ARBORICULTURAL IMPACT ASSESSMENT

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ABBREVIATIONS

Abbreviation	Description
AQF	Australian Qualification Framework.
AS	Australian Standards.
DAB	Diameter Above Buttress.
DBH	Diameter at Breast Height.
DIA	Diameter.
ELE	Estimated Life Expectancy.
m	Metre.
mm	Millimetre.
NDRE	Non-Destructive Root Exploration.
No.	Number.
NSW	New South Wales.
QTRA	Quantified Tree Risk Assessment.
sp.	Species- *It is used when the actual **species** name cannot or need not or is not specified.*
spp.	Species- *It is used to indicate several **species**.*
SRZ	Structural Root Zone.
Taronga	Taronga Conservation Society Australia
TPZ	Tree Protection Zone.
VTA	Visual Tree Assessment.

PROJECT PLANS RECIEVED

Produced By	Plan/Drawing Type	Plan/Drawing No.
Architectural - dwp	SITE PLAN – EXISTING AND DEMOLITION	AA-N1000
	SITE PLAN	AA-N1001
	SITE SECTIONS – EXISTING	AAN1150
	SITE SECTIONS – EXISTING	AA-N1151
	GENERAL ARRANGEMENT PLAN – LEVEL 1 – NUTRITION CENTRE	AA-N1200
	GENERAL ARRANGEMENT PLAN – LEVEL 2 – NUTRITION CENTRE	AA-N1201
	GENERAL ARRANGEMENT PLAN – LEVEL 3 – NUTRITION CENTRE	AA-N1202
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	SECTIONS – NUTRITION CENTRE	AA-N3000

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2 SUMMARY OF ASSESSMENT

This Arboricultural Impact Assessment (AIA) was prepared for Taronga Conservation Society Australia (Taronga). This report specifically discusses **9 trees** within the proposed development site of Taronga Wildlife Hospital, Sydney - Nutrition Centre (hereafter 'Nutrition Centre'). The Nutrition Centre is to be located back of house and will replace several standalone buildings currently providing animal food preparation and storage.

The proposal is within proximity to a significant stand of eight *Eucalyptus maidenii* (Maiden's Gums). The proposal requires varying levels of encroachment into the Tree Protection Zone and Structural Root Zone of these trees. It is expected that the existing ground conditions including the sandstone bedrock, shotcrete and existing concrete slab the storage shed is located on have impeded root growth into the footprint of the storage shed and therefore footprint of the Nutrition Centre. On this basis, the impacts to the roots of a subset of trees (Trees 9 and 10) is expected to be minimal or would be mitigable with design and construction flexibility.

However, significant crown pruning is required to achieve the necessary clearance from the proposed Nutrition Centre to allow construction, scaffolding and provide adequate clearance from the façade of the building to prevent future damage once it is constructed. On this basis, trees 9 and 10 will require removal to facilitate the proposed design.

Trees 11, 12, 13 and 14 will require removal due to significant, unmitigable encroachments into the Tree Protection Zone and Structural Root Zone. These trees will require removal to facilitate the proposed design.

The project requires the removal of four (4) category **'AA'** trees: **9, 10, 11 and 14**.
The project requires the removal of two (2) category **'A2'** trees: **12, 13.**

Category **'AA'** trees 7 and 8 are proposed to be retained.
Category **'Z'** tree 6 is proposed to be retained.

Impact	Reason	Important Trees		Unimportant Trees
		AA	A1/A2/A3	Z
Trees to be Removed due to Major Encroachment.	Tree within the proposed footprint of the development.	11, 14	12, 13	
Trees to be removed due to major pruning and crown encroachment	Volume of pruning will render trees predisposed to failure. Pruning will disfigure the crown. Trees are unlikely to survive the volume of pruning required.	9, 10		
Retained trees within the development site that have potential to be impacted from the development.	Site disturbance, demolition, and construction	7, 8		6

3 INTRODUCTION

Sydney Arbor Trees Pty Ltd have been engaged by Taronga Conservation Society (AUS) to provide a modification to the original AIA, in accordance with the technical requirements of the Secretary's Environmental Assessment Requirement (SEARs), and in support of the SSDA for the proposed development of the Taronga Wildlife Hospital, Sydney - Nutrition Centre. This AIA specifically investigates the impact the proposed development poses to these **9 trees** within the development site extent.

3.1 Purpose

This Arborist report provides an assessment of the trees identified here within and the constraint they impose on the development of the site for the proposed works. The primary purpose of this report is to aid in the planning approval.

3.2 Scope

This report is concerned only with **9 trees** within the proposed development location, where their estimated tree protection zone (TPZ) will be adversely impacted through the development works. The tree schedule is within Appendix 1 and shows the tree related information captured during the site inspection

3.3 Objectives Considered

In preparing this report, the author has considered the objectives of:

- *The State environmental Planning Policy 'Vegetation in Non-Rural Areas 2017'*
- *AS 4970 Protection of Trees on Development Sites (2009)*
- *AS 4373 Pruning of Amenity Trees (2007), and*
- *Mosman Development Control plan, and*
- *Mosman Local Environmental Plan*

3.4 Definition of a Tree

Part 3 of the Vegetation SEPP applies to the following:

(a) All trees which:

- Are 5m or more in height; or
- Have a circumference of 450mm or more measured 300mm above ground level; or
- Are listed in Council's Urban Forest Management Policy; or
- Are 2m or more in height, only if located in a heritage conservation area, or if are a heritage item or form part of a heritage item.

(b) Tree ferns (*Cyathea australis* & *Cyathea cooperi*) which are 2m or more in height.

3.5 Brief Site Description

Taronga Zoo is located on Bradleys Head Road in the suburb of Mosman as shown in Figure 1. The site is to the west of the road, with National Park to the east of the road and residential development to the immediate north of the site. The site consists of Taronga Zoo Precinct largely vegetated with ornamental, indigenous, coniferous, and introduced sometimes rare tree species.

3.6 Taronga Zoo Precinct Map

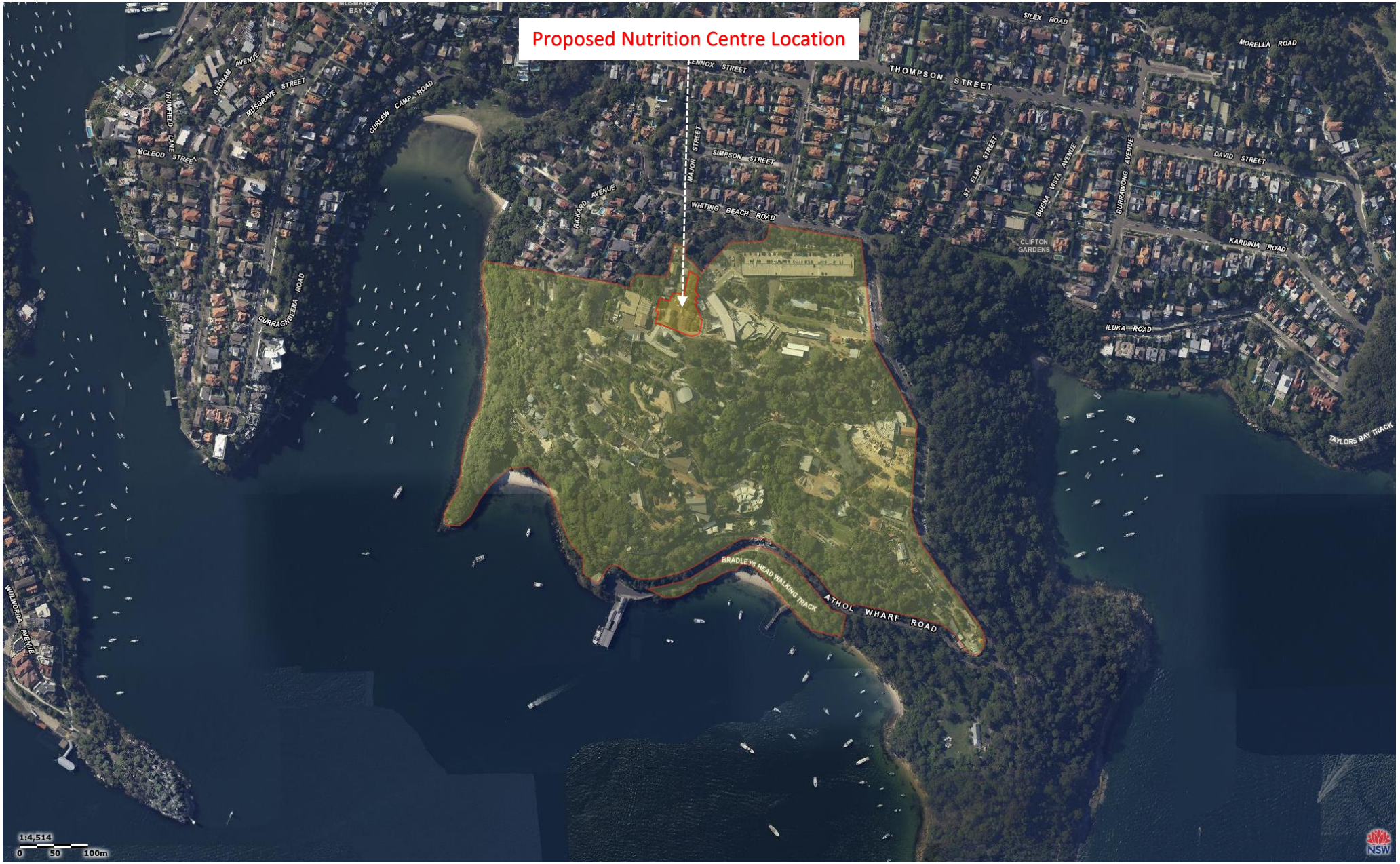

Figure 1 Shows the Taronga Zoo precinct courtesy of 6maps.

3.7 Proposed Nutrition Centre Site

Figure 2 Shows the Nutrition Centre proposed development location courtesy of Nearmap.

4 METHODOLOGY

4.1 Tree assessment

The **9 trees** referenced within this report were inspected on the following dates: 13th of July 2021, 14th of July 2021, 14th of October 2021 and the 29th of October 2021 by AQF Level 5 Consulting Arborist, Mathew Phillips. A subsequent inspection by Greg Thallon of Sydney Arbor Trees and Kane Hollstein of Canopy Consulting was completed on 6 December 2021.
The body language of the trees, any growth defects, appearance of the bark, the crown and leaves, the presence of fungal fruiting bodies and their body language and the local environment of the tree were assessed in accordance with a stage one Visual Tree Assessment (VTA) as formulated by *Mattheck and Breloer (1994).* Further current industry standard methodologies and principals outlined below were also used such as the Tree AZ methodology designed by *Barrell Tree Consultancy (2010),* and the principals of *Quantified Tree Risk Assessment (QTRA)*.

Measurements to determine the Tree Protection Zone (TPZ) were carried out in accordance with *Clause 3.2 and 3.3.5 of AS4970-2000 Protection of trees on development Sites* (Standards Australia 2009) and the following methods:

- The inspection was carried out from ground level, without the use of invasive, diagnostic tools and or advanced testing.
- There were no aerial inspections or below ground root mapping conducted.
- Tree heights and defect heights were determined using a Nikon Forestry Pro ll Laser Range Finder.
- The Diameter at Breast Height (DBH) was measured by placing a diameter tape around the tree trunk at 1.4m above ground level and recording the measurement. This measurement was used to determine the TPZ.
- The Diameter Above Buttress (DAB) was measured by placing a diameter tape around the tree trunk above the buttress roots and recording the measurement. This measurement was used to determine the Structural Root Zone (SRZ).
- Identification to species level was based on broad taxonomical features present and visible from the ground level.

4.2 Tree assessment explanations

4.2.1 Tree vigour

Ability of a tree to sustain its life processes. This is independent of the condition of a tree but may impact upon it. Vigour can appear to alter rapidly with change of seasons (seasonality) e.g., dormant, deciduous, or semi-deciduous trees. Vigour can be categorized as ‘good vigour’, ‘high vigour’, ‘low vigour’ and ‘dormant tree vigour’.

4.2.1.1 Good vigour

Ability of a tree to maintain and sustain its life processes. This may be branches, roots and trunk and resistance to predation. This is independent of the condition of a tree but may impact upon it, and especially the ability of a tree to sustain itself against predation. evident by the typical growth of leaves, crown cover and crown density,

4.2.1.2 High vigour

Accelerated growth of a tree due to incidental or deliberate artificial changes to its growing environment that are seemingly beneficial, but may result in premature aging or failure if the favourable conditions cease, or promote prolonged senescence if the favourable conditions remain, e.g. water from a leaking pipe; water and nutrients from a leaking or disrupted sewer pipe; nutrients from animal waste, a tree growing next to a chicken coop, or a stock feed lot, or a regularly used stockyard; a tree subject to a stringent watering and fertilising program; or some trees may achieve an extended lifespan from continuous pollarding practices over the life of the tree.

4.2.1.3 Low vigour

Reduced ability of a tree to sustain its life processes. This may be evident by the atypical growth of leaves, reduced crown cover and reduced crown density, branches, roots and trunk, and a deterioration of their functions

with reduced resistance to predation. This is independent of the condition of a tree but may impact upon it, and especially the ability of a tree to sustain itself against predation.

4.2.1.4 Dormant tree vigour

Determined by existing turgidity in lowest order branches in the outer extremity of the crown, with good bud set and formation, and where the last extension growth is distinct from those most recently preceding it, evident by bud scale scars. Good vigour during dormancy is achieved when such growth is evident on a majority of branches throughout the crown.

4.2.2 Tree health

The health of the subject tree(s) was rated as 'good', 'fair' or 'poor' as exhibited by crown density, crown cover, leaf colour, presence of epicormic shoots, ability to withstand predation by pests and diseases, resistance, and the degree of dieback.

4.2.3 Tree condition

A tree's crown form and growth habit, as modified by its environment (aspect, suppression by other trees, soils), the stability and viability of the root plate, trunk, and structural branches first (1st) and possibly second (2nd) order branches, including structural defects such as wounds, cavities or hollows, crooked trunk or weak trunk/branch junctions and the effects of predation by pests and diseases. These may not be directly connected with vigour, and it is possible for a tree to be of normal vigour but in poor condition. Condition can be categorised as 'good condition', 'fair condition', 'poor condition' and 'dead'.

4.2.3.1 Good condition

Tree is of good habit, with crown form not severely restricted for space and light, physically free from the adverse effects of predation by pests and diseases, obvious instability, or structural weaknesses, fungal, bacterial or insect infestation and is expected to continue to live in much the same condition as at the time of inspection provided conditions around it for its basic survival do not alter greatly. This may be independent from or contributed to by vigour.

4.2.3.2 Fair condition

Tree is of good habit or misshapen, a form not severely restricted for space and light, has some physical indication of decline due to the early effects of predation by pests and diseases, fungal, bacterial, or insect infestation, or has suffered physical injury to itself that may be contributing to instability or structural weaknesses, or is faltering due to the modification of the environment essential for its basic survival. Such a tree may recover with remedial works where appropriate, or without intervention may stabilise or improve over time, or in response to the implementation of beneficial changes to its local environment. This may be independent from or contributed to by vigour.

4.2.3.3 Poor condition

Tree is of good habit or misshapen, a form that may be severely restricted for space and light, exhibits symptoms of advanced and irreversible decline such as fungal, or bacterial infestation, major die-back in the branch and foliage crown, structural deterioration from insect damage e.g. termite infestation, or storm damage or lightning strike, ring barking from borer activity in the trunk, root damage or instability of the tree, or damage from physical wounding impacts or abrasion, or from altered local environmental conditions and has been unable to adapt to such changes and may decline further to death regardless of remedial works or other modifications to the local environment that would normally be sufficient to provide for its basic survival if in good to fair condition.

Deterioration physically, often characterised by a gradual and continuous reduction in vigour but may be independent of a change in vigour, but characterised by a proportionate increase in susceptibility to, and predation by pests and diseases against which the tree cannot be sustained. Such conditions may also be evident in trees of advanced

senescence due to normal phenological processes, without modifications to the growing environment or physical damage having been inflicted upon the tree. This may be independent from or contributed to by vigour.

4.2.3.4 Dead

Tree is no longer capable of performing any of the following 'processes' or is exhibiting any of the following 'symptoms':

Processes

-Photosynthesis via its foliage crown (as indicated by the presence of moist, green, or other coloured leaves).

-Osmosis (the ability of the root system to take up water).

-Turgidity (the ability of the plant to sustain moisture pressure in its cells).

-Epicormic shoots or epicormic strands in Eucalypts (the production of new shoots as a response to stress, generated from latent or adventitious buds or from a lignotuber).

Symptoms

-Permanent leaf loss.

-Permanent wilting (the loss of turgidity which is marked by desiccation of stems leaves and roots).

-Abscission of the epidermis (bark desiccates and peels off to the beginning of the sapwood).

4.2.4 Periods of time

The life span of a tree in the urban environment may often be reduced by the influences of encroachment and the dynamics of the environment and can be categorized as Immediate, 'short term', 'medium term' and 'long term'. **Short term** A period less than <1 – 15 years. **Medium term** A period 15 – 40 years. **Long term** A period greater than >40 years.

4.2.5 Age

Most trees have a stable biomass for the major proportion of their life. The estimation of the age of a tree is based on the knowledge of the expected lifespan of the taxa in situ divided into three distinct stages of measurable biomass, when the exact age of the tree from its date of cultivation or planting is unknown it can be categorised as: **Young.** Tree aged less than <20% of life expectancy, in situ. **Mature.** Tree aged 20-80% of life expectancy, in situ. **Over-mature.** Tree aged greater than >80% of life expectancy, in situ, or senescent with or without reduced vigour, and declining gradually or rapidly but irreversibly to death.

4.2.6 Estimated life expectancy (ELE)

The ELE is an estimate of the longevity of the subject tree in its landscape context. The ELE is modified where necessary to take into consideration tree health, structural condition, and site suitability based on species, stage of life cycle, health, contribution to the local environment, amenity values, conflicts with adjacent infrastructure and risk to the community. The ELE is also based on the site conditions not significantly being altered. The age class of the assessed tree is also dependent on known species characteristics and longevity in the urban environment and partially aids in the assessment of the ELE. The tree has been allocated one of the following ELE categories:

Long >40 years,
Medium 15-40 years,
Short <1-15 years, and
Dead.

4.2.7 Structural root zone (SRZ)

The SRZ is the area required for tree stability. A larger area is required to maintain a viable tree. The SRZ only needs to be calculated when a major encroachment into a TPZ is proposed. There are many factors that affect the size of the SRZ (e.g., tree height, crown area, soil type, soil moisture). The SRZ may also be influenced by natural or built structures, such as rocks and footings. An indicative SRZ radius can be determined from the trunk diameter measured immediately above the root buttress.

Determining the SRZ:

- SRZ radius = $\mathbf{(D \times 50)^{0.42} \times 0.64}$ where D = trunk diameter, in metres, measured above the root buttress.

NOTE: The SRZ for trees with trunk diameters less than 0.15 m will be 1.5 m.

4.2.8 Tree protection zone (TPZ)

The TPZ as described within AS 4970-2009 Protection of trees on development sites (Australian Standard® 2009) is the principal means of protecting trees on development sites. The TPZ is a combination of the **root area** and **crown area** requiring protection. It is an area isolated from construction disturbance so that the tree remains viable. This result is a setback distance radially from the trunk.

In some cases, it may be possible to encroach into or make variations to the theoretical TPZ. A 'minor encroachment' is less than 10% of the area of the TPZ and is outside the SRZ. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ.
A 'major encroachment' is greater than 10% of the TPZ or inside the SRZ. In this situation the project Arborist must demonstrate that the tree would remain viable. This may require root investigation by non-destructive methods or the use of sensitive construction methods.

Determining the TPZ:

- For single trunked trees the radius of the TPZ is calculated for each tree by multiplying its DBH x 12 (**TPZ = DBH x 12).**
- For multiple trunked trees the radius of the TPZ is calculated using the following formula: **√(DBH1)2+(DBH2)2+(DBH3)2 = total DBH x 12**
- DBH = trunk diameter measured at 1.4 metres above ground. Radius is measured from the centre of the stem at ground level.
- A TPZ should not be less than 2 metres nor greater than 15 metres (except where crown protection is required).
- The TPZ of palms, other monocots, cycads, and tree ferns should not be less than 1 metre outside the crown projection.

4.2.9 Tree AZ Brief Explanation

TreeAZ is a simplistic measure of the potential trees must contribute to amenity, which provides an indication of the benefits they could impart to the future land use. In a planning context, the detail of the future land use is undecided in the early stages and so that potential must be assessed in a way that is independent of the multitude of future land use options. Trees with a high potential to contribute to amenity are likely to be a very important planning consideration and trees with a low potential are likely to be much less important. Assessment of the multiple characteristics that affect the potential of a tree to contribute to amenity is an extremely complex and sophisticated process, which is difficult to explain in lay terms. TreeAZ refines those considerations down to a simplistic categorization that non-tree experts, mainly architects and planners, can understand and use to guide them in designing new developments. The most important information they need to know is which trees they should try to retain, and which ones can go. They do not want to know, or indeed need to know, the detailed background considerations that resulted in the categorizations. The TreeAZ categorization that the planners see is a surface veneer of simplicity, disguising the vast complexity of tree assessment that arborists perform in the background.

Category **'A'** Trees 'A1' 'A2' 'A3' & 'A4', are important trees suitable for retention for more than 10 years and worthy of being a material constraint.
NOTE: Category 'A1' trees that are already large and exceptional or have the potential to become so with minimal maintenance, can be designated as 'AA' trees at the discretion of the assessor. Although all **'A'** and 'AA' trees are sufficiently important to be material constraints, 'AA' trees are at the top of the categorization hierarchy and should be given the most weight in any selection process.
Category 'Z' Trees: Are unimportant trees not worthy of being a material constraint, either through conflicts with infrastructure, poor condition or growing location or being young trees or being environmental weeds.

4.2.10 TreeAZ categories (Version 10.04-ANZ)

CAUTION: TreeAZ assessments must be carried out by a competent person qualified and experienced in arboriculture. The following category descriptions are designed to be a brief field reference and are not intended to be self-explanatory. They must be read in conjunction with the most current explanations published at www.TreeAZ.com.

Category Z: Unimportant trees not worthy of being a material constraint

Local policy exemptions: Trees that are unsuitable for legal protection for local policy reasons including size, proximity and species

Z1	Young or insignificant small trees, i.e., below the local size threshold for legal protection, etc
Z2	Too close to a building, i.e., exempt from legal protection because of proximity, etc
Z3	Species that cannot be protected for other reasons, i.e., scheduled noxious weeds, out of character in a setting of acknowledged importance, etc

High risk of death or failure: Trees that are likely to be removed within 10 years because of acute health issues or severe structural failure

Z4	Dead, dying, diseased or declining
Z5	Severe damage and/or structural defects where a high risk of failure cannot be satisfactorily reduced by reasonable remedial care, i.e., cavities, decay, included bark, wounds, excessive imbalance, overgrown and vulnerable to adverse weather conditions, etc
Z6	Instability, i.e., poor anchorage, increased exposure, etc

Excessive nuisance: Trees that are likely to be removed within 10 years because of unacceptable impact on people

Z7	Excessive, severe and intolerable inconvenience to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e., dominance, debris, interference, etc
Z8	Excessive, severe and intolerable damage to property to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e., severe structural damage to surfacing and buildings, etc

Good management: Trees that are likely to be removed within 10 years through responsible management of the tree population

Z9	Severe damage and/or structural defects where a high risk of failure can be temporarily reduced by reasonable remedial care, i.e., cavities, decay, included bark, wounds, excessive imbalance, vulnerable to adverse weather conditions, etc
Z10	Poor condition or location with a low potential for recovery or improvement, i.e., dominated by adjacent trees or buildings, poor architectural framework, etc
Z11	Removal would benefit better adjacent trees, i.e., relieve physical interference, suppression, etc
Z12	Unacceptably expensive to retain, i.e., severe defects requiring excessive levels of maintenance, etc

NOTE: Z trees with a high risk of death/failure (**Z4**, **Z5** & **Z6**) or causing severe inconvenience (Z7 & Z8) at the time of assessment and need an urgent risk assessment can be designated as **ZZ**. **ZZ** trees are likely to be unsuitable for retention and at the bottom of the categorization hierarchy. In contrast, although **Z** trees are not worthy of influencing new designs, urgent removal is not essential and they could be retained in the short term, if appropriate.

Category A: Important trees suitable for retention for more than 10 years and worthy of being a material constraint

A1	No significant defects and could be retained with minimal remedial care
A2	Minor defects that could be addressed by remedial care and/or work to adjacent trees
A3	Special significance for historical, cultural, commemorative or rarity reasons that would warrant extraordinary efforts to retain for more than 10 years
A4	Trees that may be worthy of legal protection for ecological reasons (Advisory requiring specialist assessment)

NOTE: Category **A1** trees that are already large and exceptional or have the potential to become so with minimal maintenance, can be designated as **AA** at the discretion of the assessor. Although all **A** and **AA** trees are sufficiently important to be material constraints, **AA** trees are at the top of the categorization hierarchy and should be given the most weight in any selection process.

4.3 Development mitigation methodology

Impact	Requirements under AS 4970-2009	Mitigation (design phase)	Mitigation (construction phase)
Low impact (<10%)	*The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ. *Detailed root investigations should not be required.	N/A	*The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ. *Tree protection must be installed.
Medium impact (<20%)	*The project arborist must demonstrate the tree(s) would remain viable. *Root investigation by non-destructive methods may be required. *Consideration of relevant factors including: Root location and distribution, tree species, condition, site constraints and design factors. *The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ.	*The following design changes should be considered to retain trees where practicable, considering the retention value of the tree and the complexity and cost of the change. *Relocate services/pathways outside of tree protection zones *Design services to be installed at a minimum depth of 1200mm below ground to avoid impact to the root zones of trees. *Design pathways to be installed on or above grade, minimising/eliminating excavation within tree protection zones. *Design pathways using porous materials (eco-paving, porous asphalt, decomposed granite) to allow water and oxygen to reach the root zone. *Design pathways using tree sensitive techniques (pier and beam, suspended slabs). *The area lost to encroachment should be compensated for elsewhere, contiguous with the TPZ.	*The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ. *The project arborist would be consulted for any works within the TPZ. *Tree protection must be installed. *Tree sensitive techniques can be used to install services within the TPZ. Horizontal directional drilling (HDD), boring, non-destructive excavation (NDE). *Location and distribution of roots may be determined through non-destructive excavation (NDE) methods such as hydro-vacuum excavation (sucker truck), air spade and manual excavation.
High impact (>20%)	*The project arborist must demonstrate the tree(s) would remain viable. *Root investigation by non-destructive methods may be required. *Consideration of relevant factors including: Root location and distribution, tree species, condition, site constraints and design factors. *The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ.	*Relocate services/pathways outside of tree protection zones *Design services to be installed at a minimum depth of 1200mm below ground to avoid impact to the root zones of trees. *Design pathways to be installed on or above grade, minimising/eliminating excavation within tree protection zones. *Design pathways using porous materials (eco-paving, porous asphalt, decomposed granite) to allow water and oxygen to reach the root zone. *Design pathway using tree sensitive techniques (pier and beam, suspended slabs). *The area lost to encroachment can be compensated for elsewhere, contiguous with the TPZ.	**As above** *Removal of existing hard surfaces should be undertaken manually to avoid root damage. *Tree sensitive techniques can be used to install the services: Horizontal directional drilling (HDD), boring, non-destructive excavation (NDE).

Table 1

5 Observations

5.1 The Trees

5.1.1 Tree 6

Tree 6 is a category 'Z3' *Olea europaea var. Africana* (African Olive) of good health, good vigour, and fair condition with an ELE of 15-40 years, the subject tree is outside the proposed development footprint but within the study area. This species is a scheduled noxious weed and may be removed irrespective of the development. It may, however, provide some habitat and shelter for local fauna.

5.1.2 Tree 7

Tree 7 is a category **'AA'** mature *Eucalyptus maidenii* (Maidens Gum) of good health, good vigour, and good condition with an ELE of 15-40 years, the subject tree is outside the proposed development footprint and is an important tree suitable for retention for more than 10 years and worthy of being a material constraint. This tree is at the top of the categorization hierarchy and should be given the most weight in any selection process. The subject tree form part of the contiguous canopy with trees 5 & 8.

5.1.3 Tree 8

Tree 8 is a category **'AA'** mature *Eucalyptus maidenii* (Maidens Gum) of good health, good vigour, and good condition with an ELE of 15-40 years, the subject tree is an important tree suitable for retention for more than 10 years and worthy of being a material constraint. This tree is at the top of the categorization hierarchy and should be given the most weight in any selection process. The subject tree shares a combined canopy with tree 7 & 9.

5.1.4 Tree 9

Tree 9 is a category **'AA'** mature Eucalyptus maidenii (Maidens Gum) of good health, good vigour, and good condition with an ELE of 15-40 years, the subject tree is an important tree suitable for retention for more than 10 years and worthy of being a material constraint. This tree is at the top of the categorization hierarchy and should be given the most weight in any selection process. The subject tree shares a combined canopy with tree 8 & 10.

5.1.5 Tree 10

Tree 10 is a category **'AA'** mature *Eucalyptus maidenii* (Maidens Gum) of good health, good vigour, and fair condition with an ELE of 15-40 years, the subject tree is an important tree suitable for retention for more than 10 years and worthy of being a material constraint. This tree is at the top of the categorization hierarchy and should be given the most weight in any selection process.
The subject tree shares a combined canopy with tree 9 & 11.

The condition of this tree has been assessed as fair due to a historical wound on the southern side of the trunk. The wound at 1.8m above ground level is an open wound occlusion with a perennial fungal fruiting body consistent with *Phellinus sp.* (**Phellinus robustus**) a white rot causing fungal pathogen. The site of infection was originally tested in September 2013 by Australian Tree Consultants, Hugh Taylor a leading expert in scientific testing using 'Picus Sonic Tomograph'. Results from the test for the level of decay at the wound site and shown in indicated 77% of the test area was sound wood (brown areas), with 9% consisting of altering wood i.e., wood being altered by the fungus (green area) and 14% of the active fungus and decay (pink & blue areas).

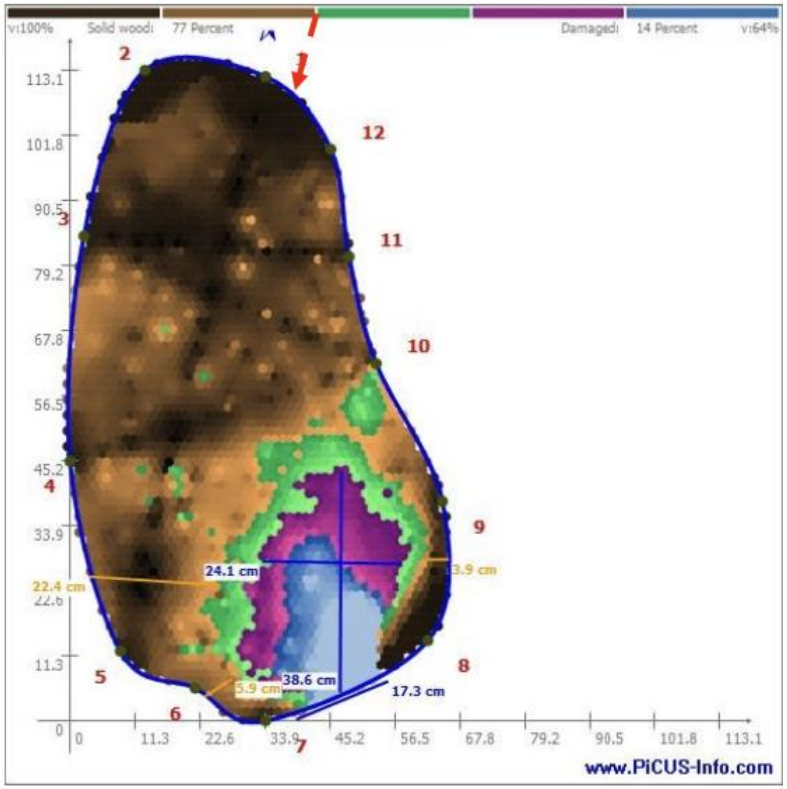

Figure 3 Shows the test Picus test results in September 2013.

The conclusion of the test resulted in the following statement: "'*The Picus results showed that 77% of the test site consisted of sound wood with 9% of altering wood and 14% of fungal activity and decay. The fungal pathogen is progressing through the remaining sound wood predominantly in northerly and westerly directions at a slow rate.*
At the time of testing, it was considered that the structural integrity of the trunk at the test location had not been sufficiently compromised by the active fungal pathogen to warrant the trees removal. Future retention of the tree is recommended with further retesting and monitoring'.

The recommendations from that test were the following:

'*Based on the results of the Picus test alone, at the time of testing the tree was considered to be structurally sound at the test location and can be considered for future retention. Retesting at the same testing location and height is recommended within two (2) years to ascertain the rate of fungal progression through the remaining sound wood.*
As a result of the testing the subject tree was retained.

Retesting of the defect site was conducted in August 2015 again by Australian Tree Consultants, Hugh Taylor. The test results as shown in figure indicated 83% of the test area was sound wood (brown areas), 11% consisted of altering wood i.e., wood being altered by the fungus (green area) and 6% active fungus and decay (pink and blue areas). The active fungal pathogen was progressing through the remaining sound wood at a slow rate, as shown by the amount of altering wood, (green colouration). There was also new incremental wood growth recorded between all sensors.

The test conclusions resulted in the following statement: '*Since the first Picus test was undertaken in 2013 two (2) program and software updates have been undertaken and now we use the newest Version 3 unit to undertake the Picus testing. Some minor adjustments can be expected between results from the old system and programs to the current program P74 Professional Series 3 unit.*
The Picus test in 2016 was undertaken at 2.4 metres above ground level (sensor 1) at the location of a past abrasion wound site. The Picus Tomograph test showed that there is altering wood 11% surrounding a small amount of fungal activity and decay 6% with 83% of sound wood remaining at the site of the test location. In comparison with the test results in 2013 no significant change has occurred with the active decay and sound wood components. The active fungal pathogen is progressing through the sound wood at a slow rate, as shown by the amount of altering wood (green colouration) and has breached the outer trunk between sensors 7 – 8 and a small pocket of decay was detected near sensors 4 – 6.

New incremental wood growth was recorded between all sensors, which is a good indication of sound wood with good levels of nutrient and water uptake which means the tree has good vitality'.

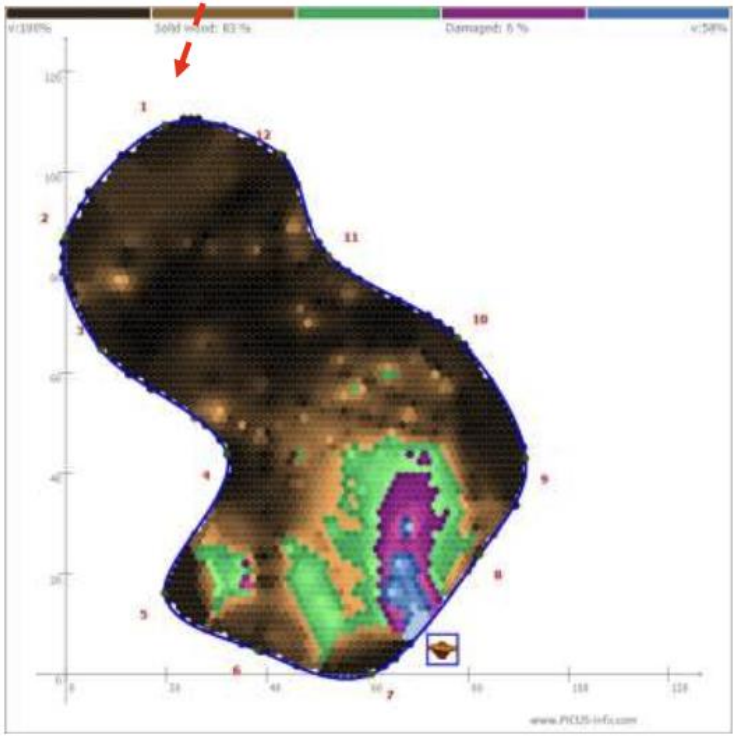

Figure 4 Shows the Picus test in September 2016

The recommendations from the second test were the following:
'*Based on the results of the Picus test as well as an OH&S/WHS assessment of the site at the time of testing the tree was considered to be structurally sound at the test location and is suitable for further retention.*
The management of the tree should be based on this Picus report as well as any other recent and, or current Arboricultural reports or Visual Tree Assessments. Further testing is recommended within the next five (5) years to ascertain the rate of change in the decay / altering and sound wood components of this tree at the testing height. We do not recommend that this tree be drilled for any reason unless to validate the Picus test results. This action may breach the natural barrier zones formed as part of the trees response to the fungus and could aid in expediting its effects.
If any significant change is noted in the condition of the tree a consulting arborist should be notified as soon as possible'.

During Sydney Arbor Trees inspection of tree 10 and the wound site on the 13th of July 2021 it was observed that the perennial fungal fruiting body (Bracket) appears to have expired with no annual release of spores on the underside of the fruiting body. This typically indicated that the fungal fruiting body has utilised the available substrate within the cavity. There were no further fruiting bodies observed within the subject tree.
Results from the VTA indicate that the subject trees vigour has aided in the trees response to the infection with an increased ability of a tree to maintain and sustain its life processes.

5.1.6 Tree 11

Tree 11 is a category **'AA'** mature *Eucalyptus maidenii* (Maidens Gum) of good health, good vigour, and good condition with an ELE of 15-40 years, the subject tree is an important tree suitable for retention for more than 10 years and worthy of being a material constraint. This tree is at the top of the categorization hierarchy and should be given the most weight in any selection process. The subject tree shares a combined canopy with tree 10 & 14.

5.1.7 Tree 12

Tree 12 is a category **'A2'** mature *Banksia integrifolia* (Coast Banksia) of good health, low vigour, and good condition with an ELE of 15-40 years, the subject tree is an important tree suitable for retention for more than 10 years and worthy of being a material constraint. This tree is at the top of the categorization hierarchy and should be given the most weight in any selection process. The subject tree is within proximity to the existing stairs and retaining wall.

5.1.8 Tree 13

Tree 13 is a category **'A2'** mature *Callistemon viminalis* (Weeping Bottle Brush) of good health, good vigour, and good condition with an ELE of 15-40 years, the subject tree is an important tree suitable for retention for more than 10 years and worthy of being a material constraint. This tree is at the top of the categorization hierarchy and should be given the most weight in any selection process. The subject tree is within proximity to the existing stairs and heritage retaining wall.

5.1.9 Tree 14

Tree 14 category **'AA'** mature *Eucalyptus botryiodes* (Bangalay) of good health, good vigour, and good condition with an ELE of 15-40 years, the subject tree is an important tree suitable for retention for more than 10 years and worthy of being a material constraint. This tree is at the top of the categorization hierarchy and should be given the most weight in any selection process. The subject tree is within proximity to the existing stairs and heritage retaining wall and is linked to the stand of Maiden's gums being the southernmost tree. This tree has matured and acclimatised to prevailing southerly winds and is likely to afford the Maidens Gum stand an element of wind protection from the south. However, it is anticipated that the stand of trees further south, construction of the Nutrition Centre, and surrounding structures to the east and south east also provide wind protection.

The Maiden's Gum stand

The stand of Maiden's Gum comprises 8 mature and similar sized trees sharing a common and combined tree canopy. The stand is growing north to south along the highest elevation of the Zoo precinct and can be observed from multiple vantage points from the west and southwest of the Zoo commanding dominance over the ridgeline. There was a 9th Maiden's Gum situated between tree 10 and 11, however, this was removed in 2013 due to a *Phellinus sp*. fungal infection that compromised the structural integrity of the tree. The fungal infection entered the tree through a large wound on the eastern side of the tree trunk. That tree was known as tree 2 of the stand.

The tree stand of Maiden's Gums has been historically encroached through development to their growing environment with significant removal of their TPZ through excavation on the western side of the stand where shotcrete is existing along the embankment to date.

6 IMPACT ASSESSMENT

The impact on trees has been assessed by the extent of disturbance within the Tree Protection Zone (TPZ) and the encroachment of structures within the Structural Root Zone (SRZ), and tree crowns, as outlined within Section 4.2.7 and 4.2.8 & 4.3.

The predominant impacts to the trees will occur due to:

- Demolition of surfaces and structures.
- Pruning required to provide space for construction and adequate building clearance for Levels 2 and 3, and the plant room of the Nutrition Centre.
- Construction of upright piers for Pods 1 and 2.
- Construction of pathways.
- Landscaping.
- Associated enabling works.

These impacts are summarised in Table 2 and elaborated upon in Table 3.

6.1 Table of Scheduled Trees

Impact	Reason	Important Trees		Unimportant Trees
		AA	A1/A2/A3	Z
Trees to be Removed due to Major Encroachment.	Tree within the proposed footprint of the development.	11, 14	12, 13	
Trees to be removed due to major pruning and crown encroachment	Volume of pruning will render trees predisposed to failure. Pruning will disfigure the crown. Trees are unlikely to survive the volume of pruning required.	9, 10		
Retained trees within the development site that have potential to be impacted from the development.	Site disturbance, demolition, and construction	7, 8		6

Table 2

Tree #	Species	Retention Value	Proposed Works	Potential Impacts	Possible Mitigation Measures	Recommendation
6	*Olea europaea var. Africana* (African Olive)	'Z'	• No proposed works within the TPZ.	No direct impact expected.	None required	**Retain. Tree protection to be in accordance with Tree Protection Plan – To be completed following detailed design stage**
7	*Eucalyptus maidenii* (Maidens Gum)	**'AA'**	• Possible installation of new landscaping	Damage to roots via heavy machinery movement	Landscaping impacts will need to be minimised with non-destructive excavation (NDE) and exclusion of heavy construction activities within the TPZ.	
8	*Eucalyptus maidenii* (Maidens Gum)		• Demolition of some existing surfaces • Demolition of the existing store shed • Construction of the first level, second level, third level and plant room of the nutrition centre • Installation of new landscaping • Minor pruning of the crown may be required for Level 2 and the plant room	It is expected that the existing ground conditions including the sandstone bedrock, shotcrete and existing concrete slab the storage shed is located on have impeded root growth into the footprint of the existing storage shed. Therefore, no significant impact to the roots of this tree are expected. Some minor pruning may be required to facilitate construction of the upper levels of the building. Provided this is under 10% of the entire crown volume and is in accordance with AS4373-2007 Pruning of amenity trees, no significant impact to this tree is expected.	Landscaping impacts will need to be minimised with non-destructive excavation (NDE) and exclusion of heavy construction activities within the TPZ. Pruning is to be in accordance with AS4373-2007 *Pruning of amenity trees*	
9	*Eucalyptus maidenii* (Maidens Gum)		• Demolition of some existing surfaces • Demolition of the existing store shed • Construction of the first level, second level, third level and plant room of the nutrition centre • Construction of pod 1 and pod 2 • Installation of new landscaping – including imported fill • Stormwater drainage works	It is expected that the existing ground conditions including the sandstone bedrock, shotcrete and existing concrete slab the storage shed is located on have impeded root growth into the footprint of the storage shed. Isolated piers will need to be constructed within the TPZ and outside the SRZ within the shotcrete embankment. Fill required for landscaping works and the stormwater line is to be over the existing concrete substrate with no excavation required. Based on the isolated pier encroachment into the TPZ, and current ground conditions, a major TPZ encroachment is not expected. However, it is anticipated this tree will require pruning of up to 30-50% of the entire crown volume and result in the removal of major scaffold branches (**Error! Reference source not found.**). Additionally, the crown dynamics and wind loading are expected to change due to the building's construction. Due to the volume and location of pruning required to facilitate the building, this tree is not viable for retention.	N/A – Trees to be removed	**Remove and replace**
10	*Eucalyptus maidenii* (Maidens Gum)		• Demolition of some existing surfaces • Demolition of the existing store shed • Construction of the first level, second level, third level and plant room of the nutrition centre • Construction of pod 1 and pod 2 • Installation of new landscaping – including imported fill • Stormwater drainage works			
11	*Eucalyptus maidenii* (Maidens Gum)		• Demolition of some existing surfaces • Demolition of the existing store shed • Construction of the first level, second level, third level and plant room of the nutrition centre • Construction of pod 1 and pod 2 • Installation of new landscaping – including imported fill	It is expected that the existing ground conditions including the sandstone bedrock, shotcrete and existing concrete slab the storage shed is located on have impeded root growth into the footprint of the storage shed. Isolated piers will need to be constructed within the TPZ and outside the SRZ within the shotcrete embankment. Fill required for landscaping works and the stormwater line is to be over the existing concrete substrate with no excavation required in the embankment area.	N/A – Trees to be removed	**Remove and replace**

Tree #	Species	Retention Value	Proposed Works	Potential Impacts	Possible Mitigation Measures	Recommendation
				The proposed link pathway will also bisect the TPZ and SRZ. This is expected to require strip footings within the SRZ which is likely to destabilise the tree. Additionally, it is anticipated this tree may require pruning of up to 10-30% of the entire crown volume. Further, the crown dynamics and wind loading may change due to the building's construction. Due to the cumulative impacts, this tree is not viable for retention.	N/A – Trees to be removed	**Remove and replace**
12	*Banksia integrifolia* (Coast Banksia)	**'A2'**	• Demolition of some existing surfaces • Construction of the first level, second level & third of the nutrition centre • Construction of a new ramp and stairs • Installation of new landscaping	This tree will be subject to a major TPZ encroachment that extends into the SRZ due to the proposed stairs and pathways. It is unlikely the built environment has significantly influenced root growth. This tree is therefore not viable for retention.		
13	*Callistemon viminalis* (Weeping Bottle Brush)	**'A2'**	• Demolition of existing surfaces • Construction of a new ramp and stairs • Installation of new landscaping	This tree will be subject to a major TPZ encroachment that extends into the SRZ due to the proposed stairs. It is also expected this tree will require substantial pruning. This tree is therefore not viable for retention.		
14	*Eucalyptus botryoides* (Bangalay)	**'AA'**	• Demolition of existing surfaces • Construction of the first level, second level & third of the nutrition centre • Construction of a new ramp and stairs • Installation of new landscaping	This tree will be subject to a major TPZ encroachment of 65-70% which extends into the SRZ for the proposed ramp and stairs. The heritage wall is expected to have influenced root growth to the south. However, additional impacts are expected due to strip footings for the proposed pathways to the east, south and west. Pruning is required to allow construction of raised pathway and pedestrian egress. Due to the significant TPZ/SRZ encroachment, this tree is not viable for retention.		

Table 3: Detailed impact assessment

Figure 5 Shows the shotcrete embankment below tree 10.

Figure 6 Shows the existing rock shelf.

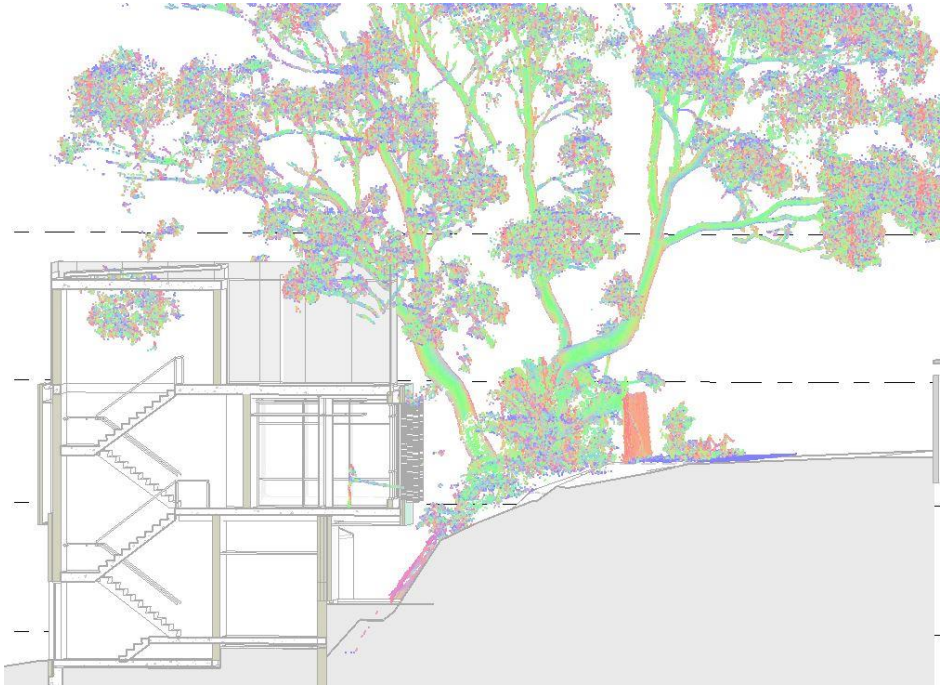

Figure 7 Shows tree 9 and point cloud assessment of branches conflicting with proposed Nutrition Centre

Figure 10 Shows tree 9 and point cloud assessment of branches conflicting with proposed Nutrition Centre

6.2 Point Cloud Survey Analysis

A point cloud survey analysis was conducted to confirm the conflicts of the proposed Nutrition Centre with trees 9, 10, 11 and 14 (Figures 9-10). Based on this detailed assessment, it has been definitely confirmed these trees are not viable for retention given the size, location, type and volume of pruning required to facilitate the proposal.

7 RECOMMENDATIONS

7.1 Tree removals

7.1.1 Category 'A' trees

If executed under the current design:
The project requires the removal of four (4) category **'AA'** trees: **9, 10, 11 and 14**.
The project requires the removal of two (2) category **'A2'** trees: **12, 13.**

7.2 Tree retention

Category **'AA'** trees 7 and 8 are proposed to be retained.
Category **'Z'** tree 6 is proposed to be retained.

7.3 Tree protection - Site-Specific Tree Protection Strategy

In order to successfully retain trees that have been identified for retention the Site-Specific Tree Protection Strategy requires development and implementation through effective administrative procedures to ensure protective measures remain in place throughout the development. The Site-Specific Tree Protection Strategy can be specifically referred to in the planning conditions.

7.4 Off-set planting

Based on provided plans, the loss of 6 site trees is to be offset with 22 trees. The proposed species and projected final growth dimensions are not known.

Offset plantings should include indigenous tree species of the Mosman area. A list of Mosman indigenous low water use species is within Appendix 4. The new trees should have the potential to reach a significant height without excessive inconvenience and be sustainable into the long term, significantly improving the potential of the site to contribute to local amenity and character.

7.5 Exploratory Root Investigation

Where trees are intended to be retained and potential works areas may enter the TPZ or SRZ, determining root location and therefore the impact to the trees is an important process.

Exploratory root excavation should be undertaken in a manner that causes the least amount of damage to root material in the process. This may include use of air excavation (air-spade) or hydro or dry-vac excavation. Root investigations should be undertaken at pre-agreed locations that will most effectively guide the final design and construction management plan.

Findings of the root investigation should be compiled into a report which identifies significant roots that should be retained and less significant roots that may be appropriate for severance. The size and volume of roots which may be cut needs to be assessed by an arborist and consider tree physiology, existing site and soil conditions and species traits and tolerance of root pruning.

8 STATEMENT OF LIMITATIONS

8.1 This Assessment report was undertaken by an Arborist with AQF level V (Diploma of Arboriculture) qualification. Mathew Phillips is a registered user of the Quantified Tree Risk Assessment ® (QTRA) methodology. Only registered licence holders having received training and regular updates from Quantified Tree Risk Assessment Limited are permitted to use the QTRA system.

8.2 It is important to note that the QTRA risk assessment does Not evaluate risk exposure during unexpected, unusual, unpredictable, severe, or unseasonal weather, weather at the extremes of the historical distribution. The risk assessment provided is valid for 12 months only.

8.3 This assessment was based on a comprehensive site inspection, observations made at the time of the inspection and information provided by the client and their employees. All conclusions reached, or tree works recommended, do not imply that the tree will withstand adverse natural conditions such as environmental influences, soil failure and erosion, severe storms, works carried out or near it, land development and mechanical impact, miss-management or maintenance or changes in the growing environment, may impact the validity of the conclusions.

8.4 Any written or verbal submission, statements taken from the results, discussions, conclusions, or recommendations made herein, may only be used where the whole of the original report is referenced in, and directly attached to that submission, report, or presentation.

8.5 All care has been taken to obtain all information from reliable sources. All data collected has been verified insofar as practically possible: however, the author can neither guarantee nor be responsible for the accuracy of information provided by others. Information contained herein, covers only those trees that were surveyed, examined, and scheduled and reflects the condition of those trees at the time of inspection.

8.6 This report is Not a warranty or guarantee, expressed or implied, that problems or deficiencies of the subject trees may not arise in the future, but a professional opinion of the status and condition of the tree. Whilst all care has been taken to prepare this report, the author takes no responsibility for the continued vitality of the tree mentioned or for any damage that it may cause in the future.

If you have any questions regarding this report or require any further information, please contact me on the details below.

Regards,

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10 APPENDICES

10.1 APPENDIX 1: Tree Schedule

TREE SCHEDULE																		
NOTE: COLOUR ANNOTATION IS			AA & A trees with Green				Z & ZZ Trees with blue text					Trees to be removed in red text						
Tree No.	Arbor Plan No.	Genus Species (Common Name)	Height (m)	Canopy Spread				1st Branch Height (m)	Diameter (m)		SRZ	TPZ	Age Class (STARS)	Health (VTA)	Vigour	Condition	E.L.E	Tree AZ Category	Arborist Notes
				N	E	S	W		@1.4m	Base									
6		Olea europaea var Africana (African Olive)	8	2	2	2	2	0.3	0.3	0.3	2.0	**3.6**	MATURE	GOOD	GOOD	FAIR	15>40	Z3 Species that cannot be protected for other reasons, i.e. scheduled noxious weeds, out of character in a setting of acknowledged importance, etc	Crown modified for browse.
7		Eucalyptus maidenii (Maidens Gum)	17	6	10	5	10	12.5	0.98	0.9	3.2	**11.8**	MATURE	GOOD	GOOD	GOOD	15>40	AA Trees are at the top of the categorization hierarchy and should be given the most weight in any selection process.	Lowest branch over roof to west 12.5m above ground level.
8		Eucalyptus maidenii (Maidens Gum)	15	6	12	3	12	12.5	0.85	0.8	3.0	**10.2**	MATURE	GOOD	GOOD	GOOD	15>40	AA Trees are at the top of the categorization hierarchy and should be given the most weight in any selection process.	Suppressed by tree 7 and 9. Lowest limb over roof 12.5m above ground level.
9		Eucalyptus maidenii (Maidens Gum)	17	12	12	5	12	12.5	2.16	1.5	3.9	**15.0**	MATURE	GOOD	GOOD	GOOD	15>40	AA Trees are at the top of the categorization hierarchy and should be given the most weight in any selection process.	Lowest branch over roof to west 12.5m above ground level.
10		Eucalyptus maidenii (Maidens Gum)	17	6	13	10	12	7.2	1.21	1.2	3.6	**14.5**	MATURE	GOOD	GOOD	FAIR	15>40	AA Trees are at the top of the categorization hierarchy and should be given the most weight in any selection process.	Requires 'picus' at defect, fungal bracket 1.8m in central trunk.
11		Eucalyptus maidenii (Maidens Gum)	15	8	8	9	11	10	1.13	0.9	3.2	**13.6**	MATURE	GOOD	GOOD	GOOD	15>40	AA Trees are at the top of the categorization hierarchy and should be given the most weight in any selection process.	1m from shot Crete
12		Banksia integrifolia (Coast Banksia)	7	2	2	5	3	0.3	0.5	0.5	2.5	**6.0**	MATURE	GOOD	LOW	GOOD	15>40	A2 Minor defects that could be addressed by remedial care and/or work to adjacent trees	Large primary extends south over retaining wall and stairs.
13		Callistemon viminalis (Weeping Bottlebrush)	5	1	0.5	1	3	1	0.25	0.25	1.8	**3.0**	MATURE	GOOD	GOOD	GOOD	15>40	A2 Minor defects that could be addressed by remedial care and/or work to adjacent trees	Suppressed leaning west.
14		Eucalyptus botryoides (Bangalay)	12	7	10	5	6	0.25	0.6	0.6	2.7	**7.2**	MATURE	GOOD	GOOD	GOOD	15>40	A2 Minor defects that could be addressed by remedial care and/or work to adjacent trees	Deadwood 100mm

Table 4

10.2 APPENDIX 2: Site & Tree Survey

PLAN SHOWING TREES PROTECTION ZONE AT
Taronga Conservation Society Australia Taronga Zoo
BEING LAND AT MOSMAN IN THE LGA OF MOSMAN

SHEET 1 OF 2

Clause 12 and Clause 70 of the Surveying and Spatial Regulation 2017

COORDINATE SCHEDULE					
MARK	MGA COORDINATES		AHD71	CLASS	METHOD
	EASTING	NORTHING			
SS 20465	337317.386	6253988.491	79.809	2A	SCIMS
SS 20466	337475.280	6254083.679	76.845	D	SCIMS

DATE OF SCIMS COORDINATES: 02.06.2021 MGA ZONE: 56 MGA DATUM: GDA94
COMBINED SCALE FACTOR: 0.999910

SHEETS LAYOUT

1
2

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GREENWICH NSW 2065
Email:info@mason.net.au TEL:02 9929 6233
Red. Ratio 1:400 Date 23.08.21 Ref. 33498-09

10.3 APPENDIX 3: Tree location plan

NOTES:	Category A Tree TPZ Category Z tree TPZ Tree to be removed - dashed line SRZ Tree number (T12)	**TREE LOCATION PLAN - TPZ/SRZ**	**CLIENT NAME** TARONGA ZOO **PROJECT NAME** NUTRITION CENTRE	**CANOPY CONSULTING** **PO BOX 902** **FIVE DOCK NSW 2046**	**VERSION** B **DATE** 20/12/2021	canopy consulting

10.4 APPENDIX 4: List of indigenous/low water use species

List of indigenous/low water use species

MOSMAN CITY COUNCIL

		Soil Type					Landscape Use			Plant Characteristics				
Botanical Name	**Common Name**	Sandstone	Clay	Riparian	Coastal & estuarine	Tertiary Alluvium	Shade tolerant	Screening	Bird attracting	Showy flowers	Interesting fruit/seed pods	Rare/uncommon	Height - metres	Width - metres
Trees														
Allocasuarina littoralis	Black She Oak	*	*			*		*	*		*		4-6	3
Angophora costata	Smooth Barked Apple	*							*	*			8-20	5-10
Banksia serrata	Old Man Banksia	*							*	*	*		4-16	2-5
Corymbia gummifera	Red Bloodwood	*												
Eucalyptus botryoides	Bangalay,Southern Mahogany	*		*					*				10-20	6-8
Eucalyptus piperita	Sydney Peppermint	*							*				15-25	8-12
Eucalyptyus haemastoma	Scribbly Gum	*							*	*			4-12	4-8
Ficus rubiginosa	Port Jackson Fig, Rusty Fig	*		*			*		*		*		5-15	5-15
Glochidion ferdinandi	Cheese Tree	*		*			*				*		5-10	4-8
Tristaniopsis laurina	Water Gum	*		*			*	*		*			3-10	3-5
Shrubs														
Allocasuarina distyla		*						*	*		*		2-3	2-3
Banksia ericifolia	Heath Leaved Banksia	*							*	*	*		2-3	2.5
Dillwynia floribunda	Parrot Pea	*		*						*			0.5	0.4
Epacris microphylla	Coral Heath	*								*			0.5	0.3
Kunzea ambigua	Tick Bush	*											2-4	2
Leptospermum laevigatum	Coastal Tea-tree				*			*		*			5-8	1-2
Leucopogon microphyllus		*							*	*	*		0.8-1	0.2-0.3
Pimelia linifolia	Rice Flower	*								*			1	1
Pittosporum revolutum	Rough Fruit Pittosporum	*					*			*	*		1-2	1.5
Rulingia hermanniifolia	Wrinkled Kerrawang	*										*	0.2-0.3	0.2
Ground Covers / Scramblers														
Centella asiatica		*	*				*						0.1	x
Dichondra repens	Kidney Weed	*	*			*	*						0.1	x
Hardenbergia violacea	False Sardaparilla	*	*	*						*				
Pratia purpurascens		*	*	*		*	*						0.1	x
Viola hederacea	Native Violet	*	*		*		*						0.1	x
Ferns														
Adiantum aethiopicum	Madenhair Fern	*	*	*			*						0.3	x
Gleichenia rupestris	Coral Fern	*					*						0.1	
Grasses / Tufted Plants														
Juncus usitatus	Common Rush	*	*	*	*	*							0.6	0.5
Lomandra longifolia	Spiny Mat Rush	*	*	*	*		*						1	1.5
Themeda australis	Kangaroo Grass	*	*	*	*								0.5	0.5