Arboricultural Impact Assessment Report

1 James Wheeler Place Wheeler Heights

Version 1

Prepared For:

Alex Smith

Date:

2^{8th} May 2025

Document Control

Document Title:	1 James Wheeler Place Wheeler Heights AIA
Report type:	Arboricultural Impact Assessment Report
Prepared for:	Alex Smith
Contact details:	E |alex@synergycg.com.au P | 0414 992 439
Prepared by:	Daniel Leonard Senior Arborist AQF level 5 TRAQ Qualified
Contact details:	Daniel.leonard@heartwood.services M | 0402 992 578
Version:	1

Contents

Table of Figures

1. Background

1.1. Introduction

Daniel Leonard (Author) was engaged by Alex Smith (Client), through Aura Trees, to provide Arboricultural advice regarding the potential impacts of a proposed development at 1 James Wheeler Place, Wheeler Heights (the site).

As part of the development strategy, the entire property is designated to function as an Asset Protection Zone (APZ) in accordance with the requirements set out in the Bushfire Planning and Design Report (Reference No. 5051).

On 27 May 2025, the Client requested the preparation of an Arboricultural Impact Assessment (AIA). This assessment will include:

- Identification of all trees that may be affected by the proposed development.
- A ground-based Visual Tree Assessment (VTA) of all potentially impacted trees.
- A retention rating for each assessed tree.
- Evaluation of any encroachments into tree protection zones and the potential for tree retention.
- Recommendations for pruning or removal where applicable; and
- A Tree Protection Plan (TPP) for the management and safeguarding of trees designated for retention.

1.2. Purpose of this report

This report provides an analysis of the impact the proposed development may have on existing trees on the site and will provide specifications for the effective management of the existing trees including tree protection measures and supervision of works.

The primary purpose of the report is to:

- identify which trees can be retained under the building proposal,
- provide evidence to Council that those trees will remain viable and be protected prior to, during and after construction.

1.3. The Proposal

The site consists of a 2-story residence with a double garage, tennis court and a swimming pool. It is surrounded by bush and backs onto a nearby lake (see attached survey plans). It is not listed as a heritage item.

The proposal is to undertake additions and alterations to the existing structure as well as realigning the driveway and soft/hard landscaping.

1.4. Subject Trees

There are a total of 39 prescribed trees on or near the site.

There are numerous shrubs and small trees located on the site that do not meet Northern Beaches Council's definition of a prescribed tree. These trees are not protected and have not been included in this report.

Specific details such as observations, species, and measurements on each tree can be found in Section 3.4 Assessment Results.

Numbered tree locations can be found in *Figure 3*.

1.5. Documents Referenced

- (IACA) Significance of a Tree Assessment Rating System (STARS),
- AS4970 - 2009 Protection of trees on development Sites,
- Heritage.nsw.gov.au,
- Architectural and Survey plans provided by the Client.
- Northern Beaches Council DCP.
- BPAD report 5051 prepared by Matthew Willis

2. Method

2.1. Assessment Method

The subject trees were assessed using a Stage One Limited Visual Tree Assessment (VTA), as outlined by Mattheck & Breloer (1994), and aligned with current best practices in modern arboriculture.

This assessment method is subject to the following limitations:

- Tree heights and canopy spreads were estimated unless otherwise specified.
- Tree species identification was based on broad taxonomic characteristics visible and available from ground level at the time of inspection, unless noted otherwise.
- A complete visual inspection was not conducted on trees that were inaccessible or located within restricted areas.
- All trees were assessed from ground level without the use of invasive diagnostic methods. However, the following non-invasive tools may have been utilized: binoculars, probe, sounding hammer, diameter tape, and an electronic data collection device.

2.2. Retention Value

The retention value of a tree or group of trees is determined using a combination of environmental, cultural physiological and social values.

- **Low:** These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.
- **Medium:** These trees are moderately important for retention. Their removal should only be considered if they are adversely affecting the proposed building/ works and all other alternatives have been considered and exhausted.
- **High:** These trees are considered important for retention and should be retained and protected. Design modification or relocation of buildings should be considered to accommodate the setbacks as prescribed by the Australian standard *AS4970 Protection of trees on development sites.*

This tree retention assessment has been undertaken in accordance with the Institute of Australian Consulting Arboriculturists (IACA) Significance of a Tree Assessment Rating System (STARS). The System uses a scale of High, Medium, and Low significance in the landscape. Once the landscape significance of a tree has been defined, the retention value can be determined. Each tree must meet a minimum of three assessment criteria in order to be classified within a category. Further details and the assessment criteria can be found in Appendix 3.

2.3. Tree Protection Zones

The most important consideration for the successful retention of trees is to ensure appropriate crown and root area of the trees remain unaffected during construction/works thus allowing them to continue to grow. This requires the allocation of Tree Protection Zones (TPZ) for all trees to be retained within the construction footprint.

As detailed in the Australian Standard for Protection of Trees on Development Sites (AS4970 – 2009), a TPZ. defines an area in which construction activity is either avoided, or as a minimum controlled, in order to successfully retain the tree/s.

The Structural Root Zone (SRZ) represents the minimum area required to maintain tree stability without consideration to the ongoing health of the tree. Severing roots within the SRZ that are >50mm is not recommended as it may lead to the decline or structural failure of the tree/s

All TPZ measurements are provided in the tree assessment data in *table 2.*

Figure 1: TPZ and SRZ cross section

2.4. Encroachment Assessment

Encroachment into the TPZ is generally broken into the three categories listed below:

- **No Encroachment:** No likely foreseeable encroachment within the TPZ,
- **Minor Encroachment (<10%):** If the proposed encroachment within the TPZ is less than 10% and there is no encroachment into the SRZ then detailed root investigations should not be required. The area that has been encroached upon should be compensated for elsewhere and be contiguous with the TPZ,
- **Major Encroachment (>10%):** The project arborist must be able to demonstrate that the subject tree/s remain viable if the encroachment is greater than 10%. The area that has been encroached upon should be compensated for elsewhere and be contiguous with the TPZ,

Figure 2: Encroachment zones

2.5. Mitigation Measures

Any encroachment within a TPZ must be compensated for to ensure the impacts of the encroachment are mitigated. The amount of compensation required increases as the level of encroachment increases.

The following table outlines the levels of encroachment and the corresponding mitigation measures that are required.

Encroachment	Mitigation Measures
No Encroachment (0%)	No mitigation measures required
Minor Encroachment (<10%)	A detailed noninvasive root investigation should not be required under most circumstances, The area that has been lost must be compensated for elsewhere, contiguous with the TPZ, and Any roots that are cut must be done so with a sharp saw to ensure a clean cut.
Major Encroachment (>10%)	A detailed noninvasive root investigation should be carried out using approved methods such as air spade, Vacuum Excavator, or hand digging. The Project Arborist must be onsite to determine which roots may be severed, The area that has been lost must be compensated for elsewhere, contiguous with the TPZ, The project arborist must be able to demonstrate the tree/s would remain viable, and consideration should be given to, size, age, species, root diameter, location and species.

Table 1: encroachment

2.6. Tree Protection Plan

A detailed, site-specific Tree Protection Plan (TPP) must be prepared by an AQF Level 5 Arboricultural Consultant and submitted to the nominated certifier for approval prior to the issuance of the Construction Certificate.

The TPP is to be developed in accordance with the principles and requirements set out in AS 4970–2009: Protection of Trees on Development Sites, and is to include, but not be limited to, the following elements:

- A site plan illustrating the location of proposed tree protection fencing, as well as trunk and ground protection measures within the Tree Protection Zones (TPZ) of all trees to be retained.
- Details and specifications for tree protection fencing and trunk protection systems.
- Specifications for any proposed pruning of above-ground tree parts.
- Root protection measures for any excavation or soil modification within the TPZ.
- Identification of hold points and a schedule for site compliance reporting, where applicable; and
- Ground protection strategies for vehicular access areas to prevent soil compaction, if required.

The full Tree Protection Plan is provided in the Appendix of this report.

3. Results

The results were calculated by overlaying the TPZ radius onto the survey plans provided. The results can be found in *Table 2*.

Any discrepancies to the Survey Plans may result in inaccuracies in the TPZ encroachment calculation.

Trees 1, 6-9, 11, 14, 26-31, 33, and 35-39 **(19 trees)** will have no encroachment into their TPZs.

3.1. Minor Encroachment (<10%)

The following trees have minor encroachment of less than 10%:

- Trees 4, 5, 12, 20, 23 and 24 (**6 trees**) will have a minor encroachment of less than 10%. Due to the proposed additions and realignment of the driveway.

3.2. Major Encroachment (>10%)

The following trees have a major encroachment of more than 10%:

- Tree 13 (**1 tree**) will have a major encroachment of 35.8%. Due to the proposed pool area. The majority of the encroachment is behind an existing retaining wall which will reduce the expected encroachment to acceptable levels. **This tree will be able to be retained and protected**. Tree sensitive excavation methods must be undertaken under the supervision of the Project Arborist when excavating around this tree.
- Tree 15 (**1 tree**) will have a major encroachment of 10.3%. Due to the proposed pool area. **This tree will be able to be retained and protected**.
- Tree 21 (**1 tree**) will have a major encroachment of 25.1%. Due to the proposed retaining wall. This tree cannot be retained if the proposed development is to proceed.
- Tree 32 (**1 tree**) will have a major encroachment of 19.9%. Due to the proposed house additions. Given the tree species and location this tree should be able to be retained. Tree sensitive excavation methods must be undertaken under the supervision of the Project Arborist when excavating around this tree.
- Trees 2, 3, 10 and 34 (**4 trees**) will have a major encroachment between 14.3.% and 29.4%. Due to the proposed driveway realignment and hardstand. This encroachment will be significantly reduced as the proposed driveway and hardstand

will be placed at or above the current grade minimizing the encroachment. Tree sensitive excavation methods must be undertaken under the supervision of the Project Arborist when excavating around these trees.

- Trees 16-19, 22 and 25 (**6 trees**) are within the proposed construction footprint.

3.3. Asset Protection Zone

Bushfire Planning Services have provided a Bushfire Planning and Design report that calculated the Bushfire attack level (BAL) as BAL 40. The management plan detailed that the entire property was to be managed as an Asset Protection Zone (APZ). The entire property will require modification to achieve the APZ. The following requirements stated in section 14 of the BPAD report must be adhered to:

- Suitable impervious areas being provided immediately surrounding the building such as courtyards, paths and driveways.
- Grassed areas/mowed lawns/ or ground cover plantings being provided in close proximity to the building.
- Restrict planting in the immediate vicinity of the building which may over time and if not properly maintained come in contact with the building.
- Maximum tree cover should be less than 30%, and maximum shrub cover less than 20%.
- Planting should not provide a continuous canopy to the building (i.e. trees or shrubs should be isolated or located in small clusters).
- When considering landscape species consideration needs to be given to estimated size of the plant at maturity.
- Avoid species with rough fibrous bark, or which retain/shed bark in long strips or retain dead material in their canopies.
- Use smooth bark species of trees species which generally do not carry a fire up the bark into the crown.
- Avoid planting of deciduous species that may increase fuel at surface/ ground level (i.e. leaf litter).

The current canopy cover on site has been calculated at 42.7%, equivalent to approximately 1,835 m². In accordance with bushfire mitigation requirements, this figure must be reduced to no more than 30%, or 1,288.5 m².

While the removal of trees with unacceptable encroachments due to the proposed construction has already contributed to a partial reduction in canopy coverage, additional removals will be necessary to meet the target threshold.

The removal of Trees 20, 23, 26, 27, 28, 29 and 33 (**7 trees**) will further reduce the canopy cover to approximately 28.9%, or 1,245 m². These trees must be removed to achieve compliance with the specified canopy cover limit and to ensure that a suitable Asset Protection Zone (APZ) is established to support the development.

Trees 31 and 33 share a continuous canopy with trees on the neighbouring property and will require selective removal of second- and third-order branches to establish a minimum canopy separation of 3 metres from the neighbouring trees.

3.4. Trees unable or unworthy of retention

The following trees are unworthy or unable to be retained:

- 16-19, 21, 22 and 25 (**7 trees**) have an unacceptable encroachment to the TPZs and or SRZ and will not be able to be retained if the proposal is to proceed.

- Trees 20, 23, 26, 27, 28, 29 and 33 (**7 trees**) will need to be removed to maintain a maximum canopy cover of 30% to conform with the APZ specifications.

- Tree 37 (**1 tree**) has a retention priority of ‘Consider for removal’. This tree should be removed as part of good arboricultural practice as it is suppressed and has a short useful life expectancy.

Of the **39** trees on or near the site, **14** will need to be removed if the proposed development is to proceed with a further **1** tree recommended for removal due to it being heavily suppressed by surrounding trees.

3.5. Assessment Results

Project Name:	Arboricultural Impact Assessment - 1 James Wheeler Place Wheeler Heights

Results

Survey Number	Genus	Species	Common Name	Height (M)	Canopy Spread (M)	Age Class	DBH (CM)	Health	Structural condition	Defects	Significance	Useful Life Expactancy	Retention Priority	TPZ Radius (M)	SRZ Radius (M)	Encroachment (%)	Comments
T1	Eucalyptus	botryoides	Southern Mahogany	16	14	Mature	48	Fair	Fair		Medium	Medium 15-40Y	Consider for retention	5.8	2.4	0.0%	
T2	Melaleuca	quinquenervia	Broad Leaved Paperbark	15	8	Mature	38	Fair	Poor	Poor live canopy ratio and codominant stems	Medium	Medium 15-40Y	Consider for retention	4.6	2.2	17.6%	Driveway will be placed at grade reducing the impact on tree roots.
T3	Eucalyptus	botryoides	Southern Mahogany	17	12	Mature	39	Fair	Fair		Medium	Medium 15-40Y	Consider for retention	4.7	2.2	14.3%	Driveway will be placed at grade reducing the impact on tree roots.
T4	Grevillea	robusta	Silky oak	17	11	Mature	42	Fair	Fair		Medium	Medium 15-40Y	Consider for retention	5.0	2.3	4.9%	
T5	Eucalyptus	microcorys	Tallowood	18	14	Mature	45	Fair	Fair		Medium	Medium 15-40Y	Consider for retention	5.4	2.4	2.5%	
T6	Angophora	costata	Smooth barked apple	17	15	Mature	44	Fair	Fair		Medium	Medium 15-40Y	Consider for retention	5.3	2.3	0.0%	
T7	Eucalyptus	botryoides	Southern Mahogany	17	16	Mature	47	Fair	Fair		Medium	Medium 15-40Y	Consider for retention	5.6	2.4	0.0%	
T8	Eucalyptus	botryoides	Southern Mahogany	16	15	Mature	44	Fair	Fair		Medium	Medium 15-40Y	Consider for retention	5.3	2.3	0.0%	
T9	Angophora	costata	Smooth barked apple	16	9	Mature	35	Fair	Fair		Medium	Medium 15-40Y	Consider for retention	4.2	2.1	0.0%	
T10	Eucalyptus	botryoides	Southern Mahogany	16	15	Mature	48	Fair	Fair		Medium	Medium 15-40Y	Consider for retention	5.8	2.4	25.8%	Driveway will be placed at grade reducing the impact on tree roots.
T11	Grevillea	robusta	Silky oak	17	12	Mature	34	Fair	Fair		Medium	Medium 15-40Y	Consider for retention	4.1	2.1	0.0%	
T12	Toona	ciliata	Australian Red Cedar	17	15	Mature	67	Fair	Good		High	Long >40Y	Priority for retention	8.0	2.8	7.6%	
T13	Angophora	costata	Smooth barked apple	17	14	Mature	61	Fair	Fair		Medium	Long >40Y	Priority for retention	7.3	2.7	35.8%	
T14	Lophostemon	confertus	Brush Box	15	10	Mature	37	Good	Fair		Medium	Medium 15-40Y	Consider for retention	4.4	2.2	0.0%	
T15	Castanosperm um	australe	Black Bean	13	9	Mature	23	Fair	Fair		Medium	Medium 15-40Y	Consider for retention	2.8	1.8	10.3%	
T16	Castanosperm um	australe	Black Bean	15	8	Mature	38	Poor	Fair	poor foliage density	Medium	Short 5-15Y	Consider for removal	4.6	2.2	100.0%	Trunk within building footprint
T17	Harpephyllum	caffrum	Kaffir Plumb	8	6	Mature	24	Fair	Fair		Medium	Medium 15-40Y	Consider for retention	2.9	1.8	100.0%	Trunk within building footprint
T18	Syzygium	paniculatum	Lilly Pilly	6	4	Mature	12	Fair	Poor	Poor branching structure	Low	Short 5-15Y	Consider for removal	2.0	1.5	100.0%	Trunk within building footprint
T19	Syzygium	paniculatum	Lilly Pilly	7	5	Mature	25	Fair	Poor	Poor branching structure	Low	Short 5-15Y	Consider for removal	3.0	1.8	100.0%	Trunk within building footprint
T20	Eucalyptus	botryoides	Southern Mahogany	21	16	Mature	46	Fair	Fair		Medium	Medium 15-40Y	Consider for retention	5.5	2.4	9.2%	

Project Name:	Arboricultural Impact Assessment - 1 James Wheeler Place Wheeler Heights															
Results																
T21	Syzygium	species	Lilly Pilly	9	7	Semi Mature	19	Fair	Poor	Poor branching structure	Low	Short 5-15Y	Consider for removal	2.3	1.6	25.1%	
T22	Elaeocarpus	angustifolius	Blue Quandong	15	10	Mature	47	Fair	Fair		Medium	Medium 15-40Y	Consider for retention	5.6	2.4	100.0%	Trunk encroachment due to the placement of the retaining wall
T23	Syzygium	species	Lilly Pilly	13	10	Mature	48	Fair	Fair		Medium	Medium 15-40Y	Consider for retention	5.8	2.4	2.2%	
T24	Eucalyptus	botryoides	Southern Mahogany	24+	22	Mature	86	Fair	Fair	large dead branches present in the canopy. Minor isolated dieback.	High	Long >40Y	Priority for retention	10.3	3.1	1.9%	
T25	Angophora	costata	Smooth barked apple	21	10	Mature	39	Fair	Fair	Borer damage at the base of the tree	Medium	Short 5-15Y	Consider for removal	4.7	2.2	100.0%	Trunk within building footprint
T26	Syncarpia	glomulifera	Turpentine	13	10	Mature	42	Fair	Fair		Medium	Medium 15-40Y	Consider for retention	5.0	2.3	0.0%	
T27	Angophora	costata	Smooth barked apple	17	14	Mature	52	Fair	Fair		Medium	Medium 15-40Y	Consider for retention	6.2	2.5	0.0%	
T28	Eucalyptus	botryoides	Southern Mahogany	17	10	Mature	53	Fair	Fair		Medium	Medium 15-40Y	Consider for retention	6.4	2.5	0.0%	
T29	Eucalyptus	botryoides	Southern Mahogany	10	10	Mature	54	Fair	Poor	previous large branch failures. Canopy reestablishing.	Medium	Medium 15-40Y	Consider for retention	6.5	2.6	0.0%	
T30	Eucalyptus	botryoides	Southern Mahogany	23	19	Mature	92	Fair	Fair	large dead branches present in the canopy.	High	Long >40Y	Priority for retention	11.0	3.2	0.0%	Avian fauna present in tree.
T31	Eucalyptus	botryoides	Southern Mahogany	21	12	Mature	57	Fair	Fair	growing on a lean away from neighbouring tree.	Medium	Long >40Y	Consider for retention	6.8	2.6	0.0%	Canopy in contact with trees on neighbouring property.
T32	Eucalyptus	botryoides	Southern Mahogany	23	18	Mature	58	Fair	Fair		High	Long >40Y	Priority for retention	7.0	2.6	19.9%	Exploratory root excavation is needed to ensure this tree can remain viable.
T33	Eucalyptus	botryoides	Southern Mahogany	17	11	Mature	46	Fair	Fair		Medium	Medium 15-40Y	Consider for retention	5.5	2.4	0.0%	Canopy in contact with trees on neighbouring property.
T34	Eucalyptus	botryoides	Southern Mahogany	18	17	Mature	60	Fair	Fair	minor cavities throught the trunk. Good rate of occlusion.	Medium	Medium 15-40Y	Consider for retention	7.2	2.7	29.4%	Hardstand will be placed at grade reducing the impact on tree roots. Canopy in contact with trees on neighbouring property. Avian fauna present in tree.

Project Name:	Arboricultural Impact Assessment - 1 James Wheeler Place Wheeler Heights															
	Results															
T35	Angophora	costata	Smooth barked apple	17	15	Mature	51	Fair	Fair		Medium	Medium 15-40Y	Consider for retention	6.1	2.5	0.0%	Canopy in contact with trees on neighbouring property. Avian fauna present in tree.
T36	Angophora	costata	Smooth barked apple	15	13	Mature	44	Fair	Fair		Medium	Medium 15-40Y	Consider for retention	5.3	2.3	0.0%	Canopy in contact with trees on neighbouring property. Avian fauna present in tree.
T37	Angophora	costata	Smooth barked apple	12	7	Semi Mature	18	Fair	Poor	Supressed	Medium	Short 5-15Y	Consider for removal	2.2	1.6	0.0%	Canopy in contact with trees on neighbouring property. Avian fauna present in tree.
T38	Angophora	costata	Smooth barked apple	16	10	Mature	33	Fair	Fair	Supressed	Medium	Medium 15-40Y	Consider for retention	4.0	2.1	0.0%	Canopy in contact with trees on neighbouring property. Avian fauna present in tree.
T39	Angophora	costata	Smooth barked apple	16	11	Mature	35	Fair	Fair	Supressed	Medium	Medium 15-40Y	Consider for retention	4.2	2.1	0.0%	Canopy in contact with trees on neighbouring property. Avian fauna present in tree.

Table 2 Results from site survey

4. Specifications

The following specifications are required if the proposed development is to proceed:

A detailed site-specific Tree Protection Plan (TPP) is to be prepared by an AQF Level 5 Arboricultural Consultant along with an AIA and submitted to the nominated certifier for approval (*See Appendix 2 for TPP*).

- Tree sensitive excavation methods must be undertaken around Trees 2, 3, 10, 13, 15, 32 and 34 (**7 trees**) under the supervision of the Project arborist. The proposed driveway should be placed at or above the current grade to reduce the impact on these trees.
- Trees 31 and 33 share a continuous canopy with trees on the neighbouring property and will require selective removal of second- and third-order branches to establish a minimum canopy separation of 3 metres from the neighbouring trees.
- The area within the TPZ of tree 24 should be de-compacted and aerated at the completion of the construction to reduce the compaction that has previously taken place.
- The Project Arborist must be informed prior to any further unplanned encroachment within the TPZs.
- The area within the tree protection fencing should be mulched with good quality leaf mulch to a depth of 100mm prior to construction to promote better tree health during the construction period.
- Ensuring that the soil moisture content stays above 50% within the TPZs will greatly benefit the trees to be retained on the site and will help offset the impacts of construction.

4.1. Tree removals

The following trees are unworthy or unable to be retained:

- 16-19, 21, 22 and 25 (**7 trees**) have an unacceptable encroachment to the TPZs and or SRZ and will not be able to be retained if the proposal is to proceed.

- Trees 20, 23, 26, 27, 28, 29 and 33 (**7 trees**) will need to be removed to maintain a maximum canopy cover of 30% to conform with the APZ specifications.

- Tree 37 (**1 tree**) has a retention priority of ‘Consider for removal’. This tree should be removed as part of good arboricultural practice as it is suppressed and has a short useful life expectancy.

Of the **39** trees on or near the site, **14** will need to be removed if the proposed development is to proceed with a further **1** tree recommended for removal due to it being heavily suppressed by surrounding trees.

Appendix 1 – Tree locations

Below is an image of the tree locations showing the TPZ and encroachments.

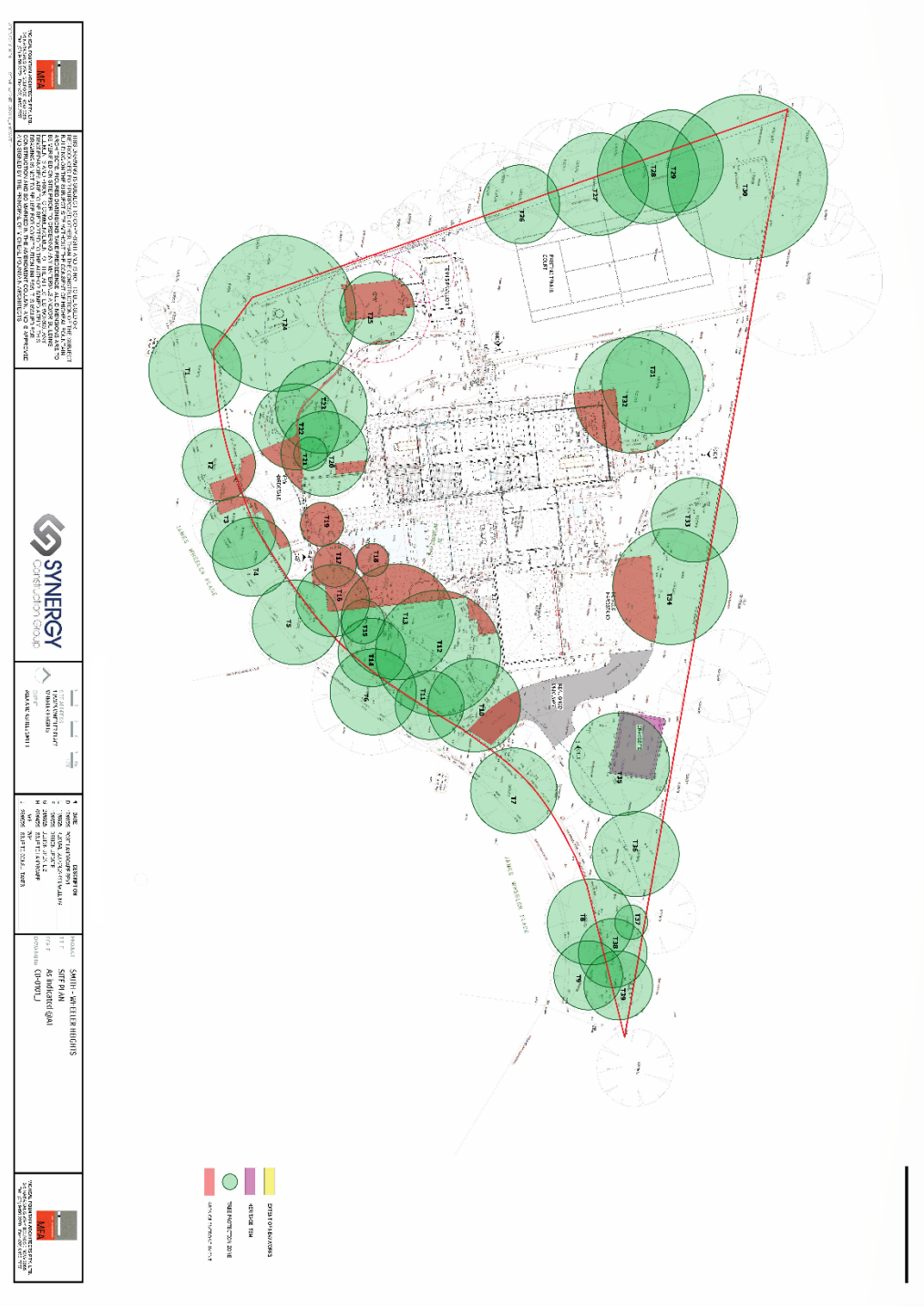

Figure 3: Showing the TPZ and area of encroachment

Appendix 2 – Removal plan

Below is an image showing the trees to be retained and removed:

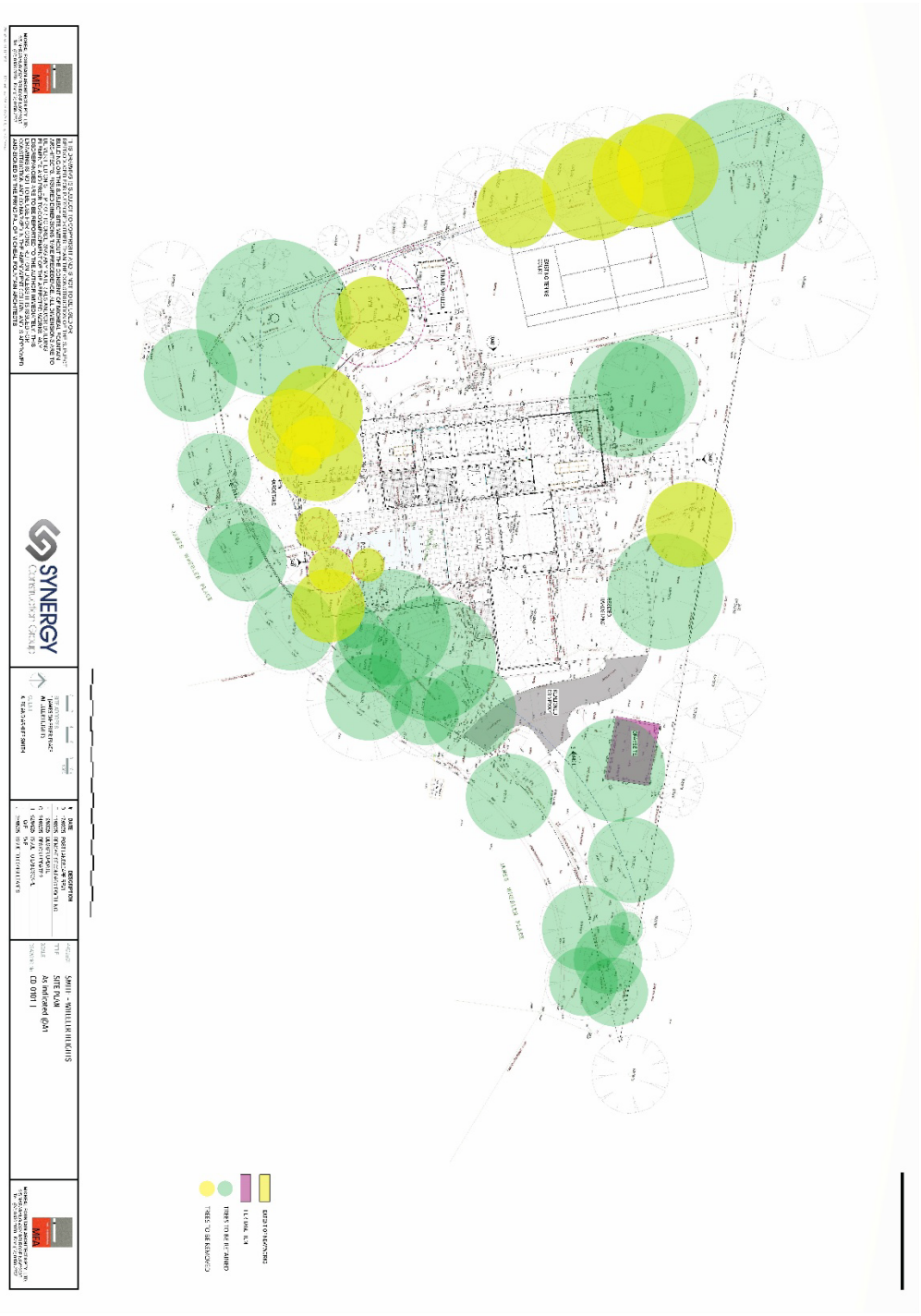

Figure 4: Tree removal/retention plan

Appendix 3 – Tree Protection Plan

Specifications

The following specifications are required if the proposed development is to proceed:

- Tree sensitive excavation methods must be undertaken around Trees 2, 3, 10, 13, 15, 32 and 34 (**7 trees**) under the supervision of the Project arborist. The proposed driveway should be placed at or above the current grade to reduce the impact on these trees.
- Trees 31 and 33 share a continuous canopy with trees on the neighbouring property and will require selective removal of second- and third-order branches to establish a minimum canopy separation of 3 metres from the neighbouring trees.
- The area within the TPZ of tree 24 should be de-compacted and aerated at the completion of the construction to reduce the compaction that has previously taken place.
- The Project Arborist must be informed prior to any further unplanned encroachment within the TPZs.
- The area within the tree protection fencing should be mulched with good quality leaf mulch to a depth of 100mm prior to construction to promote better tree health during the construction period.
- Ensuring that the soil moisture content stays above 50% within the TPZs will greatly benefit the trees to be retained on the site and will help offset the impacts of construction.

Tree Protection Fencing

Tree protection fencing must be established in the locations shown in *Figure 6*. Existing fencing, site hoarding or structures (such as a wall or building) may be used as tree protection fencing, providing the TPZ remains isolated from construction footprint.

Tree protection fencing must be installed prior to site establishment and remain intact until completion of works. Once erected, protective fencing must not be removed or altered without the approval of the project arborist.

Tree protection fencing shall be:

- Enclosed to the full extent of the TPZ (or as specified in the Specifications and Tree Protection Plan).
- Temporary mesh panel fencing (minimum height 1.8m).
- Certified and inspected by the project arborist.
- Installed prior to the commencement of works.
- Prominently signposted with 300mm x 450mm boards stating, “NO ACCESS - TREE PROTECTION ZONE”.

If tree protection fencing cannot be installed due to sloping or uneven ground, tree protection barriers must be installed as an alternative.

Specifications for tree protection barriers are as follows:

- Star pickets spaced at 2m intervals,
- Connected by a continuous high-visibility barrier/hazard mesh.
- Maintained at a minimum height of 1m.

Where approved works are required within the TPZ, fencing may be setback to provide construction access. Trunk, branch and ground protection shall be installed and must comply with AS 4970-2009, Protection of Trees on Development Sites. Any additional construction activities within the TPZ of the subject trees must be assessed and approved by the Project Arborist.

TPZ Fencing Plan

Below is an image of the Fencing plan.

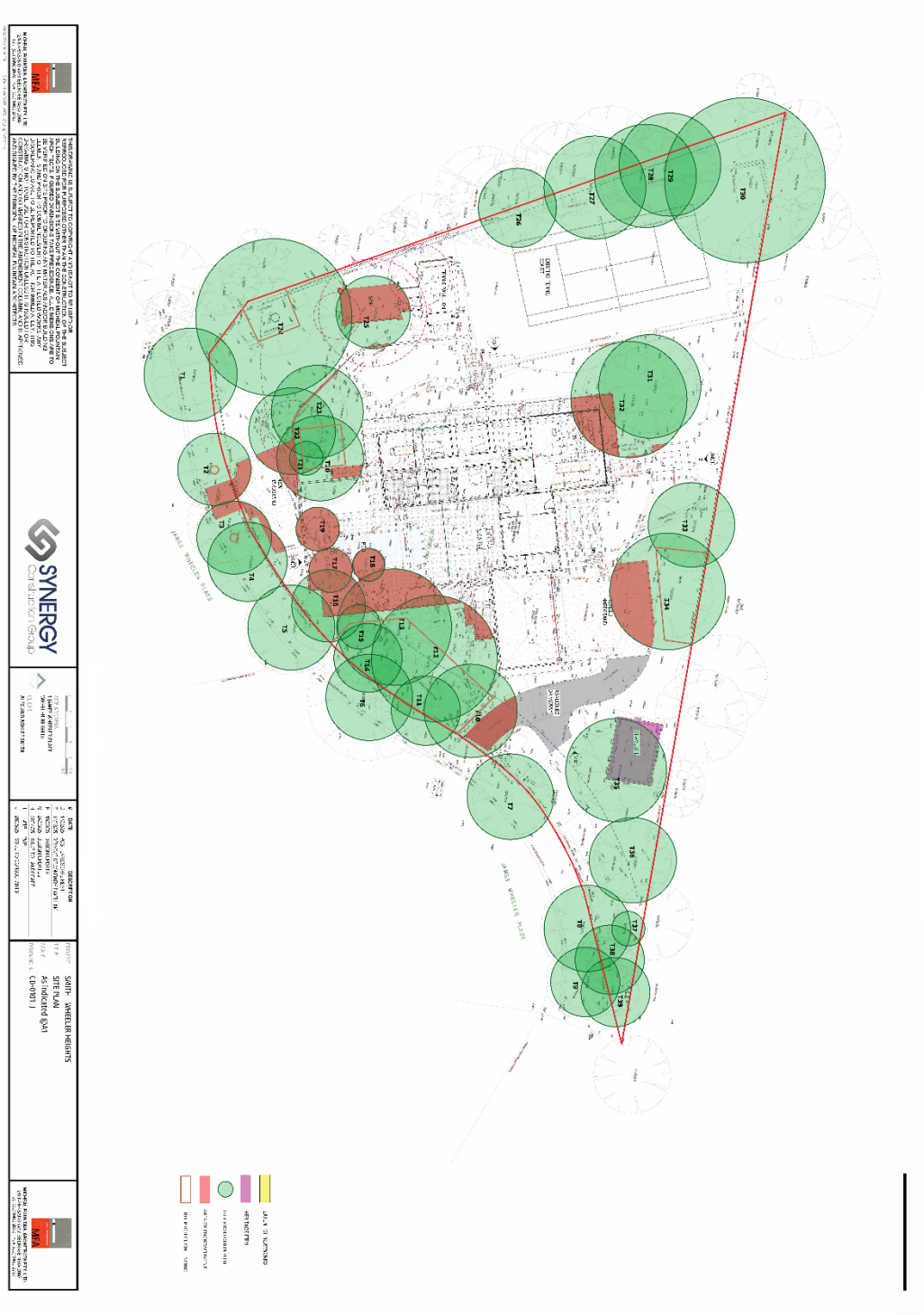

Figure 5: Fencing Plan - Fence in brown

Trunk protection

Where the provision of tree protection fencing is impractical or must be temporarily removed, trunk protection must be installed to avoid accidental mechanical damage.

Specifications for trunk protection are as follows:

- A thick layer of carpet underfelt, geotextile fabric or similar wrapped around the trunk to a minimum height of 2m.
- 1.8m lengths of softwood timbers aligned vertically and spaced evenly around the trunk (with a small gap of approximately 50mm between the timbers).
- The timbers must be secured using galvanized hoop strap.

The timbers shall be wrapped around the trunk but not fixed to the tree, as this will cause injury/damage to the tree.

Ground protection

If temporary access for vehicles, plant or machinery is required within the TPZ, ground protection shall be installed. The purpose of ground protection is to prevent root damage and soil compaction within the TPZ. Where possible, areas of existing pavement shall be used as ground protection.

Specifications for light traffic access (<3.5 tonne) are as follows:

- Permeable membrane such as geotextile fabric.
- Layer of mulch or crushed rock (at minimum depth of 100mm)

Specifications for heavy traffic access (>3.5 tonne) are as follows:

- Permeable membrane such as geotextile fabric.
- Layer of lightly compacted road base (at minimum depth of 200mm)
- Geotextile fabric shall extend a minimum of 300mm beyond the edge of the road base.

Pedestrian, vehicular and machinery access within the TPZ shall be restricted solely to areas where ground protection has been installed.

Excavations

All approved excavations (including root investigations) within the TPZ must be carried out using tree sensitive methods under supervision of the Project Arborist. These methods may include:

- Manual excavation (hand tools).
- Air spade.
- Hydro-vacuum excavations (sucker-truck).

Where approved by the Project Arborist, excavations using compact machinery fitted with a flat bladed bucket is permissible. Excavations using compact machinery shall be undertaking in small increments and guided by the Project Arborist who is to look for and prevent root damage to roots >50mm in diameter.

No over-excavation, battering or benching shall be undertaken beyond the footprint of any structure unless approved by the Project Arborist. Hand excavation and root mapping shall be undertaken along excavation lines within the TPZ prior to the commencement of mechanical excavation (to prevent tearing and shattering of roots from excavation equipment). Any conflicting roots (>50mm in diameter) shall be pruned using clean, sharp secateurs or a pruning saw to ensure a clean cut free from tears. All root pruning must be documented and carried out by the project arborist.

Underground services

All underground services should be routed outside of the TPZ. If underground services need to be installed within the TPZ, they must be installed using tree sensitive excavation methods under supervision of the Project Arborist.

Alternatively, boring methods such as horizontal directional drilling (HDD) may be used for underground service installation, providing the installation is at minimum depth of 800mm below grade. Excavations for entry/exit pits must be located outside the TPZ.

Site Inspections

In accordance with the Australian Standard, *AS 4970-2009, Protection of Trees on Development Sites*, inspections must be conducted by the Project Arborist at the following key project stages:

- Prior to any work commencing on-site (including demolition, earthworks or site clearing) and following installation of tree protection.
- During any excavations, building works and any other activities carried out within the TPZ of any tree to be retained & protected.
- Following completion of the building works.

It shall be the responsibility of the Project Manager to notify the Project Arborist prior to any works within the TPZ, of any protected tree at a minimum of 48 hours' notice. To ensure the Tree Protection Plan is implemented, hold points have been specified in the schedule of work *(Table 4).*

Schedule of Work

Hold Point	Instruction
Pre - Construction Works	A project arborist is to be nominated and a site meeting/walkthrough is to be undertaken with the principal builder.
Pre - Construction Works	Tree protection (for trees that will be retained) shall be installed prior to demolition and site establishment, this may include mulching of areas within the TPZ. Project Arborist shall inspect and certify tree protection.
During Construction works	Project Arborist to undertake monthly compliance inspections and document any noncompliance with the approved Tree protection plan along with specifying rectification works.
During Construction works	Project Arborist to supervise and document all works carried out within the TPZ of trees to be retained.
Post Construction Works	Inspection of trees by Project Arborist after all major construction has ceased, following the removal of tree protection measures.

Table 3: Hold points

Appendix 3 – STARS Retention Rating Method

Useful Life Expectancy	Tree Significance: High	Medium	Low		
Long >40 years					
Medium 15-40 years					
Short <1-15 years					
Dead					

Legend for Matrix Assessment	
	Priority for retention (High): These trees are considered important for retention and should be retained and protected. Design modification or re-location of building/s should be considered to accommodate the setbacks as prescribed by the Australian Standard AS4970 Protection of trees on development sites. Tree sensitive construction measures must be implemented if works are to proceed within the Tree Protection Zone.
	Consider for retention (Medium): These trees may be retained and protected. These are considered less critical; however, their retention should remain priority with the removal considered only if adversely affecting the proposed building/works and all other alternatives have been considered and exhausted.
	Consider for removal (Low): These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.
	Consider for removal (Low): These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.

Reference

IACA, 2010, IACA Significance of a Tree, Assessment Rating System (STARS)
Institute of Australian Consulting Arboriculturists
Australia, www.iaca.org.au