EARTHSCAPE HORTICULTURAL SERVICES
Arboricultural, Horticultural and Landscape Consultants

ABN 36 082 126 027

ARBORICULTURAL IMPACT ASSESSMENT REPORT

PROPOSED NEW DWELLING

91 LAUDERDALE AVENUE, FAIRLIGHT

July 2020

Prepared for: Liz Skerrett
36 Quinton Road
MANLY NSW 2095

Ph:- 0411 202 391

Prepared by: Andrew Morton
Dip. (Arboriculture) [AQF Level 5]
B. App. Sci. (Horticulture)
A. Dip. App. Sci. (Landscape)

EARTHSCAPE HORTICULTURAL SERVICES
Ph: - 0402 947 296

Member of Arboriculture Australia
Member International Society of Arboriculture - Australian Chapter (ISAAC)
Member Local Government Tree Resources Association (LGTRA)

TABLE OF CONTENTS

1 INTRODUCTION

1.1.1 This report was commissioned by Liz and Peter Skerrett to assess the health and condition of thirteen (13) trees located within or immediately adjacent to 91 Lauderdale Avenue, Fairlight. The report has been prepared to aid in the assessment of a Development Application (DA) for the demolition of the existing dwelling and construction of a new dwelling within the property.

1.1.2 The purpose of this report is to assess the potential impact of the proposed development on the subject trees, together with recommendations for amendments to the design or construction methodology where necessary to minimise any adverse impact. The report also provides recommended tree protection measures to ensure the long-term preservation of the trees to be retained where appropriate.

1.1.1 This report has been prepared in accordance with Northern Beaches Council's guidelines for preparation of Arborists Reports as outlined in the former Manly Council's *Tree Management Strategy* (October 2011), Schedule 4 of the *Manly Development Control Plan* 2013 (MDCP) and Sections 2.3.2 -2.3.5 of the *Australian Standard for Protection of Trees on Development Sites* (AS 4970:2009).

2 THE SITE

2.1.1 The subject property is a residential allotment known as Lot 1 in DP 975012, being 91 Lauderdale Avenue, Fairlight. For the purposes of this report, the subject allotment will be referred to as 'the site'. The total area of the site is approximately 483 m². The site is zoned Environmental Living [E4] under the *Manly Local Environmental Plan 2013* (MLEP). The site adjoins a Public Reserve (West Esplanade Park) on the southern boundary. The site contains an existing single-storey dwelling located centrally within the lot, together with a detached shed near the north-western corner and an inground swimming pool near the south-east corner of the site. The site has a steep southerly gradient divided into a number of level terrace areas with a high rock retaining wall along the northern boundary. The site contains dilapidated gardens with a number of mature trees. These include a variety of locally-indigenous, non-local native and exotic (introduced) species.

2.1.2 The soils of this area are typical of the Hawkesbury Soil Landscape Group (as classified in the *Soil Landscapes of the Sydney 1:100,000 Sheet*), consisting of shallow (less than 500 mm) discontinuous *Lithosols* and *Siliceous Sands* associated with rock outcrop; *Earthy Sands, Yellow Earths and some Yellow Podzolic soils* occur on inside of benches and along joints and fractures. Localised *Yellow and Red Podzolic soils* also occur in association with shale lenses. Soil materials are derived from Hawkesbury Sandstone. [1] The landscape of this area consists of rolling to very steep hills with slope gradients varying from 25-70%. Rock outcrop occurs as horizontal benches and broken scarps up to 10 metres, with boulders and cobble covering up to 50% of the ground surface.

2.1.3 The original vegetation of this area consisted of open forest and woodland typical of Hawkesbury Sandstone areas, most of which has now been cleared for urban development.[2] The dominant locally-indigenous tree species occurring in this area include *Angophora costata* (Sydney Red Gum), *Corymbia gummifera* (Red Bloodwood) and *Eucalyptus piperita* (Sydney Peppermint). Other species occurring in this vegetation community may include *Eucalyptus globoidea* (White Stringybark), *Eucalyptus haemastoma* (Scribbly Gum), *Eucalyptus botryoides* (Bangalay), *Elaeocarpus reticulatus* (Blueberry Ash), *Ceratopetalum gummiferum* (NSW Christmas Bush), *Allocasuarina littoralis* (Black She-Oak), *Pittosporum undulatum* (Sweet Pittosporum) and *Banksia serrata* (Old Man Banksia). *Glochidion ferdinandi* (Cheese Tree) and *Ficus rubiginosa* (Port Jackson Fig) may also be found on sheltered sites on lower slopes.

3 SUBJECT TREES

3.1.1 The subject trees were inspected by Earthscape Horticultural Services (EHS) on the 16th December 2019. Each tree has been provided with an identification number for reference purposes denoted on the attached Tree Location Plan (**Appendix 5**), based on the survey prepared by Lockley Land Title Solutions, Dwg. Ref No. 50499-002DT dated 28/05/2019. The numbers used on this plan correlate with the Tree Assessment Schedule (**Appendix 3**). Tree No. T6 was not shown on the original survey and has been plotted on the drawing in its approximate position.

4 HEALTH AND CONDITION ASSESSMENT

4.1 Methodology

4.1.1 An assessment of each tree was made using the Visual Tree Assessment (VTA) procedure.[3] All of the trees were assessed in view from the ground. No aerial inspection or diagnostic testing has been undertaken as part of this assessment.

4.1.2 The following information was collected for each tree:-

- **Tree Species** (Botanical & Common Name);
- **Approximate height**;
- **Canopy spread** (measured using laser distance measurer in four directions and an average taken);
- **Trunk diameter** (measured with a diameter tape at 1.4 metres from ground level);
- **Live Crown Size** (measured by subtracting the total height of the tree from the lowest point of the crown and multiplying by the average crown spread to give a value in square metres);
- **Health & vigour** (using foliage size, colour, extension growth, presence of disease or pest infestation, canopy density, presence of deadwood, dieback and epicormic growth as indicators),
- **Condition** (using visible evidence of structural defects, instability, evidence of previous pruning and physical damage as indicators); and
- **Suitability** of the tree to the site and its existing location (in consideration of damage or potential damage to services or structures, available space for future development and nuisance issues).

4.1.3 This information is presented in a tabulated form in **Appendix 3**.

4.2 Safe Useful Life Expectancy (SULE)

4.2.1 The remaining Safe Useful Life Expectancy[4] of the tree is an estimate of the sustainability of the tree in the landscape, calculated based on an estimate of the average age of the species in an urban area, less its estimated current age. The life expectancy of the tree has been further modified where necessary in consideration of its current health and vigour, condition and suitability to the site. The estimated SULE of each tree is shown in **Appendix 3.**

4.2.2 The following ranges have been allocated to each tree:-

- Greater than 40 years (Long)
- Between 15 and 40 years (Medium)
- Between 5 and 15 years (Short)
- Less than 5 years (Transient)
- Dead or immediately hazardous (defective or unstable)

4.2.3 SULE ratings are intended to provide a general overview of the long-term sustainability of the trees within the site in consideration of these factors. The allocated ranges are not intended to be absolute. This information is useful in guiding future planning by highlighting the probable

lifespan of individual trees, for which a clear pattern may emerge. This information may be helpful in forecasting likely tree senescence and planning for replacement planting to ensure continuity in tree canopy across the site. It should be noted that SULEs *may* be extended or reduced depending on the way trees are managed. Intervention and remedial works may extend the SULE of some trees.

5 LANDSCAPE SIGNIFICANCE

5.1 Methodology for Determining Landscape Significance

5.1.1 The significance of a tree in the landscape is a combination of its environmental, heritage and amenity values. Whilst these values may be fairly subjective and difficult to assess consistently, some measure is necessary to assist in determining the retention value of each tree. To ensure a consistent approach, the assessment criteria shown in **Appendix 1** have been used in this assessment.

5.1.2 A rating has been applied to each tree to give an understanding of the relative significance of each tree in the landscape and to assist in determining priorities for retention, in accordance with the following categories:-

1. **Significant**
2. **Very High**
3. **High**
4. **Moderate**
5. **Low**
6. **Very Low**
7. **Insignificant**

5.2 Environmental Significance

5.2.1 Tree Management Controls

Prescribed trees within the Northern Beaches Local Government Area (formerly Manly LGA) are protected under Part 3, Section 3.3.2.1 of the *Manly Development Control Plan* (MDCP) (Amendment 11) made pursuant to Clause 9 of the *State Environmental Planning Policy (Vegetation in Non-rural Areas) 2017* (SEPP VNRA). The MDCP generally protects all trees with a height of five (5) metres or greater and all threatened species, constituents of Endangered Ecological Communities (EECs) and their habitat and any tree that is within a Heritage Conservation Area or within a site listed as a Heritage Item. Some exemptions apply. The following trees are exempt (not protected) under the provisions of the MDCP 2013:-

Tree No.	Species	Exemption
T2	*Acer negundo* (Box Elder)	Environmental Weed Species
T6 & T12	*Ficus benjamina* (Weeping Fig)	Exempt species
T1, T5, T8, T9, T10 & T11	*Syagrus romanzoffianum* (Cocos Palm)	Nuisance species
T4	*Bougainvillea sp* (Bougainvillea)	Not technically a tree (vine)
T7	*Jacaranda mimosifolia* (Jacaranda)	Exempt species
T3	*Archontophoenix cunninghamii* (Bangalow Palm)	Exempt species

The remainder of the trees are protected under the MDCP 2013.

5.2.2 Wildlife Habitat

Glochidion ferdinandi (Cheese Tree) [T13] is a locally-indigenous species, representative of the original vegetation of the area and would be of benefit to native wildlife. However, none of the trees contain cavities that would be suitable as nesting hollows for arboreal mammals or birds. There were no other visible signs of wildlife habitation.

5.2.3 Noxious Plants & Environmental Weeds

None of the subject trees are scheduled as a potential 'Biosecurity Risk' ('Priority Weed' – formerly 'Noxious Weed') within NSW under the provisions of the *Biosecurity Act 2015.*

5.2.4 Threatened Species & Ecological Communities

None of the subject trees are listed as Threatened or Vulnerable Species or form part of Endangered Ecological Communities (EECs) under the provisions of the *Biodiversity Conservation Act 2016* (NSW) or the *Environment Protection and Biodiversity Conservation Act 1999.*

5.2.5 Biodiversity, Bushfire & Riparian Lands

The southern portion of the site is shown as containing any areas of biodiversity significance, as indicated on Council's *Terrestrial Biodiversity Map* forming part of the MLEP 2013. It should be noted that this area does *not* contain and remnant vegetation and therefore the reason for the listing is unclear.

The site does *not* contain any Bushfire Prone areas as indicated on the Manly Bush Fire Prone Land Map 2010. Note that this site is *not* located within a designated 10/50 vegetation clearing entitlement area.

5.3 Heritage Significance

5.3.1 Heritage Items

The site is *not* listed as an item of Environmental Heritage under Schedule 5, Part 1 of the *Manly Local Environmental Plan 2013* (MLEP).

The adjoining Public Reserve (West Esplanade Park) is listed as an item of Environmental Heritage [Landscape Item 49] under Schedule 5, Part 1 of the MLEP 2013. This item is described as Esplanade Park and Fairlight Pool, being part of Manly's foreshore open space system and containing part of the North Harbour Walkway.

5.3.2 Heritage Conservation Area

The site is *not* located within a Heritage Conservation Area under Schedule 5, Part 2 of the MLEP 2013.

5.3.3 Significant Tree Register

Northern Beaches Council does *not* currently maintain a Register of Significant Trees other than those specifically listed as Heritage Items in the MLEP.

5.3.4 General

None of the subject trees have any known or suspected heritage significance.

5.4 Amenity Value

5.4.1 Criteria for the assessment of amenity values are incorporated into **Appendix 1**. The amenity value of a tree is a measure of its live crown size, visual appearance (form, habit, crown density), visibility and position in the landscape and contribution to the visual character of an area. Generally the larger and more prominently located the tree, and the better its form and habit, the higher its amenity value

5.4.2 Note that the site is located within a Foreshore Scenic Protection Area as indicated on Council's Foreshore Scenic Protection Area Map forming part of the MLEP 2013.

6 TREE RETENTION VALUES

6.1.1 The Retention Values shown in **Appendix 3** and **Appendix 5** have been determined on the basis of the estimated longevity of the trees and their landscape significance rating, in accordance with **Table 1**. Together with guidelines contained in **Section 7** (Tree Protection Zones) this information should be used to determine the most appropriate position of building footprints and other infrastructure within the site, with due consideration to other site constraints, to minimise the impact on trees considered worthy of preservation.

TABLE 1 – TREE RETENTION VALUES – ASSESSMENT METHODOLOGY

	Landscape Significance Rating						
Estimated Life Expectancy	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Long - Greater than 40 Years	High Retention Value						
Medium- 15 to 40 Years			Moderate Retention Value				
Short - 5 to 15 years				Low Ret. Value			
Transient - Less than 5 Years				Very Low Retention Value			
Dead or Potentially Hazardous							

6.1.2 The following table describes the implications of the retention values on site layout and design.

TABLE 2 – TREE RETENTION PRIORITES.

RETENTION VALUE	**RECOMMENDED ACTION**
"High"	These trees considered worthy of preservation; as such careful consideration should be given to their retention as a priority. Proposed site design and placement of buildings and infrastructure should consider the recommended setbacks as discussed in the following section (refer also **Appendix 2**) to avoid any adverse impact on these trees. In addition to Tree Protection Zones, the extent of the canopy (canopy drip-line) should also be considered, particularly in relation to high rise developments. Significant pruning of the trees to accommodate the building envelope or temporary scaffolding is generally not acceptable.
"Moderate"	The retention of these trees is desirable, but not essential. These trees should be retained as part of any proposed development if possible. However, these trees are considered less critical for retention. If these trees must be removed, replacement planting should be considered in accordance with Council's Tree Replenishment Policy to compensate for loss of amenity (refer also **Section 9**).
"Low"	These trees are not considered to worthy of any special measures to ensure their preservation, due to current health, condition or suitability. They do not have any special ecological, heritage or amenity value, or these values are substantially diminished due to their SULE. These trees should not be considered as a constraint to the future development of the site.

"Very Low"	These trees are considered potentially hazardous or very poor specimens, or may be environmental or noxious weeds. The removal of these trees is therefore recommended regardless of the implications of any proposed development.

7 TREE PROTECTION ZONES

7.1.1 The Tree Protection Zone (TPZ) is a radial distance measured from the centre of the trunk of the tree as specified in **Appendix 4**. These have been calculated in accordance with AS 4970-2009 (Protection of Trees on Development Sites).[5]

7.1.2 The intention of the TPZ is to ensure protection of the root system and canopy from the potential damage from construction works and ensure the long-term health and stability of each tree to be retained. Incursions to the root zone may occur due to excavations, changes in ground levels, (either lowering or raising the grade), trenching or other forms or soil disturbance such as ripping, grading or inverting the soil profile. Such works may cause damage or loss of part of the root system, leading to an adverse impact on the tree.

7.2 Structural Root Zone (SRZ)

7.2.1 The Structural Root Zone (SRZ) provides the bulk of mechanical support and anchorage for a tree. This is also a radial distance measured from the centre of the trunk as specified in **Appendix 4**. The SRZ has been calculated in accordance with AS 4970-2009 (Protection of Trees on Development Sites).

7.2.2 Incursions within the SRZ are not recommended as they are likely to result in the severance of woody roots which may compromise the stability of the tree or lead to its decline and demise.

7.3 Acceptable Encroachments to the Tree Protection Zone.

7.3.1 Where encroachment to the TPZ is unavoidable, an incursion to the TPZ of not exceeding 10% of the area of the TPZ and outside the SRZ may be acceptable. Examples of acceptable incursions are shown in **Appendix 2**. Greater incursions to the TPZ may result in an adverse impact on the tree.

7.3.2 Where incursions greater than 10% of the TPZ are unavoidable, exploratory excavation using non-destructive methods may be required to evaluate the extent of the root system affected and determine whether or not the tree can remain viable

7.4 Acceptable Encroachments to the Canopy

7.4.1 The removal of a small portion of the crown (foliage and branches) is generally tolerable provided that the extent of pruning required is less than 10% of the total foliage volume of the tree and the removal of branches does not create large wounds or disfigure the natural form and habit of the tree. All pruning cuts must be undertaken in accordance with AS 4373:2007. This generally involves reduction of the affected branches back to the nearest branch collar at the junction with the parent branch, rather than at an intermediate point. The latter is referred to as "lopping" and is no longer an acceptable arboricultural practice. Generally speaking, the minimum pruning as required to accommodate any proposed works is desirable. Extensive pruning can result in a detrimental impact on tree health and may lead to exposure of remaining branches to wind forces that they were previously sheltered from, leading to a greater risk of branch failure.

7.4.2 Clearance to between the building line and canopy should take into account any projecting structures, such as balconies, awnings and the roofline and any requirement for temporary scaffolding to be erected during construction (typically 1-1.5 metres wide). High structures should

preferably be located outside the canopy dripline (as shown indicatively on the attached plans) in order to avoid or minimise canopy pruning.

7.5 Protection under Council's Controls

7.5.1 Notwithstanding the above recommendations, Council may require a greater setback from certain types of structures to ensure the on-going protection of the tree (i.e. its protection status under Council's Tree Management Controls). In the Northern Beaches Local Government Area (LGA), a tree located within two (2) metres of the foundation of an approved building (excluding decks, patios, sheds pergolas and the like, even where they are attached to the building) is *not* protected under the MDCP. The measurement is taken from the trunk of the tree at ground level to the foundation wall of the building. As such, if a tree is considered worthy of preservation, Council is unlikely to approve the construction of a dwelling or building within two (2) metres of the tree (regardless of whether this can be undertaken without having an adverse impact on its health or longevity).

8 PROPOSED DEVELOPMENT

8.1.1 The proposed development includes the demolition of the existing dwelling and ancillary structures and construction of a new dwelling within the property, together with associated landscape works. The existing in-ground swimming pool will be retained and refurbished.

9 IMPACT ASSESSMENT

9.1.1 The intention of this assessment is to determine the incursions to the root zones and canopies created by the proposed development and evaluate the likely impact of the proposed works on the subject trees. Details shown on the following plans were used in this assessment:-

Title	Author	Dwg No.	Date
Landscape Plans	Sue Barnsley Design	LD01 & LD02 [A]	19.06.2020
Landscape Sections	Sue Barnsley Design	LD03 & LD04 [A]	19.06.2020

9.1.2 A summary of the impact of the proposed development on each tree within the site is shown in **Appendix 5**. The following criteria have been examined as part of this assessment:-

- Existing Relative Levels (R.L.);
- Tree Protection Zone (TPZ);
- Structural Root Zone (SRZ);
- Footprint and envelope of the proposed development and temporary structures (scaffolding, hoardings etc);
- Incursions to the TPZ & SRZ, including estimated cut & fill beyond the building footprint;
- Incursions to the tree canopy from the building envelope and temporary structures; and
- Assessment of the likely impact of the works on existing trees.

9.1.3 The proposed development will necessitate the removal of ten (10) trees of low and very low retention value. These include Tree No.s T1, T8, T9 & T10 (Cocos Palm), T2 (Box Elder), T4 (Bougainvillea), T6 & T12 (Weeping Fig), T7 (Jacaranda) & T13 (Cheese Tree). None of these trees are considered significant or worthy of special measures to ensure their preservation. The removal of these trees to accommodate the proposed development is therefore considered warranted in this instance. It should be noted that with exception of T13, all of these trees are exempt from Council's Tree Management Controls.

9.1.4 The proposed development will also necessitate the removal of one (1) tree of moderate retention value, being T3 (Bangalow Palm). This tree is not considered significant, but is in good health and condition and makes a fair contribution to the amenity of the site and surrounding properties. In order to compensate for loss of amenity resulting from the removal of this tree to accommodate the proposed development, consideration should be given to replacement planting with a new tree elsewhere within the site in accordance with **Section 11**.

9.1.5 Proposed new pavements and stairs are located within the TPZ of T5 and T11 (Cocos Palms). In the case of T11, the proposed works are located beyond an existing retaining wall that would form a barrier to the root growth of this tree. As such, the proposed works will not result in any actual incursion to the root zone and therefore there will be no adverse impact on this tree. In the case of T5, the proposed new works will result in some encroachment to the root zone, which may lead to an adverse impact on this tree. Note that both of these trees are exempt from Council's Tree Management Controls, therefore no special tree protection measures are required to be implemented. In order to minimise any adverse impact on these trees, existing pavements and structures within the TPZs should be demolished in accordance with **Section 10.7** and all excavations for the footings of new structures and buildings within the TPZs should be undertaken in accordance with **Section 10.8**.

9.1.6 No other trees will be adversely affected by the proposed development.

10 RECOMMENDED TREE PROTECTION MEASURES

10.1 Tree Protection Plan

10.1.1 The following Tree Protection Measures should be read in accordance with the Tree Protection Plan (**Appendix 6**). The Tree Protection Plan (TPP) indicates the position of tree protection devices and other recommended measures to ensure the protection of trees within the site to be retained as part of the proposed development.

10.2 Prohibited Activities

10.2.1 The following activities should be avoided within specified Tree Protection Zones (refer **Appendix 4 & 6** for extent of the TPZ for each tree):-

- Excavations and trenching (with exception of the approved remediation works, underground services, building foundations or pavement sub-grade);
- Soil disturbance, surface grading, compaction, tyning, ripping or cultivation of soil;
- Mechanical removal of vegetation, including extraction of tree stumps;
- Soil level changes including the placement of fill material (excluding imported validated fill for remediation works or placement of fill for approved works)
- Movement and storage of plant, equipment & vehicles (except within defined temporary haul roads, where ground protection has been installed, or within the footprint of existing floor slabs or paved areas);
- Erection of site sheds (except where approved by the site arborist);
- Affixing of signage, barricades or hoardings to trees;
- Storage of building materials, waste and waste receptacles;
- Stockpiling of spoil or fill;
- Stockpiling of bulk materials, such as soil, sand, gravel, roadbase or the like;
- Stockpiling of demolition waste;
- Disposal of waste materials and chemicals including paint, solvents, cement slurry, fuel, oil and other toxic liquids;
- Other physical damage to the trunk or root system; and
- Any other activity likely to cause damage to the tree.

10.3 Tree Damage

10.3.1 Care shall be taken when operating cranes, drilling rigs and similar equipment near trees to avoid damage to tree canopies (foliage and branches). Under no circumstances shall branches be torn-off by construction equipment. Where there is potential conflict between tree canopy and construction activities, the advice of the Site Arborist must be sought.

10.3.2 In the event of any tree becoming damaged for any reason during the construction period a consulting arborist [Australian Qualification Framework Level 5] shall be engaged to inspect and provide advice on any remedial action to minimise any adverse impact. Such remedial action shall be implemented as soon as practicable and certified by the arborist.

10.4 Tree Removal

10.4.1 The removal of Trees [**T1, T, 2, T3, T4, T6, T7, T8, T9, T10, T12 & T13**] shall be carried out by an experienced tree surgeon in accordance with the NSW WorkCover Code of Practice for the Amenity Tree Industry (1998). Care shall be taken to avoid damage to other trees during the felling operation.

10.4.2 Stumps located within the TPZs of trees to be retained shall be grubbed-out where required using a mechanical stump grinder (or by hand where less than 150mm in diameter) without damage to the root system of other trees. Where trees to be removed are within the SRZ of any trees to be retained, consideration should be given to cutting the stump close to ground level and retaining the root crown intact. Stumps within the Tree Protection Zone of other trees to be retained shall **not** be pulled out using excavation equipment or similar.

10.5 Trunk Protection

10.5.1 Trunk protection boarding shall be erected around Trees [**T5 & T11**] to avoid accidental damage, as indicated on the Tree Protection Plan (**Appendix 6**). The trunk protection shall consist of a layer of carpet underfelt (or similar) wrapped around the trunk, followed by 1.8 metre lengths of softwood timbers (90 x 45mm in section) aligned vertically and spaced evenly around the trunk at 150mm centres (i.e. with a 50mm gap) and secured together with 2mm galvanised wire or galvanised hoop strap as shown in **Figure 3**. Recycled timber (such as demolition waste) may be suitable for this purpose, subject to the approval of the Project Arborist. The timbers shall be wrapped around the trunk (over the carpet underfelt), but not fixed to the tree to avoid mechanical injury or damage to the trunk. Trunk protection should be installed prior to any site works and maintained in good condition for the duration of the construction period. Carpet underfelt (alone) is sufficient for trees with a trunk diameter of less than 200mm. This shall be wrapped around the trunk in a double layer and held in place with heavy-duty fibre reinforced adhesive tape (e.g. Gaffer Tape).

Figure 3 – Detail of Trunk Protection

10.6 Ground Protection

10.6.1 Construction haul routes shall be confined to existing paved areas wherever possible. Where this is not feasible and construction haul routes or access for plant and equipment must traverse soft landscape areas within TPZs of [**any tree nominated for retention**], 20mm thick marine ply sheets or truck mats (such as Envirex Versadeck® access mats) (refer **Figure 4** shall be placed over the top of the ground surface to minimise compaction and disturbance of the underlying soil profile and root zone.

Figure 4 – Showing typical detail for truck mats.

10.6.2 Ground protection shall be installed prior to any site works and maintained in good condition for the duration of the construction period. On completion of the works, ground protection shall be removed without damage or disturbance to the underlying soil profile.

10.7 Demolition Works within Tree Protection Zones

10.7.1 Demolition of paved areas within the Tree Protection Zones (TPZs) of trees [**T5 & T11**] shall be undertaken under the supervision of a qualified Arborist [Australian Qualification Framework (AQF) Level 5].

10.7.1 Concrete pavements shall be demolished by breaking the slab into manageable sections (using a rock hammer or similar) and asphalt pavements shall be removed by breaking the topcoat into manageable pieces. The broken sections shall be carefully lifted and folded over the remaining paved surface to minimise disturbance and compaction of the underlying soil profile. Special care shall be taken where underlying woody roots have lifted or displaced the pavement. Any plant or equipment used in demolition work shall operate within the footprint of existing paved areas and avoid traversing soft landscape areas. Where this is unavoidable, suitable ground protection shall first be installed in accordance with **Section 10.6**.

10.7.2 The pavement sub-base within the TPZ shall be gradually removed (where required) in layers of no greater than 50mm thick using a small rubber tracked excavator or alternative approved method to avoid excessive disturbance and compaction of the underlying soil profile and damage to underlying roots and minimise. The machine shall work within the footprint of the existing path footprint to avoid compaction of the underlying soil. The final layer of sub-base material shall be removed using hand tools were required to avoid compaction of the underlying soil profile and avoid damage to any underlying woody roots.

10.7.3 Demolition of existing walls, kerbs and other structures within the TPZ of trees [**T5 & T11**] shall be undertaken under the supervision of a qualified Arborist [AQF level 5]. The structures shall be demolished using equipment on stationed outside the TPZ where possible or within the footprint of existing hardstand areas.

10.7.4 Care shall be taken to avoid the root systems, trunks and lower branches of trees in the vicinity of the structures during demolition works, with special attention required during demolition of the footings and other sub-surface members to avoid damage to woody roots. An observer ('spotter') shall be employed to assist the plant operator in order to detect and avoid damage to underlying woody roots during demolition. Trunk and/or branch protection shall be installed where there is a potential risk of damage to trees in proximity or overhead of the work.

10.8 Excavations within Tree Protection Zones

10.8.1 Prior to any mechanical excavations for building foundations or pavement sub-grade within the TPZs of Trees [**T5 & T11**] exploratory excavation using non-destructive techniques shall be taken along the perimeter of the structure or pavement within the TPZ. Non-destructive excavation techniques may include the use of hand-held implements, air pressure (using an Air-spade® device) or water pressure (hydro-excavation in combination with a vacuum extraction unit). The exploratory excavation shall be undertaken along the perimeter of the foundation or pavement (within the TPZ) to the depth of the foundation or to a maximum of 800mm from surface levels, to locate and expose any woody roots prior to any mechanical excavation.

10.8.2 All care shall be undertaken to preserve woody roots intact and undamaged during exploratory excavation. Any roots encountered of less than 40mm in diameter may be cleanly severed with clean sharp pruning implements at the face of the excavation. The root zone in the vicinity of the excavation shall be kept moist following excavation for the duration of construction to minimise moisture stress on the tree. Where large woody roots (greater than 40mm diameter) are encountered during exploratory excavations, further advice from a qualified arborist shall be sought prior to severance.

10.9 Alternative Construction Methods

10.9.1 Where necessary, (to avoid severing large woody roots) consideration should be given to the installation of an elevated structure (e.g. pier and beam footing, suspended slab or floor supported on piers, cantilevered slab, up-turned edge beam etc) in preference to structures requiring a deep edge beam or continuous perimeter strip footing. The beam section of any pier and beam footing should be placed **above** grade to avoid excavation within the SRZ. Pier footings intersecting large woody roots should be slightly offset where necessary to avoid root severance.

10.9.2 For masonry walls or fences it may be acceptable to delete continuous concrete strip footings and replace with suspended in-fill panels (e.g. steel or timber pickets, lattice etc) fixed to pillars. For paved areas, consideration should be given to raising the proposed pavement level and using a porous fill material in preference to excavation where large woody roots are found within the sub-base.

10.10 Underground Services

10.10.1 All proposed stormwater lines and other underground services should be located outside TPZs of trees proposed to be retained wherever possible or installed by alternative measures. Alternative measures include suspending pipelines beneath the floor of a building or structure (to avoid excavation with the TPZ), non-destructive excavation methods or Horizontal Directional Drilling (HDD). Where the installation of service lines within TPZs is unavoidable, the pipelines or conduits should be installed as follows.

10.10.2 Trenching for underground services and stormwater pipes within the TPZs of Trees [**any tree nominated for retention**], shall be undertaken using non-destructive excavation in accordance with **Section 10.6**. Where large woody roots are encountered during excavation or trenching (root diameter greater than 40mm), these shall be retained intact wherever possible (e.g. by tunnelling beneath roots and inserting the pipeline or conduit beneath or re-routing the service etc). Where this is not practical and root pruning is the only alternative, proposed root pruning should be assessed by a qualified arborist [AQF 5] to evaluate the potential impact on the health and stability of the subject tree.

10.10.3 Installation of underground services and stormwater pipes within the SRZs of Trees [**any tree nominated for retention**], shall only be undertaken by Horizontal Directional Drilling (HDD) (also referred to as sub-surface boring or Micro-tunnelling for large diameter pipes). The Invert Level of the pipe, plus the pipe diameter, must be lower than the estimated root zone depth as specified. At this site a minimum depth of 1 metre to the invert level of the pipe is specified.

10.11 Root Pruning

10.11.1 Where root pruning of [**any tree nominated for retention**] is required to facilitate construction, roots shall be severed with clean, sharp pruning implements and retained in a moist condition during the construction phase using Hessian material or mulch where practical. Severed roots shall be treated with a suitable root growth hormone containing the active constituents Indol-3-yl-Butric Acid (IBA) and 1-Naphthylacetic Acid (NAA) to stimulate rapid regeneration of the root system.

10.11.2 Any required root pruning shall be carried out in accordance with Australian Standard 4373-2007 – *Pruning of Amenity Trees* by a qualified and experienced arborist or tree surgeon [Australian Qualification Framework Level 3] in accordance with the NSW WorkCover Code of Practice for the Amenity Tree Industry (1998). No roots of greater than 40mm in diameter should be removed or pruned without further advice from a Consulting Arborist [Australian Qualification Framework Level 5].

11 REPLACEMENT PLANTING

11.1.1 In order to compensate for loss of amenity resulting from the removal of trees to accommodate the proposed development, a minimum number of two (2) new trees capable of attaining a height of at least ten (10) metres at maturity should be planted within the allotment.

11.1.2 Replacement trees should preferably include some locally indigenous species. These will be most appropriate to the site conditions and be most valuable in terms of preserving the landscape character and wildlife habitat of the area. The following species are appropriate to the site conditions and could be considered for replacement planting:-

- *Ficus rubiginosa* (Port Jackson Fig)
- *Syzygium paniculatum* (Magenta Cherry)
- *Acmena smithii* (Lillypilly)
- *Elaeocarpus reticulatus* (Blueberry Ash)
- *Syzygium leuhmannii* (Small leaf Lillypilly)
- *Glochidion ferdinandi* (Cheese Tree)
- *Angophora costata* (Sydney Red Gum)

Andrew Morton
EARTHSCAPE HORTICULTURAL SERVICES
14th July 2020

REFERENCES

[1] GA Chapman & CL Murphy (1989)
Soil Landscapes of the Sydney 1:100,000 Sheet
Soil Conservation Service of NSW. Sydney

[2] Benson, Doug & Howell, Jocelyn (1990)
Taken for Granted: the Bushland of Sydney and its Suburbs.
Kangaroo Press & The Royal Botanic Gardens, Sydney, NSW

[3] Mattheck, Dr. Claus & Breloer, Helge (1994) – Sixth Edition (2001)
The Body Language of Trees – A Handbook for Failure Analysis
The Stationery Office, London, England

[4] Barrell, Jeremy (1996)
Pre-development Tree Assessment
Proceedings of the International Conference on Trees and Building Sites (Chicago)
International Society of arboriculture, Illinois, USA

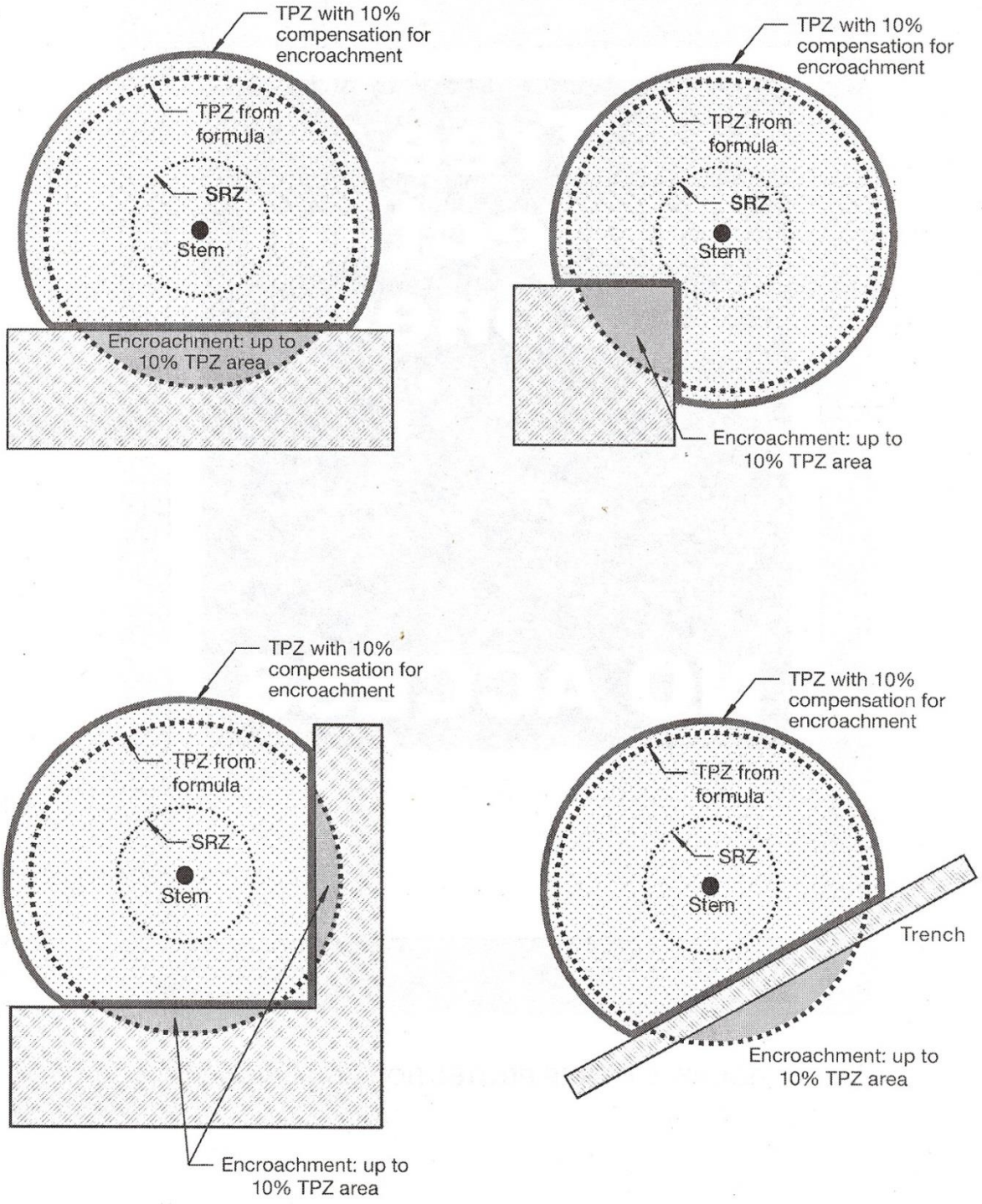
[5] Council of Standards Australia (August 2009)
AS 4970 – 2009 – Protection of Trees on Development Sites
Standards Australia, Sydney

APPENDIX 1 - CRITERIA FOR ASSESSMENT OF LANDSCAPE SIGNIFICANCE

RATING	HERITAGE VALUE	ECOLOGICAL VALUE	AMENITY VALUE
1. SIGNIFICANT	The subject tree is listed as a Heritage Item under the Local Environment Plan (LEP) with a local, state or national level of significance or is listed on Council's Significant Tree Register	The subject tree is scheduled as a Threatened or Vulnerable Species as defined under the provisions of the *Biodiversity Conservation Act 2016* (NSW) or the *Environment Protection and Biodiversity Conservation Act 1999*.	The subject tree has a very large live crown size exceeding 300m² with normal to dense foliage cover, is located in a visually prominent position in the landscape, exhibits very good form and habit typical of the species
	The subject tree forms part of the curtilage of a Heritage Item (building /structure /artefact as defined under the LEP) and has a known or documented association with that item	The tree is a locally indigenous species, representative of the original vegetation of the area and is known as an important food, shelter or nesting tree for endangered or threatened fauna species	The subject tree makes a significant contribution to the amenity and visual character of the area by creating a sense of place or creating a sense of identity
	The subject tree is a Commemorative Planting having been planted by an important historical person (s) or to commemorate an important historical event	The subject tree is a Remnant Tree, being a tree in existence prior to development of the area	The tree is visually prominent in view from surrounding areas, being a landmark or visible from a considerable distance.
2. VERY HIGH	The tree has a strong historical association with a heritage item (building/structure/artefact/garden etc) within or adjacent the property and/or exemplifies a particular era or style of landscape design associated with the original development of the site.	The tree is a locally-indigenous species, representative of the original vegetation of the area and is a dominant or associated canopy species of an Endangered Ecological Community (EEC) formerly occurring in the area occupied by the site.	The subject tree has a very large live crown size exceeding 200m²; a crown density exceeding 70% (normal-dense), is a very good representative of the species in terms of its form and branching habit or is aesthetically distinctive and makes a positive contribution to the visual character and the amenity of the area
3. HIGH	The tree has a suspected historical association with a heritage item or landscape supported by anecdotal or visual evidence	The tree is a locally-indigenous species and representative of the original vegetation of the area and the tree is located within a defined Vegetation Link / Wildlife Corridor or has known wildlife habitat value	The subject tree has a large live crown size exceeding 100m²; The tree is a good representative of the species in terms of its form and branching habit with minor deviations from normal (e.g. crown distortion/suppression) with a crown density of at least 70% (normal); The subject tree is visible from the street and surrounding properties and makes a positive contribution to the visual character and the amenity of the area
4. MODERATE	The tree has no known or suspected historical association, but does not detract or diminish the value of the item and is sympathetic to the original era of planting.	The subject tree is a non-local native or exotic species that is protected under the provisions of the local or state planning controls (Development Control Plan etc).	The subject tree has a medium live crown size exceeding 40m²; the tree is a fair representative of the species, exhibiting moderate deviations from typical form (distortion/suppression etc) with a crown density of more than 50% (thinning to normal); and
			The tree is visible from surrounding properties, but is not visually prominent – view may be partially obscured by other vegetation or built forms. The tree makes a fair contribution to the visual character and amenity of the area.
5. LOW	The subject tree detracts from heritage values or diminishes the value of a heritage item	The subject tree is scheduled as exempt (not protected) under the provisions of the local or state planning controls (DCP etc) due to its species, nuisance or position relative to buildings or other structures.	The subject tree has a small live crown size of less than 40m² and can be replaced within the short term (5-10 years) with new tree planting
6. VERY LOW	The subject tree is causing significant damage to a heritage Item.	The subject tree is listed as an Environment Weed Species in the relevant Local Government Area, being invasive, or is a known nuisance species.	The subject tree is not visible from surrounding properties (visibility obscured) and makes a negligible contribution or has a negative impact on the amenity and visual character of the area. The tree is a poor representative of the species, showing significant deviations from the typical form and branching habit with a crown density of less than 50% (sparse).
7. INSIGNIFICANT	The tree is completely dead and has no known heritage value (or any habitat value)	The tree is scheduled as a potential 'Biosecurity Risk' ('Priority Weed' – formerly 'Noxious Weed') within NSW or within the relevant Local Government Area under the provisions of the *Biosecurity Act 2015*	The tree is completely dead and represents a potential hazard.

Ref:- Morton, A (2006) **Determining the Retention Value of Trees on Development Sites**
TreeNet - Proceedings of the 7th National Street Tree Symposium 2006 Government of South Australia Department for Transport, Energy and Infrastructure

APPENDIX 2 – ACCEPTABLE INCURSIONS TO THE TREE PROTECTION ZONE (TPZ)



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

REF:- Council of Standards Australia (August 2009)
AS 4970 – 2009 – Protection of Trees on Development Sites
Standards Australia, Sydney

APPENDIX 3 - TREE HEALTH AND CONDITION ASSESSMENT SCHEDULE

Tree Identification No.	Species	Height (m)	Spread (m)	Trunk Diameter (mm)	Live Crown Size (m^2)	Maturity Class	Condition	Previous Pruning	Health		Remaining Safe Useful Life Expectancy (SULE)	Landscape Significance Rating	Retention Value	Location
									Vigour	Pest & Disease				
1	***Syagrus romanzoffianum*** (Cocos Palm)	12	5	210	20	M	Appears stable with sound branching structure. Root plate confined to narrow garden bed.	No Evidence	Good	No Evidence	Medium 15-40 Years	6	**Low**	On-site
2	***Acer negundo*** (Box Elder)	11	12	341	84	M	Appears stable with fair branching structure. Root plate confined to narrow garden bed. Exibits a prominent lean to the east.	Previously lopped at 4-5 metres (crown restored).	Good	No Evidence	Medium 15-40 Years	6	**Low**	On-site
3	***Archontophoenix cunninghamii*** (Bangalow Palm)	13	5	217	15	M	Appears stable with sound branching structure. Located close (<0.5 metres) to existing retaining wall (1.1 metres in height)	No Evidence	Good	No Evidence	Long - more than 40 years	5	**Moderate**	On-site
4	***Bougainvillea sp*** (Bougainvillea)	5	8	100x4	40	M	Appears stable with poor branching structure.	Previously lopped at 2-3 metres (crown restored).	Fair	No Evidence	Short 5-15 Years	6	**Very Low**	On-site
5	***Syagrus romanzoffianum*** (Cocos Palm)	13	5	350	15	M	Appears stable with fair branching structure. Exhibits a slight lean to the west. Located close (<0.5 metres) to existing retaining wall (2+ metres in height).	No Evidence	Good	No Evidence	Short 5-15 Years	6	**Very Low**	On-site
6	***Ficus benjamina*** (Weeping Fig)	6	3	120 + 100	12	I	Unstable with poor branching structure. Growing through former plant container into underlying pavement. 100% epicormic sprouts emanating from old pruning wounds with high bark inclusion at 1 metre.	Previously lopped at 3 metres (crown restored). Crown lifted to 3 metres.	Very Good	No Evidence	Transient (less than 5 years)	6	**Very Low**	On-site
7	***Jacaranda mimosifolia*** (Jacaranda)	8	9	420	36	OM	Appears stable with poor branching structure. Located within raised planter. Exhibits a large wound with decay in PL at 2.5 metres due previous branch loss. Crown suppressed on east side due to previous pruning.	Previously lopped at 3-4 metres (crown restored). Selectively pruned over boundary and roofline.	Fair with slightly thinning crown	No Evidence	Short 5-15 Years	6	**Very Low**	On-site
8	***Syagrus romanzoffianum*** (Cocos Palm)	9	5	270	10	M	Appears stable with sound branching structure. Located close (<1.0 metre) to existing retaining wall and pool. Confined root zone.	No Evidence	Good	No Evidence	Medium 15-40 Years	6	**Low**	On-site
9	***Syagrus romanzoffianum*** (Cocos Palm)	7	4	250	8	SM	Appears stable with sound branching structure. Located close (<1.0 metre) to existing pool. Confined root zone.	No Evidence	Fair	No Evidence	Short 5-15 Years	6	**Very Low**	On-site

APPENDIX 3 - TREE HEALTH AND CONDITION ASSESSMENT SCHEDULE

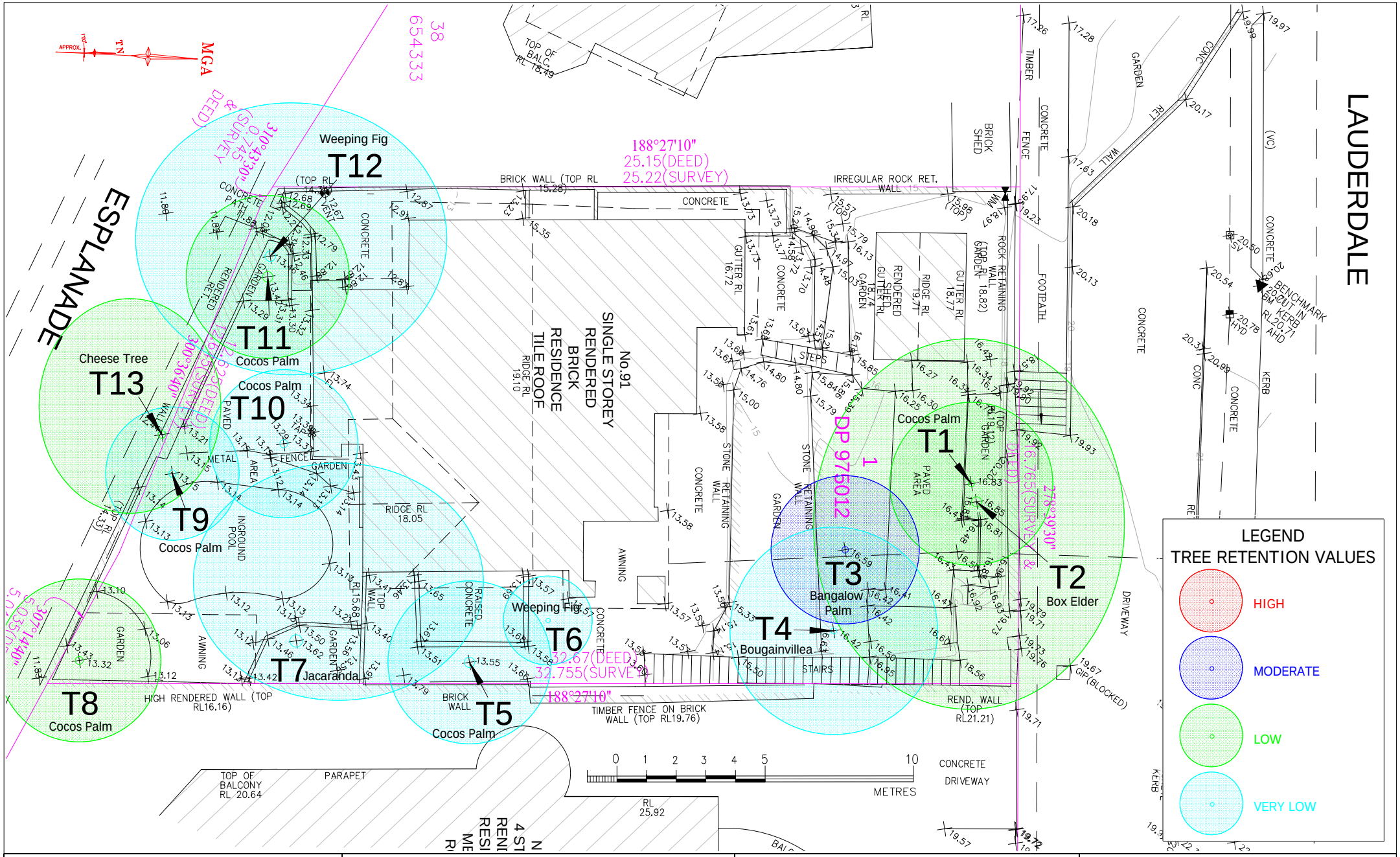
Tree Identification No.	Species	Height (m)	Spread (m)	Trunk Diameter (mm)	Live Crown Size (m^2)	Maturity Class	Condition	Previous Pruning	Health		Remaining Safe Useful Life Expectancy (SULE)	Landscape Significance Rating	Retention Value	Location
									Vigour	Pest & Disease				
10	***Syagrus romanzoffianum*** (Cocos Palm)	9	5	270	15	M	Appears stable with sound branching structure.	No Evidence	Good	No Evidence	Short 5-15 Years	6	**Very Low**	On-site
11	***Syagrus romanzoffianum*** (Cocos Palm)	13	5	300	25	M	Appears stable with sound branching structure. Located close (<0.5 metres) to existing masonry wall.	No Evidence	Very Good	No Evidence	Medium 15-40 Years	6	**Low**	On-site
12	***Ficus benjamina*** (Weeping Fig)	9	10	350	60	SM	Appears stable with fair branching structure. Located close (<0.5 metres) to existing masonry wall. Aerial roots growing through cracks in wall. Exhibits multiple co-dominant PLs (x3) at 2 metres with included bark.	No Evidence	Very Good	No Evidence	Short 5-15 Years	6	**Very Low**	On-site
13	***Glochidion ferdinandi*** (Cheese Tree)	6	6	261	24	M	Stability suspect with poor branching structure. Growing in very narrow planter immediately adjacent masonry wall/fence. Exhibits a severe bark inclusion at 2 metres at junction of co-dominant PLs.	No Evidence	Good	No Evidence	Short 5-15 Years	4	**Low**	On-site

APPENDIX 4 - IMPACT ASSESSMENT SCHEDULE

Tree Identification No.	Species	Construction Tolerance	Tree Protection Zone (m R)	Structural Root Zone (m R)	TPZ (m^2)	Incursions To Root Zone &/or Canopy	Likely Impact	Recommendation
1	***Syagrus romanzoffianum*** (Cocos Palm)	G	3.5	1.7	38.5	Located within footprint of proposed patio/entry paved area and associated pergola.	Proposed works will necessitate removal.	Remove tree.
2	***Acer negundo*** (Box Elder)	M	6.0	2.1	113.0	Located within footprint of proposed patio/entry paved area and associated pergola.	Proposed works will necessitate removal.	Remove tree.
3	***Archontophoenix cunninghamii*** (Bangalow Palm)	G	3.0	1.7	28.3	Located within footprint of proposed dwelling.	Proposed works will necessitate removal.	Undertake replacement planting with a new tree elsewhere within the site to compensate for loss of amenity in accordance Section 11.
4	***Bougainvillea sp*** (Bougainvillea)	M	4.0	1.7	50.2	Located within footprint of proposed pathway.	Proposed works will necessitate removal.	Remove tree.
5	***Syagrus romanzoffianum*** (Cocos Palm)	G	4.2	2.1	55.5	Proposed dwelling (lower ground floor) offset 3 metres north-west at RL13.70 (close to existing grade, within footprint of existing dwelling and paved area). First floor roofline offset 0.5 metres west. Proposed paved area offset 2.1 metres west (within footprint of existing concrete pavement). Proposed stairs offset 0.7 metres north at RL 13.65 (close to existing grade). Excavations for stair footings within TPZ.	Excavations for stair footings may result in some root loss/root severance, leading to an adverse impact. Minimal clearance to roofline/gutter.	To be retained - no special tree protection measures required.
6	***Ficus benjamina*** (Weeping Fig)	M	2.0	1.6	13.1	Located within footprint of proposed dwelling.	Proposed works will necessitate removal.	Remove tree.

APPENDIX 4 - IMPACT ASSESSMENT SCHEDULE

Tree Identification No.	Species	Construction Tolerance	Tree Protection Zone (m R)	Structural Root Zone (m R)	TPZ (m^2)	Incursions To Root Zone &/or Canopy	Likely Impact	Recommendation
7	***Jacaranda mimosifolia*** (Jacaranda)	M	5.0	2.3	79.8	Surrounding raised garden and associated retaining walls to be demolished within SRZ/TPZ. Proposed dwelling roof offset 1.3 metres west and 2.7 metres north. Substantial canopy pruning required to clear building envelope and temporary scaffolding.	Proposed works will necessitate removal.	Remove tree.
8	***Syagrus romanzoffianum*** (Cocos Palm)	G	3.2	1.9	33.0	Located within footprint of proposed new landscape works.	Proposed works will necessitate removal.	Remove tree.
9	***Syagrus romanzoffianum*** (Cocos Palm)	G	3.0	1.8	28.3	Located within footprint of proposed new landscape works. Located within 300mm of existing pool coping.	Proposed works will necessitate removal.	Remove tree.
10	***Syagrus romanzoffianum*** (Cocos Palm)	G	3.2	1.9	33.0	Located within footprint of proposed new landscape works.	Proposed works will necessitate removal.	Remove tree.
11	***Syagrus romanzoffianum*** (Cocos Palm)	G	3.5	2.0	38.5	Located within footprint of proposed new landscape works. Proposed new stairway offset 1.1 metres west (within footprint of existing retaining wall). No actual incursion to root zone.	No adverse impact.	To be retained - no special tree protection measures required.
12	***Ficus benjamina*** (Weeping Fig)	M	5.0	2.1	78.5	Existing low retaining wall offset 0.5 metres west to be demolished within SRZ (roots growing through wall). Proposed new stairway offset 0.4 metres west Excavations for new stairs and associated retaining wall within SRZ.	Proposed works will necessitate removal.	Remove tree.
13	***Glochidion ferdinandi*** (Cheese Tree)	M	4.0	1.9	50.2	No proposed works within TPZ.	Proposed to be removed - growing out of existing masonry retaining wall/fence.	Remove tree.



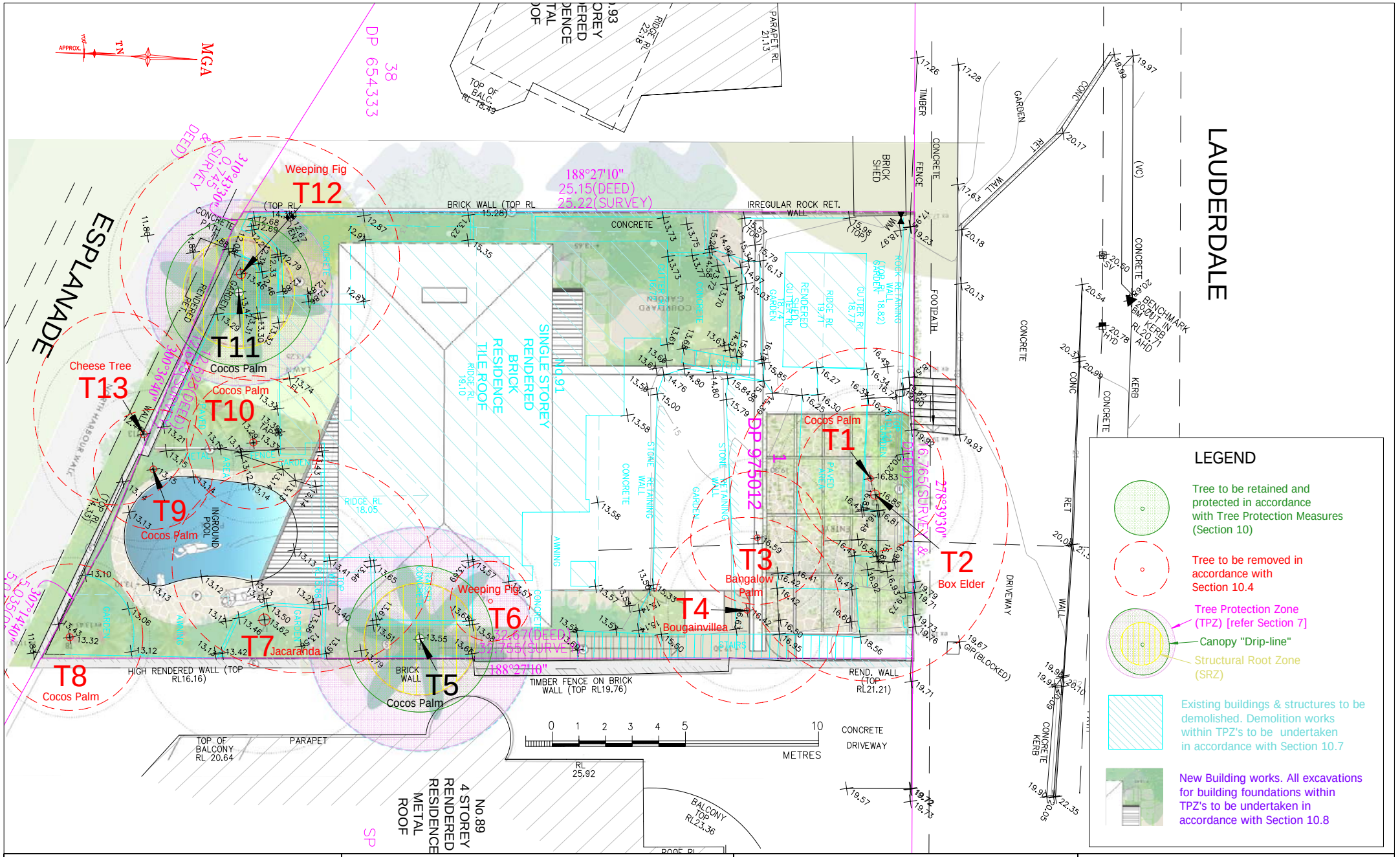
APPENDIX 5
TREE LOCATION PLAN SHOWING
TREE RETENTION VALUES
91 LAUDERDALE AVENUE, FAIRLIGHT

Earthscape Horticultural Services
Arboricultural and Horticultural Consultants
PO Box 364
BEROWRA NSW 2081
Ph: 02 9456 4787
Fax: 02 9456 5757 e: earthscape@iinet.net.au

Based on the Survey Drawing
prepared by Lockley Land Title Solutions
Dwg Ref No. 50499 002DT
Dated 28/05/2019

DWG No. T20-010601 [A]

DATE: 06/01/2020



APPENDIX 6

TREE PROTECTION PLAN

91 LAUDERDALE AVENUE, FAIRLIGHT

Earthscape Horticultural Services
Arboricultural and Horticultural Consultants
PO Box 364
BEROWRA NSW 2081
Ph: 02 9456 4787
Fax: 02 9456 5757 e: earthscape@iinet.net.au

Based on the Survey Drawing

prepared by Lockley Land Title Solutions

Dwg Ref No. 50499 002DT

Dated 28/05/2019

DWG No. T20-010602 [B]

DATE: 14/07/2020