ARBORICULTURAL DEVELOPMENT IMPACT ASSESSMENT REPORT

11 Bruce St MONA VALE NSW 2103

DEVELOPMENT APPLICATION
NEW DWELLING

PREPARED FOR
B. Hastie + C. Handley

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1. SUMMARY

This Arboricultural Development Impact Assessment Report was undertaken for B. Hastie + C. Handley for submission to Northern Beaches Council with a Development Application for a new dwelling and swimming pool at 11 Bruce Street Mona Vale NSW 2103.

The aim of the Report is to identify four (4) surveyed trees located on or near the site and assess the health, condition and significance of these trees and the potential impact of the works on their viability.

The report is based on observations made on site on 30.6.20 and development plans and specifications supplied by project consultants. Architectural plans and Australian Standards are referenced in the Report. It includes background research, site investigations, visual tree assessments, tree protection calculations, incursion calculations and impact assessments. No diagnostic investigation or aerial inspections are included. Assessment data is included in Appendix F.

Current industry accepted literature is referenced as a basis for the conclusions obtained. The Australian Standard, AS4970-2009 *Protection of trees on development sites* is referred to for terminology and methodology for assessing acceptable levels of incursions into tree protection zones.

The Report is not intended to be a comprehensive tree risk assessment; however it makes recommendations, where appropriate, for further assessment, treatment or testing of trees where potential structural problems have been identified.

The Report finds that site consists of a managed garden setting with exotic tree and shrub species. The adjoining headland reserve supports locally indigenous species and noxious weeds.

Of the four (4) trees identified, two (2) are exempt from protection under Pittwater 21 DCP 2014 (PDCP):

- **Tree 1** *Olea europaea subsp. cuspidata*
- **Tree 3** *Cotoneaster glaucophyllus*

The Report supports the removal of one (1) tree:

- **Tree 3** *Cotoneaster glaucophyllus*

The Report supports the retention of three (3) trees on and adjoining the site with tree protection measures:

- **Tree 1** *Olea europaea subsp. cuspidata*
- **Tree 2** *Magnolia grandiflora*
- **Tree 4** *Araucaria heterophylla*

Recommendations are made for:

- Tree protection measures during the construction stage
- general monitoring of tree health and structural decline
- arboricultural consultation before, during and after construction

2. INTRODUCTION

2.1 BACKGROUND

This Report has been commissioned by B. Hastie + C. Handley to provide an arboricultural and development impact assessment to accompany a development application to Northern Beaches Council for a new dwelling house and swimming pool. The site is identified as Lot 9 in DP 15762 and is known as 11 Bruce Street Mona Vale.

Background investigations, site inspections and visual tree assessments were undertaken on 30.6.20 with this Report being completed on 28.9.20. Information contained in this Report reflects the condition of the trees at the time of inspection and completion of the Report.

The purpose of the report is to inform the design process and assist Council in the DA assessment by evaluating the health and condition of the trees and making recommendations relating to their relative retention values. The report reviews the proposed development and its potential impact on the future viability of existing trees and includes recommendations for tree management and protection measures during development to optimize the viability of trees identified for retention.

The Development Impact Assessment Report is not intended to be a comprehensive tree risk assessment; however, the report may make recommendations, where appropriate, for further assessment, treatment or testing of trees where potential structural problems have been identified, or where below ground investigation may be required. The Report gives recommendations for tree retention or removal, and provides guidelines for tree protection and maintenance.

Site and tree plans included in this Report are intended for the purpose of recording test results and making general recommendations. They are not intended to be used for any other purpose

2.2 THE SITE

The site is located at 11 Bruce Street Mona Vale with a total area of 592.1m² (REFER FIG 1 p3). Climatic conditions on the site are generally coastal temperate throughout the year. Residential properties are located to the north (13 Bruce St.) and the south (9 Bruce St.)

Northern Beaches Council mapping identifies the site as:

- E4 Environmental Living
- Identified on the Biodiversity Map as adjoining the Warriewood Beach Reserve.
- Not bushfire prone
- Not a Heritage Conservation Area

The site slopes down to the east with an elevation ranging from RL 23.00 to 30.00 AHD. Soils of this area are fine grained Narrabeen Group sediments, described as Watagan soils[1] associated with coastal headlands and bluffs. The general fertility is low to moderate with low permeability. The soil are typically strongly acid with low or moderate available water capacities and very low nutrient status. Site soil has been modified for amenity use.

2.3 EXISTING VEGETATION

The general findings and data collected for the four (4) surveyed trees are contained in the Schedule of Assessed Trees. (APPENDIX F)

The original vegetation of the area was tall eucalypt open-forest with closed-forest (rainforest) in sheltered positions. Much of the native vegetation on the Northern Beaches peninsula has been cleared and the adjoining

[1] Chapman, G.A. & Murphy, C.L., 1989, p51

Warriewood Beach Reserve is degraded with substantial invasive weeds. The site displays extensive disturbance from its original vegetation.
Within the vicinity, remaining native tree species include *Gochidion ferdinandi* (Cheese Tree), *Banksia integrifolia* (Coastal Banksia), *Eucalyptus robusta* (Swamp Mahogany), *Livistona australis* (Cabbage Tree Palm), *Ficus rubiginosa* (Port Jackson Fig), *Acmena smithii* (Lillypilly), *Eucalyptus botryoides* (Bangalay), *Notelaeae longifolia* (Mock Olive).

Figure 1
LOCATION PLAN

Site trees generally are prescribed for protection under Pittwater LEP 2014 (PLEP) and Pittwater 21 DCP 2014 (PDCP) B4.22 Preservation of Trees or Bushland Vegetation if over 5m. Exemptions are listed for dead trees, trees considered of high risk of failure or an imminent danger to life and property or where the base of the tree trunk at ground level is located on the subject site and within two (2) metres of an existing approved dwelling. Species exemptions are detailed in the PDCP B4.22 Table 1.

No locally indigenous trees occur on site that are listed as Threatened or Vulnerable Species or form part of Endangered Ecological Communities under Australian and/or State Government legislation (ie *Biodiversity Conservation Act 2016* (NSW*) (BCA),* Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 (EP+BCA).*

2.4 THE PROPOSAL

It is proposed to construct a new two storey dwelling with piered driveway access to a double garage above the dwelling. An inground swimming pool is also proposed.

3. METHODOLOGY

3.1 TREE IDENTIFICATION

Trees were identified and their genus, species and common names used. Identification was by the use of data collected and references from Fairley, A. & Moore, P. (1989) Brooker, M.I.H. & Kleinig, D.A. (1999) and Beadle, N.C.W., Evans, O.D., & Carolin, R.C. (1982) and New South Wales Flora Online[2].

[2] Fairley & Moore, 1989, Brooker & Kleinig. 1999, Beadle, Evans & Carolin, 1982
NEW SOUTH WALES FLORA ONLINE http://plantnet.rbgsyd.nsw.gov.au

3.2 DATA COLLECTION

- In preparation for this Report, a ground level, visual tree assessment (VTA)[3] was undertaken by the author on 30.6.20. No aerial inspection, tree root mapping or woody tissue testing were undertaken as part of this assessment. The above ground root crown, trunk and canopy were examined visually and defects and indicators of decay noted.

- Information was collected on each tree and is presented in a tabulated form in the Schedule of Assessed Trees. (REFER APPENDIX F) This information was used to establish a Useful Life Expectancy (U.L.E.), Landscape Significance Value, Tree Retention Value, Structural Root Zone and Tree Protection Zone for each tree.

- Tree heights and canopy spreads were visually estimated. Trunk diameters were measured at 1.4m above ground level for DBH and immediately above base swelling for DAB unless otherwise stated and rounded to the nearest 5mm.

- Tree locations have been identified using the Survey provided and corresponding tree numbers assigned. These location numbers are shown on Assessed Trees Location Plan. (APPENDIX E)

- Field observations were recorded by hand on a Tree Assessment Sheet and photographs were taken on a Canon Ixus 75 Digital SLR camera.

- Definitions and explanations of terms used in this Report are outlined in the Terms + Definitions (APPENDIX A)

- Information contained in this Report relates only to the trees examined and reflects the condition of those trees at the time of inspection.

- All tree offsets mentioned in this Report are to centre of trunk unless otherwise stated.

- Site and tree plans included in this Report are intended for the purpose of recording test results and making general recommendations. They are not intended to be used for any other purpose.

3.3 DOCUMENTS + PLANS REFERENCED

The following documents were reviewed:

Legislation, Environmental Planning Instruments + Council Policies:

- Pittwater Development Control Plan 2014
- Pittwater Local Environmental Plan 2014 + Mapping
- *Biodiversity Conservation Act 2016* (NSW)

Plans:

- Architectural Plans by James de Soyres Architecture
  1912 DA-13 Basement Plan (28.9.20)
  1912 DA-12 Ground Floor Plan (28.9.20)
  1912 DA-11 Garage Floor Plan (28.9.20)
  1912 DA-21 Sections (28.9.20)
  1912 DA-32 Sections (28.9.20)
- Landscape Plan by Trish Dobson Landscape Architecture
  2007/DA-L01 Landscape Site Plan (28.9.20)
- Survey by Detailed Surveys Consulting Surveyors
  Dwg No 1 Ref 075/19 4.12.19)

[3] VTA – Visual Tree Assessment is a visual assessment method undertaken by tree professionals and recognized as a systematic method of identifying tree characteristics and hazard potential. VTA is an assessment method described by Claus Mattheck in *The Body Language of Trees – A handbook for failure analysis*. (Mattheck & Breloer 1994)

3.4 STANDARDS + CODES OF PRACTICE

- Australian Standard, AS4970-2009 *Protection of trees on development sites*
- Australian Standard AS4373-2007 *Pruning of amenity trees*
- NSW Work Cover Authority Code of Practice, Tree Work, 2007

3.5 ASSESSMENT METHODOLOGY

3.5.1 HEALTH

The following codes has been assigned for Health (+ Vigour) records.

GOOD (G)	Exhibiting no apparent or minor pest / disease, good growth extension, minor abnormalities, normal foliage size, colour and density
FAIR (F)	Exhibiting fair to moderate (non-life threatening) pest / disease, fair extension growth, small foliage size, abnormal colouration, thin foliage cover
POOR (P)	Exhibiting extensive or untreatable pest / disease, poor extension growth, significant deadwood or dieback, evidence of rapid decline, sparse foliage

3.5.2 CONDITION

The assessment of tree condition is undertaken by visual inspection of the tree, taking into account the condition of the tree roots, trunk, branches, foliage, previous pruning works, pest and disease and the surrounding environment. The following codes have been assigned for Condition (Structure, Stability + Damage) records:

GOOD (G)	Good structure, stable and free from all but minor visible defects and damage. Any minor defects can be successfully remediated or do not require treatment. No visible evidence of instability
FAIR (F)	Fair structure, containing defect and/or damage that may be able to be remediated to provide acceptable stability
POOR (P)	Poor structure, evidence of instability or contains defects and/or damage which render the tree potentially hazardous or prone to failure. Cannot be successfully remediated.

3.5.3 MATURITY CLASS

The following maturity classification has been assigned to each tree

OVERMATURE (OM)	Greater the 80% of life expectancy for the species. Trees are senescent, being in a state of gradual decline
MATURE (M)	50-80% of life expectancy for the species
SEMI-MATURE (SM)	20-50% of life expectancy for the species
IMMATURE OR YOUNG (I)	Less than 20% of the life expectancy for the species

3.5.4 U.L.E.

The condition of each tree is used to determine the Useful Life Expectancy (U.L.E.)[4]. Each tree has been assigned a U.L.E. which is an estimate of the sustainability of the tree in the landscape, based on an estimate of the average age of the species in an urban setting, less its estimated current age. This age is then modified to take into account the current health, condition and suitability for the local environment of the site and safety aspects. For full details of the assessment criteria refer to APPENDIX B. The ULE categories are:

LONG	(1)
MEDIUM	(2)
SHORT	(3)
TRANSIENT	(4)
YOUNG	(5)

[4] ULE is based on a method described by Jeremy Barrell in the *Proceedings of the International Conference on Trees and Building Sites* (Chicago), (Barrell, J. (1996)

3.5.5 LANDSCAPE SIGNIFICANCE

Trees need to be considered in relation to the overall environment. A relative Landscape Significance rating has been assigned to each tree. The value of each is based on a combination of its amenity, environmental/wildlife and heritage values. Details of the assessment criteria used are shown in Appendix B. The rating categories are:

VERY HIGH (VH)
HIGH (H)
MODERATE (M)
LOW (L)

3.5.6 RETENTION VALUES

Relative Retention Values of trees have been determined based on the combined consideration of estimated useful longevity (ULE) and the landscape significance rating. (SEE APPENDIX B) This information was used to determine the most appropriate position of building footprints and other infrastructure within the site so as to minimize the impact on the trees considered worthy of preservation.
Retention Value ratings:

HIGH (H)
MODERATE (M)
LOW (L)
VERY LOW (VL)

3.5.7 T.P.Z. and S.R.Z.

Tree Protection Zones (T.P.Z.) and Structural Root Zones (S.R.Z.) were calculated for all trees assessed using the methods described in the Australian Standard, AS 4970-2009 *Protection of trees on development sites*. (REFER AS4970-2009, 3.2 and 3.3.5 AMENDMENT No.1)

4. OBSERVATIONS AND DISCUSSION

4.1 GENERAL ASSESSMENT OF TREES

RETENTION VALUES

Four (4) trees or groups of trees located on / adjoining the site were assessed. Retention Values are tabulated below:

Total number of Trees	**HIGH** RETENTION VALUE **1**	**MODERATE** RETENTION VALUE **1**	**LOW** RETENTION VALUE	**VERY LOW** RETENTION VALUE **2**
	Tree Numbers	Tree Numbers	Tree Numbers	Tree Numbers
Proposed to be RETAINED 3	**4** *Araucaria heterophylla*	**2** *Magnolia grandiflora*		**1** (exempt) *Olea europaea subsp. cuspidata*
Proposed to be REMOVED 1				**3** (exempt) *Cotoneaster glaucophylla*

Details of individual trees are included in the Schedule of Assessed Trees. (APPENDIX F) Photographs are included in Photographs of Assessed Trees. (APPENDIX D)

4.2 POTENTIAL IMPACTS OF PROPOSED WORKS

4.2.1 AS 4970-2009

The Australian Standard, AS 4970-2009 *Protection of trees on development site*s (AS4970-2009) provides guidelines for calculating Tree Protection Zones (TPZ's) as a means of protecting tree root and crown areas during construction works. The TPZ indicates the minimum area to be isolated from disturbance so that the tree remains viable.

Proposed encroachments into the TPZ's of less than 10% which are outside the Structural Root Zones (SRZ's) are considered 'minor' and are permissible if an area of corresponding proportions can be provided contiguously with the relevant TPZ. Encroachments of more than 10% are 'major' requiring professional assessment to determine whether trees can be safely retained to become a viable and stable assets within the future landscape.

4.2.2 EXEMPT TREES PROPOSED FOR REMOVAL

The following site tree identified on the survey is exempt from protection under PDCP + PLEP and is proposed for removal.

TREE NO.	SPECIES	COMMON NAME	EXEMPTION
3	*Cotoneaster glaucophylla*	Cotoneaster	Exempt Species PDCP B4.22

4.2.3 TREES PROPOSED FOR RETENTION – POTENTIAL IMPACTS OF WORKS

Potential Impacts on Prescribed Trees Proposed for Retention

TPZ areas of the following prescribed trees are located within 5m of the development and are impacted by proposed works. The canopy of Tree 2 *Magnolia grandiflora* is impacted by driveway works. No significant long term impact is expected with tree sensitive design and general / specific tree protection measures being implemented to ensure the health and vigour throughout the works. Both trees are recommended for retention:

TREE NO.	COMMENTS	RET VALUE	IMPACTS OF WORKS	RECOMMENDATIONS
Tree 2 *Magnolia grandiflora*	Semi-mature exotic tree. Protected PDCP 21 B4.22. Appears stable. Suspended driveway, basement + ground floor structures including planter boxes located within TPZ of tree. (See Dwg TP-02) 10x1m strip of exposed roots along edge of road.	MOD	ROOT IMPACTS 20.1m2 (15.1%) incursion into 133m2 TPZ proposed by planter boxes basement wall and ground floor pathways. Potential impacts of piering for suspended driveway within TPZ of Tree 2. One pier proposed within SRZ must be relocated to beyond SRZ area Potential impacts assessed as MODERATE in consideration of size of incursion (15.1%) and semi-mature age of tree and its ability to adapt to changes in soil conditions. Sufficient contiguous soil area for root growth is available to compensate for incursion. Incursion acceptable with strict adherence to specific tree protection measures as specified. CANOPY IMPACTS The piered driveway crosses within the canopy of Tree 2. Minimal careful pruning of the canopy must be supervised by Project Arborist and undertaken (min AQF3 Arborist)	Retain + Protect with specific tree protection measures. (Refer to Section 5.4 Specific Tree Protection) No works within TPZ in road reserve permissible. Pier holes must be investigated using non-destructive methods prior to mechanical digging. No piers should be located within the SRZ. Minimal careful pruning of Tree 2 canopy must be undertaken (min AQF3 Arborist) under the supervision of Project Arborist. (Refer to Section 5.4 Specific Tree Protection) Care should be taken when planting in TPZ to avoid unnecessary root damage.

TREE NO.	**COMMENTS**	**RET VALUE**	**IMPACTS OF WORKS**	**RECOMMENDATIONS**
Tree 4 *Araucaria heterophylla*	Mature exotic tree. Protected PDCP 21 B4.22. Located on eastern side of site. Good health + vigour. Appears stable. Minor sandstone log wall and back-filling proposed within TPZ. No works in SRZ.	HIGH	2.7m2 (1.6%) incursion into 163m2 TPZ proposed by wall + backfill works. No works proposed within SRZ. Incursion assessed as 'MINOR' and permissible under AS4970 as less than 10% incursion and sufficient contiguous soil area for root growth is available to compensate.	Retain + Protect with general tree protection measures. Excavation within TPZ should be undertaken by hand. With exception of small area of fill calculated in this 1.6% incursion assessment, no changes permitted in soil levels within TPZ

Potential Impacts on Exempt Trees Proposed for Retention

The TPZ area of exempt Tree 1 *Olea europaea subsp.* cuspidate is located beyond the direct influence of proposed works. No significant long term impact is expected with tree sensitive design and general tree protection measures being implemented to ensure the health and vigour throughout the works. It is recommended for retention.

4.3 TREE PROTECTION

GENERAL TREE PROTECTION

The effect of the impacts and injuries that can result from construction works are cumulative, with small insignificant events adding up over the length of the project. [5] Tree preservation during development must allow for sufficient space to minimize injury. Tree protection requires the commitment of all parties with the key focus being on prevention of damage.

TREE PROTECTION ZONES

A Tree Protection Zone (TPZ) is a radial distance measured from the centre of tree trunks calculated in accordance with AS4970-2009 *Protection of trees on development sites* and demarcates the minimum zone that should be protected to maintain the viability of the tree to sustain future health. TPZ's are provided in the Schedule of Assessed Trees (APPENDIX F) and are shown on the Tree Protection Plan. (APPENDIX E) On the basis of TPZ's identified, sturdy tree protection fencing, trunk, canopy and root protection (as required) must be erected prior to the commencement of any clearing, demolition, excavation or construction works (APPENDIX C)

STRUCTURAL ROOT ZONES

A Structural Root Zone (SRZ) is a radial distance measured from the centre of tree trunks calculated in accordance with AS4970-2009 *Protection of trees on development sites* which identifies the root area the provides the mechanical support and anchorage to the tree. Incursions into the SRZ are not recommended as they severely compromise the tree stability.

ACCEPTABLE INCURSIONS INTO TREE PROTECTION ZONES

AS4970-2009 *Protection of trees on development sites* defines an incursion of less than 10% of the TPZ area and outside of the SRZ as a minor encroachment and where an encroachment is unavoidable it is permissible under AS4970-2009 if it can be compensated by provision of an equivalent area elsewhere and contiguous with the TPZ. Encroachments greater than 10% are defined as major and permissible if the project arborist can demonstrate that the tree would remain viable. The area lost to the encroachment should be by compensated elsewhere and contiguous with the TPZ.

[5] Clarke & Matheny, 1999, p6

5. RECOMMENDATIONS

5.1 TREE RETENTION

The following three (3) trees on/adjoining the site shall be retained with general and specific tree protection measures:

Tree 1 *Olea europaea subsp. cuspidata*
Tree 2 *Magnolia grandiflora*
Tree 4 *Araucaria heterophylla*

5.2 TREE REMOVAL

The following one (1) tree on site shall be removed:

Tree 3 *Cotoneaster glaucophylla*

5.3 GENERAL TREE PROTECTION

The following general comments apply:

- Tree protection fencing: Temporary tree protection fencing consisting of chainwire panels minimum 1.8m high supported by steel stakes of concrete blocks, fastened together and supported to prevent sideways movement must be located as shown on Tree Protection Plan. Existing boundary fences or walls to be retained shall constitute part of the tree protection fence where appropriate.
  Where the proposed location is not feasible, the Project Arborist should be consulted and alternate measures implemented e.g. trunk, branch and ground protection. The TPZ fence cannot be removed, altered or relocated without the approval of the Project Arborist. Care should be taken during fence installation to avoid damage to tree roots.
  Tree protection fencing must be installed prior to commencement of site works and maintained throughout the extent of the works until construction activity is completed. No storage of any kind including materials, fuel, chemicals, cement, and site sheds permitted. No access to personnel. No washing, rinsing, cleaning of tools within 6m of any trees.
- Signage: A sign is to be erected on all tree protection fencing stating clearly that the trees are protected under Council's development consent and that "No Access" is permitted within the zone without the authorization of the Project Arborist.
- Removal of Vegetation under Canopy of Trees to be Retained: Care shall be taken when removing Council approved trees located under or entwined with canopies of trees to be retained. Intertwining branches shall be removed prior to removal of trees to reduce unintentional damage to retained trees.
- Water Regime: Minimise changes to tree water and drainage conditions, provide supplementary irrigation in extended periods of dry.
- Dust + Contaminant Protection: Ensure unnecessary exposure to dust by erection of protective fencing where applicable.
- Crown Pruning: If required, shall be in accordance with AS4373-2007 *Pruning of amenity trees.*
- Minimise pruning: Removal of deadwood from trees is recommended prior to commencement of works. A minimum amount of live material should be removed.
- Root Pruning: Project Arborist shall be notified if tree roots greater than 40mm diameter are encountered in trees to be retained. Any roots smaller than 40mm in diameter may be cleanly severed with a sharp pruning implement at the face of the excavation.
- Minimise Soil Compaction: Maintain tree protection areas throughout entire period of construction works. No stockpiling around root zone.
- Mulch: Cover root area in TPZ with 100mm thick coarse mulch to reduce soil compaction and soil moisture loss. Remove and replace mulch after construction to remove any contaminants.
- Minimise Excavation: Only Council approved works are to undertaken within TPZ's. Maintain natural ground level around trees, do not import fill, pass service trenches through fenced area, route utilities around trees, tunnel services rather than trenching, lay irrigation lines on the surface.
- Supervision: An AQF Level 5 Project Arborist should be present to certify works, supervise excavation, cutting of torn roots or redesign around roots and monitoring of unforeseen changes or decline.

5.4 SPECIFIC TREE PROTECTION

TREE 2 *Magnolia grandiflora*

A Project Arborist should be appointed to supervise any activities in the vicinity of trees, including fencing, excavation, root and canopy pruning, and make periodic visits and reports to monitor the state of the trees.

Excavation within Tree Protection Zone

Prior to any mechanical excavation for works within the TPZ of Tree 2, exploratory excavation using non-destructive techniques shall be undertaken along the perimeter of the wall structures for planter boxes and basement excavation to the depth of the proposed footings but not exceeding 600mm. Non-destructive excavation techniques may include the use of hand-held implements, air or water pressure devices.

Likewise, non-destructive exploratory holes shall be dug to 600mm deep in the proposed locations of driveway piers. Pier locations should be modified if tree roots larger than 40mm are encountered. All care shall be taken to preserve woody roots intact and undamaged during exploratory excavation. Project Arborist should be consulted for further advice should roots greater than 40mm be encountered.

Proposed pier located within the SRZ must be relocated beyond SRZ on Structural Engineer's advice. Wherever possible, equipment required for excavation / piering shall be located outside TPZ of Tree 2. If this proves impossible, ground protection should be installed before commencement of works.

Canopy Pruning

Canopy pruning of Tree 2 that is required for canopy lifting for construction of piered driveway crossing shall be carried out in accordance with *AS 4373-2007 – Pruning of amenity trees*. All pruning work shall be carried out by a qualified arborist or tree surgeon with a minimum qualification of AQF 3 under the supervision of the Project Arborist. Only those branches considered essential for construction should be removed.

Root Pruning

Should roots greater than 40mm diameter be encountered, Project Arborist should be notified. Roots smaller than 40mm may be cleanly severed with a sharp pruning implements. Cover exposed roots with moist hessian until backfilling.

Underground Services

No underground services are permitted within the TPZ or SRZ of Tree 2. All stormwater and other underground services should be located outside the TPZ.

Fill Material, Plant + Equipment

No fill material shall be placed within the TPZ of Tree 2. Plant and equipment essential for the construction of works within the front building line shall be located outside the TPZ wherever possible. Where not possible, suitable ground protection should be installed in accordance with Appendix C (p22).

Tree Damage

Care shall be taken when operating cranes, drilling rigs and similar equipment near trees to avoid damage to canopies. Should branches accidentally be torn off, stubs should be cleanly pruned by qualified arborist (AQF3 minimum). Where there is potential conflict between tree canopy and construction activities, Project Arborist shall be consulted. Care shall be taken when planting within TPZ to avoid unnecessary root damage.

Protection of Tree Roots on Road Reserve

The road reserve area within the TPZ of Tree 2 must be fenced prior to commencement of any site works so as to exclude access and potential damage to exposed tree roots within the road reserve.

Mulch

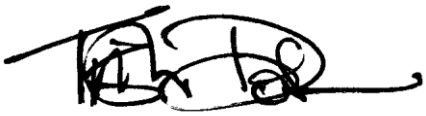
Cover root area within TPZ of Tree 2 with 100mm thick coarse mulch to reduce soil compaction and soil moisture loss. Remove and replace mulch after construction to remove any contaminants.

5.5 ARBORIST INVOLVEMENT

Activities before and during construction can be critical to the success of tree preservation. The Project Arborist should must be notified and attend site to supervise during:

- Any works within tree protection zones of protected trees
- Exploratory Investigation for footings + piers
- Canopy pruning of Tree 2
- If tree roots larger the 40mm diameter are encountered during excavation
- If any damage affects protected trees, e.g. wounds, branch tearouts, chemical spills, etc.
- If any signs of tree decline are observed, e.g. leaf yellowing, leaf drop, branch drop,
- Where approved excavation works are to be undertaken within the T.P.Z. of protected trees non-destructive methods shall be used
- After the installation of tree protection fencing and prior to commencement of works including demolition

Report prepared by Trish Dobson
28 September 2020



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7. APPENDICES

APPENDIX A - TERMS + DEFINITIONS

The following relate to terms and definitions included in this report.

Aerial Inspection
Where the subject tree is climber by a professional tree worker or Arborist specifically to inspect and assess the upper stem and crown of the tree for signs or symptoms of defects, disease, etc.

Age Class – Immature (IM), Semi-Mature (SM), Mature (M), Over Mature (OM). Assessment of the trees current age. A Mature (M) tree has reached a near stable size (biomass) above and below ground. Trees can have a Mature age class for over 90% of life span. Over-mature (OM) trees show symptoms of irreversible decline and decreasing biomass.

Body Language
In trees, the outward display of growth responses and/or deformation in response to mechanical stresses

Co-dominant
Refers to stems or branches equal in size and relative importance.

Condition
The general form and structure of the trunk/s and branching. Trunk lean, trunk/branch structural defects, canopy skewness or other hazards are considered.

Contact stress
The sharing of stress loading at a point where a tree grows against another tree or structure, further distributing the loading as the surface areas touching increase.

Crown
Parts of the tree above the trunk, including leaves, branches and scaffolds.

DAB Diameter at Base
Tree trunk diameter measure at base of tree

DBH Diameter at Breast Height
Tree trunk diameter measured at breast height (1.4m above ground level).

Dead Wood
Refers to any whole limb that no longer contains living tissue. The trees upper canopy foliage or crown condition is an important indicator of an individual trees health. Dieback is the progressive death of branches or shoots originating from the tips. Crown dieback is a recognizable, visible symptom of the early stages of decline and potential tree death. The safety of the target is considered the primary basis for deadwood removal.

Defect
Any internal or external structural weakness or deformity which reduces the stability of the tree

Decay
Process of degradation of wood by micro-organisms and fungus.

Decline
The response of the tree to a reduction of energy levels resulting from stress. Recovery from a decline is difficult and slow and decline is usually irreversible

Dieback The death of some areas of the *crown*. Symptoms are leaf drop, bare twigs, dead branches and tree death, respectively. This can be caused by root damage, root disease, bacterial or fungal canker, severe bark damage, intensive grazing by insects, *abrupt changes* in growth conditions, drought, water-logging or over-maturity. Dieback often implies reduced *resistance, stress* or *decline* which may be temporary.

Grafted Branches
Where two or more convergent or crossed or entwined branches from the same tree or another tree of a related species grow and merge forming a permanent union sharing vascular functions and structural loading. This may be deliberate.

Hazard
The combination of a failure of tree (or tree parts) with the presence of an adjacent target.

Height
Tree height estimated from the ground. These measurement have not been confirmed with a clinometer or other surveying instrument.

Included Bark
Growth of bark at the interface of two or more branches on the inner side of a branch union or in the crotch where the bark is turned inward rather than pushed out.

Leaning Trees
A tree where the trunk grows or moves away from upright. A lean may occur anywhere along the trunk influenced by a number of contributing factors e.g. Genetically predetermined characteristics, competition for space or light, prevailing wind, aspect, slope or other factors. A leaning tree may maintain a static lean or display an increasingly progressive lean over time and may be hazardous and prone to failure and collapse, The degrees of leaning can be categorized as:

Slight	a lean where the trunk is growing at an angle within 0°-15°
Moderate	a lean where the trunk is growing at an angle within 15°-30°
Severe	a lean where the trunk is growing at an angle within 30°-45°
Critical	a lean where the trunk is growing at an angle within >45°
Progressive	a lean where the degree of leaning appears to be increasing over time
Static	a lean that appears to have stabilized over time

Obtusely Divergent
Branch growing in a direction away from its point of attachment where the angle in the crotch is greater than >90° and less than <180°.

Occlusion
Growth processes where wound wood develops to enclose and conceal the wound and restore the growing surface of the structure

Phototropism
A directional growth movement towards light (positive tropism) or away from a source of light (negative tropism)

Structural Root Zone - SRZ Radius
The area around a tree required for tree stability. Earthworks should be prohibited within the SRZ. The area is calculated from the formula and graph at Figure 1 of AS4970-2009. The SRZ graph has been adapted from the work of Claus Mattheck (1994).

Suppressed Crown
Suppressed crowns of trees are generally not restricted for space but restricted for light by being *overtopped* by other trees and occupying an understorey position in the canopy and growing slowly.

Retention Value
A visual tree assessment method to determine a qualitative and numerical rating for the viability of urban trees for development sites and management purposes, based on general tree and landscape assessment criteria using classes of age, condition and vigour. SRIV is for the professional manager of urban trees to consider the tree in situ with an assumed knowledge of the taxon and its growing environment. It is based on the physical attributes of the tree and its response to its environment considering its position in a matrix for age class, vigour class, condition class and its sustainable retention with regard to the safety of people or damage to property. This also factors the ability to retain the tree with remedial work or beneficial modifications to its growing environment or removal and replacement. SRIV is supplementary to the decision made by a tree management professional as to whether a tree is retained or removed (IACA - Institute of Australian Consulting Arboriculturists 2005).

Self-correcting
Atypical stem growth subsequently influenced and modified by reaction wood to return it to a more typical habit or form

Senescent Tree of advanced old age, or over-mature leading towards death

ULE – Useful Life Expectancy. A systematic tree assessment procedure developed by Jeremy Barrell, Hampshire, England. It gives a length of time that the Arborist feels a particular tree can be retained with an acceptable level of risk based on the information available at the time of inspection. SULE ratings are **1. Long** (retainable for 40 yrs or more with an acceptable level of risk), **2. Medium** (retainable for 16-39 yrs), **3. Short** (retainable for 5-15 years) and **4. Removal** (tree requiring removal within 5yrs or immediate removal due to imminent hazard or absolute unsuitability), **5. Small**, young or regularly pruned trees that can be reliably moved or replaced.

Tree Protection Zone TPZ Radius
The radial distance in metres, measured from the centre of the tree stem which is subject to protective fencing or barrier to create an exclusion zone. A radial offset (m) equal to twelve times (x12) DBH measured from the centre of trunk (for trees less than 0.3m DBH minimum TPZ is 2.0m). To satisfactorily retain the tree construction activity (both soil cut and fill) must be restricted within this offset. TPZ offsets are rounded to the nearest 0.1m. Existing constraints to root spread can vary TPZ. Generally an area equivalent to the TPZ should be available to the tree post development. Encroachment occupying up to 10% of the TPZ are is acceptable without detailed root zone assessment. Encroachments greater than 10% require specific arboricultural assessment.

Tree Protection Fencing
At minimum tree protection fencing shall consist of 1.8m high chain wire panels supported by concrete feet and fastened together and supported to prevent sideways movement. The tree shall not be damaged during the installation of the protection fencing. A more permanent fence may be installed under the supervision of a consulting Arborist.

Vigour (syn. Health)
The general appearance of the canopy/foliage of the tree at the time of inspection. Vigour can vary with the season and rainfall frequency. A tree can have 'Good' vigour but be hazardous due to 'Poor' condition. A tree in Good vigour has the ability to sustain its life processes. Vigour is synonymous with health.

VTA Visual Tree Assessment
A procedure of defect analysis developed by Mattheck and Breloer (1994) that uses the growth response and form of a tree to detect defects.

APPENDIX B - TREE ASSESSMENT METHODOLOGY

- U.L.E. Useful Life Expectancy
- Landscape Significance Rating
- Retention Values
- Examples of Minor Encroachments

U.L.E. CATEGORIES and SUB-CATEGORIES

	1	2	3	4	5
	LONG ULE	**MEDIUM ULE**	**SHORT ULE**	**TRANSIENT ULE HAZARDOUS**	**YOUNG, MOVED OR REPLACED**
	Trees that appeared to be retainable at the time of assessment for **more than 40 years** with and acceptable level of risk	Trees that appeared to be retainable at the time of assessment for **15 to 40 years** with and acceptable level of risk	Trees that appeared to be retainable at the time of assessment for **5 to 15 years** with and acceptable level of risk	Trees that should be removed within the next **5 years**	Trees that can be reliably transplanted or replaced
A	Structurally sound trees located in positions that can accommodate future growth	Trees that may only live for between 15 and 40 more years	Trees that may only live for between 5 and 15 more years	Dead, dying, suppressed or declining trees through disease or inhospitable conditions	Small trees less than 5 metres in height
B	Trees that could be made suitable for retention in the long term by remedial Care	Trees that may live for more than 40 years, but would need to be removed for safety or nuisance reasons	Trees that may live for more than 15 years, but would need to be removed for safety or nuisance reasons	Dangerous trees through instability or recent loss of adjacent trees	Young trees less than 15 years old but over 5 metres in height
C	Trees of special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to secure their long term retention	Trees that may live for more than 40 years, but should be removed to prevent interference with more suitable individuals or to provide space for new planting	Trees that may live for more than 15 years, but should be removed to prevent interference with more suitable individuals or to provide space for new planting	Dangerous trees through structural defects including cavities, decay, included bark, wounds or poor form	Formal Hedges and trees that have been regularly pruned to artificially control growth
D		Trees that could be made suitable for retention in the medium term by remedial Care	Trees that require substantial remedial care and are only suitable for retention in the short term	Damaged trees that are clearly not safe to retain	
E				Trees that may live for more than 5 years, but should be removed to prevent interference with more suitable individuals or to provide space for new planting	
F				Trees that may cause damage to existing structures within 5 years	
G				Trees that will become dangerous after removal of other trees for reasons given in A-F	
H				Trees in categories (A) to (G) that have a high wildlife habitat value and, with appropriate treatment, could be retained subject to regular review	

Ref. Modified from Barrell, Jeremy (1996)
Pre-development Tree Assessment
Proceedings of the International Conference on Trees and Building Sites (Chicago)
International Society of arboriculture, Illinois, USA

U.L.E. CATEGORIES and SUB-CATEGORIES

CRITERIA FOR ASSESSMENT OF LANDSCAPE SIGNIFICANCE RATING

1. SIGNFICANT

Tree is listed as a Heritage Item within the WLEP2009 with a local, state or national significance; OR
Tree forms part of a curtilage of a Heritage Item and has a known or documents association with the Item; OR
Tree is a Commemorative Planting having been planted by an important historical person(s) or to commemorate an important historical event; OR
Tree is schedules as a Threatened Species or is a key indicator species of an Endangered Ecological Community as defined under the *Threatened Species Conservation Act* 1995 (NSW) or the *Environment Protection and Biodiversity Conservation Act* (1999); OR
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 an endangered or threatened fauna species; OR
Tree is a remnant tree, being a tree in existence prior to development of the area; OR
Tree has a very large live crown size exceeding 300m² with 70-100% foliage cover, is visible against the skyline, exhibits very good form and habitat typical of the species and 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; OR
Tree is visually prominent in a view from surround areas, being a landmark or visible from a considerable distance

2. VERY HIGH

Tree has a strong historical association with a heritage item within or adjacent to the property and/or exemplifies a particular era or style of landscape design associated with the original development of the site; OR
Tree is a locally indigenous species and representative of the original vegetation of the area and is located within a defined Wildlife Corridor or has known wildlife habitat value; OR
Tree has a very large live crown size exceeding 200m², a crown density exceeding 70% crown cover, 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

Tree has a suspected historical association with a heritage item or landscape supported by anecdotal or visual evidence; OR
Tree is a locally indigenous species and representative of the original vegetation of the area; OR
Tree has a large crown size exceeding 100m²; AND
Tree is a good representative of the species in terms of its form and branching habitat with minor deviations from the normal (e.g. crown distortion / suppression) with a crown density of at least 70% crowns cover; AND
Tre is visible from the street and surrounding properties and makes a positive contribution to the visual character and amenity of the area.

4. MODERATE

Tree has a medium live crown size exceeding 40m²; AND
Tree is a fair representative of the species, exhibiting moderation deviations from typical form (e.g. distortion / suppression) with a crown density of more than 50% crown cover, AND
Tree make a fair contribution to the visual character and amenity of the area, AND
Tree is visible from surrounding properties, but is not visually prominent – view may be partially obscured by other vegetation or built forms: OR
Tree has a known or suspected association.

5. LOW

Tree has a small live crown size of less than 40m² and can be replaced within the short term with a new tree planting; OR
Tree is a poor representative of the species, showing significant deviations from typical form and branching habit with a crown density of less than 50% crown cover; AND
Tree is not visible from the surrounding properties and makes a negligible contribution or has a negative impact on the amenity and visual character of the area.

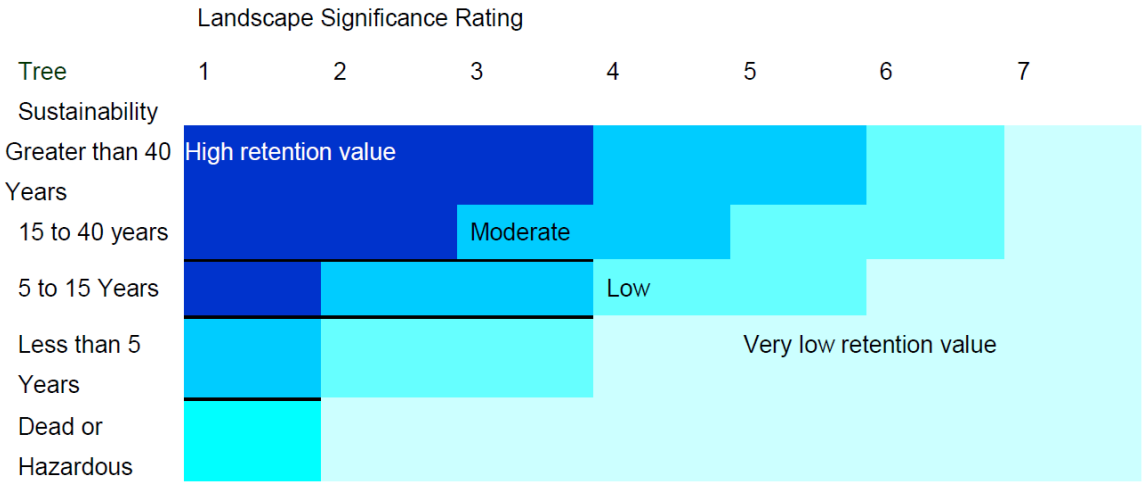
6. VERY LOW

Tree is listed as an Environmental Wee Species in the relevant Local Government Area, being invasive or a nuisance species; OR
Tree is a species listed in Appendix 5;

7. INSIGNIFICANT

Tree is a declared Priority Weed / Biosecurity Matter under the *Biosecurity Act 2015* ; OR
Tree poses a threat to human life or property.

FROM APPENDIX 17 PITTWATER 21 DCP 2014



TREE RETENTION VALUE MATRIX
FROM APPENDIX 17 PITTWATER DCP 2014

The matrix is interpreted as shown:

HIGH	Trees that should be retained	Major redesign may be considered so as to retain **HIGH** trees
MODERATE	Trees that could be considered for retention	Minor redesign may be considered to retain **MODERATE** trees
LOW	Trees that could be considered for removal	**LOW** trees should not constrain the proposed development
VERY LOW	Trees that should be removed to facilitate development / safety or Permanently fenced off	**VERY LOW** trees are dangerous or in irreversible decline

RETENTION VALUES MATRIX DEFINITIONS

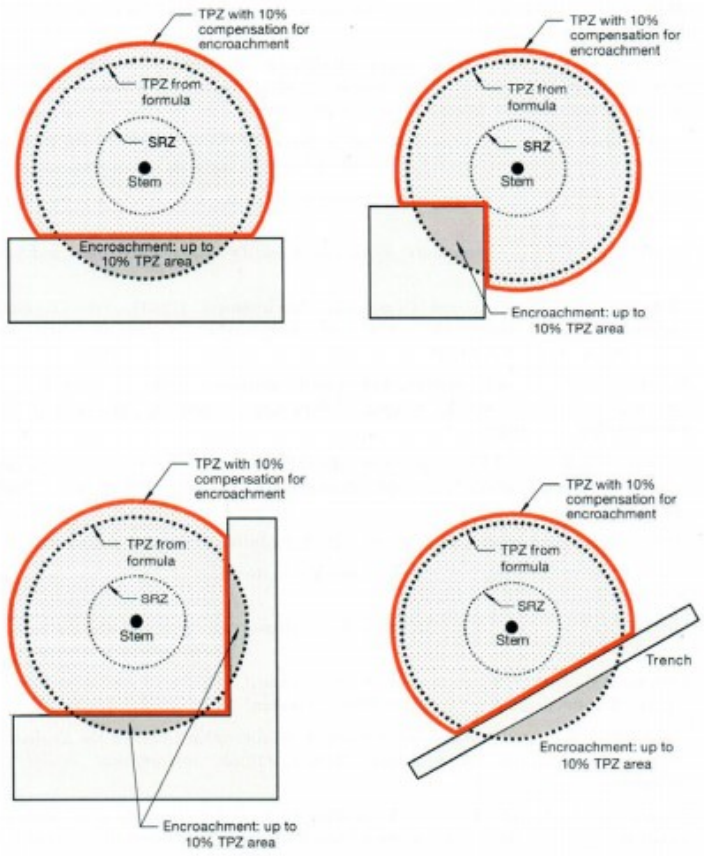
TREE RETENTION VALUE MATRIX
RELATIVE RETENTION VALUE using combined ULE and LANDSCAPE SIGNIFICANCE RATING

APPENDIX D

ENCROACHMENT INTO TREE PROTECTION ZONE

(Informative)

Encroachment into the tree protection zone (TPZ) is sometimes unavoidable. Figure D1 provides examples of TPZ encroachment by area, to assist in reducing the impact of such incursions.



NOTE: Less than 10% TPZ area and outside SRZ. Any loss of TPZ compensated for elsewhere.

FIGURE D1 EXAMPLES OF MINOR ENCROACHMENT INTO TPZ

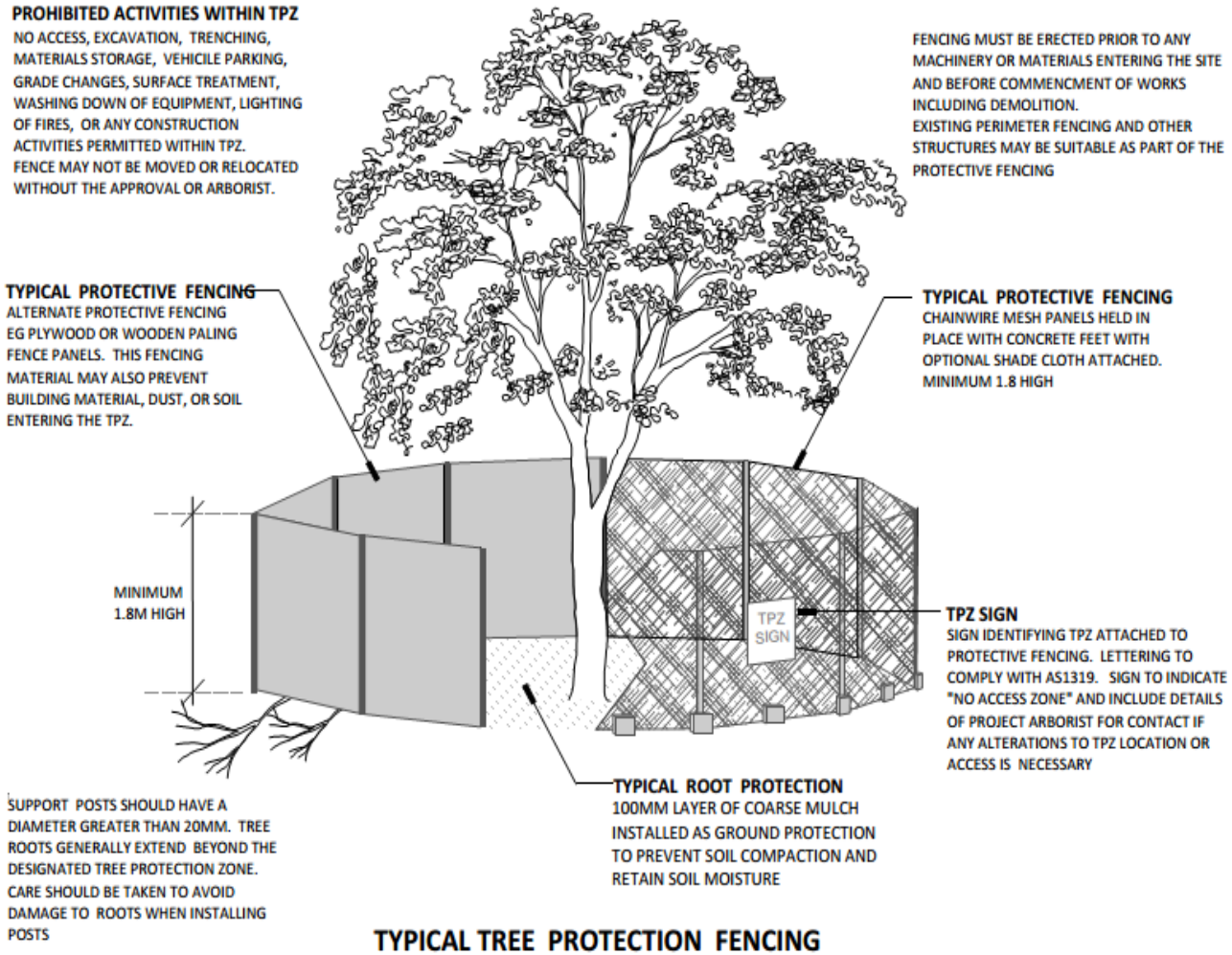
EXAMPLES OF MINOR ENCROACHMENTS INTO TPZ

Source: STANDARDS AUSTRALIA
AUSTRALIAN STANDARD AS4970-2009
Protection of trees on development sites

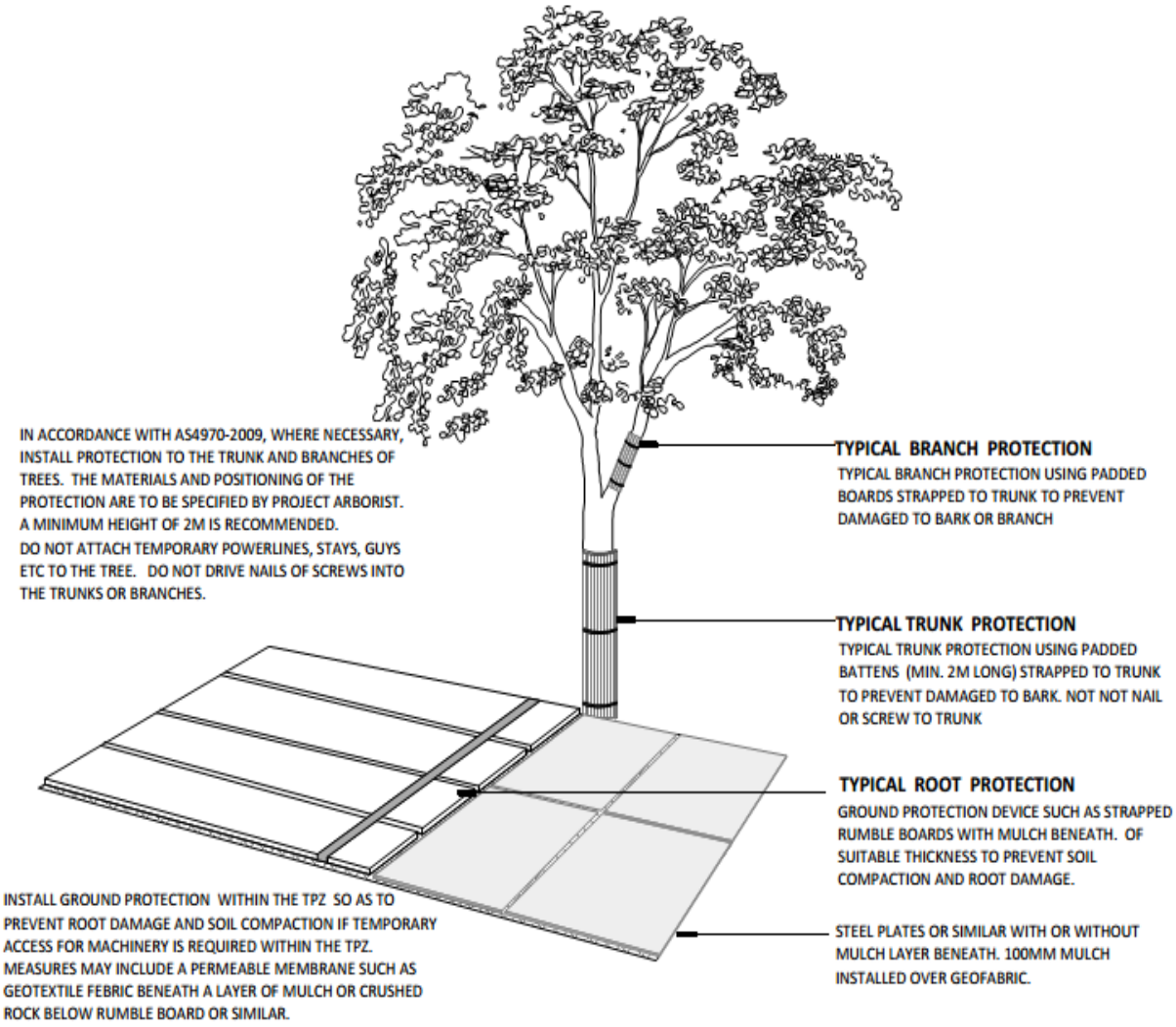
APPENDIX C - TREE PROTECTION MEASURES

General Tree Protection Measures

TYPICAL PROTECTION SIGNAGE



TYPICAL TREE PROTECTION FENCING



TYPICAL TRUNK, BRANCH AND GROUND PROTECTION

APPENDIX D - PHOTOGRAPHS OF ASSESSED TREES

TREE 1 *Olea europaea subsp. cuspidata* on road reserve. Proposed to be retained

TREE 2 *Magnolia grandiflora* located in front building setback. 'Moderate' impact by works. To be retained. Roots on road reserve to be protected.

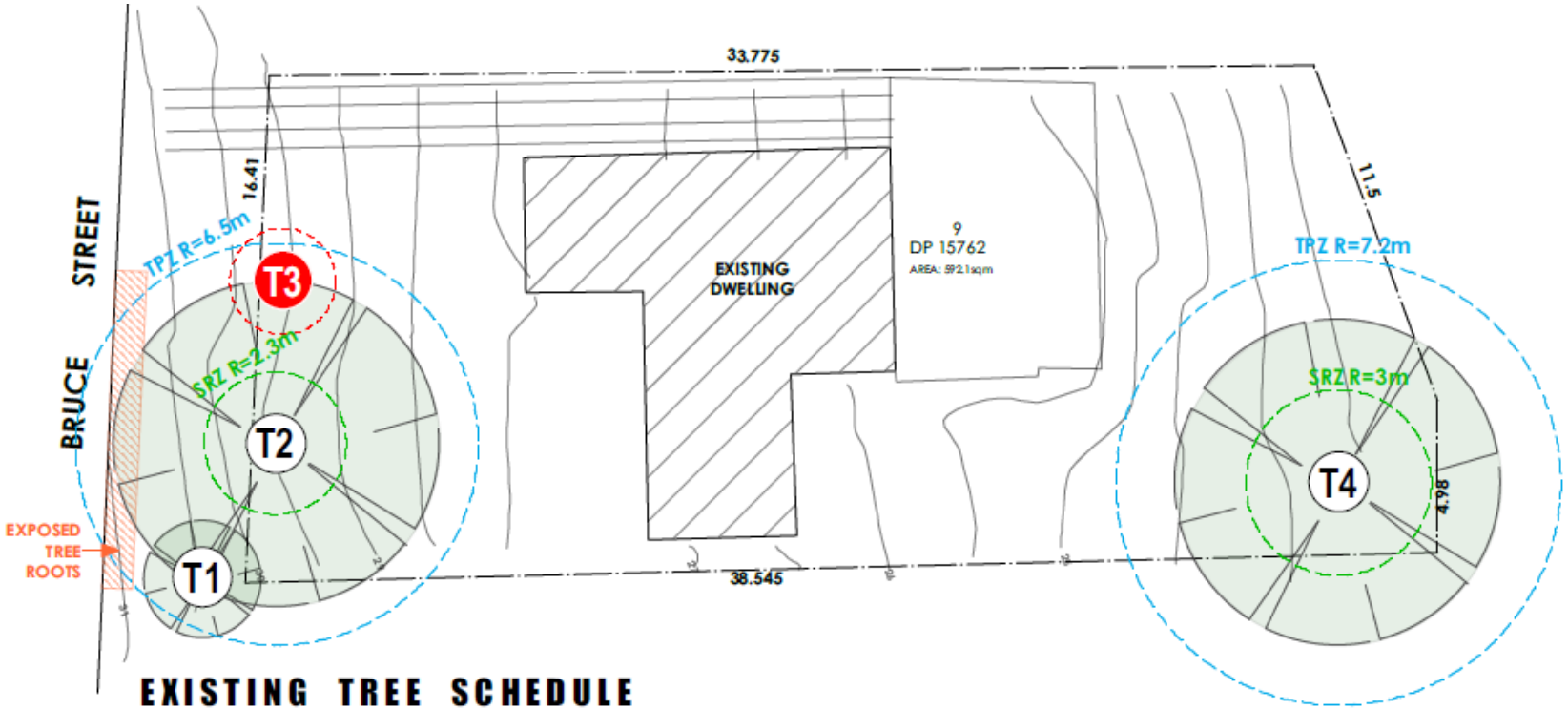
TREE 3 *Cotoneaster glaucophyllus* in front building setback. Exempt Species. Proposed to be removed.

TREE 4 *Araucaria heterophylla* in eastern building setback area. 'Minor' impact by works. Proposed to be retained.

APPENDIX E - PLANS

TP-01 Tree Location Plan

TP-02 Tree Protection Areas + Incursions



EXISTING TREE SCHEDULE

TREE NO	BOTANICAL NAME	COMMON NAME	DBH	DAB	HEIGHT	SPREAD	T.P.Z.	S.R.Z.	HEALTH	CONDITION	STATUS
T1	OLEA EUROPAEA subsp. CUSPIDATA	Eropean Olive	210mm	200mm	5m	4m	2.5m	1.7m	good	good	RETAIN Exempt species on road reserve
T2	MAGNOLIA GRANDIFLORA	Southern Magnolia	540mm	420mm	6m	7m	6.5m	2.3m	good	fair	RETAIN + PROTECT
T3	COTONEASTER GLAUCOPHYLLUS	Cotoneaster	Multi	0.5m	5m	6m			fair	fair	REMOVE Exempt Species
T4	ARAUCARIA HETEROPHYLLA	Norfolk Island Pine	600mm	770mm	13m	12m	7.2m	3m	good	good	RETAIN + PROTECT

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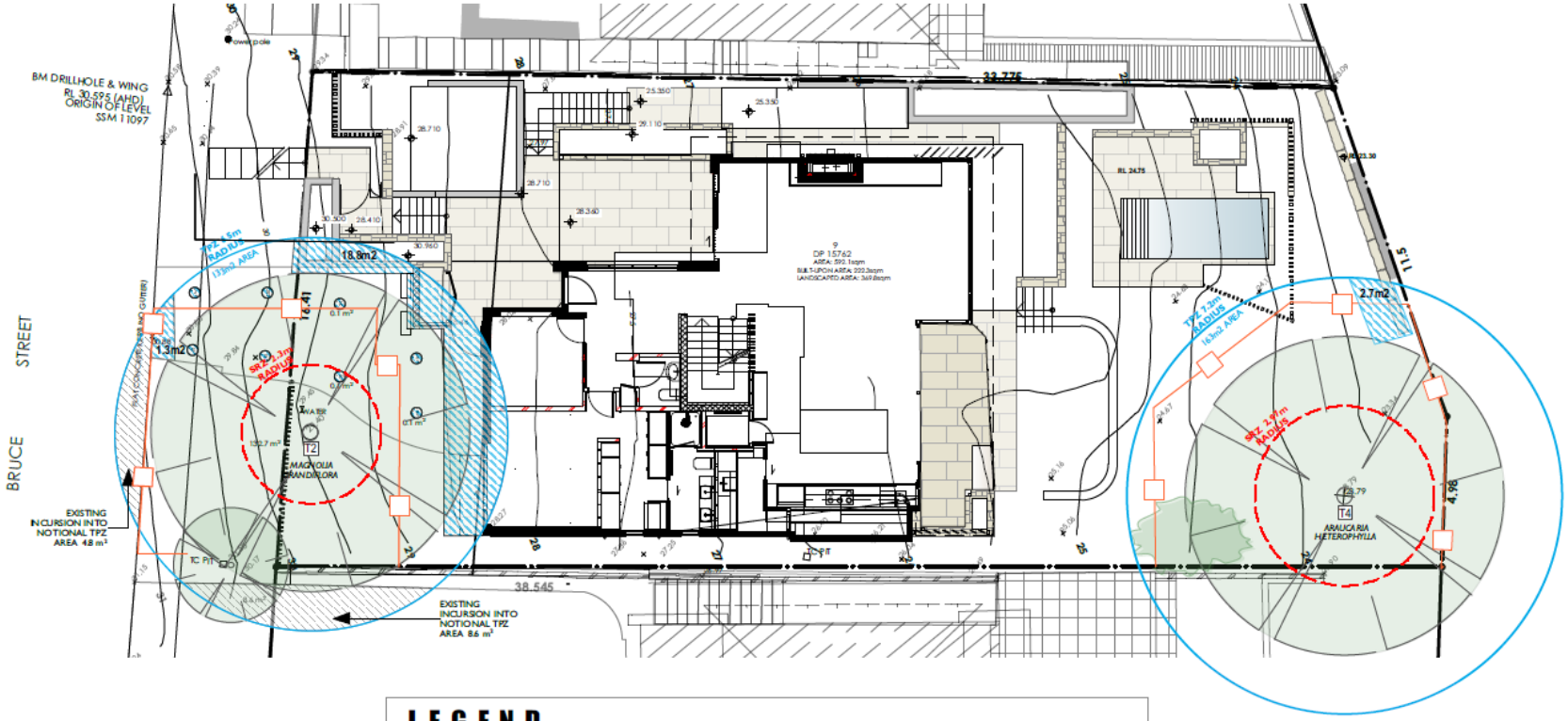
0m 1m 2m 3m 4m 5m

TREE LOCATION PLAN

11 BRUCE STREET, MONA VALE

1:200 @ A4 SCALE
SEPT 2000 DATE
2007 JOB
DA ISSUE
2007 / TP01 DWG



LEGEND

- T8 — EXISTING TREES TO BE REMOVED
- T1 — EXISTING TREES TO BE RETAINED
- TPZ - TREE PROTECTION ZONE
- SRZ STRUCTURAL ROOT ZONE
- TPZ INCURSION
- TREE PROTECTION FENCE

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0m 1m 2m 3m 4m 5m

INCURSIONS / TREE PROTECTION PLAN

11 BRUCE STREET, MONA VALE

1:200 @ A4 SCALE
SEPT 2000 DATE
2007 JOB
DA ISSUE

2007 / TP02 DWG

Appendix F - Schedule of Assessed Trees

9 NARRABEEN STREET, NARRABEEN NSW 2101
REFER TO APPENDIX B FOR ASSESSMENT METHODOLOGIES

NO	GENUS SPECIES (Common Name)	HEIGHT	SPREAD	DBH	DAB	MATURITY CLASS	HEALTH	STRUCTURAL CONDTION	DEADWOOD	ULE	LANDSCAPE SIGNIFICANCE	RETENTION VALUE	TREE PROTECTION (METRES)	STATUS TREES REQUIRING REMOVAL REGARDLESS OF DEVELOPMENT DUE TO HAZARD RISK or DEATH	COMMENTS + IMPACTS
TREES TO BE RETAINED TREES TO BE REMOVED	DETAILS	m	m	mm @ 1.4m	mm @ base	OverMature Mature SemiMature Immature	GOOD FAIR POOR	GOOD FAIR POOR DEAD	%	1 >40 yrs 2 15-40yrs 3 5-15 yrs 4 <5yrs Dead or Hazard 5 Young,	Signif. V.High High Mod. Low V. Low Insig.	High Mod Low V.Low	**TPZ** SRZ	TREES FOR REMOVAL WITH MINOR DEFECTS, LOW ULE OR EXEMPT UNDER LOCAL DCP PROTECTED TREES REQUIRING REMOVAL DUE TO IMPACT OF DEVELOPMENT	
1	*OLEA EUROPAEA subsp. CUSPIDATA* *(European Olive)*	5	4	3x120 (210)	200	SM	GOOD	GOOD	<5%	3A	7 INSIG	VERY LOW	**2.5m** 1.7m	**RETAIN + PROTECT** WITH SPECIFI TREE PROTECTION MEASURES	Exotic species. EXEMPT PDCP 21 B4.22 (Exempt Species List) Located on road reserve. Appears stable. Not adversely impacted by works. No works in TPZ
2	*MAGNOLIA GRANDIFLORA* (Southern Magnolia)	6	7	130, 160 2x180 2x200 220, 240 (540)	420	SM	GOOD	FAIR	<5%	2A	4 MOD	MOD	**6.48m** 2.3m	**RETAIN + PROTECT** WITH GENERAL TREE PROTECTION MEASURES	Semi-mature exotic tree. Protected PDCP 21 B4.22. Located on western side of site. Appears stable. 10x1m strip of exposed roots along edge of road. 20.1m2 (15.1%) incursion into 133m2 TPZ proposed by works. 'Moderate' impact. Pier works within SRZ should be relocated.
3	*COTONEASTER GLAUCOPHYLLUS* (Cotoneaster)	5	6	Multi		SM	FAIR	FAIR	<10%	5A	7 INSIG	VERY LOW		**REMOVE** EXEMPT FROM PROTECTION	Exotic species. EXEMPT PDCP 21 B4.22 (Exempt Species List)
4	*ARAUCARIA HETEROPHYLLA* (Norfolk Is Pine)	13	12	600	770	M	GOOD	GOOD	0%	1A	3 HIGH	HIGH	**7.2m** 2.97m	**RETAIN + PROTECT** WITH GENERAL TREE PROTECTION MEASURES	Mature exotic tree. Protected PDCP 21 B4.22. Located on eastern side of site. Healthy canopy. No salt damage. Exposed roots on N + W. Lawn, wall + gardens located within TPZ. Appears stable. Memorial plaque attached. Exposed roots in lawn. 2.7m2 (1.6%) incursion into 163m2 TPZ proposed by works. 'Minor' and permissible under AS4970. No works in SRZ.