colour]

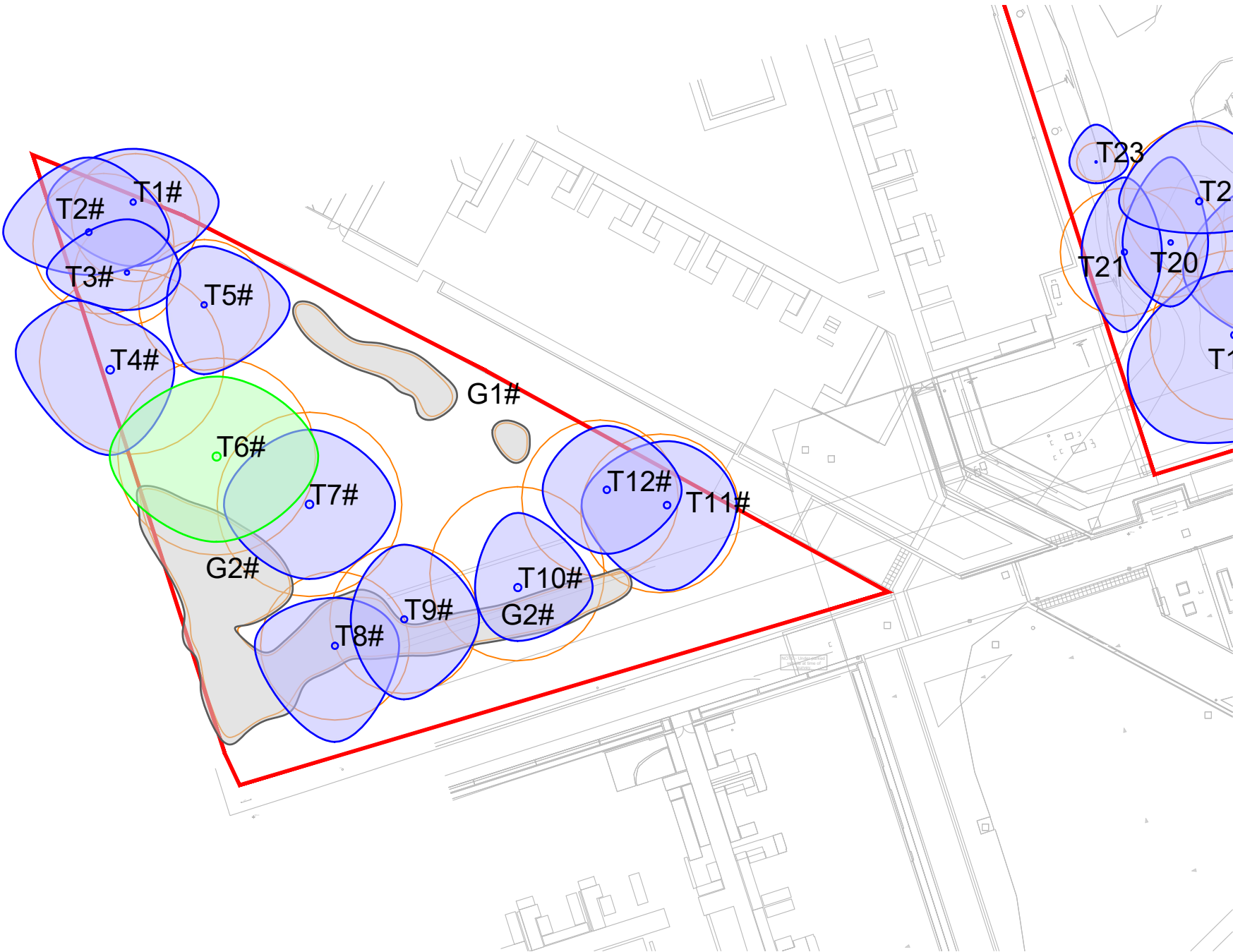
- T1/G1/W1 Trees
- Root Protection Area (RPA)
- Survey Boundary
- Approximate location
(Feature not shown on supplied topographical survey)

Tree Quality Categorisation

(Based on BS 5837:2012 Trees in relation to design, demolition and construction - Recommendations)

- Category A
(High quality)
- Category B
(Moderate quality)
- Category C
(Low quality)
- Category U
(Unsuitable for retention)

NOTE: This drawing should be read in conjunction with the respective Arboricultural Survey Data (Appendix A).



Rev	Description	Drawn	Approved	Date
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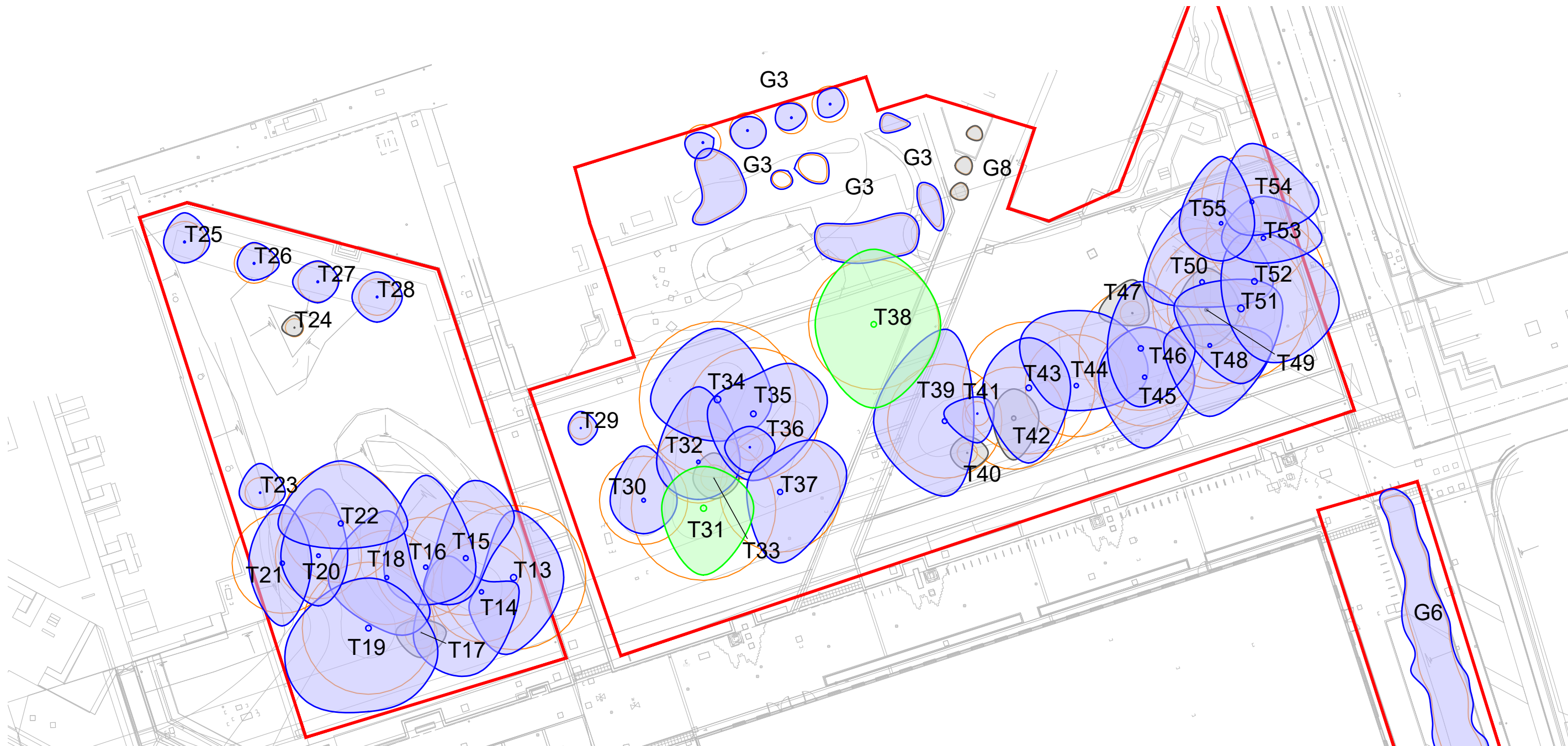
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Project
Birley Fields, Manchester

Title
Arboricultural Impact Assessment [BASELINE] - Inset 1 of 4

Drawing Number
D10100.001

Drawn	Checked	Approved	Scale	Date
AAB	HEE	RMG	1:500 @ A3	21/12/2023



KEY

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(Low quality)
- Category U
(Unsuitable for retention)

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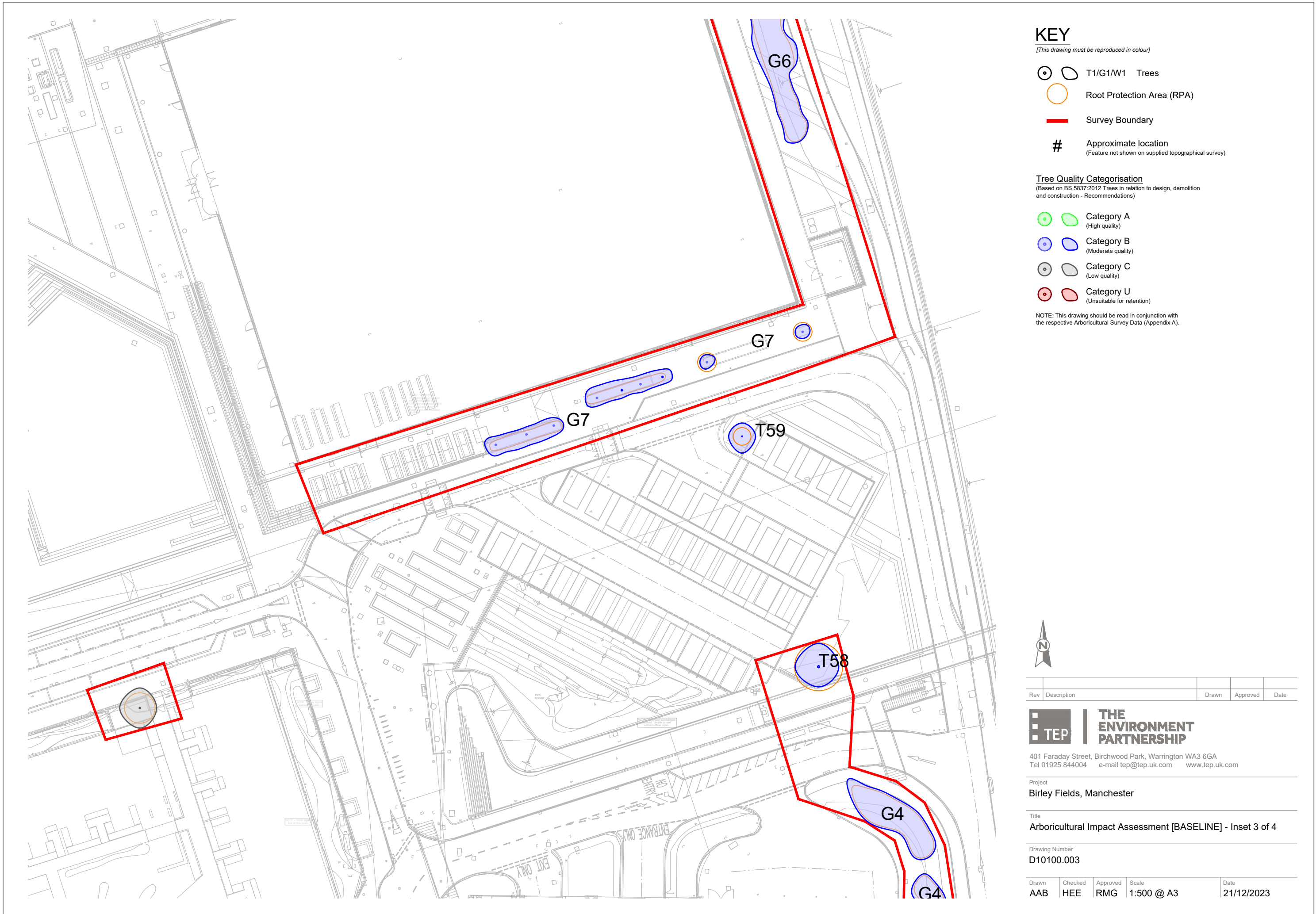
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Drawing Number
D10100.002

Drawn	Checked	Approved	Scale	Date
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- Root Protection Area (RPA)
- Survey Boundary
- Approximate location
(Feature not shown on supplied topographical survey)

Tree Quality Categorisation
(Based on BS 5837:2012 Trees in relation to design, demolition and construction - Recommendations)

- Category A
(High quality)
- Category B
(Moderate quality)
- Category C
(Low quality)
- Category U
(Unsuitable for retention)

NOTE: This drawing should be read in conjunction with the respective Arboricultural Survey Data (Appendix A).



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Drawing Number
D10100.003

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KEY

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- Root Protection Area (RPA)
- Survey Boundary
- # Approximate location
(Feature not shown on supplied topographical survey)

Tree Quality Categorisation
(Based on BS 5837:2012 Trees in relation to design, demolition and construction - Recommendations)

- Category A
(High quality)
- Category B
(Moderate quality)
- Category C
(Low quality)
- Category U
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Title
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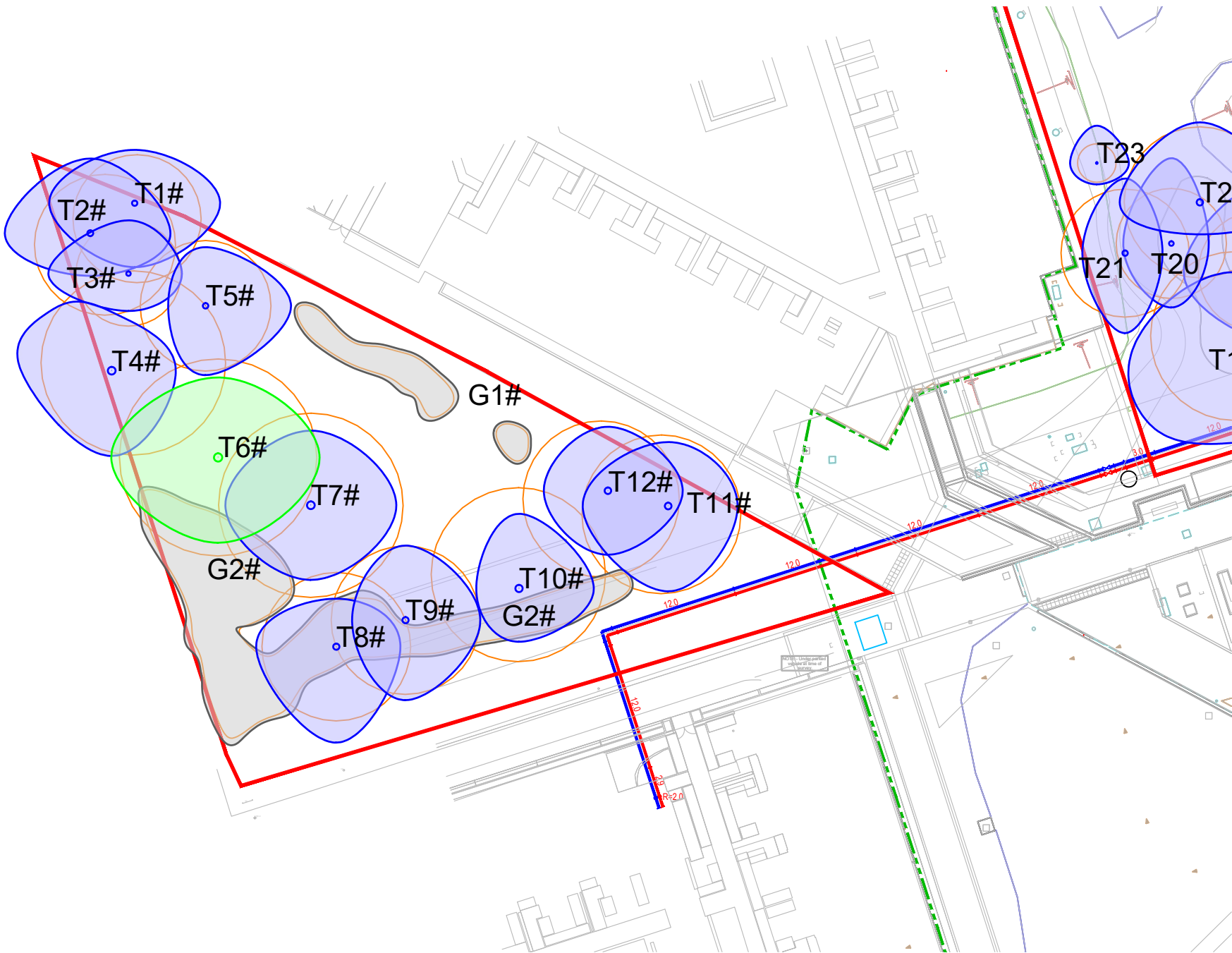
Drawing Number
D10100.004

Drawn	Checked	Approved	Scale	Date
AAB	HEE	RMG	1:500 @ A3	21/12/2023

Arboricultural Impact Assessment

3.0 Effects

- 3.1. In simple terms, the effects on arboriculture comprises an account of which existing trees would not be retained within the proposed development; what significance they have; and whether adverse effects would or can be mitigated or offset.
- 3.2. This drawing presents the results of an assessment in accordance with BS 5837, including a definitive account of which trees would be removed or pruned.
- Proposed development**
- 3.3. The proposed development comprises 2 boreholes with associated pipework connections. The proposed layout is shown opposite and is based on drawing DH & BH Pipe Trench Option C (No Reference).
- Proposed tree works**
- 3.4. A reasonable worst case assessment of the requirement to prune or remove trees has been made on the basis of BS 5837, the proposed construction methods, and professional judgement. The works listed below and illustrated opposite form part of the proposed development, and would be permitted by the grant of planning consent:
- 3.4.1. 1 individual tree (T57) and one small tree within G3 would be removed to facilitate the pipework routes.
- 3.4.2. The current pipework route runs close to several small trees, in these cases their retention is considered possible with supervision of the excavation process (See drawings D10100.009-012).
- 3.5. Tree losses would result in a minor loss of landscape and amenity value; the majority of trees are quite small but have good potential to provide long term canopy cover.
- Effects on designated or protected features**
- 3.6. Trees are a material consideration and the quality of trees, planning policies, and the presence of any special status or designation is likely to be considered by consenting authorities when determining a planning application.
- 3.7. The removal of trees, without mitigation, constitutes an adverse effect that is likely to be regarded by consenting authorities as contrary to the overarching environmental objective within national planning policy to protect and enhance the natural environment and biodiversity.
- 3.8. In consideration of the desktop search results described previously, there are no adverse effects that cannot be mitigated or offset and which therefore lead to potential grounds for a refusal of planning permission.
- 3.9. It will be for the consenting authority to evaluate the proposed development, including mitigation measures, in consideration of all relevant local and national planning policies and guidance.



KEY

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- T1/G1/W1 Trees
- Root Protection Area (RPA)
- Survey Boundary
- # Approximate location
(Feature not shown on supplied topographical survey)

Trees and hedgerow to be retained and protected

- Category A
(High quality)
- Category B
(Moderate quality)
- Category C
(Low quality)
- Category U
(May be retained for habitat value)

Proposed tree and hedgerow works

- Trees to be removed
(Canopy outline denotes tree quality category)

NOTE: This drawing should be read in conjunction with the respective Arboricultural Survey Data (Appendix A).



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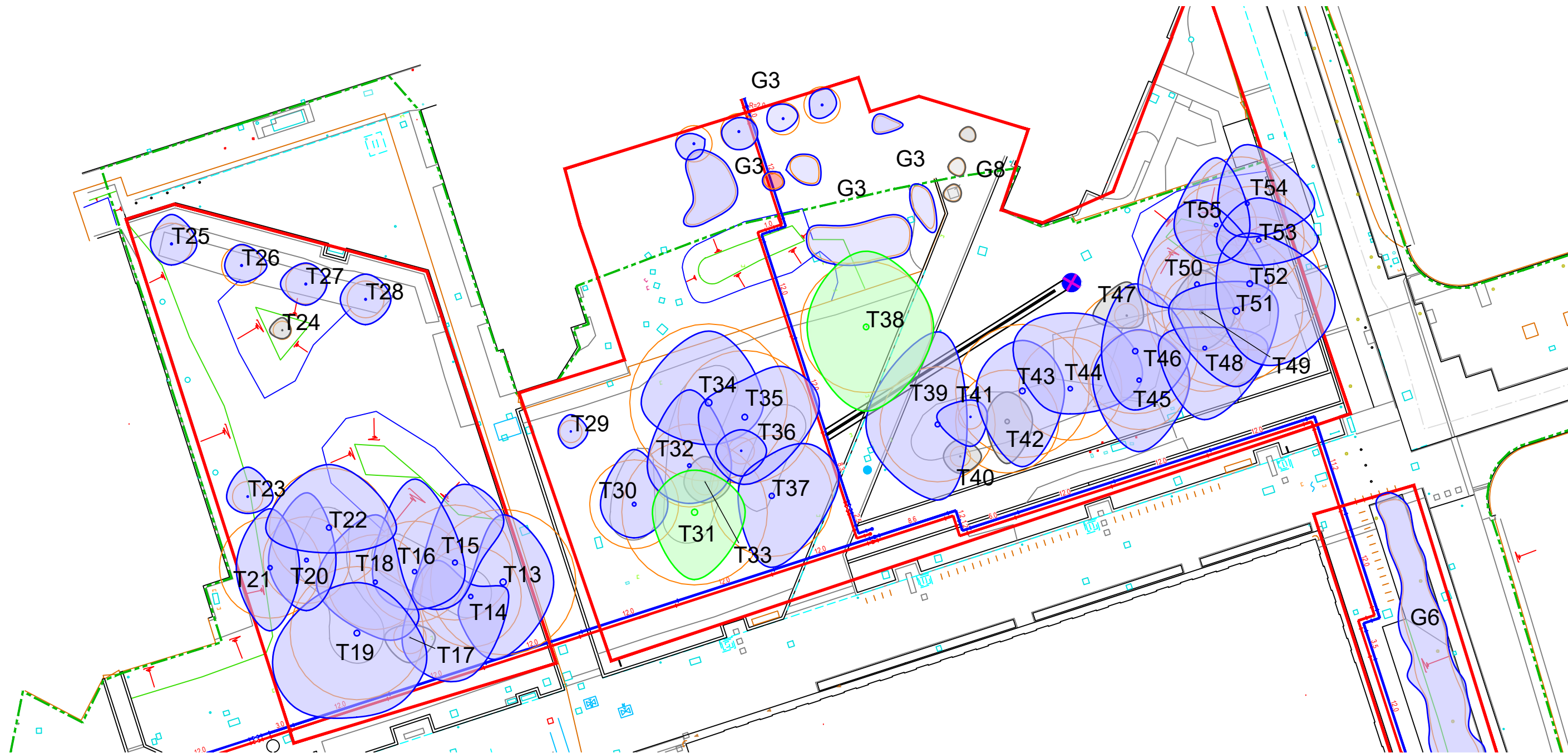
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Title
Arboricultural Impact Assessment [EFFECTS] - Inset 1 of 4

Drawing Number
D10100.005

Drawn	Checked	Approved	Scale	Date
AAB	HEE	RMG	1:500 @ A3	21/12/2023



KEY

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- Root Protection Area (RPA)
- Survey Boundary
- # Approximate location
(Feature not shown on supplied topographical survey)

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(High quality)
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(Moderate quality)
- Category C
(Low quality)
- Category U
(May be retained for habitat value)

Proposed tree and hedgerow works

- Trees to be removed
(Canopy outline denotes tree quality category)

NOTE: This drawing should be read in conjunction with the respective Arboricultural Survey Data (Appendix A).



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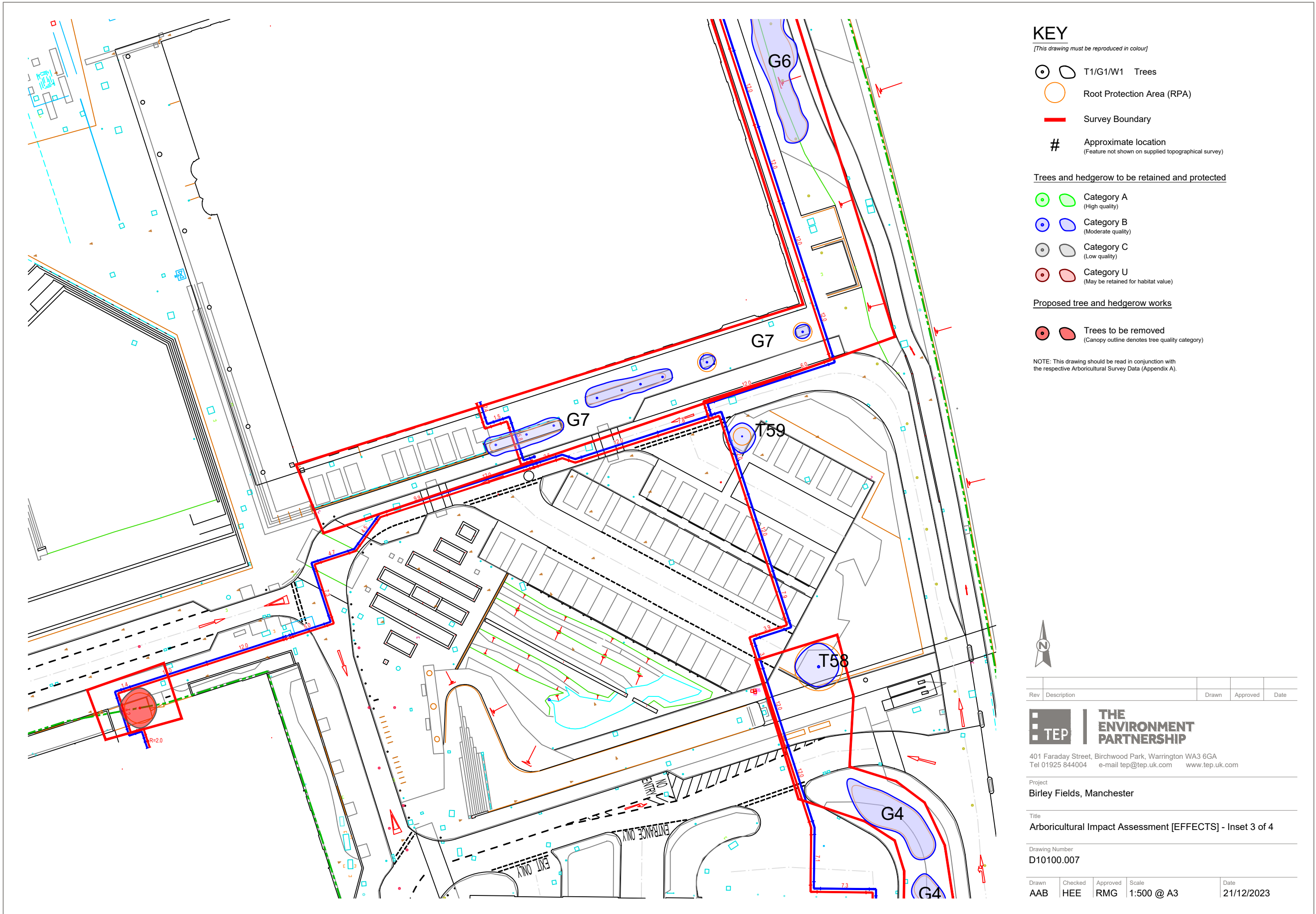
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Arboricultural Impact Assessment [EFFECTS] - Inset 2 of 4

Drawing Number
D10100.006

Drawn	Checked	Approved	Scale	Date
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- Root Protection Area (RPA)
- Survey Boundary
- # Approximate location
(Feature not shown on supplied topographical survey)

Trees and hedgerow to be retained and protected

- Category A
(High quality)
- Category B
(Moderate quality)
- Category C
(Low quality)
- Category U
(May be retained for habitat value)

Proposed tree and hedgerow works

- Trees to be removed
(Canopy outline denotes tree quality category)

NOTE: This drawing should be read in conjunction with the respective Arboricultural Survey Data (Appendix A).



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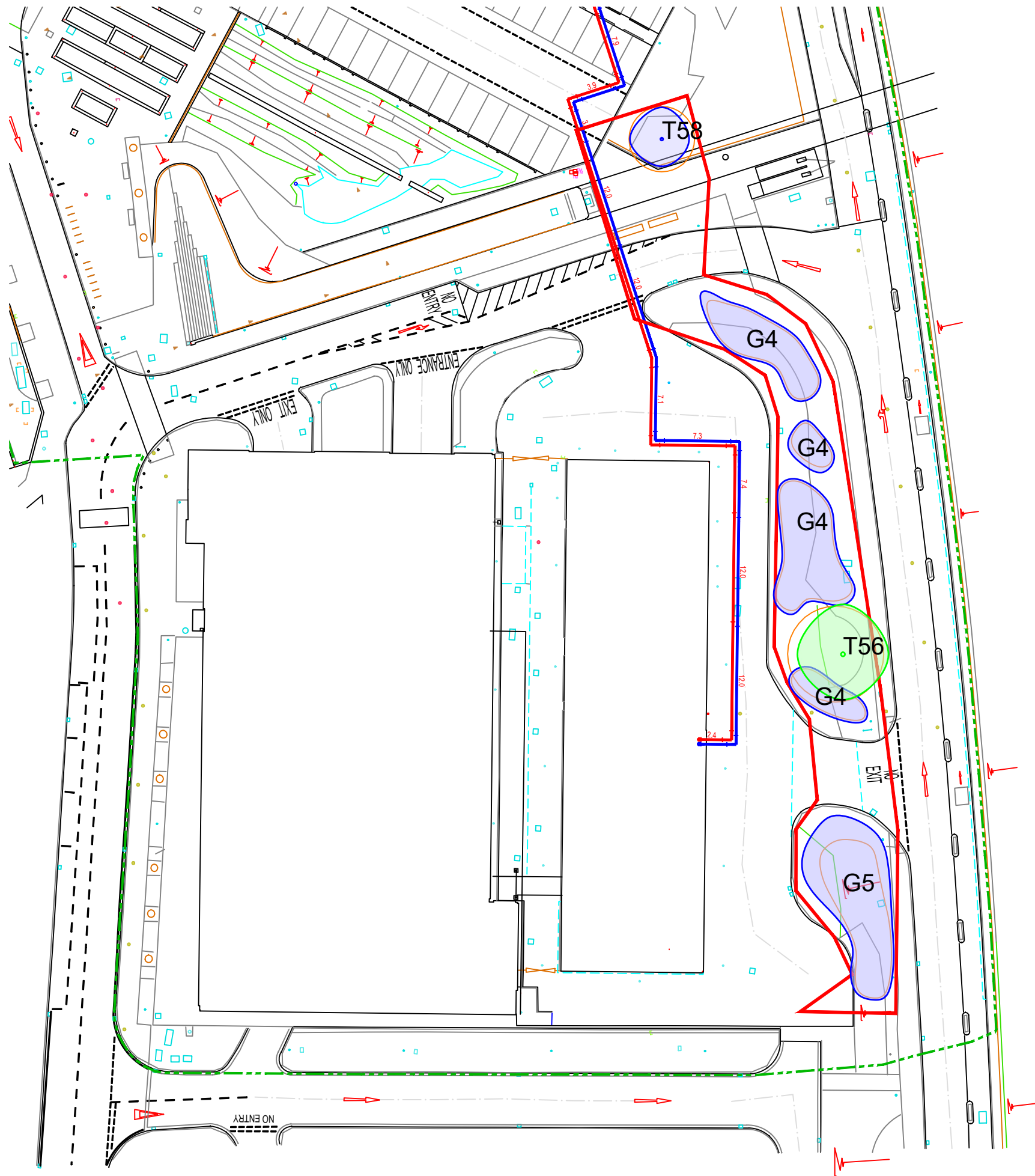
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Title
Arboricultural Impact Assessment [EFFECTS] - Inset 3 of 4

Drawing Number
D10100.007

Drawn	Checked	Approved	Scale	Date
AAB	HEE	RMG	1:500 @ A3	21/12/2023



KEY

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- T1/G1/W1 Trees
- Root Protection Area (RPA)
- Survey Boundary
- # Approximate location
(Feature not shown on supplied topographical survey)

Trees and hedgerow to be retained and protected

- Category A
(High quality)
- Category B
(Moderate quality)
- Category C
(Low quality)
- Category U
(May be retained for habitat value)

Proposed tree and hedgerow works

- Trees to be removed
(Canopy outline denotes tree quality category)

NOTE: This drawing should be read in conjunction with the respective Arboricultural Survey Data (Appendix A).



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Title
Arboricultural Impact Assessment [EFFECTS] - Inset 4 of 4

Drawing Number
D10100.008

Drawn	Checked	Approved	Scale	Date
AAB	HEE	RMG	1:500 @ A3	21/12/2023

Arboricultural Impact Assessment

4.0 Mitigation

- 4.1. This drawing describes mitigation measures that are incorporated within the proposed development and would be secured by the grant of planning permission. It also outlines recommended measures, which are not proposed but which could be secured by planning condition or agreement and therefore relied upon to draw conclusions regarding overall effects in planning terms.
- 4.2. This information is presented in the format of a method statement, which describes actions to be completed by the site manager in chronological order.

Proposed measures

- 4.3. The site manager and all contractors must observe and implement everything in this section to avoid a breach of planning.
- Pre-start
- 4.4. The site manager will read, understand and retain responsibility for implementing this document.
- 4.5. A copy of this document in colour and at A3 will be made available for inspection on site and introduced to all relevant contractors.
- 4.6. Arboriculturist and author of this document, Angus Blankenstein can be contacted on 07767 167506, if required to assist with the correct interpretation of this document and/or inspect tree works and tree protection measures.
- 4.7. An Arboricultural Contractor will be appointed to undertake tree works.
- 4.8. The alignment of temporary tree protection measures shown opposite will be marked out accurately.
- 4.9. Tree protection fencing will be installed as shown opposite as a **thick black line**.
- 4.10. The specification for tree protection fencing will be as per Appendix C.
- 4.11. The site manager will inspect and verify the correct installation of tree protection and maintain a photographic record.
- 4.12. Tree protection fencing will not be removed or realigned; and storage, excavation, level change, and access is prohibited within areas of tree protection except as described by this document or an approved Arboricultural Method Statement.

During construction

- 4.13. Works will proceed in a careful and logical manner, to prevent accidental damage from cranes, booms and other plant/vehicles.
- 4.14. If major roots (>25mm diameter) are uncovered during construction, works liable to damage them will cease, they will be loosely covered, and arboricultural advice will be sought.
- 4.15. Excavation in proximity to retained trees, shown opposite as a **pink hatch**, will be done using an air lance and soil vacuum under the supervision of the Arboricultural Consultant.
- 4.16. The Arboricultural Consultant will monitor the level and likelihood of potential root loss and make on-site management recommendations.
- 4.17. Where minor roots less than 25mm are encountered, they will be severed neatly at the trench face using a sharp spade, bypass secateurs or a pruning saw as appropriate.
- 4.18. Following completion of all construction works and removal of vehicles, plant, compounds and materials, tree protection will be removed.

Recommended measures

- 4.19. The client, site manager and/or contractors should implement everything in this section; compliance may be specifically required by planning condition.

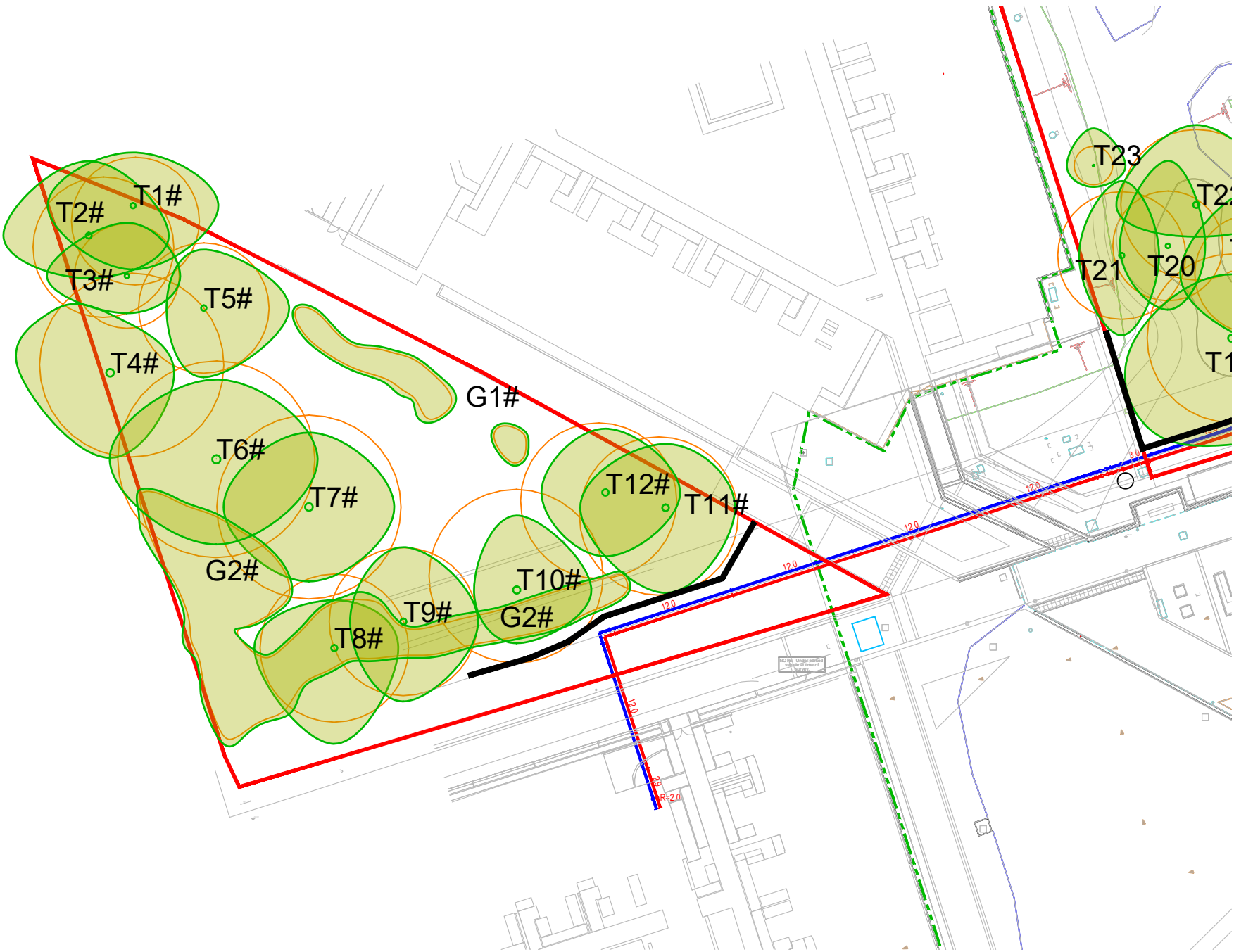
Planting

- 4.20. A scheme of tree planting should be produced and implemented to offset adverse effects associated with the proposed development and tree loss.
- 4.21. The planting should aim to maintain or enhance the benefits provided by trees, particularly their visual amenity. It should include:
- 4.21.1. Replacement of small amenity trees to ensure continuity of canopy cover.
- 4.21.2. Species choice should aim to improve biodiversity and resilience.
- 4.22. Provision should be made for the maintenance of new planting in accordance with BS 8545:2014 Trees: from nursery to independence in the landscape - Recommendations, and replacement of failures for a period of at least 5 years.

KEY

[This drawing must be reproduced in colour]

-   T1/G1 Retained trees
-  Root Protection Area (RPA)
-  Survey Boundary
-  Approximate location
(Feature not shown on supplied topographical survey)
-  Tree Protection Fencing
(Must be installed prior to works commencement)
-  Supervised excavation



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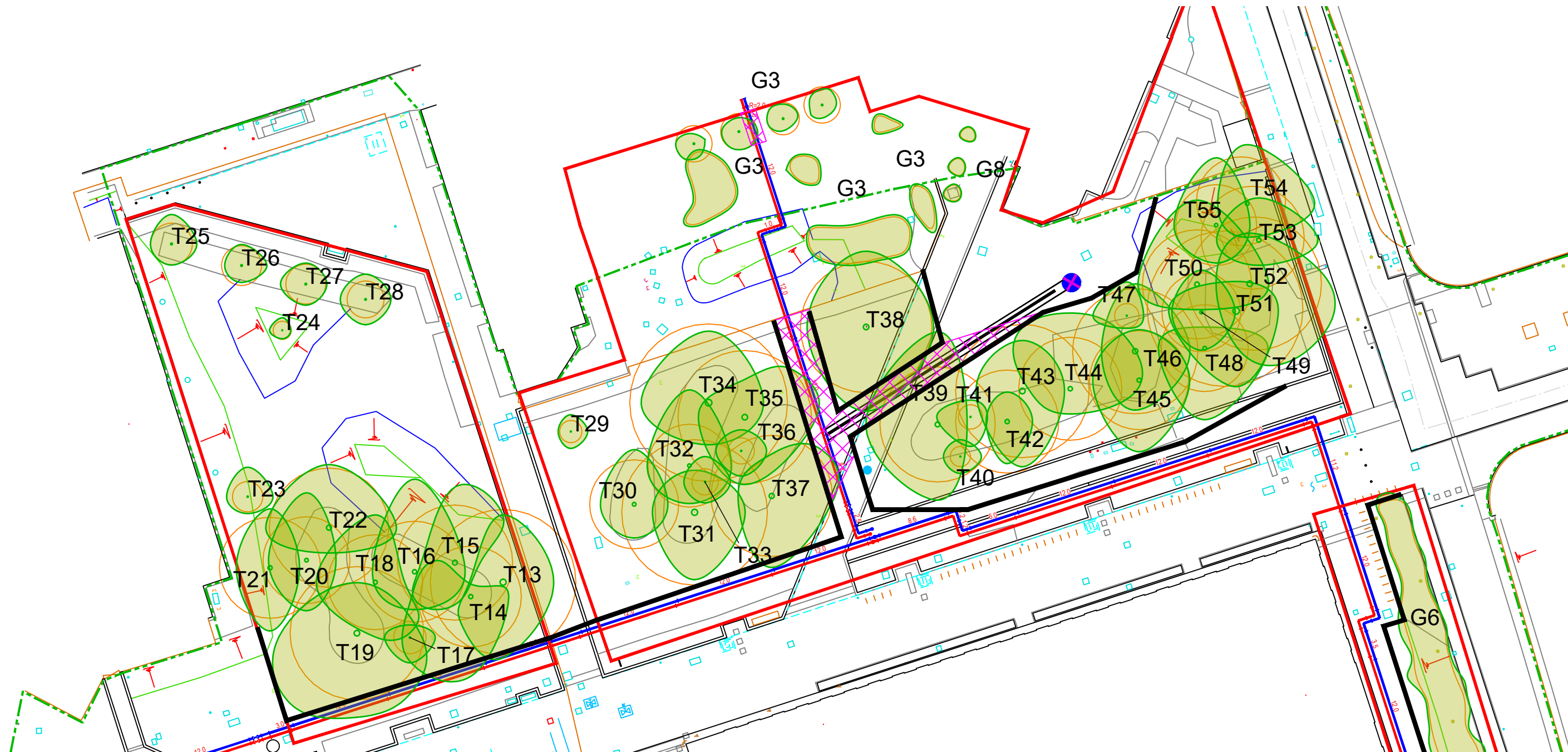
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Project
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Title
Arboricultural Impact Assessment [MITIGATION] - Inset 1 of 4

Drawing Number
D10100.009

Drawn	Checked	Approved	Scale	Date
AAB	HEE	RMG	1:500 @ A3	21/12/2023



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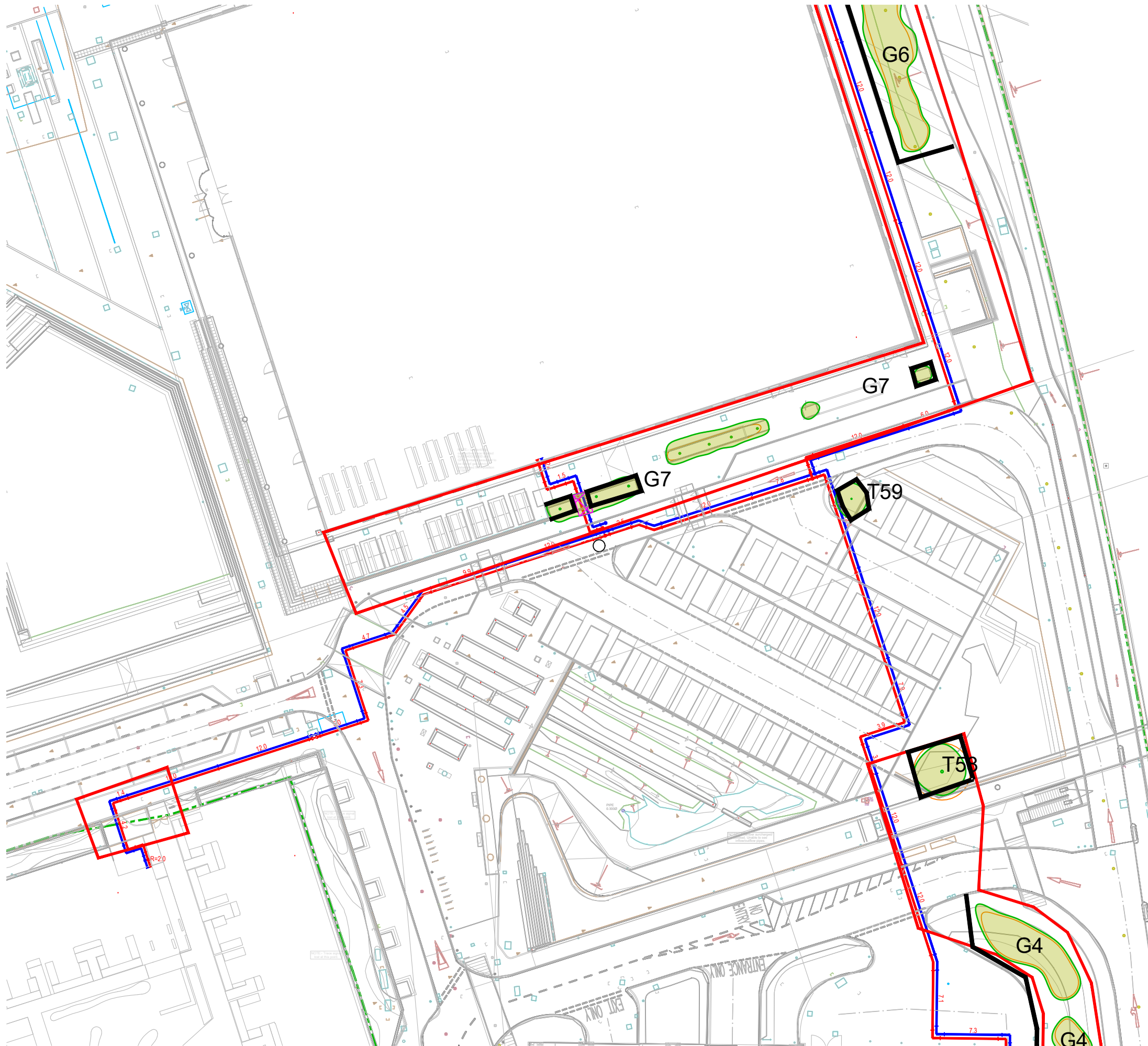
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Title
Arboricultural Impact Assessment [MITIGATION] - Inset 2 of 4

Drawing Number
D10100.010

Drawn	Checked	Approved	Scale	Date
AAB	HEE	RMG	1:500 @ A3	21/12/2023



KEY

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-   T1/G1 Retained trees, groups and woodland
-  Root Protection Area (RPA)
-  Survey Boundary
-  Approximate location
(Feature not shown on supplied topographical survey)
-  Tree Protection Fencing
(Must be installed prior to works commencement)
-  Supervised excavation



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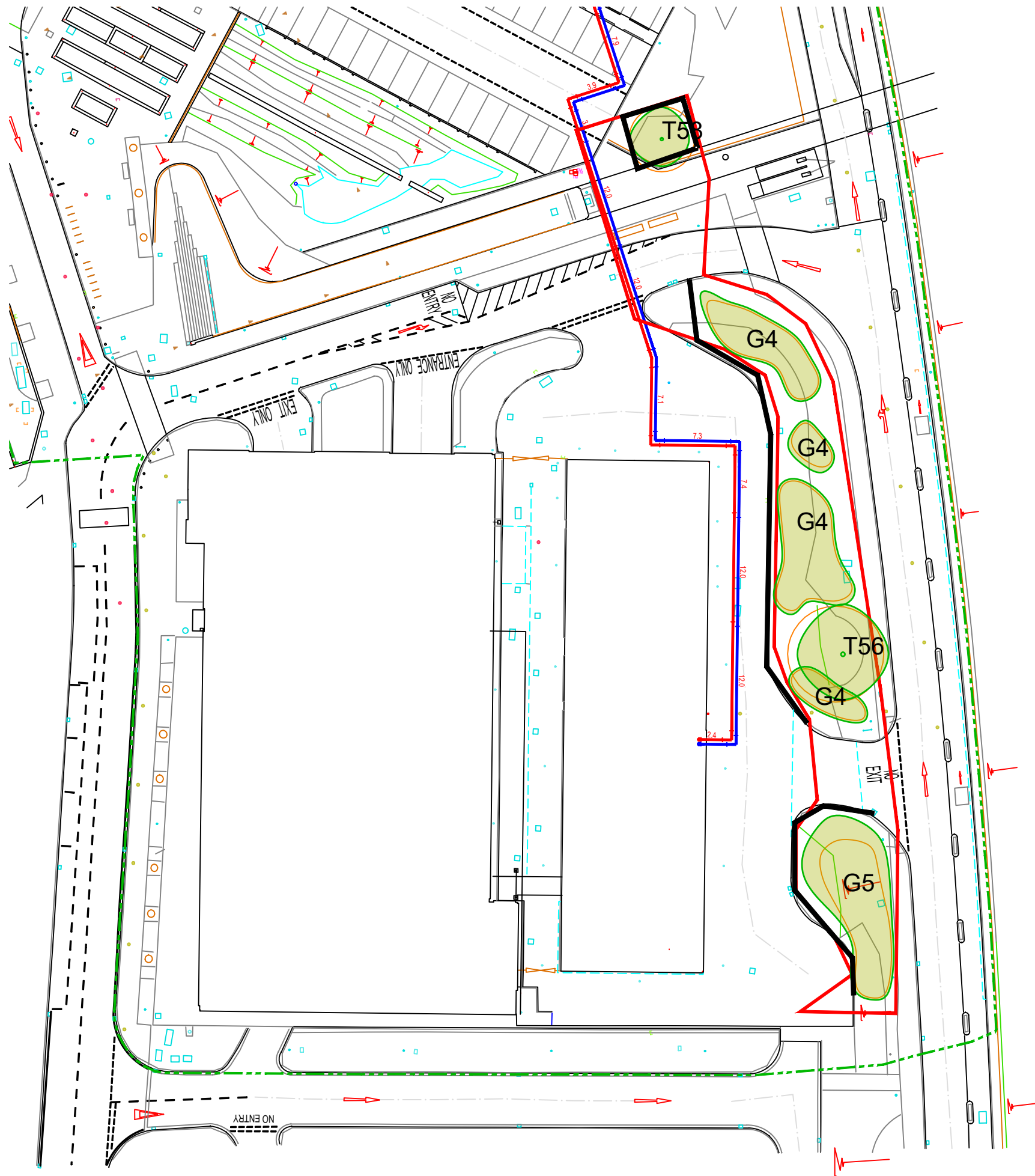
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Title
Arboricultural Impact Assessment [MITIGATION] - Inset 3 of 4

Drawing Number
D10100.011

Drawn	Checked	Approved	Scale	Date
AAB	HEE	RMG	1:500 @ A3	21/12/2023



KEY

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- Root Protection Area (RPA)
- Survey Boundary
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(Feature not shown on supplied topographical survey)
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AAB	HEE	RMG	1:500 @ A3	21/12/2023



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APPENDIX A: Arboricultural Data Sheets



Surveyor **Angus Blankenstein**
 Survey Date **11.08.23**
 Site **Birley Fields, Manchester**
 Drawing Ref **D10100.001**

Italicised Feature Ref: Inspection of this feature was restricted
Italicised Values: Feature value was estimated

APPENDIX A: Arboricultural Survey Data Sheets

Ref	Species	Height	Canopy Ground Clearance	Stem Diameter (or range)	No. of stems/ individuals	Crown Spread North	Crown Spread South	Crown Spread East	Crown Spread West	Lowest Branch Height	Lowest Branch Direction	Maturity	Condition	Comments on form, condition, health and significant defects	Management recommendations in current context	BS 5837 Quality Category	Estimated Remaining Contribution
		(m)	(m)	(mm)	arising below 1.5m	(m)	(m)	(m)	(m)	(m)	(N,S,E,W)	Young, Middle Age, Mature	Good, Fair, Poor, Veteran			A,B,C,U (1,2,3)	Long, Medium, Short, Very Short
Trees																	
T1	Common ash	12.0	5.0	500	1	5.0	6.0	8.0	8.0	4.0	W	Middle Age	Fair	Large tree in slightly raised area. Kerbs within 2m of stem. Bifurcated at 2m with good union. Crown raised with well occluded wounds. Some dead wood in crown. Minimal ash dieback present		B ,1, 2	Medium
T2	Common ash	12.0	2.0	550	1	7.0	4.0	7.5	8.0	3.0	N	Middle Age	Fair	Large tree in slightly raised area. Footway 2m to west. Large wound at 2m to west with some decay. Tearout wound to southern limb at 5m. Some dead wood in canopy. Minimal ash dieback present		B ,1, 2	Medium
T3	Small-leaved lime	12.0	1.5	410	1	5.0	3.5	5.0	7.5	2.0	SW	Middle Age	Good	Within collective group of large trees. Bifurcate at 2m with good union. Various pruning wounds and small stubs. Slightly suppressed to south. Some dead wood in crown.		B ,1, 2	Long
T4	Small-leaved lime	14.0	1.5	720	1	5.5	8.0	6.0	8.5	2.0	S	Middle Age	Good	Large tree within group. Footway 2.5m to west. Numerous well occluded pruning wounds. Some dead wood in crown. No major defects noted		B ,1, 2	Long
T5	Small-leaved lime	14.0	1.0	510	1	5.5	6.5	8.0	3.5	4.0	E	Middle Age	Good	Large tree within group. Crown bias and slight stem lean to east. Some dead wood in crown. Occasional pruning wounds. No major defects noted		B ,1, 2	Long
T6	London plane	12.0	1.5	770	1	7.5	8.0	9.5	10.0	2.0	N	Middle Age	Good	Large tree within group. Broad spreading crown. Small elders growing amongst root buttresses. Minor dead wood in crown. Cavity to south of main stem at 4.5m. No major defects		A ,1, 2	Long
T7	Small-leaved lime	12.0	0.5	720	1	7.0	7.0	8.0	8.0	2.0	S	Middle Age	Good	Large tree within group. Broad spreading crown to almost ground level at East. Some minor dead wood in crown. Various small cavities. No major defects		B ,1, 2	Long
T8	London plane	13.0	1.0	580	1	4.5	9.0	6.0	7.5	3.0	SW	Middle Age	Good	Within continuous group. Broad crown down to ground level south. Some dead wood in crown. Slightly suppressed to north. Low concrete wall 1.5m north		B ,1, 2	Long
T9	Small-leaved lime	12.0	3.0	580	1	7.0	7.5	7.0	5.0	2.0	E	Middle Age	Good	Large tree on edge of group. Some pruning wounds and stubs. Minor dead wood in crown. Low concrete wall 2m to north		B ,1, 2	Long
T10	Small-leaved lime	12.0	2.0	680	1	7.0	5.0	7.0	4.0	2.0	SE	Middle Age	Good	Large tree on edge of group. Heavy limb to south-east. Old pruning wounds and small stubs. Some dead wood in canopy. Low concrete wall 2m to north. Some small cavities. No major defects		B ,1, 2	Long
T11	London plane	12.0	2.0	620	1	6.0	8.0	6.5	8.0	2.5	S	Middle Age	Good	Large tree on edge of group. Kerb 2m to north. Pruning wounds and stubs, some decay. Minor dead wood in crown. No major defects		B ,1, 2	Long
T12	Small-leaved lime	14.0	2.0	610	1	6.0	6.0	7.0	6.0	2.5	N	Middle Age	Good	Large tree on edge of group. Numerous well occluded pruning wounds. Minor dead wood in crown. No major defects noted		B ,1, 2	Long
T13	Silver maple	14.0	2.0	720	1	8.0	9.0	6.0	4.0	3.5	SW	Middle Age	Fair	Large tree in open space. Kerb and path 2m to east. Large stem removed at 3.5m to north-east with decay column starting to extend down main stem. Good vigour		B ,1, 2	Medium
T14	Silver maple	13.0	2.0	500	1	1.5	9.5	4.5	7.0	5.0	S	Middle Age	Fair	Tree within open space. Suppressed to north and east with canopy bias to south-west. Large broken branch with torn remnant. Small stem wound at 1m to north. Minor dead wood throughout		B ,1, 2	Medium
T15	Silver maple	13.0	2.0	570	1	9.0	5.0	3.0	4.0	2.0	NE	Middle Age	Fair	Upright form with crown bias to north-east. Minor stem wounds that are occluding well. Minor dead wood throughout canopy		B ,1, 2	Medium
T16	Silver maple	13.0	2.0	500	1	11.0	4.5	6.0	5.0	2.0	N	Middle Age	Fair	Stem lean and crown bias to north. Broken and dead branches throughout canopy. Some small branch socket cavities developing on lower stem.		B ,1, 2	Medium
T17	Common ash	9.0	1.0	160	1	1.5	3.0	3.0	3.0	2.0	SW	Middle Age	Fair	Narrow upright tree. Oversailed by large silver maples. Some small basal wounds. No ash dieback observed		C ,1, 2	Medium
T18	Silver maple	13.0	2.5	470	1	8.0	6.5	3.5	7.0	2.5	W	Middle Age	Fair	Part of larger group. Some dieback noted with crown a little sparse. Minor dead wood throughout. Some early cavity formation at pruning sites		B ,2	Medium



Surveyor Angus Blankenstein
 Survey Date 11.08.23
 Site Birley Fields, Manchester
 Drawing Ref D10100.001

APPENDIX A: Arboricultural Survey Data Sheets

Italicised Feature Ref: Inspection of this feature was restricted
Italicised Values: Feature value was estimated

Ref	Species	Height	Canopy Ground Clearance	Stem Diameter (or range)	No. of stems/ individuals	Crown Spread North	Crown Spread South	Crown Spread East	Crown Spread West	Lowest Branch Height	Lowest Branch Direction	Maturity	Condition	Comments on form, condition, health and significant defects	Management recommendations in current context	BS 5837 Quality Category	Estimated Remaining Contribution
		(m)	(m)	(mm)	arising below 1.5m	(m)	(m)	(m)	(m)	(m)	(N,S,E,W)	Young, Middle Age, Mature	Good, Fair, Poor, Veteran			A,B,C,U (1,2,3)	Long, Medium, Short, Very Short
T19	Silver maple	12.0	1.5	660	1	6.0	10.0	7.5	9.0	2.5	SW	Middle Age	Fair	Largest tree within group. Broad crown biased to south-west. Heavy almost horizontal limb extending 11m to south-west. Slightly sparse crown in places. Large basal suckers removed in past with some decay. Pruning wounds throughout		B ,1, 2	Medium
T20	Sycamore	14.0	2.5	430	1	8.0	6.0	3.5	4.5	3.5	S	Middle Age	Fair	Upright tree within group. Suppressed to east and west. Some dead wood in crown. Reasonable vigour		B ,1, 2	Long
T21	Sycamore	13.0	2.0	500	1	7.0	7.5	3.5	4.0	3.5	SW	Middle Age	Good	Upright tree on edge of group. Crown bias to north and south. Some large pruning wounds to western side where cleared from building. Some decay forming at these points. Minor dead wood in crown. Good overall form and vigour		B ,1, 2	Long
T22	Sycamore	14.0	2.0	590	1	7.5	3.0	8.0	7.5	3.0	N	Middle Age	Fair	Tree on edge of group. Crown biased to north and suppressed to south with dead branches. Overall crown has good vigour. Some pruning wounds		B ,1, 2	Long
T23	Norway maple	8.0	2.5	150	1	3.5	2.0	3.0	2.5	2.0	S	Middle Age	Good	Small tree on edge of group. Good form and vigour, slightly suppressed to south		B ,1	Long
T24	Scots pine	4.0	1.0	90	1	1.5	1.0	1.0	1.5	1.0	W	Young	Good	Young landscape tree. Some small branches removed.		C ,1, 2	Long
T25	Himalayan birch	8.0	1.0	206	2	3.5	2.5	3.0	2.5	2.0	E	Middle Age	Good	Twin stemmed ornamental tree. Typical form for species		B ,2	Long
T26	Himalayan birch	8.0	1.5	197	4	2.5	2.0	3.0	2.0	2.0	E	Middle Age	Good	Multistemmed ornamental tree. Rather upright form. Some minor pruning wounds		B ,2	Long
T27	Himalayan birch	8.0	1.5	197	3	2.5	2.5	2.5	3.0	2.0	N	Middle Age	Good	Multistemmed ornamental tree. Some small pruning wounds. Brash piled at base		B ,2	Long
T28	Himalayan birch	8.0	1.5	182	4	3.0	3.0	3.0	3.0	2.0	W	Middle Age	Good	Multistemmed ornamental tree. Some small pruning wounds		B ,2	Long
T29	Scots pine	4.0	1.0	110	1	2.0	2.0	2.0	1.5	1.5	N	Young	Good	Small amenity tree. Numerous small pruning wounds. Occasional stem wounds		B ,2	Long
T30	Sycamore	13.0	2.5	440	1	6.5	4.0	4.0	4.0	2.5	S	Middle Age	Fair	Large tree on edge of group. Suppressed to east. Some dead wood in canopy. Some pruning wounds		B ,2	Long
T31	Common beech	18.0	2.0	720	1	5.0	8.0	6.0	5.0	5.0	S	Mature	Good	Large tree within group. Welfare units and containers within RPA to south but ground protection present. Bifurcate at 2.5m with good union. Good example of tree with no major defects noted		A ,1, 2	Long
T32	Sycamore	16.0	2.0	410		9.0	4.5	5.0	5.0	4.0	NE	Middle Age	Good	Suppressed by large tree to south. Canopy bias to north. Some minor dead wood in crown. No major defects		B ,1, 2	Long
T33	Broad-leaved cockspur thorn	6.0	1.5	130	1	3.0	2.5	3.0	2.5	2.0	W	Middle Age	Fair	Small tree within group. Very congested crown. Some small pruning wounds		C ,2	Medium
T34	Silver maple	16.0	4.0	780	1	8.5	5.0	6.5	8.0	4.5	W	Middle Age	Fair	Large tree on edge of group. Slightly sparse crown. Numerous pruning wounds with some early decay. Occasional stubs. Minor dead wood throughout. Wound to main stem at 1m to north with weak occlusion. Crown bias to north and west.		B ,1, 2	Medium
T35	Silver maple	15.0	4.0	660	1	4.5	8.0	8.5	5.5	4.0	NW	Middle Age	Fair	Large tree on edge of group. Suppressed to west. Some pruning wounds, generally well occluded.		B ,1, 2	Medium
T36	Wild cherry	8.0	1.5	130	1	2.5	3.0	3.0	3.0	2.0	W	Middle Age	Good	Small tree within group. Even crown. No major defects		B ,1	Long
T37	London plane	13.0	2.0	600	1	5.0	8.5	7.5	4.0	3.5	E	Middle Age	Good	Large tree on edge of group. Construction storage units in RPA but some ground protection present. Partial break to small northern limb. Various other broken branches and tearout wounds. Pruning wounds also present. Some minor dead wood in canopy		B ,1, 2	Long
T38	London plane	15.0	1.5	650	1	9.0	10.0	8.0	7.0	2.0	NW	Middle Age	Good	Large open grown tree with broad, spreading canopy. Some pruning wounds and minor decay. Good form and vigour. Prominent in landscape		A ,1, 2	Long
T39	London plane	15.0	1.5	570	1	11.0	9.0	3.5	8.5	2.5	E	Middle Age	Good	Large tree on end of linear group. Suppressed to east. Old pruning wound with cavity formation at 2m to west. Some tearout wounds. Generally good vigour		B ,1, 2	Long
T40	Field maple	6.0	2.0	100	1	2.0	2.0	2.5	2.0	2.0	NE	Young	Good	Small amenity tree. Dense, even crown		C ,2	Long
T41	Wild cherry	5.0	1.5	120	1	2.0	3.5	2.0	4.0	2.0	W	Middle Age	Good	Small tree forming understorey within linear group. Some small pruning wounds		B ,2	Long
T42	Silver maple	14.0	3.0	510	1	3.5	5.0	3.0	2.5	2.5	NW	Middle Age	Fair	Upright tree with narrow suppressed crown. Woodpecker hole at 3m to north-east. Dead wood throughout crown		C ,2	Medium



Surveyor Angus Blankenstein
Survey Date 11.08.23
Site Birley Fields, Manchester
Drawing Ref D10100.001

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Italicised Values: Feature value was estimated

Ref	Species	Height	Canopy Ground Clearance	Stem Diameter (or range)	No. of stems/ individuals	Crown Spread North	Crown Spread South	Crown Spread East	Crown Spread West	Lowest Branch Height	Lowest Branch Direction	Maturity	Condition	Comments on form, condition, health and significant defects	Management recommendations in current context	BS 5837 Quality Category	Estimated Remaining Contribution
		(m)	(m)	(mm)	arising below 1.5m	(m)	(m)	(m)	(m)	(m)	(N,S,E,W)	Young, Middle Age, Mature	Good, Fair, Poor, Veteran			A,B,C,U (1,2,3)	Long, Medium, Short, Very Short
T43	Silver maple	16.0	2.0	660	1	6.0	9.0	5.0	5.5	4.0	SE	Middle Age	Fair	Large tree within linear group. Epicormic growth on main stem. Some dead wood in crown. Small pruning wounds and decay pockets.		B ,2	Medium
T44	London plane	15.0	2.0	510	1	9.0	3.0	8.0	5.0	2.0	E	Middle Age	Good	Large tree within linear group. Suppressed to south with crown biased to north. Some dead wood in crown. Upright form		B ,1, 2	Long
T45	London plane	15.0	3.0	490	1	6.0	8.5	6.0	5.5	2.0	SW	Middle Age	Good	Upright tree within linear group. Crown rather confined. Some dead wood in crown.		B ,1, 2	Long
T46	London plane	15.0	2.0	620		8.0	7.0	6.5	4.0	2.5	S	Middle Age	Good	Large tree in linear group. Canopy bias to north. Some dead wood present in crown. No major defects		B ,1, 2	Long
T47	Wild cherry	3.0	2.0	120	1	4.0	1.5	2.0	4.0	1.5	W	Middle Age	Fair	Small understorey tree. Some bark wounds and decay		C ,2	Medium
T48	London plane	15.0	2.0	430		2.5	8.5	7.5	5.5	2.5	E	Middle Age	Good	Crown bias to south. Some dead wood in crown. Part of linear group		B ,1, 2	Long
T49	Wild cherry	15.0	8.0	390	1	5.0	4.5	4.0	3.5	5.0	S	Middle Age	Fair	Upright tree within rather sparse canopy. Numerous pruning wounds. Dead wood throughout. Ganoderma sp bracket at base to west.		C ,2	Short
T50	Wild cherry	14.0	1.5	540	1	10.0	3.0	8.5	7.0	5.0	N	Middle Age	Fair	Large tree at edge of linear group. Desire line passes base. Crown bias and slight lean to north. Multistemmed above 2m with good unions. Some dead wood in crown. Visible surface roots with some mower damage		B ,2	Medium
T51	Silver maple	16.0	2.0	770	1	3.5	9.0	5.0	8.0	2.5	W	Middle Age	Good	Large tree within group. Crown bias to south, suppressing trees to north removed. Some dead wood and stubs in canopy. Good vigour		B ,1, 2	Medium
T52	Silver maple	15.0	2.0	660	1	6.0	9.0	9.5	4.0	2.0	E	Middle Age	Fair	Large tree with crown bias and slight stem lean south-east. Suppressing trees to west removed. Minor dead wood throughout crown. Concrete steps 5m to east.		B ,2	Medium
T53	Silver maple	16.0	2.0	510	1	5.0	3.0	7.0	5.0	2.5	E	Middle Age	Good	Large tree within group. Crown bias to east. Concrete steps 2.5m to east. Good vigour		B ,1, 2	Medium
T54	London plane	15.0	2.0	440	1	7.0	4.0	8.0	3.5	2.0	N	Middle Age	Good	Large tree within group. Forms mutual crown with T55 to west. Concrete steps 2m to east. Some dead wood in crown. Some pruning wounds		B ,1, 2	Long
T55	London plane	15.0	1.5	400	1	8.0	4.5	4.0	5.0	2.0	S	Middle Age	Good	Within group. Canopy bias to north. Forms mutual crown with T54 to east. Some dead wood in crown. No major defects		B ,1, 2	Long
T56	Broad-leaved cockspur thorn	5.0	2.0	440	1	5.5	5.0	5.0	5.0	1.5	S	Mature	Good	Broad spreading tree, large for species. Dense congested crown with gnarled and twisted branches. Good vigour. Numerous old pruning wounds. Minor dead wood in crown. Interesting tree		A ,1, 2	Long
T57	Cherry species	6.0	2.5	190	1	3.0	3.0	2.5	3.0	2.0	E	Middle Age	Fair	Ornamental tree in planting bed next to building. Rather crudely pruned with numerous stubs and flush cuts. Slightly sparse crown		C ,2	Medium
T58	Rowan	8.0	2.0	300	1	3.5	3.0	3.0	3.5	2.0	W	Middle Age	Good	Medium sized tree next to pedestrian flyover. Large for species with broad rounded crown. Dense shrubs below. No major defects		B ,1, 2	Long
T59	Austrian pine	3.0	0.5	110	1	2.0	2.5	2.0	2.0	0.5	SW	Middle Age	Good	Small amenity tree in planter at edge of parking area. Low crown form		B ,2	Long



Surveyor **Angus Blankenstein**
Survey Date **11.08.23**
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Drawing Ref **D10100.001**

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Italicised Values: Feature value was estimated

Ref	Species	Height	Canopy Ground Clearance	Stem Diameter (or range)	No. of stems/ individuals	Crown Spread North	Crown Spread South	Crown Spread East	Crown Spread West	Lowest Branch Height	Lowest Branch Direction	Maturity	Condition	Comments on form, condition, health and significant defects	Management recommendations in current context	BS 5837 Quality Category	Estimated Remaining Contribution
		(m)	(m)	(mm)	arising below 1.5m	(m)	(m)	(m)	(m)	(m)	(N,S,E,W)	Young, Middle Age, Mature	Good, Fair, Poor, Veteran			A,B,C,U (1,2,3)	Long, Medium, Short, Very Short
Groups																	
G1	European larch, Wild cherry, Pedunculate oak, Black locust	3 to 6	1.0	90 to 180	5							Young to Middle Age	Good	Small recently planted trees on edge of overgrown open space. Typical forms		C ,2	Long
G2	Silver birch, Common hazel, Common ash, Elder, Rowan	3 to 10	1.0	100 to 230	25							Young to Middle Age	Fair	Smaller trees forming edge and understorey to wider group. Some multistemmed forms.		C ,2	Medium
G3	Field maple, Silver birch, Himalayan birch, London plane, Wild cherry, Rowan	3 to 9	1.0	80 to 210	15							Middle Age	Good	Amenity trees within fenced off garden. Unable to access. Planes heavily pruned with vigorous regrowth		B ,2	Long
G4	Silver birch, Apple species, Wild cherry	3 to 8	1.0	160 to 200	10							Middle Age	Good	Linear group in planting bed. Some multistemmed forms. Generally good condition. Dense undergrowth		B ,2	Long
G5	Silver birch, Apple species, Cherry species	5 to 8	0.5	80 to 230	4							Middle Age	Good	Further linear group in planting bed. Multistemmed apple. Dense undergrowth in places.		B ,2	Long
G6	Silver birch, Scots pine, Wild cherry	3 to 5	1.5	75 to 140	15							Young to Middle Age	Good	Linear group of amenity trees between building and cycleway. Forms effective screen and part of a green corridor. One recently planted tree is dead.		B ,2	Long
G7	Black locust	4 to 6	2.0	120 to 190	8							Middle Age	Good	Small amenity trees in planting pits next to building. Even crown forms. No major defects noted		B ,2	Long
G8	Himalayan birch	4 to 5	2.0	90 to 100	3							Middle Age	Good	Small ornamental trees in planting pits. Typical forms		C ,1, 2	Long



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APPENDIX B: Survey Method

Limitation

Trees are dynamic living organisms with a constantly changing structure; even healthy trees can change or decline. Survey information is presented as being correct at the time of survey. Limitations to the reliability of the survey data are noted within Appendix A and the main report text.

Scope

All woody vegetation with a stem diameter exceeding 75mm is recorded. Below this threshold, vegetation may also be recorded at the discretion of the surveyor. The survey includes woody vegetation within a defined boundary, and on adjacent land where the characteristics, location or context of the tree mean that activity within the boundary could affect the tree, or be influenced by it. This is typically up to 15m outside the boundary.

Resolution

Vegetation is recorded as either an individual *Tree*, *Group* of trees, *Woodland*, or *Hedgerow*. This is done at the discretion of the surveyor to provide a useful resolution to the survey data, to differentiate between features with varying attributes and group those with common attributes, and collective value or function.

Typically, *Trees* are recorded where they are arranged separately; different from adjacent trees; or where the assessment would benefit from greater detail. *Groups* are coherent arboricultural features comprising trees with a collective form, function, history or management opportunities. *Woodland* is recorded where areas of tree cover have the qualities of a woodland habitat, including age and species structure, natural regeneration, and associated non-arboreal features. *Hedgerow* describes linear features largely comprising woody vegetation that are under, or could be returned to, regular hedgerow management. It should be noted that these terms are also used in other assessment types, sometimes with different definitions.

Tree locations

The location of trees is based on stem locations and canopy spreads taken from a topographical survey, where available. Where this information is not available, this is noted in Appendix A and locations should be regarded as approximate. Approximate locations are based on one or more of: GPS data captured during the survey; aerial photographs; and measurement from known points of reference. Approximate stem locations are typically accurate to within a few metres. Stem locations are shown for all *Trees*.

Groups, *Woodland* and *Hedges* are principally described in terms of their canopy outline, although stem locations may also be shown. Individual tree canopy outlines are projected on Drawings based on measurements taken as described below (see Crown Spread). *Groups*, *Woodland* and *Hedges* canopy outlines are projected based on the same hierarchy of source data as stem locations.

Tree survey

The survey is conducted from ground level by an arboriculturist, taking account of the tree, and its context. The nature of the soil is not assessed. Non-invasive assessment tools may be used as appropriate, including hypsometer, measuring tape, probe and nylon mallet.

The following attributes are recorded for each feature (see Arboricultural Survey Data Sheets at Appendix A):

Reference Number	A unique code per feature, typically but not necessarily a chronological sequence, in the form <i>Tn</i> for <i>Trees</i> ; <i>Gn</i> for <i>Groups</i> ; <i>Wn</i> for <i>Woodlands</i> ; and <i>Hn</i> for <i>Hedgerows</i>
Species	The common name is given. All species are listed for <i>Groups</i> , <i>Woodland</i> and <i>Hedgerows</i> . The Latin name may also be given if further clarification is required.
Height	Top height recorded in metres, or the range for <i>Groups</i> , <i>Woodland</i> and <i>Hedgerows</i>
Canopy Ground Clearance	The height of the canopy above ground level in metres
Stem Diameter	A measurement taken at 1.5 metres above ground level, or the nearest representative point below, in millimetres. For multi-stemmed trees a single figure is calculated according to BS5837 4.6. For <i>Groups</i> , <i>Woodland</i> and <i>Hedgerows</i> , the range of diameters

No. of Stems / Individuals	The number of stems arising below a height of 1.5 metres, or for <i>Groups</i> , <i>Woodland</i> and <i>Hedgerows</i> an estimate or count of the number of trees
Crown Spread	Radial branch spread in metres at cardinal points (N, S, E, W) from the location of the <i>Tree</i> stem at ground level (for <i>Groups</i> , <i>Woodland</i> and <i>Hedgerows</i> , see <i>Tree Locations</i>)
Lowest Branch Height	The height of the first significant branch at the point of attachment (<i>Trees</i> only)
Lowest Branch Direction	The direction of growth of the first significant branch from the point of attachment (<i>Trees</i> only)
Maturity	Classification describing age relative to the species, and size and growth potential, in order to inform management decisions • Young means small and/or recently planted and could be relocated, or replaced on a like for like basis • Middle Age means established and independent, within the growth stage of life, and with potential to continue increasing in height and/or spread • Mature means having reached ultimate height and/or spread, given the location and surroundings; further increases will be slow or limited • Mixed Age (<i>Groups</i>, <i>Woodland</i> and <i>Hedgerows</i> only) means comprising all three maturity classes
Condition	An overall assessment of a feature's physiological and structural state, informing longevity and quality categorisation, and supported by <i>Comments</i> • Good condition means with vitality and resilience commensurate with species and age, and without significant defects or pathogens • Fair condition means with tolerable reduction of vitality and resilience, and/or remediable or tolerable defects and/or pathogens • Poor condition means with declining or significant loss of vitality and resilience, and/or significant and irreparable defects and/or pathogens • Dead condition means without photosynthetic or metabolic capacity, or moribund and in imminent terminal decline • Mixed (<i>Groups</i> and <i>Woodland</i>) means comprising more than one condition class • Veteran means trees of exceptional value, meeting recognised criteria including age, size and characteristics. Classification is partly informed by the sustained presence of structural defects, physiological decline, and pathogens, and their contribution to biodiversity. Undesirable characteristics in ordinary trees may be desirable in veteran trees, therefore <i>Veteran</i> can be understood as a superlative <i>Condition</i> that supersedes other categories (excluding <i>Dead</i>).
Comments	A description of all significant characteristics of the feature and its context that are not described by other attribute fields; including observations to support the classification of <i>Condition</i> , <i>Quality Category</i> and <i>Estimated Remaining Contribution</i> as appropriate
Management Recommendations	Recommendations for arboricultural works based on the current land use, in the interests of good arboricultural practice. These are incidental to the primary survey purpose, and not a comprehensive schedule in pursuit of any particular objective.
BS 5837 Quality Category	Tree quality assessment based on Table 1 of BS 5837:2012 (see below) comprising quality categories A , B , C and U and sub-categories 1 , 2 and 3
Estimated Remaining Contribution	A forecast of the durability of the feature in its current form and context, and therefore the reliance that can be placed on any benefits or functions it provides. This is influenced by <i>Species</i> and <i>Condition</i>, and is not necessarily a forecast of life expectancy. • Long means more than 40 years • Medium means 20 to 40 years • Short means 10 to 20 years • Very Short means less than 10 years

Table 1 Cascade chart for tree quality assessment

Category and definition	Criteria (including subcategories where appropriate)			Identification on plan
Trees unsuitable for retention (see Note)				
Category U Those in such a condition that they cannot realistically be retained as living trees in the context of the current land use for longer than 10 years	- Trees that have a serious, irremediable, structural defect, such that their early loss is expected due to collapse, including those that will become unviable after removal of other category U trees (e.g. where, for whatever reason, the loss of companion shelter cannot be mitigated by pruning) - Trees that are dead or are showing signs of significant, immediate, and irreversible overall decline - Trees infected with pathogens of significance to the health and/or safety of other trees nearby, or very low quality trees suppressing adjacent trees of better quality <i>NOTE Category U trees can have existing or potential conservation value which it might be desirable to preserve; see 4.5.7.</i>			See Table 2
	1 Mainly arboricultural qualities	2 Mainly landscape qualities	3 Mainly cultural values, including conservation	
Trees to be considered for retention				
Category A Trees of high quality with an estimated remaining life expectancy of at least 40 years	Trees that are particularly good examples of their species, especially if rare or unusual; or those that are essential components of groups or formal or semi-formal arboricultural features (e.g. the dominant and/or principal trees within an avenue)	Trees, groups or woodlands of particular visual importance as arboricultural and/or landscape features	Trees, groups or woodlands of significant conservation, historical, commemorative or other value (e.g. veteran trees or wood-pasture)	See Table 2
Category B Trees of moderate quality with an estimated remaining life expectancy of at least 20 years	Trees that might be included in category A, but are downgraded because of impaired condition (e.g. presence of significant though remediable defects, including unsympathetic past management and storm damage), such that they are unlikely to be suitable for retention for beyond 40 years; or trees lacking the special quality necessary to merit the category A designation	Trees present in numbers, usually growing as groups or woodlands, such that they attract a higher collective rating than they might as individuals; or trees occurring as collectives but situated so as to make little visual contribution to the wider locality	Trees with material conservation or other cultural value	See Table 2
Category C Trees of low quality with an estimated remaining life expectancy of at least 10 years, or young trees with a stem diameter below 150 mm	Unremarkable trees of very limited merit or such impaired condition that they do not qualify in higher categories	Trees present in groups or woodlands, but without this conferring on them significantly greater collective landscape value; and/or trees offering low or only temporary/transient landscape benefits	Trees with no material conservation or other cultural value	See Table 2

Table 1: Extract from **British Standards Institution (2012) BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations**, page 9

Note on Root Protection Areas:

Data is captured during the survey to inform the design of Root Protection Areas (RPA). These are a design tool, representing the area around a tree in which restrictions to some activities may be required to avoid significant harm, particularly to roots and soil. The RPA is a function of *Stem Diameter*, and additional considerations including management history, barriers to root growth, topography, ground conditions and tree characteristics. These factors are combined by an arboriculturist to produce a buffer zone for each feature from which the exclusion of construction activities would ensure the continued reliability of the survey data at Appendix A, including *Condition*, *BS 5837 Quality Category* and *Estimated Remaining Contribution*.

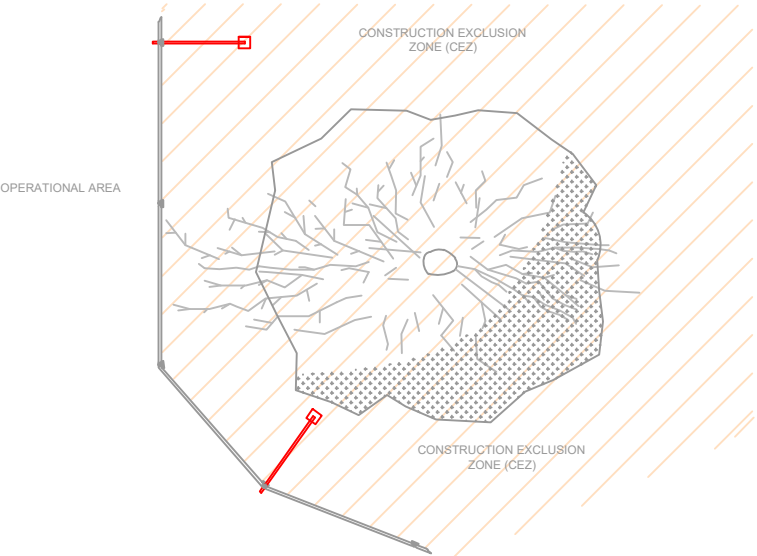
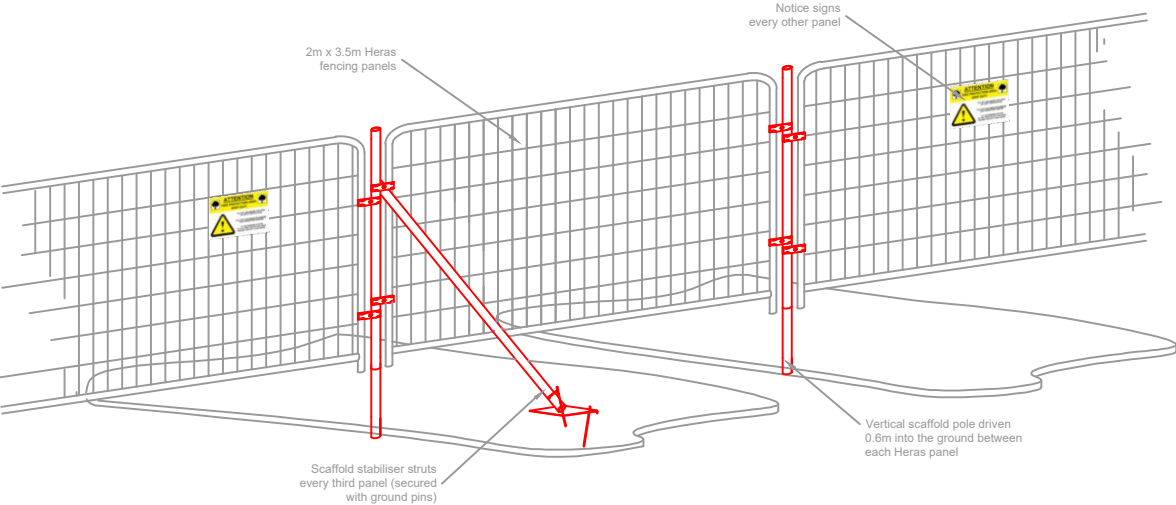
For *Trees*, RPA is defined as a circle with a radius 12 times the *Stem Diameter*, which may be modified to reflect the considerations above.

For *Groups* and *Woodland* RPA is based on the size and location of peripheral constituent trees, and presented as an offset from the canopy edge giving equivalent or greater protection to all trees of any size, or modified to reflect significant variation in constituent tree sizes and/or the considerations above.

For *Hedgerow*, no RPA is shown. Typically, hedgerow requires a smaller stand-off than trees due to reduced crown dimensions. Any stand-off should include sufficient space for access and ongoing management and should therefore normally be based on the canopy spread rather than root spread.

APPENDIX C: Specification Drawings

Tree Protection Fencing for use on soft surfaces

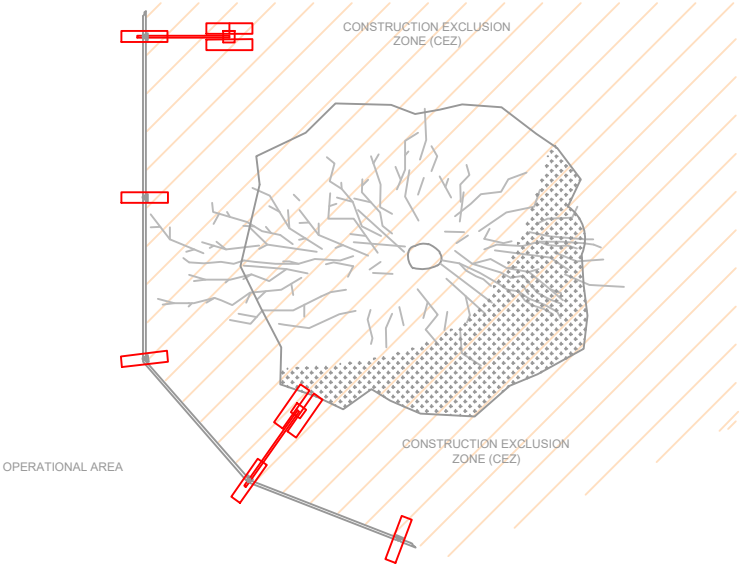
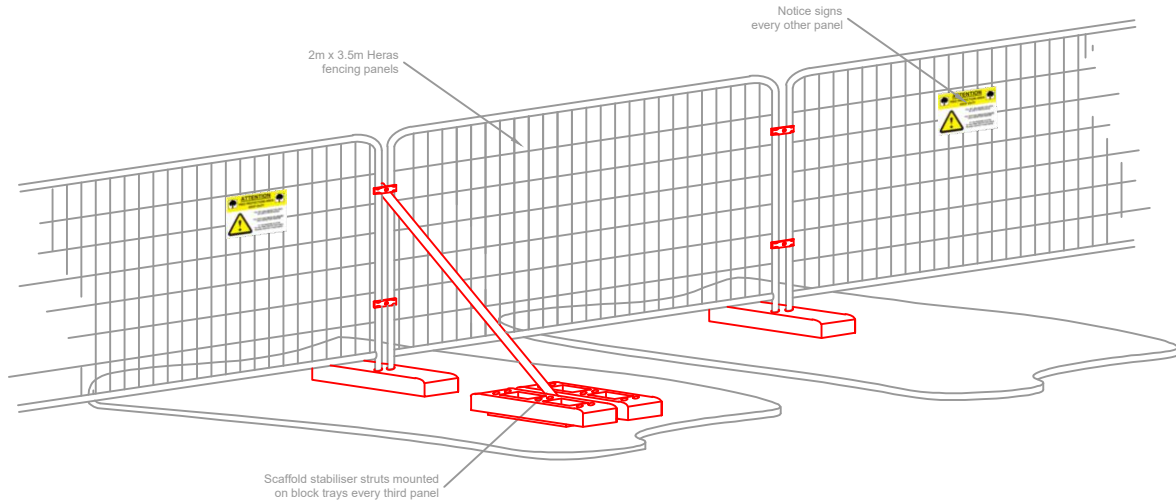


Per 3No. Heras panels (10.5m)

Component	Quantity
2m x 3.5m Standard Heras panels	3
3m Galvenised steel scaffold pole	3
Heras fecurity fence clip	12
Heras stabilising support bar	1
Stabilising pin	2
Tree protection notice	2

Notes:

Tree Protection Fencing for use on hard surfaces



Per 3No. Heras panels (10.5m)

Component	Quantity
2m x 3.5m Standard Heras panels	3
Rubber fencing block tray (footing)	5
Scaffold clamp double coupler	6
Heras stabilising strut support bar	3
Tree protection notice	2

Notes:

Rev	Description	Drawn	Approved	Date
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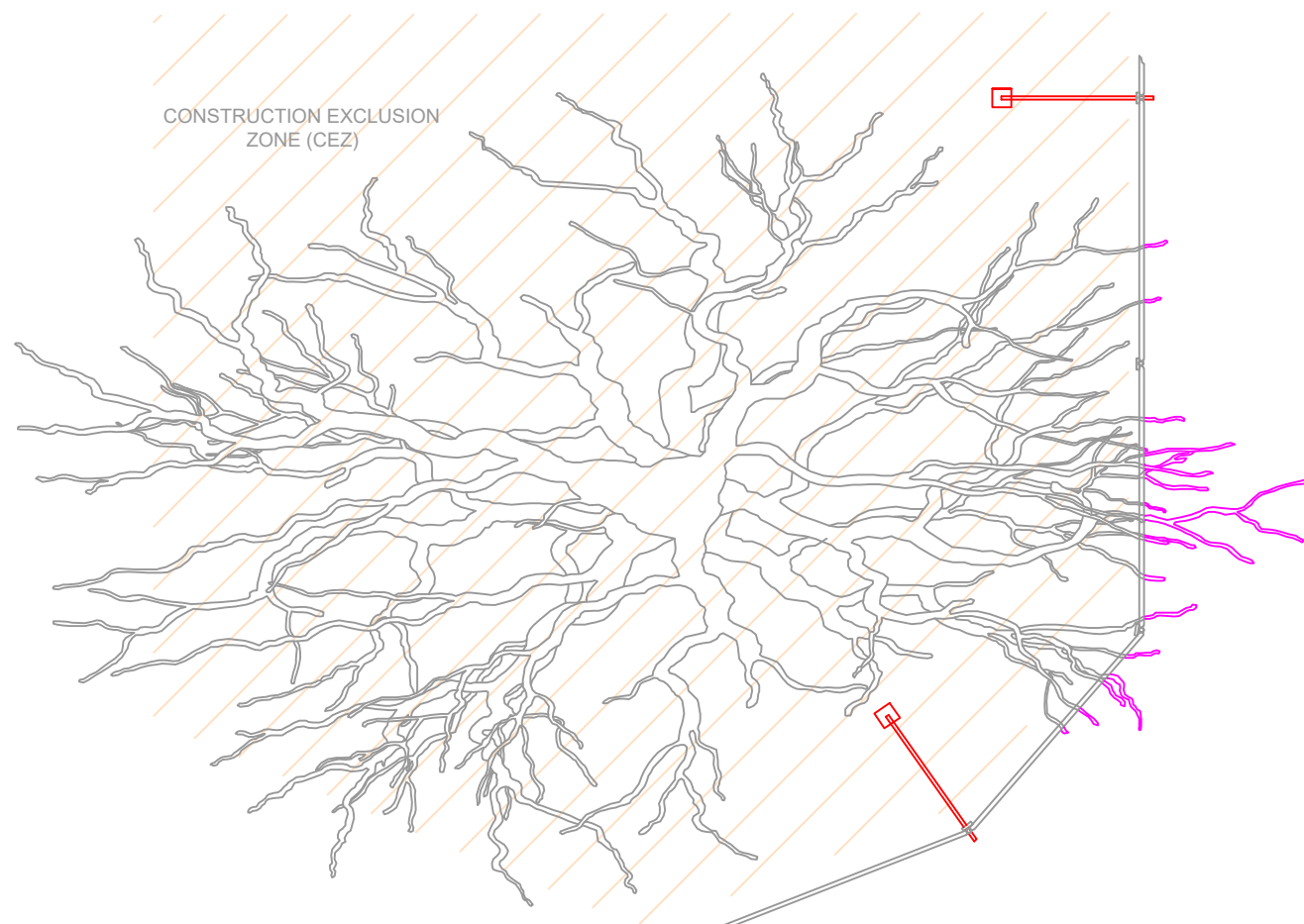
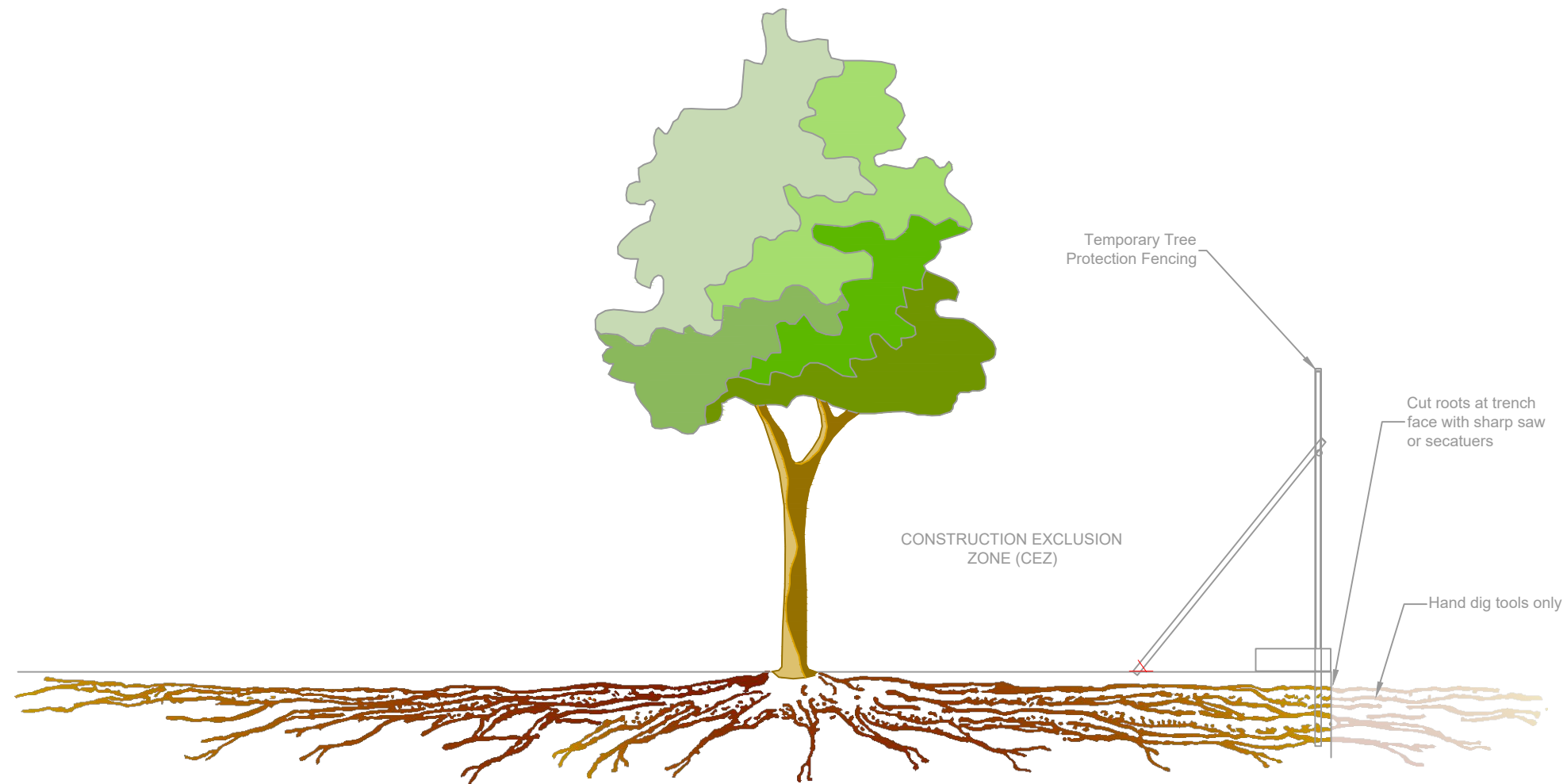
401 Faraday Street, Birchwood Park, Warrington WA3 6GA
Tel 01925 844004 e-mail tep@tep.uk.com www.tep.uk.com

Project

Title
Temporary tree protection fencing specifications

Drawing Number
TEP.ARB.FEN.003

Drawn	Checked	Approved	Scale	Date
TDP	RMG	JGS	(not to scale) @ A3	09/07/2019



Rev	Description	Drawn	Approved	Date
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PARTNERSHIP**

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Project

Title
Excavation - Watching Brief Root Pruning

Drawing Number
TEP.ARB.EXC.001

Drawn	Checked	Approved	Scale	Date
RMG	TDP	JGS	Not to scale @ A3	25/07/2019

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