



Construction Impact Assessment and Management Plan



7 Rock Bath Road, Palm Beach

Prepared for: Dylan Ferrell Design

Prepared by: George Palmer

Dated: December, 2018



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1. Summary

1.1 This report has been requested as part a Development Application (DA) to Pittwater Council for the works detailed. This will primarily involve the reconfiguration of the front garden, pool and parking facilities and require the removal of a number of tree ferns.

1.2 The purpose of this report is to identify all existing trees, assess both health and condition, determine landscape significance and life expectancy. A determination for preservation, removal or transplantation will be made based on sustainability and suitability within the setting. For the purpose of this report Botanics has assessed the likely impact that the proposed development will have on the subject trees. This report will then provide recommendations in relation to the management of these in accordance with Australian Standard (AS) 4970 *for the Protection of Trees on Development Sites*. Pruning and removal works will be based on AS4373 *for the Pruning of Amenity Trees* where applicable.

1.3 The existing residence sits on the southern side of Rock Bath Road, Palm Beach and is elevated up to the south. These contours have been retained with the construction of the garage on the lowest level, with an elevated walkway leading to the main entertaining area, holding the existing swimming pool. The residence is a double storey block from this level with north facing ocean views over Palm Beach.

2. Background

2.1 The site will have been cleared of all native vegetation as part of the original subdivision, as well as subsequently following the construction of the existing swimming pool and surrounds. This garage and pool no longer meet the domestic living requirements of the current owners and the proposed design has been developed to address this.

3. Aims

3.1 The aims of this report are to;

- Review Council Policies for applicable conditions regarding the site and documented trees;
- Conduct a visual assessment of the documented trees and their growing environment;
- Provide a detailed list of Tree Preservation Recommendations aimed at preserving those trees documented for preservation.

3.2 There is no warranty or guarantee, expressed or implied that health, pests, disease, deficiencies, decay or any structural failures may occur at any time following documentation. Information contained in this report covers only the documented trees and reflects their health and condition at the time of inspection.



4. Methodology

4.1 A Visual Tree Assessment (VTA) was performed from ground level and consideration was given to the overall health of each tree, percentage of canopy, epicormic growth, deadwood and form for this species. The tree heights and canopy spreads have been estimated and where relevant the orientation of the canopy spread noted. The trunk diameters of each tree has been estimated at breast height of 1.4meters (DBH) and measured with a diameter tape where required to calculate Tree Protection Zones. The site was inspected by consulting arborist George Palmer in December, 2018.

5. Observations

5.1 As noted, the site is located on the southern side of Rock Bath Road, Palm Beach with the site topography rising further south. This elevated platform allows visual access to the north and over Palm Beach and the ocean. Existing trees, including well established Melaleucas (Trees 10 and 17) have been reduced to maintain this visual access via reduction pruning (lopping). This has affected their natural habit and reduced their amenity contributions and arboricultural significance.

5.2 Additional trees that have been "lopped" include two (2) Camphor laurels (Trees 15 and 16) that look to have been cut down to ground level and allowed to regrow. This has resulted in the development of multiple leaders with inclusions. These trees have been recommended for removal for this, as well as a range of additional reasons and irrespective of the proposed development.

5.3 There is a stand of well established *Cyathea cooperi*, or Australian tree ferns (Trees 4, 5, 6, 7 and 8) located between the rear of the carport and the swimming pool. These appear to be in both good health and condition, clearly benefiting from high soil moisture levels and an impermeable, underground bedrock.

6. Tree Data

6.1 As noted, the site will have been cleared as part of the original subdivision and following the construction of the existing swimming pool and residence. None of the sixteen (16) documented trees are part of the remnant Spotted Gum Forest plant community <https://www.environment.nsw.gov.au/determinations/PittwaterSpottedGumForestEndComListing.htm>. and all, including the *Cyathea*'s will have been planted here. A detail of tree species, size and significance has been detailed in the attached **Tree Table**.

6.2 Tree 1 is a small but well established *Magnolia figo*, or Port Wine Magnolia located adjacent to the site's western boundary. The tree is less than 5m in height and has been documented for removal due to poor form and horticultural context.

6.3 Tree 2 is a well established *Agonis flexuosa*, or Western Australian Peppermint located within the neighbouring residence. The tree has multiple sections of visible surface decay at both its base and through its central canopy. It is located outside the construction impact zone and documented for retention.

6.4 The semi mature *Jacaranda mimosifolia*, or Jacaranda located on the site's rear, western boundary has been documented as Tree 3. This tree has developed with a low canopy that leans to the north east and over the courtyard. This tree is again located outside the construction impact zone and has been documented for preservation.

6.5 Trees 4, 5, 6, 7 and 8 are all *Cyathea cooperi*, or Australian Tree ferns located between the rear of the carport and the northern edge of the swimming pool. These are all well established, semi mature examples of the species.

6.6 Tree 9 is a semi juvenile *Erythrina*, or Coral tree located on the lower verge. This is a poor tree species for a range of reasons and should be removed irrespective of the proposed development.



6.7 Trees 10 and 17 are both *Melaleuca quinquenervia*, or Paperbark trees located within the front garden. These are a native tree species that will have been planted here as part of the early landscape works that will have occurred following this portion of the construction. As noted, both have been reduction pruned, or “lopped” to maintain visual access to Palm Beach and the ocean.

6.8 Tree 11 is a semi mature *Cinnamomum camphora*, or Camphor laurel tree located within the western neighbour's residence. This is poor tree species for a broad range of reasons and should be removed irrespective of the proposed development. The tree is however located within the neighbouring residence and has been documented for retention.

6.9 The neighbouring *Cyathea* has been documented as Tree 12. This is a well established and mature example of the species that can be estimated to be over thirty (30) years of age. This tree is again located outside the construction impact zone and documented for retention.

6.10 Trees 13 and 14 are both *Ulmus parvifolia*, or Chinese Elms located within planters adjacent to the front entrance. These are less than 5m in height and supported on trunks of less than 30cm in diameter and should not be considered as a material constraint to the proposed development.

6.11 Trees 15 and 16 are both *Cinnamomum camphora*, or Camphor laurels that have been cut down to ground level and allowed to regrow. This regrowth has resulted in the formation of multiple leaders from ground level with inclusions. The trees look to have entered a cycle of decline, despite their vigorous nature and are required for removal irrespective of the proposed development.

7. Discussion

7.1 The proposed works will involve the excavation of the front portion of the site to allow for the construction. This will require the removal of those trees located here. This includes the *Cyathea cooperi*, or Tree frees detailed as Trees 4, 5, 6, 7 and 8.

7.2 Additional trees recommend for removal include the Port Wine Magnolia documented as Tree 1. This is less than 5m in height and has a history of poor pruning affecting its amenity contribution. The tree is also out of context in this landscape setting.

8. Recommendations

8.1 It will be recommended that Trees 1, 4, 5, 6, 7, 8, 9, 10, 13 and 14 be removed for the reasons outlined. This should be done in accordance with WorkCover Standards http://www.safework.nsw.gov.au/_data/assets/pdf_file/0009/52866/Amenity-Tree-Industry-Code-of-Practice.pdf. following formal approval from Northern Beaches Council.

8.2 The remaining trees documented as Trees 2, 3, 11, 12 and 17 have been documented for retention and will be preserved throughout the construction process with the implementation of the following Tree Protection Recommendations.

8.3 All Tree Protection Zones as outlined in **Figure 1** will need to be recognised and all works with them done in accordance with AS4970 Standards for the Protection of Trees on Development Sites.

8.4 The impacts of compaction will need to be considered within TPZs outlined. This will require the installation of “rumble boards” between the street and the construction site.

8.5 Any roots requiring removal to allow the proposed works to occur should be cut cleanly at the edge of the construction to limit the spread of decay.



8.6 The remaining Tree Protection Recommendations are generic recommendations that have been based on *AS4970 Standards* and should be implemented where applicable.

8.6.0 Appointment of Site Arborist

A site arborist shall be appointed prior to the commencement of work on site. The Site Arborist shall clearly mark out all trees to be removed and ensure that all trees documented for retention are preserved with the implementation of the following tree protection measures. The Site Arborist shall have a minimum qualification equivalent to a NSW TAFE Certificate Level 5 or above in Arboriculture.

8.6.1 Inspection Points

Give 5 working days notice to allow inspections to be undertaken at the following stages;

Inspection Point	Inspection Personnel
Installation of Tree Protection Zones including Tree Protection Fencing, Silt Fencing and Signage	Site Arborist
Modification of the Tree Protection Zone	Site Arborist
Works within the Tree Protection Zone	Site Arborist
Completion of Construction Works	Site Arborist Site Supervisor.

8.6.2 Education

Contractors and site workers shall receive a copy of these specifications prior to the commencement of work. Contractors and site workers undertaking any works within a TPZ shall sign the site log to confirm that they have read and understand these specifications prior to their undertaking.

8.6.3 Tree Protection Zones

Where applicable, all trees to be retained through the construction process shall be protected from mechanical damage and the indirect impacts of the construction process with the installation of Tree Protection Zones. Unless otherwise stated, the following activities must not be carried out within a TPZ;

- modification of existing soil levels
- excavation or trenching
- cultivation of soil
- mechanical removal of vegetation
- movement of natural rock
- storage of materials, plant or equipment
- erection of site sheds
- affixing signage or hoarding to trees
- disposal of chemical waste or construction material
- any activity that may directly or indirectly affect the health of these or surrounding trees.

Note: If access to a TPZ is required as part of the approved development, prior authorisation is required by the Site Arborist.

8.6.4 Tree Protection Fencing



Tree Protection Fencing shall be installed at the perimeter of the TPZ. As a minimum the Tree Protection Fencing shall be 1.8 meters high temporary chain supported by steel stakes. This shall be fastened and supported to prevent sideways movement. The trees woody roots shall not be damaged during the installation of this Tree Protection Fencing. This Tree Protection Fencing shall be erected prior to the commencement of works on site and shall be maintained for the duration of the construction process.

8.6.5 Signage

Tree Protection Signage shall be attached the the TPZ and displayed in a prominent location. These signs shall be repeated in 10m intervals or closer where the fence changes direction. These shall be a minimum of a 72 font size and each sign at-least 600 x 500mm.

8.6.6 Mulching

The area within the TPZ shall be mulched and maintained with 80mm of leaf litter mulch for the duration of the construction process. This mulch shall be spread by hand to limit the impact on underlying roots and shall be installed prior to the commencement of works on site.

8.6.8 Site Management

Materials and waste storage, site sheds and temporary services shall not be located within the TPZ unless specified. Storage points shall be covered when not in use and be no greater than 2m in height.

8.6.8 Works within the TPZ

The TPZ may need to be modified during the works to allow access between the protected tree and the proposed construction. The TPZ shall remain as specified and only those works detailed in the proposed construction undertaken.

8.6.9 Completion of Works within specified TPZ

Upon the completion of works within a TPZ the protective fencing shall be reinstated as specified. Where the construction of new structures does not allow for the reinstallation of fencing the TPZ shall be modified by the Site Arborist.

George Palmer
Diploma Horticulture- Arboriculture (Level 5)
Associate Diploma Horticulture- Landscape.

Disclaimer

All care has been taken to assess potential hazards, but trees are inherently dangerous. This assessment was carried out from the ground, and covers what was reasonable to be assessed at the time of inspection. No aerial or underground inspections were carried suability is accepted for damage or injury caused by trees and no responsibility is accept if the recommendations in this report are not adhered to. Limitations on the use of this reportThis report is to be utilised in its entirety only.

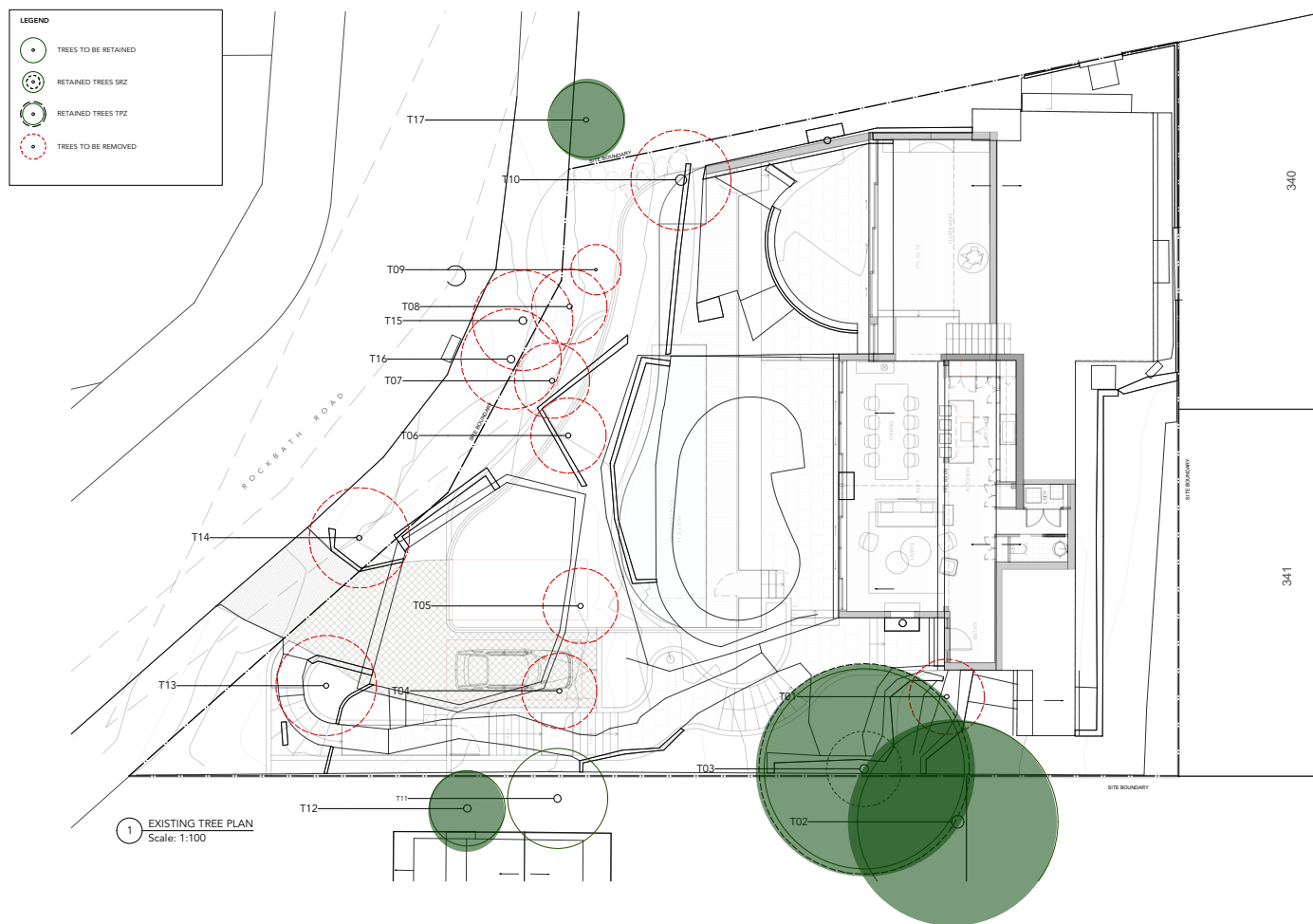


Figure 1 Shows the locations of the documented trees in relation to the proposed development and the TPZ required for ongoing consideration.



Figure 2 Shows the existing pool and the tree ferns required for removal.

Figure 3 Shows the poor basal structure of the *Melaleuca* documented as Tree 10.



Tree Table for 7 Rock Bath Road, Palm Beach.

T#	Species	Remnant Native, Exotic.	Age Class	Canopy Height and Spread.	Trunk Diameter DBH	Basal Diameter DGL	Significance	Amenity value	Ecological Value	Defects	SRZ	TPZ	Implications
T1	Magnolia figo (Port Wine Magnolia)	E	SM	5 x 3	3 x 10cm	30cm	Low	Low	Low	L	2m	3m	A small tree of limited amenity located outside the ClZ and documented for removal.
T2	Agonis flexuosa (West Australian Peppermint)	N	M	8 x 8	50cm (est.)	50cm	Moderate	Moderate	Moderate	D.	2.5m	6m	A well established example of the species located within the neighbouring residence and documented for retention.
T3	Jacaranda mimosifolia (Jacaranda)	E	M	8 x 8	35cm	40cm	Moderate	Moderate	Moderate		2.3m	5m	A well established example of the species located directly adjacent to the sites wester boundary.
T4 - T8.	Cyathea cooperii (Australian tree fern)	N	SM	6 x 3	20cm	25cm	Moderate	Moderate	Moderate		NA	NA	All part of a stand of similar trees located between the rear of the carport and the northern edge of the swimming pool.
T9	Erythrina sykesii (Coral tree)	E	J	6 x 2	10cm	12cm	Low	Low	Low	W	NA	NA	A poor tree species for a broad range of reasons and recommend for removal irrespective of the proposed development.
T10	Melaleuca quinquenervia (Paperbark)	N	SM	7 x 4	3 x 25	35cm	Low	Low	Low	I.	2.5m	5m	A semi mature example of the species that has been reduction pruned to maintain visual access to Palm Beach and the ocean.

Tree Table for 7 Rock Bath Road, Palm Beach.

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T11	Cinnamomum camphora (Camphor laurel)	E	SM	10 x 4	50cm (est.)	60cm (est.)	Low	Low	Low	L,D	NA	NA	A poor form of this poor tree species located within the neighbouring residence. Recommended for removal, documented for retention.
T12	Cyathea cooperii (Australian tree fern)	N	M	10 x 3	30cm	30cm	Moderate	Moderate	Moderate		2m	4m	A well established example of the species located within the neighbouring residence and outside the CIZ of the proposed. Retain.
T13	Ulmus parvifolia (Chinese elm)	E	J	5 x 4	20cm	25cm	Low	Low	Low	L.	2m	3.5m	1 of 2 similar trees located at the front entrance. Recommended for removal.
T14	Ulmus parvifolia (Chinese elm)	E	J	5 x 4	20cm	25cm	Low	Low	Low	L.	2m	3.5m	As above. Both located under power lines and documented for removal.
T15 and T16	Cinnamomum camphora (Camphor laurel)	E	SM	4 x 4	30cm	35cm	Low	Low	Low	D,I,W	NA	NA	Both trees have been cut back to ground level and allowed to regrow. Poor form and structure and recommended for removal irrespective of the proposed.
T17	Melaleuca quinquenervia (Paperbark)	N	J	5 x 3	20cm	25cm	Low	Low	Low		2.5m	5m	A poor example of the species located in the front garden. Suppressed by adjacent plant material and in decline.

Tree Table for 7 Rock Bath Road, Palm Beach.

Genus, Species, and Common name

The botanical and common name of each tree is identified and recorded. Occasionally the exact species name is unknown; sp. Is recorded to indicate this.

Height, Spread, Trunk Diameter, DBH and DRB

The Trees height and spread are recorded in meters.

The tree DBH is recorded in millimeters. DBH is an abbreviation of diameter (of the trunk) measured at breast height (or 1.4 meters from the base of the trunk). If more than one trunk is present the DBH is calculated in accordance with AS4970-2009 Protection of Trees on Development Sites.

If the tree has multiple trunks each trunk DBH will be recorded individually.

The tree DRB is recorded in millimeters. DRB is an abbreviation of Diameter (of the trunk) measured above the root buttress. It is required to calculate the SRZ in accordance with AS4970-2009 Protection of Trees on Development Sites when there is major encroachment within the TPZ, i.e. greater than 10% is encroached upon or if there is an encroachment within the SRZ.

Age

The age class of each tree is estimated as either:

J- Juvenile, a young sapling, easily replaced from nursery stock

SM- Semi mature, a tree that has not grown to mature size

M- Mature, a tree that has reached mature size and will slowly increase in size over time.

OM- Over mature, a tree that has been mature for a long period and is beginning to display signs of decline, e.g. large dead branches

S- Senescent, an over mature tree that is now in decline

Health

The Tree's health is recorded as a measurement of:

G- Good, the does not appear stressed with no excessive dieback, insect infestation, decay, deadwood or epicormic shoots

Avg- Average health, the tree appears stressed and has some crown dieback, and/or areas or few epicormic shoots, and/or some deadwood in the crown and some new growth at the branch tips. These trees may benefit from remediation of the growing environment to reduce stress and return it to good health.

F- Fair, the tree may have areas of crown die back, and/or many epicormic shoots, and/or reduced new growth at branch tips. These trees have been stressed for a short period of time; remediation of the growing environment may improve the trees health.

P- Poor, the tree may have large areas of crown die back, and/or many epicormic shoots, and/or reduced new growth at branch tips. These trees have been stressed for a long time, remediation of the growing environment would not return the tree to good health.

Crown Condition

The crown condition of each tree is assessed and recorded as either:

G- Good Condition: the tree appears to have no visible indication of inherent structural effects.

Avg- Average Condition: the tree has minor structural defects which may be corrected with remedial works or pruning, allowing the tree to return to Good Condition.

F- Fair Condition: the tree has visible structural defects such as (but not limited to) dead branches, and/or an unbalanced crown, and/or leaning trunk and/or signs of decay. These trees do not demonstrate the typical form of their species, or have been damaged or have begun to deteriorate. Remedial works or pruning may return the tree to Average Condition.

P- Poor Condition: the tree has significant structural defects such as (but not limited to) very large dead branches, and/or extremely unbalanced crown, and/or subsiding trunk, and/or large areas of decay. These trees do not demonstrate the typical form of their species, or have been severely damaged or have deteriorated significantly. Remedial pruning would not return the tree to fair condition.

Significance

The landscape significance of a tree is an essential criterion to establish the importance that a particular tree may have on a site. When determining a trees significance within the landscape context, the following questions are asked.

Significance is measured as high, medium, or low. High being a affirmative answer for 4 or more questions, Medium being 3 affirmative answers, and Low being 2 or less affirmative answers.

- Is the tree a local native remnant; an endangered species, a part of an endangered species community; or does the tree provide critical habitat.

Tree Table for 7 Rock Bath Road, Palm Beach.

RATING	HERITAGE VALUE	ECOLOGICAL VALUE	AMENITY VALUE
1. SIGNIFICANT	The subject tree is listed as a Heritage Item under the Local Environment Plan (LEP) with a local, state or national level of significance or is listed on Council's Significant Tree Register	The subject tree is scheduled as a Threatened Species as defined under the Threatened Species Conservation Act 1995 (NSW) or the Environmental Protection and Biodiversity Conservation Act 1999	The subject tree has a very large live crown size exceeding 300m ² with normal to dense foliage cover, is located in a visually prominent position in the landscape, exhibits very good form and habit typical of the species
	The subject tree forms part of the curtilage of a Heritage Item (building/structure/artefact as defined under the LEP) and has a known or documented association with that item	The tree is a locally indigenous species, representative of the original vegetation of the area and is known as an important food, shelter or nesting tree for endangered or threatened fauna species	The subject tree makes a significant contribution to the amenity and visual character of the area by creating a sense of place or creating a sense of identity
	The subject tree is a Commemorative Planting having been planted by an important historical person (s) or to commemorate an important historical event	The subject tree is a Remnant Tree, being a tree in existence prior to development of the area	The tree is visually prominent in view from surrounding areas, being a landmark or visible from a considerable distance.
2. VERY HIGH	The tree has a strong historical association with a heritage item (building/structure/artefact/garden etc) within or adjacent the property and/or exemplifies a particular era or style of landscape design associated with the original development of the site.	The tree is a locally-indigenous species, representative of the original vegetation of the area and is a dominant or associated canopy species of an Endangered Ecological Community (EEC) formerly occurring in the area occupied by the site.	The subject tree has a very large live crown size exceeding 200m ² ; a crown density exceeding 70% (normal-dense), is a very good representative of the species in terms of its form and branching habit or is aesthetically distinctive and makes a positive contribution to the visual character and the amenity of the area
3. HIGH	The tree has a suspected historical association with a heritage item or landscape supported by anecdotal or visual evidence	The tree is a locally-indigenous species and representative of the original vegetation of the area and the tree is located within a defined Vegetation Link / Wildlife Corridor or has known wildlife habitat value	The subject tree has a large live crown size exceeding 100m ² ; The tree is a good representative of the species in terms of its form and branching habit with minor deviations from normal (e.g. crown distortion/suppression) with a crown density of at least 70% (normal); The subject tree is visible from the street and surrounding properties and makes a positive contribution to the visual character and the amenity of the area
4. MODERATE	The tree has no known or suspected historical association, but does not detract or diminish the value of the item and is sympathetic to the original era of planting.	The subject tree is a non-local native or exotic species that is protected under the provisions of this DCP.	The subject tree has a medium live crown size exceeding 40m ² ; The tree is a fair representative of the species, exhibiting moderate deviations from typical form (distortion/suppression etc) with a crown density of more than 50% (thinning to normal); and
			The tree is visible from surrounding properties, but is not visually prominent – view may be partially obscured by other vegetation or built forms. The tree makes a fair contribution to the visual character and amenity of the area.
5. LOW	The subject tree detracts from heritage values or diminishes the value of a heritage item	The subject tree is scheduled as exempt (not protected) under the provisions of this DCP due to its species, nuisance or position relative to buildings or other structures.	The subject tree has a small live crown size of less than 40m ² and can be replaced within the short term (5-10 years) with new tree planting
6. VERY LOW	The subject tree is causing significant damage to a heritage item.	The subject tree is listed as an Environment Weed Species in the Leichhardt Local Government Area, being invasive, or is a known nuisance species.	The subject tree is not visible from surrounding properties (visibility obscured) and makes a negligible contribution or has a negative impact on the amenity and visual character of the area. The tree is a poor representative of the species, showing significant deviations from the typical form and branching habit with a crown density of less than 50% (sparse).
7. INSIGNIFICANT	The tree is completely dead and has no visible habitat value	The tree is a declared Noxious Weed under the Noxious Weeds Act (NSW) 1993 within the relevant Local Government Area.	The tree is completely dead and represents a potential hazard.

Amenity value

Amenity value is a subjective measurement based on the tree's contribution to the landscape, it may be based on the tree's visual form, however it also includes non visual attributes such as provision of shade for a seat, screening of poor views or for privacy, or if it has historical significance. The amenity value is recorded as:

H- High, the trees form is an excellent example of its species and it makes a great specimen and/or it has other attributes such as screening, or its historical significance. These trees are visually prominent and valuable to the community or public domain.

M- Medium, the tree may have an altered form and/or it has attributes that provide amenity to local residents only.

L- Low, the tree is not a good specimen and it does not provide substantial benefit to local residents or the community.

Ecological value

Ecological value is a measurement of the trees contribution to the environment. It is determined by the trees area of origin, its potential to provide habitat to native fauna and its potential to become an environmental pest. The ecological value is recorded as:

Tree Table for 7 Rock Bath Road, Palm Beach.

H- High, the tree is locally native or remnant and/or it has habitat for native fauna

M- Medium, the tree is native but not locally native

L- Low, the tree is not native and/or it may be a listed nuisance or weed species.

Ha- Habitat, is the tree valued by fauna for food (i.e. foliage, fruit, or sap) or shelter (i.e. nesting, roosting, dray, or hollow).

Form

The form, structure or shape of each tree is assessed and recorded as either one or a combination of several of the below terms may be used to describe the trees form; (U) Upright, (B) Broad, (C) Conical, (Sh) Shrub, (CS) Crown Shy (also referenced is the adjacent dominant tree canopy i.e. T4), (V) Vase, (D) Dome, (P) Palm, (S) Spreading, (L) Leaning or (BM) Basal Multi Trunked.

Crown form may also be assessed in accordance with the relationship with the neighbouring tree and recorded as either: S- Suppressed, the crown is located beneath another larger crown and is leaning away (Crown Shy); C- Codominant, the crown is adjacent to another crown of similar size, their crown areas may appear joined; D- Dominant, the crown is above the lower crowns; E- Emergent, the crown emerges from a lower canopy formed by the other dominant or codominant crowns.

Defects

The presence of one or a combination of several defects is recorded (W) Wound, (D) Decay, (F) Fungus, (B) Bulge, (FB) Fibre Buckling, (C) Cracks, (S) Split, (H) Hollow, (DB) Die back, (Epicormic Shoots, (DW) Dead wood, (I) Inclusion, (CA) Cavities, (PF) Previous Failure, (R) Root Damage, (P) Pruning wound, (PD) Pests and Diseases, (ST) Storm Damage.

Structural Root Zone (SRZ)

The SRZ is a radial area extending outwards from the center of the trunk. This area contains the majority of the structural woody roots. This area is primarily responsible for stability. Root damage or root loss within this zone greatly increases the opportunity for decay fungi to ingress in to the heartwood, causing internal decay in addition to destabilizing the trees structural integrity. The SRZ is calculated as follows (This calculation is derived from the Australian Standard 4970-2009 Protection of Trees on Development Sites):

$$\text{SRZ (Radius)} = (\text{D} \times 50)^{0.42} \times 0.6$$

Tree protection Zone (TPZ)

The TPZ is a circular area with a radius measured by multiplying the DBH by twelve, or a circular area the size of the trees drip line, whichever is greater. This area contains the majority of the essential structural and feeder roots responsible for stability, gaseous exchange and water and nutrient uptake. Excavation, back filling, compaction or other disturbance should not occur in this area. The TPZ is used to identify the minimum area required for the safe retention of a given tree. This calculation is derived from the Australian Standard 4970-2009 Protection of Trees on Development Sites. An incursion to 10% within the TPZ is potentially acceptable if no other option is available. A major encroachment (in excess of 10%) is required to be clearly justified by the project Arborist and compensated for elsewhere. Justification methodology may vary depending on site or individual trees health, vigor and ability to withstand disturbance may require root investigation.