Arboricultural Impact Assessment

Proposed Residential Development at

1b The Serpentine, Bilgola Beach

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2 Summary

This Arboricultural Impact Assessment (AIA) is based on twenty six (26) trees located at 1b The Serpentine, Bilgola Beach (subject site).

The tree population of the site consists of a combination of naturally occurring locally native species and planted trees. The locally native tree population consists mostly of Cabbage Tree Palms, *Livistona australis*. The proposed works include alterations and additions to the existing dwelling including a new carport and vehicle turning bay and landscape improvements.

The Retention Values of the subject trees were rated as outlined in the following Table. Refer to the Tree Protection Plan (Attachment C) for tree locations.

Table A: Retention Values of the Subject Trees.

	High Retention Value (Tree Number)	**Medium Retention Value (Tree Number)**	**Low Retention Value (Tree Number)**
To be Retained	7, 8, 9, 11, 12, 14, 16, 18, 21, 24, 26	10, 13, 15, 17, 20, 23, 25	1, 5
To be Removed	-	2, 3, 19, 22	4, 6

The majority of assessed trees are able to be retained on site including all of the High Retention Value and the majority of the Medium Retention Value trees. Six (6) trees are proposed to be removed to facilitate the proposed works.

There are works proposed within the Tree Protection Zones (TPZ) of Trees 10, 12, 17, 18, 21, 23 and 24. Recommendations have been made regarding tree protection measures and tree sensitive construction methods to limit the impact on retained trees. If the recommendations of this report are followed no long term impact on the retained trees is likely.

3 Introduction

3.1 Background

This Arboricultural Impact Assessment (AIA) was prepared for Bruce McConochie in relation to the existing trees and proposed building works at 1b The Serpentine, Bilgola Beach (subject site)

The purpose of this AIA is to assess the likely impacts of the proposed works on the existing site trees and make recommendations regarding construction methods and tree protection measures to limit adverse impacts on trees recommended for retention.

This AIA has been prepared in accordance with the Australian Standard 4970-2009, *Protection of trees on development sites.*

3.2 Subject Site/Subject Trees

The subject site (1b The Serpentine) is currently occupied by a two storey residential dwelling, driveway and open landscape space.

All trees located within 5.0m of the proposed works have been assessed. The tree population of the site is made up of a mixture of naturally occurring locally native species and planted exotics and natives. There are other trees on the site that were not assessed due to their distance from the proposed works.

A significant portion of the tree population consists of naturally occurring Cabbage Tree Palms, *Livistona australis.*

Refer to the Tree Protection Plan (Attachment C) for tree locations and numbers. A detailed description of the subject trees is included in the Tree Assessment Table (Attachment A).

3.3 Proposed Works

It is proposed to undertake alterations and additions to the existing dwelling including a new carport and landscape improvements.

4 Methodology

4.1 Site Inspection

Site inspection and tree assessment was undertaken on the 12th of March, 2015. The trees were assessed from ground level using a Tree Assessment Table, which is included as Attachment A. The definitions and explanations of terms used are outlined in the Tree Table Definitions page which is included at Attachment B.

The tree assessment was undertaken for the purpose of pre-development planning. Detailed tree risk assessment was not included in the scope of works.

4.2 Plans and Diagrams

The set of plans for DA prepared by Mathew Woodward Architecture, dated 12/08/2015 (Issue B) were provided for review as part of this assessment.

No Stormwater Plans or Engineering Detail were available for review as part of this assessment.

All tree protection diagrams were hand drawn by Bluegum Tree Care and Consultancy.

4.3 Tree Protection Zones

Tree assessments in accordance with the Australian Standard 4970-2009, *Protection of trees on development sites*, require calculation of a Tree Protection Zone (TPZ) and Structural Root Zone (SRZ). The following is a brief explanation of these terms:

Tree Protection Zone -TPZ: This is the area that should be isolated from construction disturbance so that the tree remains viable. Some disturbance within the TPZ may be possible following arboricultural assessment.

Structural Root Zone -SRZ: This is the area or undisturbed soil and roots required to maintain tree stability. Excavation within the SRZ can lead to whole tree failure.

Refer to the Tree Assessment Table (Attachment A) for the Tree Protection Zones of the assessed trees.

4.4 Retention Values

Retention values are derived from a combination of Estimated Life Expectancy rating and Landscape and Environmental Significance ratings.

- **HIGH Retention Value**: These trees are worthy of retention and design consideration should be made where possible to allow their retention.
- **MEDIUM Retention Value**: These trees are worthy of retention and minor design consideration should be made to retain these trees wherever possible (e.g. placement of ancillary structures, garden retaining walls, driveway levels).
- **LOW Retention Value**: These trees should not be considered to be a constraint to design layout. Some of these trees should be removed irrespective of any proposed development.

The method of determining and defining retention values used in this report has been derived from the ©Retention Index developed by Tree Wise Men® Australia Pty Ltd.

4.5 Consideration for Tree Retention and Removal

Where demolition of existing structures, excavation or fill is proposed within the Tree Protection Zone (TPZ), arboricultural assessment and sensitive construction methods will be required. Where works are proposed outside of the TPZ, no sensitive construction methods are required.

Tree removal recommendations have been based on tree Retention Values and construction offsets. Trees may generally be recommended for removal in the following circumstances:

- Trees located within construction footprints.

- Trees with construction proposed within SRZ where root loss cannot be avoided through sensitive design.
- Trees with a TPZ loss of more than 25%, may be recommended for removal providing tree sensitive design cannot be implemented to avoid significant root and canopy loss.
- Trees with low Retention Values may be recommended for removal irrespective of proposed development.

5 Potential Impacts of Proposed Works

5.1 Trees to be removed

Tree Number	Retention Value	Reason for Removal
2, 3	Medium	Within the proposed turning bay footprint. This species (*Erythrina crista-galli*) is exempt from protection under the Pittwater Council DCP.
4	Low	Almost dead at the time of inspection. Proposed for removal due to poor health and short estimated life expectancy.
6	Low	Proposed for removal due to its inappropriate location and cracking of the nearby driveway slab. This species (*Phoenix canariensis*) is exempt from protection under the Pittwater Council DCP.
19	Medium	Within the proposed building footprint. This species (*Archontophoenix alexandrae*) is exempt from protection under the Pittwater Council DCP.
22	Medium	Within the proposed building footprint.

5.2 Potential Impacts of Proposal on Retained Trees

Tree Number	Works proposed within the Tree Protection Zone (TPZ)
10	Proposed stair replacement within the TPZ. Less than 10% of the TPZ area will be affected by the works. No notable impact is expected.
12, 17, 18, 21, 23	Proposed steel post footing(s) for new building additions within the Tree Protection Zone and Structural Root Zone. Minor excavation will be required to install footings. No other excavation is proposed. Each of these trees are palms (monocots) and have a dense mat of slender fibrous roots rather than large woody roots. Consequently, minor root disturbance close to the trunk is unlikely to affect stability. The building is to be fully elevated on post footings with no impact on soil oxygen levels or groundwater flow. No notable long-term impact is expected.
24	This tree is likely to have an asymmetrical root zone with roots spread across the slope at the level of the terraced planter bed. The carport has been designed to ensure that no excavation occurs within the planter bed. This tree is in a semi-mature age-class and has good health/vigour. No impact is expected with the current carport design.

Incidental Impacts: There is the potential for incidental/accidental damage to the trunk, canopy and shallow roots of all retained trees throughout the construction process. Trees are commonly impacted on construction sites in the following ways.

- Stripping of topsoil and removal of organic material form the soil surface.
- Compaction of the topsoil and damage to surface roots through use of heavy machinery and frequent foot traffic.
- Soil contamination through washing out barrows and disposal or spillage of chemical materials.
- Root loss due to unforeseen excavation for plumbing upgrades and landscape construction.
- Bark/trunk and branch injuries from accidental contact with machinery.

These impacts can be easily avoided through communication with building contractors and basic tree protection measures.

6 Recommendations

6.1 Site Establishment –Prior to Construction

Tree Removal: Six (6) trees are proposed to be removed as part of the project. It is also recommended that the small Cocos Palm growing at the base of Tree 18 be removed. Tree removal works should be undertaken in accordance with the WorkCover Code of Practice for Amenity Tree Industry, 1998.

Canopy Pruning: Tree 1 (Oleander) may require some pruning on the northern side of the canopy to facilitate site access for heavy vehicles. This species is tolerant of heavy pruning and no impact is expected.
Tree 23 (Canary Island Date Palm) may require removal of some of the lower fronds to allow construction and clearance of the proposed building addition roof line.

Trunk Protection: Trunk protection is recommended for Trees 18, 21 and 24. Trunk battening is aimed at preventing accidental bark wounds as often occurs on construction sites where heavy machinery is used. Refer to Figure A below for detail of adequate trunk protection.

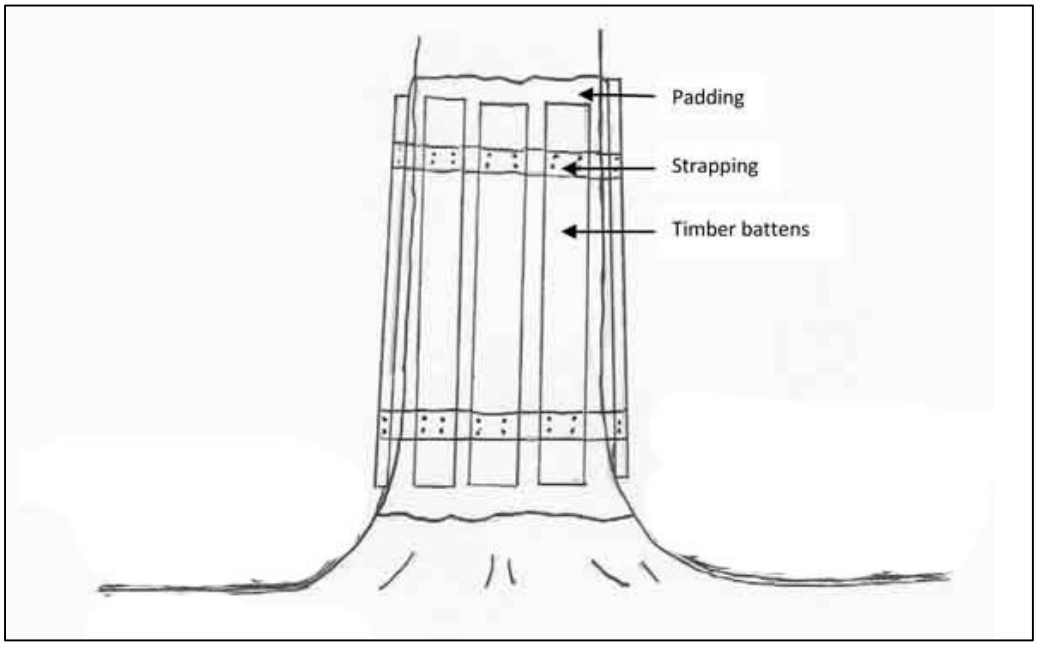

Figure A: Specification of appropriate trunk protection.

6.2 During Construction

Tree Protection Zones: Refer to the Tree Assessment Table (Attachment A) for the spread of TPZ's of trees nominated for retention. The following should be prohibited within the Tree Protection Zones:

- Stripping of topsoil or organic surface material.
- Storage of material, vehicles and machinery.

- Disposal of solid, liquid or chemical waste.
- Any excavation, fill or other construction activity other than that discussed in this report.

If the existing groundcover is stripped within a Tree Protection Zone, it should be replaced with leaf and woodchip mulch to a depth of 80mm.

Steel Post Footings: The setout of the building footings should be undertaken with consideration of the positions of Trees 18 and 21. The footing positions should be spaced with the maximum possible clearance from these trees. All roots encountered during excavation should be cleanly cut using secateurs.

Landscape Works: Existing ground levels should be retained within all TPZ's of retained trees. There must be no stripping of topsoil within the TPZ's of retained trees. For the benefit of retained trees and new plantings, mulched garden beds are a preferable option to lawn or paving.

Underground Services: No hydraulics or services plans have been reviewed as part of this assessment. Existing service easements and trenches should be used wherever possible. Any new services must be routed outside of the Structural Root Zones of retained trees. Where services need to be installed within TPZ', excavation must be carried out by hand under supervision of an AQF Level 5 Arborist.

7 Statement of Impartiality

- This report prepared by Bluegum Tree Care & Consultancy (BTCC) reflects the impartial and expert opinion of Alexis Anderson.
- BTCC is acting independently of and not as the advocate for the owners of the subject trees.
- BTCC does not undertake tree pruning and removal works and will not have any involvement with pruning or removing trees which are the subject of this report.

8 Limitations

- The findings of this report are based upon and limited to visual examination of trees from ground level without any climbing, internal testing or exploratory excavation.
- The tree assessment was undertaken for the purpose of pre-development planning. Detailed tree risk assessment was not requested or included in the scope of works.
- This report reflects the health and structure of trees at the time of inspection. Bluegum cannot guarantee that a tree will be healthy and safe under all circumstances or for a specified period of time. There is no guarantee that problems or defects with assessed trees, will not arise in the future. Liability will not be accepted for damage to person or property as a result of failure of assessed trees.

Tree No.	Common Name/ Genus Species	DBH (mm)	Height (m)	Canopy Spread Radius (m)	Age Class	Health / Vigour	Structural Condition	Tree Protection Zone (m)	Structural Root Zone (m)	Estimated Life Expectancy (ELE)	Landscape and Environmental Significance	Retention Value	Comments	Likely Construction Impacts	Proposed Action.
1	Oleander, *Nerium Oleander*	Multi 300	6	3	M	G	G	3.6	1.5	Long (30+ yrs)	4	Low	This species is exempt from protection under the Pittwater Council DCP.	Nil	Retain and protect. Pruning of the northern side of the canopy may be required to facilitate site access.
2	Brazilian Coral Tree, *Erythrina crista-galli*	520	7	4	M	F	G	6.2	2.5	Medium (10-30 yrs)	3	Medium	This species is exempt from protection under the Pittwater Council DCP.	Within proposed new turning bay.	Remove.
3	Brazilian Coral Tree, *Erythrina crista-galli*	410, 340, 300	7	5	M	F	G	7.3	2.7	Medium (10-30 yrs)	3	Medium	This species is exempt from protection under the Pittwater Council DCP.	Within proposed new turning bay.	Remove.
4	Weeping Bottlebrush, *Callistemon viminalis*	250	4	2	M	P	F	3.0	1.8	Short (0-10 yrs)	4	Low	Almost dead at the time of inspection.	Proposed turning bay within the TPZ.	Remove due to poor health.
5	Sydney Red Gum, *Angophora costata*	Multi 280 @ 300mm	5	3	M	P	F	3.4	1.9	Short (0-10 yrs)	3	Low	Severe dieback of the upper canopy. Only the lower branches remain alive.	Nil.	Retain and protect.
6	Canary Island Date Palm, *Phoenix canariensis*	900	4	3	M	G	G	4.0	2.0	Long (30+ yrs)	4	Low	Cracking thedriveway slab. This species is exempt from protection under the Pittwater Council DCP.	Extended garden retaining wall within the TPZ.	Remove due to innappropriate location.
7	Cabbage Tree Palm, *Livistona australis*	240	9	2	M	G	G	2.8	1.8	Long (30+ yrs)	2	High	Growing through the existing deck.	Nil.	Retain and protect.
8	Cabbage Tree Palm, *Livistona australis*	240	8	2	M	G	G	2.8	1.8	Long (30+ yrs)	2	High		Nil.	Retain and protect.
9	Cabbage Tree Palm, *Livistona australis*	330	10	2	M	G	G	4.0	2.1	Long (30+ yrs)	2	High		Nil.	Retain and protect.
10	Alexander Palm, *Archontophoenix alexandrae*	170	7	2	M	G	G	2.0	1.6	Long (30+ yrs)	3	Medium	This species is exempt from protection under the Pittwater Council DCP.	Proposed stair replacement within the TPZ.	Retain and protect.
11	Cabbage Tree Palm, *Livistona australis*	260	9	2	M	G	G	3.1	1.9	Long (30+ yrs)	2	High		Nil.	Retain and protect.
12	Cabbage Tree Palm, *Livistona australis*	300	10	2	M	G	G	3.6	2.0	Long (30+ yrs)	2	High		Steel post footing for the proposed studio building within the SRZ.	Retain and protect.
13	Cabbage Tree Palm, *Livistona australis*	200	2	2	SM	G	G	2.4	1.7	Long (30+ yrs)	3	Medium		Nil.	Retain and protect.

Tree No.	Common Name/ Genus Species	DBH (mm)	Height (m)	Canopy Spread Radius (m)	Age Class	Health / Vigour	Structural Condition	Tree Protection Zone (m)	Structural Root Zone (m)	Estimated Life Expectancy (ELE)	Landscape and Environmental Significance	Retention Value	Comments	Likely Construction Impacts	Proposed Action.
14	Cabbage Tree Palm, *Livistona australis*	280	9	2	M	G	G	3.4	1.9	Long (30+ yrs)	2	High		Nil	Retain and protect.
15	Alexander Palm, *Archontophoenix alexandrae*	200	5	2	M	F	G	2.4	1.7	Long (30+ yrs)	3	Medium	This species is exempt from protection under the Pittwater Council DCP.	Nil	Retain and protect.
16	Cabbage Tree Palm, *Livistona australis*	240	8	2	M	G	G	2.9	1.8	Long (30+ yrs)	2	High		Nil	Retain and protect.
17	Alexander Palm, *Archontophoenix alexandrae*	220	5	2	M	G	G	2.6	1.8	Long (30+ yrs)	3	Medium	Cocos Palm growing at base. This species is exempt from protection under the Pittwater Council DCP.	Steel post footing for the proposed new building within the TPZ.	Retain and protect.
18	Cabbage Tree Palm, *Livistona australis*	240	9	2	M	G	G	2.9	1.8	Long (30+ yrs)	2	High		Steel post footing for the proposed new building within the SRZ.	Retain and protect. Remove Cocos Palm growing from base.
19	Alexander Palm, *Archontophoenix alexandrae*	230	6	2	M	G	G	2.8	1.8	Long (30+ yrs)	3	Medium	This species is exempt from protection under the Pittwater Council DCP. 2 other Alexander Palms growing from the base.	Within proposed building footprint.	Remove.
20	Coast Banksia, *Banksia integrifolia*	400	9	3	M	G	F	4.8	2.3	Medium (10-30 yrs)	3	Medium		Proposed building additions within the TPZ.	Retain and protect.
21	Cabbage Tree Palm, *Livistona australis*	350	8	2	M	G	G	4.2	2.1	Long (30+ yrs)	2	High		Steel post footing for the proposed new building within the SRZ.	Retain and protect.
22	Bangalay, *Eucalyptus botryoides*	380	13	5	M	F	F	4.6	2.2	Medium (10-30 yrs)	3	Medium	The foliage was damaged from a psyllid infestation at the time of inspection. Trunk decay at the base.	Within proposed building footprint.	Remove.
23	Canary Island Date Palm, *Phoenix canariensis*	600	7	4	M	G	G	4.0	1.5	Long (30+ yrs)	3	Medium	This species is exempt from protection under the Pittwater Council DCP.	Steel post footing for the proposed new building within the SRZ.	Retain and protect. Canopy pruning may be required to allow adequate clearances.
24	Cabbage Tree Palm, *Livistona australis*	310	4	2	SM	G	G	3.7	2.0	Long (30+ yrs)	2	High		Proposed carport within TPZ radius, though outside of likely zone of root spread.	Retain and protect.
25	Pandanus, *Pandanus sp.*	200	4	2	M	F	G	2.0	1.5	Long (30+ yrs)	3	Medium		Proposed carport within TPZ radius, though outside of likely zone of root spread.	Retain and protect.
26	Cabbage Tree Palm, *Livistona australis*	300 (approx)	9	2	M	G	G	3.6	2.0	Long (30+ yrs)	2	High	Located on the adjoining property. Not surveyed. Located approx. 3.0m from the boundary.	Nil	Retain.

Attachment B: TREE ASSESSMENT DEFINITIONS

Height. Tree height is estimated from ground level. This assessment is made independently of data plotted on survey plan. These measurements have not been confirmed with clinometer or other surveying instrument.

Diameter at Breast Height (DBH). Trunk diameter is measured at 1.4 metres above ground level. A diameter tape is used which calculates the diameter from a measurement of the circumfrence. DBH is primarily used for the calculation of the TPZ and SRZ.
If a tree has more than 4 trunks, the diameter of the four largest trunks is recorded. For irregular trunk formations the DBH is calculated as outlined in Appendix A of AS4970-2009 -*Protection of Trees on Development Sites*.

Canopy Spread Radius. Average canopy spread radius is estimated from the centre of trunk to the outer edge of canopy. Refer to Comments column for detail of heavily skewed canopy spread.

Age Class - This is an estimation of the tree's current age class based on size, growth habit, local environmental conditions and comparison with surrounding trees.

- **Immature (IM)**: This is a juvenile specimen that is likely to have germinated within the previous 5 years.
- **Semi Mature (SM)**: This is a tree that is established within its growing environment, though has not reached an age of reproductive maturity or the natural growth habit of a mature individual.
- **Mature (M)**: This is a tree has reached both reproductive maturity and a physical form and shape typical for the species. Trees can have a Mature Age Class for the majority of their life span.
- **Late-Mature (LM)**: There trees show early signs of senescence with symptoms such as reduced canopy density and an accumulation of dead branches.
- **Over-mature (OM)**: These trees show symptoms of irreversible decline such as canopy dieback with dead branches concentrated in the upper canopy.

Health - Good (G), Fair (F) or Poor (P). This is primarily based on the extent of vigorous new foliage growth at branch tips and the colour, size and density of foliage generally. The percentage of live branches to dead branches is considered. The location of any dead branches is also considered. The presence of any pest or disease is considered as part of this assessment. Health can vary with climatic conditions.

Structural Condition - **Good (G), Fair (F) or Poor (P).** This is an assessment of tree structure and stability. Root anchorage, trunk lean, structural defects, canopy skew and any hazardous features are considered. Dead branches can be considered as part of Structural Condition if they are of a size and location that could cause injury or property damage.

Tree Protection Zone (TPZ). This is a radial distance of (12X) the DBH measured from centre of trunk. TPZ is rounded to the nearest 0.1 metre. A TPZ should not be less than 2m or greater than 15m. The TPZ for palms and other monocots should not be less than 1m outside of the crown projection. Existing constraints to root spread can vary the TPZ. For a tree to remain viable, construction activity should be excluded or undertaken with care within the TPZ. Disturbance within up to 10% of the TPZ area is considered to be a minor encroachment. Disturbance to more than 10% of the TPZ area is considered a major encroachment. Major encroachment into the TPZ is possible depending on the type of disturbance, and species tolerance to disturbance. Exploratory excavation may be required to quantify the presence of roots at the alignment of proposed ground disturbance.
This is based upon the Australian Standard AS 4970, 2009, *Protection of trees on development sites* and the Matheney & Clarke "*Guidelines for adequate tree preservation zones for healthy, structurally stable trees*".

Structural Root Zone (SRZ). This is a radial distance based on the following formula- **SRZ =(D x 50) $^{0.42}$ x 0.64** (for trees less than 150mm Diameter, a minimum SRZ of 1.5 metres). SRZ measurements are rounded to the nearest 0.1m. .
The Structural Root Zone is the area of soil and roots required to maintain tree stability. Excavation within the SRZ can result in whole tree failure. Fully elevated construction is possible within SRZ with specific rootzone assessment. Existing constraints to root spread can vary the SRZ. This method of determining SRZ is outlined at Section **3.3.5** of Australian Standard AS 4970, 2009, *Protection of trees on development sites.*

Estimated Remaining Life Expectancy: This gives a length of time that the Arborist believes a particular tree can be retained from the time of assessment with an acceptable level of risk based on the information available at the time of the inspection. This system of rating does not take into consideration the likely impacts of any proposed development. Ratings are **Long** (retainable for 30 years or more with an acceptable level of risk), **Medium** (retainable for 10-30 years), **Short** (retainable for 0-10 years) and **Removal** (tree requiring removal due to risk/hazard or absolute unsuitability).

Landscape & Environmental Significance*. This is an assessment of the impact of the tree on the surrounding landscape amenity and natural environment. Rarity, habitat value, physical prominence, historical and cultural significance of the tree are considered in this rating system. The Landscape & Environmental Value ratings used in this report are:

1. Very High Value: This is an outstanding specimen that holds irreplaceable environmental, landscape or cultural value.

2. High Value: An excellent specimen that holds environmental, landscape or cultural value that is present in other site trees or that could be replaced.

3. Moderate Value: Can be a good to fair specimen with environmental, landscape or cultural value that is common within other trees in the locality.

4. Low Value: Removal would not result in any loss of site amenity or environmental value. Can include undesirable or weed species or trees growing in unsuitable locations.

5. Very Low Value : Dead or hazardous with no other environmental or cultural value. Could also include weed species. These trees should be removed or pruned in a way to make safe irrespective of any development.

***Note**: The concept of using a five (5) point scale to assess tree significance was derived from the Tree Wise Men® Australia Pty Ltd ©Significance Rating Scale.

Retention Value*. Retention values are derived from a combination of Estimated Life Expectancy rating and Landscape and Environmental Significance ratings.

<table>
<tr><td rowspan="6">Landscape & Environmental Significance</td><td></td><td colspan="4">Estimated Life Expectancy</td></tr>
<tr><td></td><td>Long</td><td>Medium</td><td>Short</td><td>Removal</td></tr>
<tr><td>Very High (1)</td><td colspan="2" rowspan="2">HIGH</td><td rowspan="2">MEDIUM</td><td rowspan="5"></td></tr>
<tr><td>High (2)</td></tr>
<tr><td>Medium (3)</td><td colspan="2">MEDIUM</td><td rowspan="3">LOW</td></tr>
<tr><td>Low (4)</td><td colspan="3" rowspan="2"></td></tr>
<tr><td>Very Low (5)</td></tr>
</table>

HIGH Retention Value: These trees are worthy of retention and major design consideration should be made where feasible to allow this.

MEDIUM Retention Value: These trees are worthy of retention and minor design consideration should be made to retain these trees wherever possible (e.g. placement of ancillary structures, garden retaining walls, driveway levels).

LOW Retention Value: These trees should not be considered to be a constraint to design layout. Some of these trees should be removed irrespective of any proposed development.

***Note:** The method of determining and defining retention values used in this report has been derived from the ©Retention Index developed by Tree Wise Men® Australia Pty Ltd.

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Bluegum
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Tree Protection Plan

1b The Serpentine, Bilgola Beach

This plan is to be read in conjunction with the Arboricultural Impact Assessment report prepared for this site, August, 2015.

This plan has been prepared using the Lower Ground Plan, Matthew Woodward Architecture, as a base.

The approximate locations of Trees 7 and 26 have been plotted based on estimated positions.

Legend	
Subject Tree to be Retained – Tree Protection Zone	
Subject Tree to be Removed	2
Subject Tree to be Transplanted	N/A
Trunk Protection