

ARBORICULTURAL IMPACT ASSESSMENT REPORT

STAGE 1 STATION STREET, MENANGLE



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1.0 INTRODUCTION

1.1 Purpose of this Report

Sturt Noble Arboriculture was engaged by Mirvac to prepare an Arboricultural Impact Assessment Report and Tree Protection Recommendations in relation to the proposed Stage 1 residential subdivision development of a nine hectare site near the corner of Menangle Road and Station Street in Menangle. Stage 1 consists of approximately 97 new residential lots, local roads, drainage, detention and water quality basin, park and service utilities.

This report deals with those trees on Stage 1A and 1B of this subdivision.

The purpose of this report is to:

- Assess and review the condition of existing trees by undertaking a Visual Tree Assessment.
- Assess each individual tree's suitability to be retained as a sustainable part of the proposed development in the long term, considering the likely impacts of works proposed.
- Provide recommendations for tree removal, retention and protection.
- Provide recommendations where appropriate to enable trees to be retained or have better long term health outcomes and minimize potentials for hazard.
- To provide information on appropriate tree protection measures, appropriate setbacks, constraints and tree management procedures during site works.

This report has been carried out as per the Methodology outlined in **Appendix 1**

1.2 Background

The preparation of this report has been prepared in awareness and consideration of the following standards, controls and guidelines:

- Wollondilly Shire Council's Development Control Plan 2016 including:
 - Control 6.3 Heritage Conservation Area – Menangle
 - PART 10 – Tree removal
- Australian Standard AS4970-2009 Protection of Trees on Development Sites
- Australian Standard AS4373-2007 Pruning of Amenity Trees

It has also taken into consideration advice from the following reports:

- Ecological Assessment Report prepared by EMM on 33/06/14

1.3 The Proposal

This impact assessment has been prepared based on the following plans:

- General Arrangement Plan 17-003293-01 Drawing no. 001 – prepared by Calibre
- Site Regrading Plan 01 of 02 17-003293-01 Drawing no. 201 – prepared by Calibre

- Site Regrading Plan 02 of 02 17-003293-01 Drawing no. 202 – prepared by Calibre

Refer to plans **Appendix 2.2**

The proposed works to the site include:

- Bulk Earthworks.
- Grading and construction of residential lots, local roads, drainage, detention and water quality basins and open space/parks.
- Excavation for services and utilities.
- Under-boring of utilities along Stevens Road
- Installation of Street Tree planting.
- Installation of Street lighting and signage
- Installation of Landscaping including new hard finishes and retaining walls.
- Installation of footpaths.
- Installation of Driveway crossovers.

The plans provided by Calibre Consulting of the proposed new Residential Development are minimal at this stage and show the proposed lot layout, road reserves and bulk grading.

1.4 Foreseeable Construction Impacts

Foreseeable impacts noted from the proposed development, construction type and anticipated methodology include:

- Excavations and filling for Bulk Earthworks.
- Excavations and construction of new kerb and gutter and road pavements.
- Excavations for landscape paved areas and retaining walls.
- Excavations and trenching for underground services.
- Ripping or cultivation of soil for landscaped areas.
- Excavations and footings for boundary fences.
- Soil level changes including the placement of fill material for the footings and to make up grades to landscape areas.
- Laying impermeable paving to paths and slabs.
- Movement and storage of plant, equipment & vehicles;
- Erection of site sheds;
- Storage of building materials, waste and waste receptacles.

2.0 PLANNING CONTROLS

2.1 Planning Definitions

Wollondilly Shire Council's Development Control Plan 2016 Volume 1 – General defines the following:

“Native Vegetation means any of the following types of indigenous vegetation:

- (a) trees (including any sapling or shrub, or any shrub);*
- (b) understorey plants;*
- (c) groundcover (being any type of herbaceous vegetation);*
- (d) plants occurring in a wetland.*

Vegetation is indigenous if it is a species of vegetation, or if it comprises species of vegetation, that existed in the state before European settlement.

In this section a tree is considered to be a tree or shrub which meets one of the following:

- (a) is greater than 3 metres in height; or*
- (b) The trunk has a circumference of 450mm at 1 metre above ground level; or*
- (c) has a branch span of greater than 3 metres.”*

2.2 Council Consent

Wollondilly Shire Council's DCP notes the following planning and approval requirements:

- *Any prescribed tree or native vegetation shall not be ringbarked, cut down, topped, lopped, removed, poisoned, injured, or wilfully destroyed without a Tree and Bushland Vegetation Removal Permit unless authorised by a current Development Consent.*
- *Some trees as outlined in the DCP are exempt. These species can be removed without consent from Council. These include:*
 - *Removal of a tree or other form of vegetation being carried out under the following legislation:*
 - *(a) Action required, or authorised to be carried out under the Electricity Supply Act 1995, the Roads Act, 1993 or the Surveying and Spatial Information Act 2002.*
 - *(b) The Clearing of Native Vegetation that is authorised by a development consent or a Property Vegetation Plan under the Native Vegetation Act, 2003.*
 - *(c) Functions as required to protect persons from dangers to their safety and health, and to protect property from destruction or damage, arising from floods and storms under the State Emergency Services Act, 1989.*
 - *(d) Works for which an order or permit has been issued by the NSW Rural Fire Services under the Rural Fires Act, 1997.*
 - *(e) Any removal authorised for removal from the NSW Rural Fire Service 10/50 Vegetation Clearing Code of Practice for NSW.*
 - *(f) Removal carried out in accordance with a license, permit, authority or approval under the Water Act, 1912 or the Water Management Act, 2000.*

- *(g) Removal for the purpose of the construction, operation and maintenance of infrastructure by Water NSW in the exercise of its land management activities within SP2 zones, including roads, tracks, viewing platforms, signs and recreation facilities.*
- *(h) Removal on Crown Lands within the meaning of the Crown Lands Act, 1993 or on crown public roads within the meaning of the Roads Act, 1993, where removal is being undertaken or authorised by the Department of Lands.*
- *(i) Any clearing carried out in accordance with an order under the Trees (Disputes between Neighbours) Act, 2006 or other like Neighbourhood Dispute legislation.*
- Removal of a tree or other vegetation species that is a declared noxious weed by the NSW Government under the Noxious Weeds Act, 1993 or that is a species of tree identified on Councils exempt list, regardless of size (unless the tree is listed as a heritage item):

3.0 THE EXISTING SITE

3.1 The Site

The project is located adjacent to Station Street and Menangle Road, Menangle NSW, being subdivision of Part Lots 201 and 202DP590247 and Lot 21 DP581462. The site is situated within the Wollondilly Shire Council Local Government Area (LGA). Refer Figure 1 – Site location plan.

The site is characterised by agricultural land and is located to the north, north east and east of Menangle township. The lots are currently zoned RU1 Primary Production under the LEP.

The proposed Stage 1 development consists of approximately 97 residential lots, local roads, drainage, detention and water quality basins, a Park and service utilities. It is proposed to separately undertake bulk earthworks within the Stage 1 area and upgrade the intersection of Menangle Road and Station Street with a roundabout, in preparation for the Stage 1 development.

In addition, it is proposed to subdivide the Stage 1, Park and Neighbourhood Centre from the existing “parent” lots upfront (procedural subdivision) to isolate heritage and other items. Note the construction scope excludes the neighbourhood centre.

We note that the site is within a heritage and landscape conservation area.

This report deals with those trees on Stage 1A and 1B of this subdivision. Stage 1A is located between Menangle Road, Station Street and Stevens Road. Stage 1B is a small lot located on Menangle Road.

The site currently contains a range of farm buildings including metal and timber sheds, silos, a derelict single story private residence, paved driveways and the heritage listed two storey Camden Park “Central Creamery”. It is largely cleared agricultural land with trees being a combination of scattered groupings of remnant endemic species and individual planted specimens of both exotic and native (non endemic) species.



Figure 1: Location Plan

3.2 Soils

The site is on clay/loam soils derived from Wianamatta Shales on the Cumberland Plain at low altitudes (mainly below 150 m)

3.3 Vegetation Communities

EMM (2014) completed an Ecological Assessment of the broader site. The study area was found to be dominated by exotic grassland. Four native vegetation communities were recorded in the study area. In line with the vegetation types described in NPWS (2002) these include:

- Shale Plains Woodland;
- Shale/Sandstone Transition Forest (Low Sandstone Influence);
- Alluvial Woodland; and
- Grey Myrtle Dry Rainforest.

None of these communities were found in Stage 1A and 1B of this subdivision which are the subject of this assessment.

No threatened flora species were recorded in the study area. Given the high level of project and non-detection of threatened flora during targeted surveys, they are considered unlikely to occur

3.4 The Trees

Twenty Six (26) trees been surveyed as part of this assessment, of which fifteen (15) trees are located on the site and eleven (11) are located in close proximity to the site boundary or in Stevens Road reserve. The trees consist of a mix of 6 exotic specimens,

16 Australian native trees and 4 endemic trees. Refer to **Appendix 2.1** for tree locations and numbers.

Each of the trees assessed has been allocated a useful life expectancy (ULE) that is based on their health, vigour, structure and age class. The ULE does not take into account the impact of the proposed development.

A complete and detailed tree assessment schedule was prepared and is included in **Appendix 3**.

Nine (9) trees are located outside the sites property boundary in Councils road reserve for Stevens Road and could potentially be affected by road works. One (1) tree is located outside the site in the location of a proposed detention basin.

3.5 Special Tree Conditions

None of the trees are listed on the Councils Significant Tree Register

The Tree preservation orders apply to all trees with the exception of two Silky Oaks (*Grevillea robusta*) which are on Councils exempt list. We note however that the site is within a heritage and landscape conservation area and within Wollondilly Shire Council's Development Control Plan 2016 Volume 1 Section 6.3 item 15 identifies "*species of trees appropriate to Menangle including...Silky Oaks*". As such we consider the High Retention value Silky Oak Tree No. 23 to be suitable for retention.

There are no endangered species on site. Four (4) trees are part of an indigenous plant community Shale Plains Woodland; being Narrow Leaf Ironbark (*Eucalyptus crebra*).

4.0 ABORICULTURE IMPACT ASSESSMENT

4.1 Construction Assumptions

It is assumed for this report that the following activities will impact on existing trees.

- Excavations and filling for Bulk Earthworks.
- Excavations and construction of new kerb and gutter and road pavements.
- Excavations and trenching for underground services.
- Under-boring of utilities along Stevens Road
- Ripping or cultivation of soil for landscaped areas.
- Excavations and footings for boundary fences.
- Soil level changes including the placement of fill material for the footings and to make up grades to landscape areas.
- Laying impermeable paving to paths and slabs.
- Movement and storage of plant, equipment & vehicles;
- Erection of site sheds;
- Storage of building materials, waste and waste receptacles

We note extensive site filling across the site will impact on most trees on individual lots.

A separate Aboricultural Impact Assessment shall be provided to accompany the development applications for the civil and servicing works that follow so any additional impacts from these works can be assessed.

4.2 Trees to be removed

The plans show that sixteen (16) trees will need to be removed to accommodate the proposed development.

Table 1: Trees to be removed

Site filling/ construction works critical to the following trees	Other (poor condition, other studies, etc)	Tree species to be removed (exempt and can be removed without consent)
Tree numbers 6, 11, 12, 14-21,25,26	Tree number 10,22	Tree number 24

Application required for the removal of these trees should be sought as part of the Development Application.

Tree 06 and 12 are to be removed unless the on-site arborist determines that the works do not affect these trees.

4.3 Trees to be retained

With implementation of the tree protection measures it should be possible to retain all other trees on the developed site. The plans show that ten (10) trees are proposed to be retained.

Table 2: Trees to be retained

Clear of all works	Minor Encroachment from bulk earthworks	Major Encroachment from bulk earthworks
Tree number 1-5, 7-9, 13,	Tree number 23	n/a

- Proposed site design and Construction of the subdivision development and associated infrastructure/ facilities should consider the Tree Protection Zones as discussed in the following sections to minimise any adverse impact.
- Careful consideration is especially required to all works proposed in the Stevens Road Reserve to ensure impacts to the street trees are minimised. This shall include the works themselves, their location and construction methodology.

4.4 Works within Tree Protection Zones

Encroachment to trees within site boundary

- The supplied plans show that 10mm of fill is proposed in the TPZ of tree 23. Due to the shallow depth of fill, the encroachment is not deemed to be major. Fill is to be kept clear of the existing trunk.

Encroachment to trees outside site boundary

- Tree numbers 3-5, 7-9 and 13 located outside the site, within the Stevens Road Reserve may be affected by future road works. Once works to this area are confirmed these trees will need to be reassessed. Careful consideration should be given to all proposed work to ensure impacts to the street trees are minimised. This shall include the works themselves, their location and construction methodology.

Other works

- Any disturbance to soils within TPZ's could destabilise the trees or impact on long term health. Should any changes to soil within the TPZ/ SRZ be proposed further discussion and assessment must be undertaken.
- The plan in **Appendix 2.3** indicates trees TPZ's and SRZ's and should be used to inform later design decisions and temporary tree protection fences.

4.5 Pruning works

In addition to Tree Protection Zones, the extent of the canopy (canopy dripline) should also be considered, particularly in relation to construction activities and along access points.

Significant pruning of trees to accommodate digging machinery is generally not acceptable. Trees may not be pruned by more than 10% without consent.

Branches should be temporarily pushed or tied where possible to minimise the amount of pruning works.

4.6 Ongoing management of trees to be retained

A number of the trees identified to be retained have structural defects and/or deadwood at the time of assessment. Ongoing monitoring and maintenance should be undertaken especially for trees located in areas of high use and activity.

Tree numbers 1, 3-9 and 13 should be pruned to remove deadwood.

5.0 TREE PROTECTION RECOMMENDATIONS

5.1 Tree Protection Measures

It is recommended that a site specific Tree Protection Plan (TPP) is prepared to guide the construction process to ensure all trees designated for retention remain as a sustainable part of the landscape in the long term.

The plan shall be prepared by a consulting arborist (AQF Level 5) and should at a minimum include a detailed plan of the locations of, and specifications for, tree protection measures.

The TPP shall include a monitoring schedule relating to critical points during the works (hold points) where the Project Arborist is required to visit the site and confirm that works are being undertaken as conditioned by Council/as required.

The following tree protection measures shall be implemented prior to the commencement of any site works, and shall remain in place for the duration of the development.

5.2 Tree Protection Zones

The Tree Protection Zones recommended for all trees within the site are to be retained and shall be equivalent to the Tree Protection Zone as specified in this report. This is a radial distance measured from the centre of the trunk of the subject trees.

The following activities are prohibited within the specified Tree Protection Zones:-

- Excavations and trenching (with exception of the approved foundations and underground services);
- Ripping or cultivation of soil;
- Mechanical removal of vegetation;
- Soil disturbance or movement of natural rock;
- Soil level changes including the placement of fill material (excluding any suspended floor or slab);
- Movement and storage of plant, equipment & vehicles;
- Erection of site sheds;
- Affixing of signage or hoardings to trees;
- Storage of building materials, waste and waste receptacles;
- 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.

Place a 50-75mm layer of coarse organic mulch over the entire surface of the TPZ. Where the TPZ is adjacent to construction activities first lay down geotextile fabric beneath the mulch to facilitate easy removal of the mulch at completion and any accidental spillage of construction materials.

Install drip irrigation around the root zone if required by the Project Arborist.

5.3 Tree Protection Fencing

All trees within the site to be retained shall be protected prior to and during construction from all activities that may result in detrimental impact by erecting a suitable protective fence beneath the canopy to the full extent of the Tree Protection Zone (excluding the footprint of the proposed works and areas within adjoining properties).

As a minimum the fence should consist of temporary chain wire panels 1.8 metres in height, supported by steel stakes as required and fastened together and supported to prevent sideways movement. The fence shall be erected prior to the commencement of any work on-site and shall be maintained in good condition for the duration of construction. Where tree protection zones merge together a single fence encompassing the area is deemed to be adequate.

Appropriate signage shall be installed on the fencing to prevent unauthorised movement of plant and equipment or entry to the Tree Protection Zone.

Refer to **Appendix 4** for examples of protective fencing and signage.

5.4 Trunk, Branch & Ground Protection

Where provision of tree protection fencing is impractical due to its proximity to the proposed building envelope, trunk protection shall be erected around the tree to avoid accidental damage. As a minimum, the trunk protection shall consist of two metre (2m) lengths of hardwood timbers (100 x 50mm) spaced at 100-150mm centres secured together with 2mm galvanised wire. These shall be strapped around the trunk (not fixed in any way) to avoid mechanical injury or damage. Trunk protection should be installed prior to any site works and maintained in good condition for the duration of the construction period.

Pavements should be avoided within the Tree Protection Zone of trees to be retained where possible. Proposed paved areas within the Tree Protection Zone of trees to be retained should be placed above grade to minimise excavations within the root zone and avoid root severance and damage.

Placement of fill material within the Tree Protection Zone of trees to be retained should be avoided where possible. Where placement of fill cannot be avoided, the material should be a coarse, gap-graded material such as 20 – 50mm crushed basalt (Blue Metal) or equivalent to provide some aeration to the root zone. Note that Roadbase or crushed sandstone or other material containing a high percentage of fines is unacceptable for this purpose. The fill material should be consolidated with a non-vibrating roller to minimise compaction of the underlying soil. A permeable geotextile may be used beneath the sub-base to prevent migration of the stone into the sub-grade. No fill material should be placed in direct contact with the trunk.

Refer to **Appendix 4** for examples of trunk, branch and ground protection.

5.5 Demolition Works within Tree Protection Zones

Where demolition of structures and pavements is required within the Tree Protection Zones of trees to be retained it is to be carried out to avoid disturbance to existing soils, damage to existing roots or potential root growth.

Machinery shall work within the footprint of existing pavements where possible to avoid compaction of the adjacent soil and Tree Protection Zones.

When removing hard surfaces it shall be stripped-off in thick layers using a small rubber tracked excavator or alternative approved method to avoid damage to underlying roots and minimise soil disturbance. The final layer of sub-base material shall be removed using hand tools where required to avoid compaction of the underlying soil profile and damage to woody roots.

If any concentrations of roots or roots with diameters equal to or greater than 50mm are encountered they must be retained in an undamaged condition for assessment by the Project Arborist. If the Project Arborist deems surrounding underground elements such as footing and pipes are providing support, these elements shall be left in-situ.

5.6 Excavations within Tree Protection Zones

The excavator shall work within the footprint of existing pavements where possible to avoid compaction of the adjacent soil and Tree Protection Zones.

5.7 Underground Services

All proposed underground services should be located as far away as practicable from existing trees to be retained to avoid excavation within the Tree Protection Zone.

For underground services, where the incursion to the Root Zone is less than 10% of the total TPZ (i.e. beyond the Minimum Setback Distance), a chain trenching device may be used. A backhoe or skid steer loader (bobcat) is unacceptable due to the potential for excessive compaction and root damage. Where large woody roots (greater than 50mm in diameter) are encountered during excavation or trenching, these shall be retained intact wherever possible (eg by sub-surface boring beneath roots or re-routing the service etc).

Excavations required for underground services within the Structural Root Zone of any tree to be retained should only be undertaken by sub-surface boring. The Invert Level of the pipe, plus the pipe diameter, must be lower than the estimated root zone depth as specified at a minimum depth of 600mm. This will depend on the soil conditions at the site. Where this is not practical and root pruning is the only alternative, proposed root pruning should be assessed by the Project Arborist to determine continued health and stability of the subject tree.

5.8 Canopy pruning

Care shall be taken when operating backhoes, excavators 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 Project Arborist must be sought.

All pruning works shall be directed by the Project Arborist and shall be carried out by an AQF Level 3 Arborist. All pruning works shall be in accordance with the Australian Standard (AS) 4373:2007 *Pruning of amenity trees*. This standard outlines appropriate pruning practices and procedures that reduce the risk of damage and injury to trees. Correct pruning practices respect the natural form and branching habit of a tree and work with the trees natural defence mechanisms against disease to avoid damage and injury to trees.

Pruning should always be limited to the minimum amount necessary to achieve the desired aim. Significant loss of foliage created by excessive pruning may weaken the tree, leading to premature decline or predisposition to branch failure or disease, creating potential hazards.

Council consent will be required prior to commencement of the work. Pruning must be performed in accordance with *Australian Standard (AS) 4373:2007 Pruning of amenity trees* (Standards Australia 2007).

5.9 Root Investigation

Exploratory excavation may be required where the proposed excavation created by the development works exceeds 10% of the Tree Protection Zone of any Prescribed Tree; or service trenches are required within the TPZ; to determine the impact of the development on the tree. The purpose of the investigation is to verify the quantity, size, type, depth and orientation of tree roots along the perimeter of the proposed encroachment in order to make an informed judgement in relation to the potential impact on the tree.

Exploratory excavation shall only be carried out using non-destructive or non-injurious techniques, such as careful digging using hand held implements, using compressed air (Airscape®), water pressure, or suction (vacuum device) or a combination of these techniques, to carefully remove soil without damaging roots. The work shall be undertaken by an arborist with a minimum qualification of AQF Level 3. Once roots are exposed, a visual examination can be carried out with the Project Arborist to evaluate the potential impact of the proposed root loss on the health and stability of the tree.

The results of the root investigation together with the Development Impact Assessment must be documented in the report and submitted together with the DA. The report shall contain information that demonstrates that the trees will remain viable in conjunction with the works.

5.10 Root Pruning

Where root pruning is required, roots shall be severed with sterile, clean, sharp pruning implements resulting in a clean cut. Any excavated root zones shall be retained in a moist condition during the construction phase using Hessian material or mulch where practical. Trees that have roots removed shall have drip irrigation installed around the root zone to ensure they receive an adequate supply of water.

5.11 Tree Damage/ Decline

If trees show signs of stress or deterioration, remedial action shall be taken to improve the health and vigour of the subject tree(s) in accordance with best practice arboricultural principles. Advice must be sought from the Project Arborist.

In the event of any tree becoming damaged for any reason during the construction period the Project Arborist must 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.

6.0 CONCLUSION

26 trees have been considered as part of this assessment and their locations are shown in **Appendix 1**, of which fifteen (15) trees are located on the site and eleven (11) are located in close proximity to the site boundary or in Stevens Road reserve.

The supplied plans and assessment show that:

- Sixteen (16) trees will need to be removed to accommodate the proposed development. These trees are Nos. 6, 10-12, 14-22, 24, 25 & 26. Refer to the tree retention plan in **Appendix 2.4**.
- Tree 06 and 12 are to be removed unless the on-site arborist determines that the works do not affect these trees.
- Ten (10) trees are to be retained as part of the proposed development. These trees are Nos. 1-5, 7-9, 12 and 23. Trees to be retained as part of the approved development must be protected from potential damage caused by construction activities. Refer to section 5.0 for tree protection recommendations and to the tree retention plan in **Appendix 2.4**.

Fill within tree 23's TPZ is to be minimised as much as possible and not to exceed the 10mm fill proposed. Fill to be installed carefully to ensure it does not touch the trunk.

Tree numbers 1, 3-9 and 13 should be pruned to remove deadwood.

Tree numbers 3-5, 7-9 and 13 located outside the site, within the Stevens Road Reserve may be affected by future road works. Once works to this area are confirmed these trees will need to be reassessed. Careful consideration should be given to all proposed work to ensure impacts to the street trees are minimised. This shall include the works themselves, their location and construction methodology.

Further detail of site works is required. This should be provided prior to construction so any additional impacts can be assessed.

Where recommended work processes and tree protection measures cannot be adhered to further advice should be sought from the Project Arborist.

7.0 DISCLAIMER

The author and Sturt Noble Arboricultural Consulting take no responsibility for actions taken and their consequences, contrary to those expert and professional instructions given as recommendations.

This is not a hazard assessment report and it should be noted that trees are always inherently dangerous. This assessment was carried out from the ground, and covers what was reasonably able to be assessed and available to the assessor at the time of inspection. No aerial or subterranean inspections were carried out and structural weakness may exist within roots, trunk or branches.

Any protection or preservation methods recommended are not a guarantee of tree survival or safety but are designed to improve vigour and reduce risk. Timely inspections and reports are necessary to monitor the trees' condition. No responsibility is accepted for damage or injury caused by the trees and no responsibility is accepted if the recommendations in this report are not followed.

Limitations on the use of this report: Trees are dynamic living structures, growing and adapting to conditions around them. Tree condition will change and vary over time depending on weather, environmental factors and mechanical or human interaction.

This report is to be utilised in its entirety only. Any written or verbal submission, report or presentation that includes statements taken from the findings, discussions, conclusions or recommendations made in this report, may only be used where the whole of the original report (or a copy) is referenced in, and directly attached to that submission, report or presentation.

Assumptions: Care has been taken to obtain information from reliable resources. All data have been verified insofar as possible; however, Sturt Noble Arboricultural Consulting can neither guarantee nor be responsible for the accuracy of information provided by others.

Unless stated otherwise: Information contained in this report covers only the trees that were examined and reflects the condition of the trees at the time of inspection.

Assessment is limited to the conditions at the time of the inspection and only trees discussed in the report have been assessed.

Where access to the base of the tree is limited, such as difficult site access due to site conditions, only general comments can be made. Assessment of tree health and structure is limited to that visible from the site of proposed works and may not reflect the true condition of the tree. Assessment of tree health and structure is limited to that visible from the site of proposed works and may not reflect the true condition of the tree.

Plans used to assess likely impact are those appended/ referenced.

Ongoing monitoring of all trees is advised and where significant changes are observed, further advice should be requested. Unusual developments or sudden changes in a tree's condition should be addressed immediately.

8.0 REFERENCES

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APPENDIX 1: METHODOLOGY

A1.1 Site Inspection

This report, its comments and recommendations have been prepared based on the information gathered during a detailed site inspection carried out on the on the 16th May 2018. This assessment is summarised in **Appendix 1**.

A1.2 Tree Locations

The location of the subject trees are based on the site survey prepared by APW Johnson dated 27/04/2018 Dwg. Ref. 300058-DET-001.

A1.3 Visual Tree Assessment

The trees were assessed from the ground by the Visual Tree Assessment (VTA) method as described in Mattheck & Breloer (1994), using non-invasive tools such as binoculars and acoustic mallet. No digging or exposing of the root zones occurred in this inspection and no aerial inspection by climbing was performed. No aerial inspection or diagnostic testing was undertaken as part of this assessment.

The following data was collected for each tree:

- Botanical and common name.
- Tree dimensions (approximate only).
- Canopy density (approximate only).
- Overall health and vitality, including epicormic growth, deadwood and predation by pests and diseases.
- Structural condition including evident faults such as Bark Inclusions or poor branch attachments, decay, cavities and mechanical or biological damage.
- Stability of the tree including excessive trunk lean, stability of the soil, soil cracking, soil heaving, exposed roots and root damage.

A1.4 Retention Value (ULE)

Each tree has been given a useful life expectancy value (ULE) according to the rating system set out in the ULE Matrix. The ULE does not take into account the impact of the proposed development.

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

A1.5 Landscape Significance Assessment

Landscape Significance is an essential criterion to establish the importance that a particular tree may have on a site. Each tree has been given a Tree Significance in landscape rating based on the 'IACA Significance of a Tree, Assessment Rating System'. A tree is to have a minimum of three criteria in a category to be applicable for that rating.

Tree Significance in the landscape ratings:

High	Medium	Low
<ul style="list-style-type: none"> The tree is in good condition and good vigour; The tree has a form typical for the species; The tree is a remnant or is a planted locally indigenous specimen and/or is rare or uncommon in the local area or of botanical interest or of substantial age; The tree is listed as a Heritage Item, Threatened Species or part of an Endangered ecological community or listed on Councils significant Tree Register; The tree is visually prominent and visible from a considerable distance when viewed from most directions within the landscape due to its size and scale and makes a positive contribution to the local amenity; The tree supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group or has commemorative values; The tree's growth is unrestricted by above and below ground influences, supporting its ability to reach dimensions typical for the taxa in situ - tree is appropriate to the site conditions. 	<ul style="list-style-type: none"> The tree is in fair-good condition and good or low vigour; The tree has form typical or atypical of the species; The tree is a planted locally indigenous or a common species with its taxa commonly planted in the local area The tree is visible from surrounding properties, although not visually prominent as partially obstructed by other vegetation or buildings when viewed from the street, The tree provides a fair contribution to the visual character and amenity of the local area, The tree's growth is moderately restricted by above or below ground influences, reducing its ability to reach dimensions typical for the taxa in situ. 	<ul style="list-style-type: none"> The tree is in fair-poor condition and good or low vigour; The tree has form atypical of the species; The tree is not visible or is partly visible from surrounding properties as obstructed by other vegetation or buildings, The tree provides a minor contribution or has a negative impact on the visual character and amenity of the local area, The tree is a young specimen which may or may not have reached dimension to be protected by local Tree Preservation orders or similar protection mechanisms and can easily be replaced with a suitable specimen, The tree's growth is severely restricted by above or below ground influences, unlikely to reach dimensions typical for the taxa in situ - tree is inappropriate to the site conditions, The tree is listed as exempt under the provisions of the local Council Tree Preservation Order or similar protection mechanisms, The tree has a wound or defect that has potential to become structurally unsound. Environmental Pest / Noxious Weed Species The tree is an Environmental Pest Species due to its invasiveness or poisonous/ allergenic properties, The tree is a declared noxious weed by legislation. Hazardous/Irreversible Decline The tree is structurally unsound and/or unstable and is considered potentially dangerous, - The tree is dead, or is in irreversible decline, or has the potential to fail or collapse in full or part in the immediate to short term.

A1.6 Tree Protection Zones (TPZ) and Structural Root Zones (SRZ)

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.

The Structural Root Zone (SRZ) is located within the TPZ around the base of a tree and provides the bulk of mechanical support and anchorage for a tree.

The Tree Protection Zones (TPZ) and Structural Root Zones (SRZ) have been arrived at using methods as detailed in Australian Standard AS 4970– 2009. Specific site factors are also considered that may influence the location of the TPZ and/or structural tree roots.

A1.7 Encroachment and Development Impacts

Encroachments and development impacts to tree TPZ's and SRZ's include;

- Excavation
- Filling
- Changes to existing soil levels
- Placing items and elements within the zones even if only temporarily
- Soil disturbance
- Any other physical damage to the trunk or root system or any other activity likely to cause damage to the tree.

Under *AS 4970:2009 Protection of trees on development sites*, a minor encroachment of up to 10% of the area of the TPZ is considered acceptable, provided that there is no encroachment to the SRZ. The area lost to this encroachment should be compensated for elsewhere in a contiguous area to the TPZ.

Major encroachments is greater than 10% of the area of the TPZ and the Project Arborist must determine and demonstrate that the tree would remain viable. More detailed investigations, such as exploratory excavations and root investigation to enable an informed evaluation of the potential impact of the proposed works may be required.

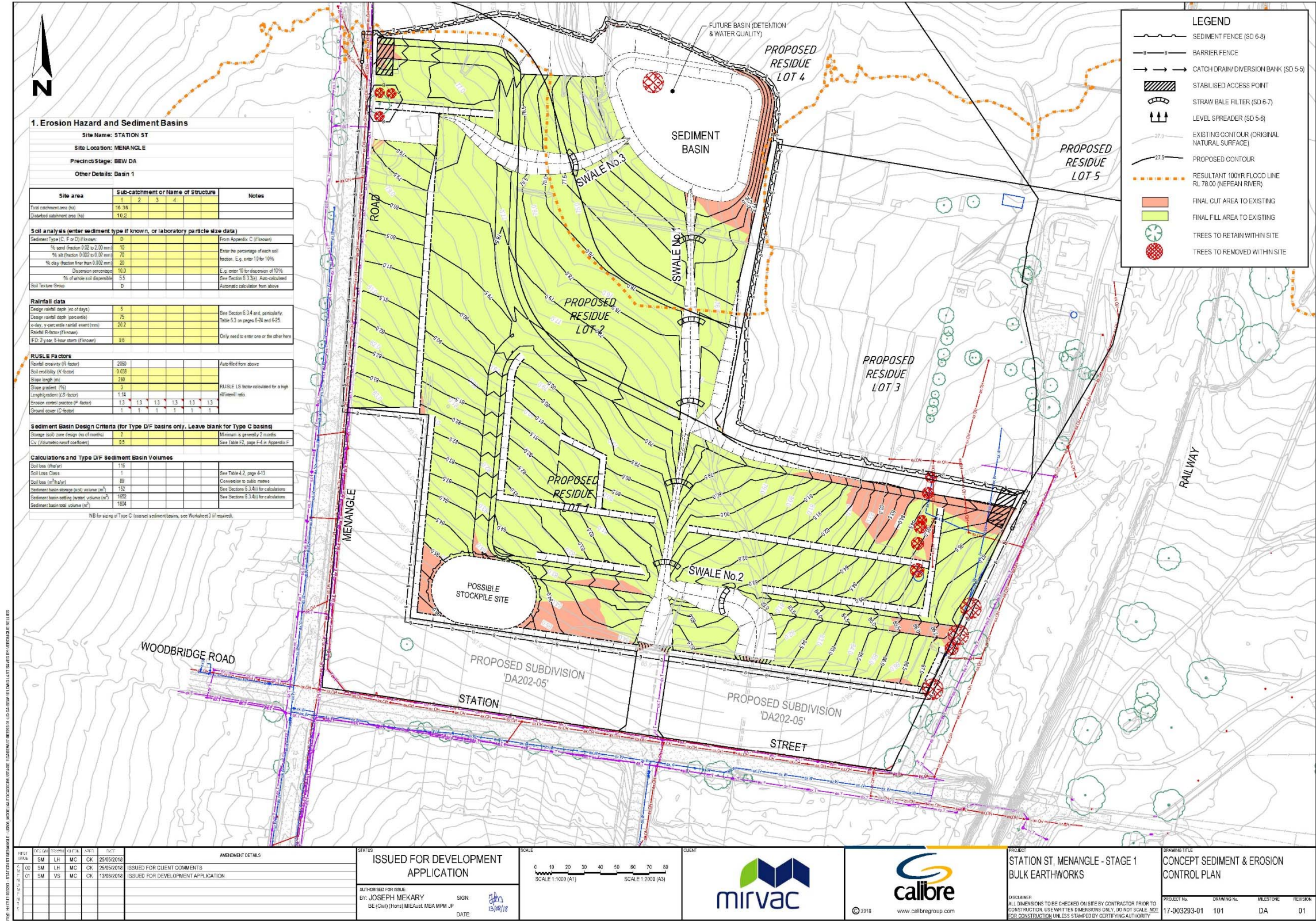
Encroachments into the SRZ are not likely to be supported unless the Project Arborist has undertaken exploratory investigation and can demonstrate that there will be minimal impact to the tree.

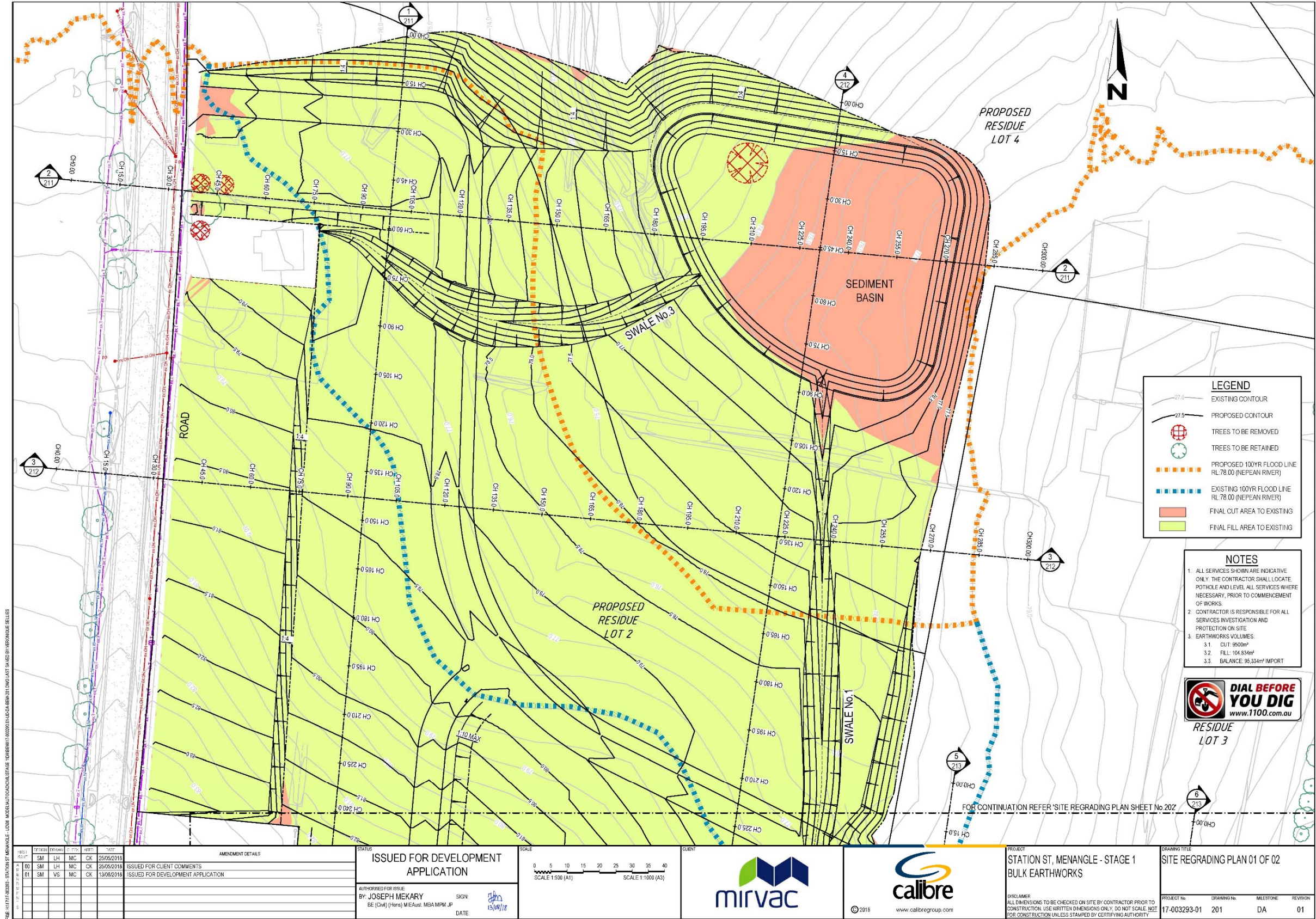
APPENDIX 2: PLANS

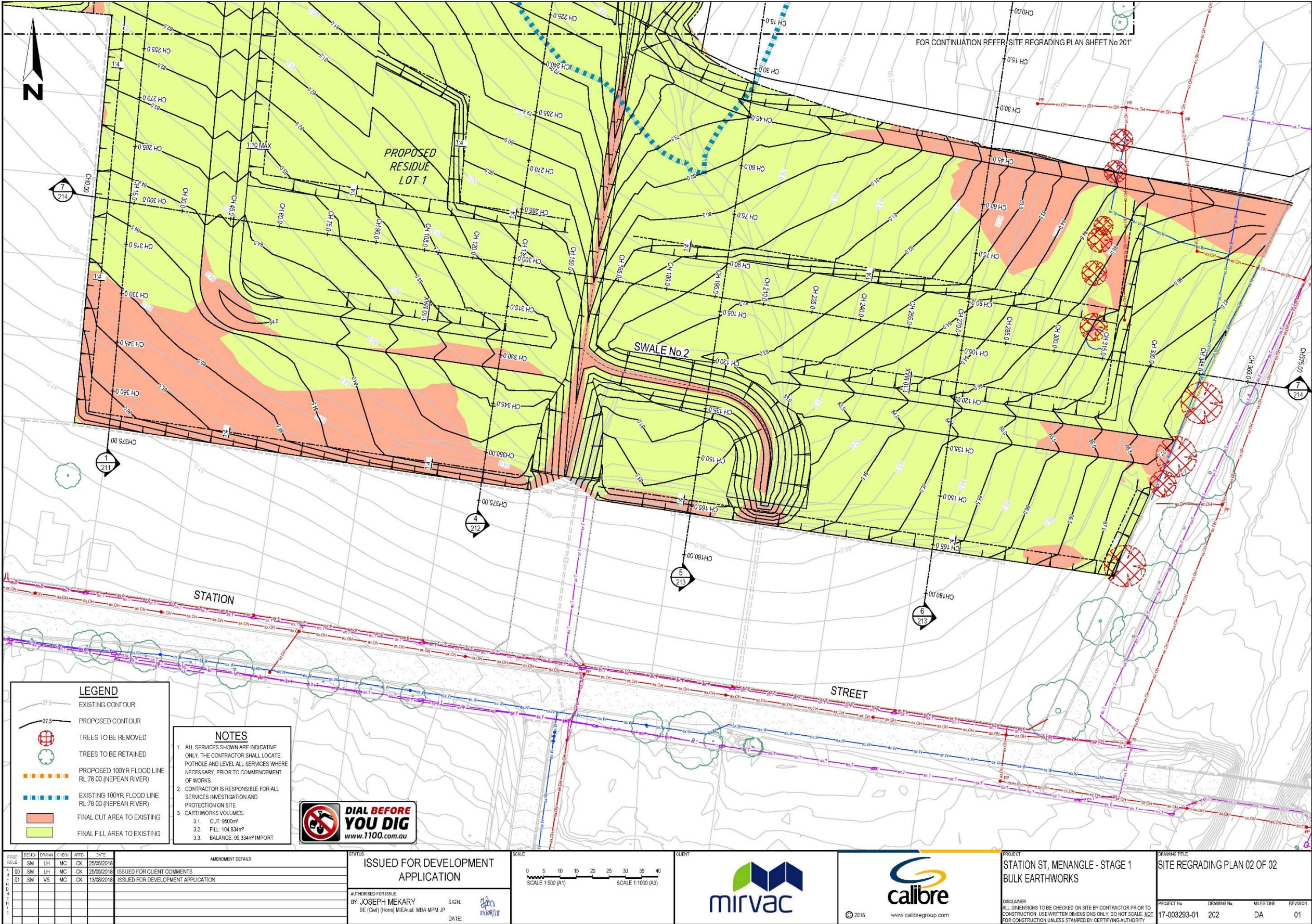
A2.1 Existing Trees



A2.2 Development Plans







A2.3 Tree Retention Values



A2.4 Tree Retention Plan



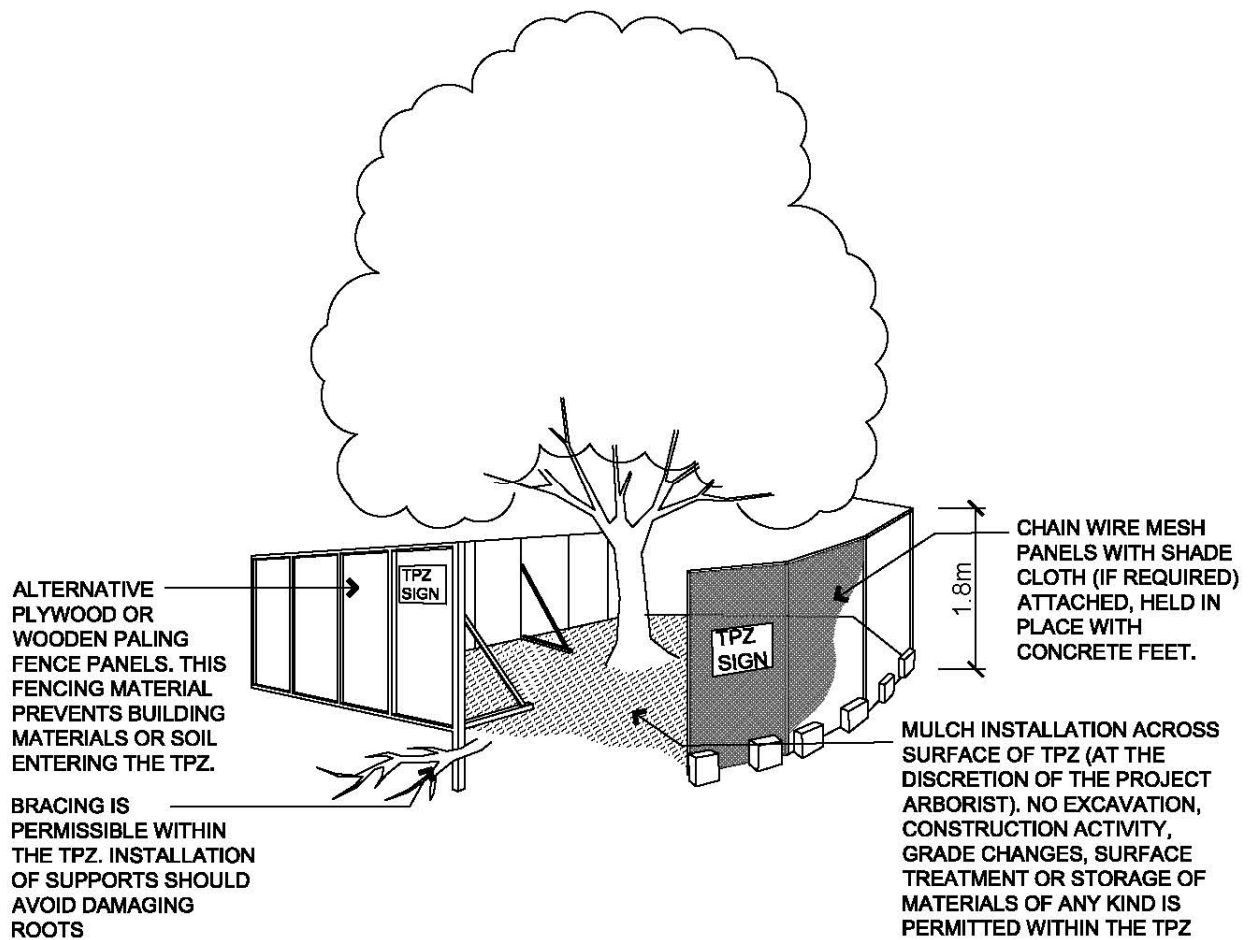
APPENDIX 3: TREE ASSESSMENT SCHEDULE

Tree Number	Species	Age Class	Height (m)	Spread (m)	DBH (m)	Crown	Condition	Comment	ULE	Risk Rating	Retention Value	TPZ (m)	SRZ (m)	Proposed Development Impact / Incursion	Recommended Action
1	<i>Eucalyptus crebra</i> (Narrow Leaf Ironbark)	M	23	19 NS 24 EW	1.40	CO SYM	Fair	Borer damage occurs to the lower trunk and branches. A large branch tear wound occurs at 10 metres above ground level. Burls occurs to the base of the trunk and lower branches. Large deadwood occurs within the canopy. Branches up to 500mm have previously failed within the canopy.	1b	Low	High	15.0	3.9	Located outside site	RETAIN AND PROTECT – Prune to remove deadwood 30mm+ diameter.
2	<i>Eucalyptus crebra</i> (Narrow Leaf Ironbark)	M	14	8 NS 8 EW	0.56	SU SYM	Fair	One main leader has previously snapped out. Epicormic growth occurs within the canopy.	1a	Low	Medium	6.7	2.7	Located outside site	RETAIN AND PROTECT
3	<i>Eucalyptus crebra</i> (Narrow Leaf Ironbark)	M	23	8 NS 12 EW	0.50	D SYM	Fair	Borer damage occurs to the trunk. Foliage is sparse within the canopy. Deadwood, epicormic growth and 15% tip dieback occurs within the canopy.	2d	Low	Medium	6.0	2.7	Located outside site	RETAIN AND PROTECT – Prune to remove deadwood 30mm+ diameter.
4	<i>Eucalyptus melliodora</i> (Yellow Box)	M	26	12 NS 20 EW	0.75	CO SYM	Fair	A narrow branch junction occurs at 3 metres above ground level. Mistletoe, tip dieback and deadwood occur within the canopy. The tree has been previously pruned for clearance to overhead wires.	1b	Low	High	9.0	3.1	Located outside site	RETAIN AND PROTECT – Prune to remove deadwood 30mm+ diameter.
5	<i>Eucalyptus melliodora</i> (Yellow Box)	M	19	14 NS 22 EW	0.91	CO SYM	Fair	A narrow branch junction with included bark occurs at 5 metres above ground level. Small wounds with good wound wood development occur to the lower trunk. Deadwood and fused branches occur within the central canopy.	1b	Low	Medium	10.9	3.0	Located outside site	RETAIN AND PROTECT – Prune to remove deadwood 30mm+ diameter.
6	<i>Eucalyptus melliodora</i> (Yellow Box)	M	25	11 NS 16 EW	0.78	CO SYM	Fair	Growth splits and wounds occur to the trunk from 2 to 4 metres above ground level. 15% Mistletoe, Tip dieback and deadwood occur within the canopy.	1b	Low	Medium	9.4	3.0	0-1m of fill proposed to 30% of TPZ.	REMOVE unless on-site Arborist determines unaffected by works. Then Retain and Protect and remove deadwood 30mm+ diameter.
7	<i>Eucalyptus melliodora</i> (Yellow Box)	M	17	8 NS 15 EW	0.53	CO SYM	Fair	Deadwood and 20% epicormic growth occurs within the canopy.	1b	Low	High	6.4	2.7	Located outside site	RETAIN AND PROTECT – Prune to remove deadwood 30mm+ diameter.
8	<i>Eucalyptus melliodora</i> (Yellow Box)	M	21	18 NS 23 EW	0.82	CO SYM	Good	A small cavity occurs at 2 metres above ground level with termite mud tracking to the root crown. Minor deadwood and 2 x deadwood hangers occur within the canopy. The tree has previously pruned to provide clearance to overhead wires.	1b	Low	High	9.8	3.2	Located outside site	RETAIN AND PROTECT – Prune to remove deadwood 30mm+ diameter and deadwood hangers.
9	<i>Eucalyptus melliodora</i> (Yellow Box)	M	23	8 NS 20 EW	0.66	CO ASYM biased North	Good	Small deadwood and 5% epicormic growth occurs within the canopy. The tree has been previously pruned to provide clearance to overhead wires.	1b	Low	High	7.9	3.1	Located outside site	RETAIN AND PROTECT – Prune to remove deadwood 30mm+ diameter.
10	<i>Eucalyptus melliodora</i> (Yellow Box)	OM	21	8 NS 12 EW	1.01	CO SYM	Poor	Extensive borer damage associated large wounds and poor wound wood development occurs from the root crown to 3.5 metres above ground level and extends 45% circumference. Extensive tip dieback and large deadwood occurs within the canopy. Very little foliage remains.	4a	Low	Low	12.1	3.3	Located within new roadway	REMOVE
11	<i>Eucalyptus melliodora</i> (Yellow Box)	M	20	12 NS 14 EW	0.65	CO SYM	Fair	Tip dieback, large deadwood and 50% epicormic growth occurs within the canopy.	2d	Low	Medium	7.9	2.9	Located within new roadway	REMOVE

Tree Number	Species	Age Class	Height (m)	Spread (m)	DBH (m)	Crown	Condition	Comment	ULE	Risk Rating	Retention Value	TPZ (m)	SRZ (m)	Proposed Development Impact / Incursion	Recommended Action
12	<i>Eucalyptus melliodora</i> (Yellow Box)	M	21	15 NS 14 EW	0.65	D SYM	Fair	Tip dieback, deadwood and 25% mistletoe occur within the canopy. A branch tear wound with good wound wood development occurs from 1 to 3 metres above ground level. The tree has been previously pruned for clearance to overhead wires.	2d	Low	Medium	7.9	2.9	0-1m of fill proposed to 30% of TPZ. New kerb works proposed within TPZ.	REMOVE unless on-site Arborist determines unaffected by works. Then Retain and Protect and remove deadwood 30mm+ diameter.
13	<i>Celtis sp.</i> (Hackberry)	M	7	5 NS 5 EW	0.30	SU ASYM biased North	Fair	Narrow branch junctions with included bark occur at the root crown. The tree has been previously pruned for clearance to overhead wires.	4e	Low	Low	3.6	2.0	Located outside site	RETAIN AND PROTECT – Prune to remove deadwood 30mm+ diameter.
14	<i>Celtis sp.</i> (Hackberry)	OM	14	11 NS 9 EW	0.42	D ASYM biased East	Poor	Surface tree roots are damaged. A cavity occurs to the base of the trunk with heartwood decay evident. Extensive tip dieback and large deadwood occurs within the canopy. Narrow branch junctions with included bark occur at 3 metres above ground level.	4a	Low	Low	5.0	2.5	0-1m cut and fill required within whole TPZ	REMOVE
15	<i>Flindersia australis</i> (Australia teak)	M	8	9 NS 9 EW	0.31	CO SYM	Poor	Borer damage occurs to the base of the trunk. Tip dieback occurs within the canopy. Foliage is chlorotic going into winter.	3a	Low	Low	3.7	2.2	0-1m fill required within whole TPZ	REMOVE
16	<i>Tamarix aphylla</i> (Athel Pine)	M	7	3 NS 4 EW	0.20	IN ASYM biased North	Poor	The tree has previously collapsed and re-shot. Burls occur to the lower trunk. Epicormic growth and tip dieback occurs within the canopy.	4e	Low	Low	2.4	2.0	0-1m fill required within whole TPZ	REMOVE
17	<i>Tamarix aphylla</i> (Athel Pine)	M	14	8 NS 7 EW	0.58	D SYM	Poor	Surface tree roots and root crown are damaged. %0% epicormic growth and large deadwood occur within the canopy. Termite damage is evident at the base of the trunk.	4e	Low	Low	7.0	2.6	0-1m fill required within whole TPZ	REMOVE
18	<i>Flindersia australis</i> (Australia teak)	M	4.5	4 NS 4 EW	0.22	CO SYM	Poor	Burls occurs to the base of the trunk. Rubbing branches occur within the canopy. Extensive tip dieback occurs within the canopy. Foliage is chlorotic going into winter.	5a	Low	Low	2.6	1.8	0-1m fill required within whole TPZ	REMOVE
19	<i>Flindersia australis</i> (Australia teak)	M	5	6 NS 5 EW	0.27	CO SYM	Poor	Surface tree roots are damaged. Narrow branch junctions with included bark occur to the base of the trunk. Large branch dieback and tip dieback occurs within the canopy. Foliage is chlorotic going into winter.	3a	Low	Low	3.2	1.9	Located within new roadway	REMOVE
20	<i>Tamarix aphylla</i> (Athel Pine)	OM	15	8 NS 5 EW	0.50	D SYM	Poor	The tree has previously collapsed and re-shot. Burls occur to the lower trunk. Epicormic growth and tip dieback occurs within the canopy.	4e	Low	Low	6.0	2.5	Located within new roadway	REMOVE
21	<i>Flindersia australis</i> (Australia teak)	M	5	4 NS 5 EW	0.19	CO ASYM biased East	Poor	Tip dieback occurs within the canopy. Foliage is chlorotic going into winter.	5a	Low	Low	2.3	1.7	0-1m fill required within 50% of TPZ	Located outside site REMOVE
22	<i>Flindersia australis</i> (Australia teak)	M	6	5 NS 5 EW	0.24	SU ASYM biased South	Poor	Burls occur to the root crown. Tip dieback occurs within the canopy.	4e	Low	Low	2.9	1.9	0-1m fill required within whole TPZ	REMOVE
23	<i>Grevillea robusta</i> (Silky Oak)	M	21	11 NS 13 EW	0.73	D SYM	Good	The tree has been pruned for clearance to overhead wires.	1a	Low	High	8.8	3.0	0-10mm fill proposed within trees TPZ.	RETAIN AND PROTECT

Tree Number	Species	Age Class	Height (m)	Spread (m)	DBH (m)	Crown	Condition	Comment	ULE	Risk Rating	Retention Value	TPZ (m)	SRZ (m)	Proposed Development Impact / Incursion	Recommended Action
24	<i>Grevillea robusta</i> (Silky Oak)	OM	16	7 NS 6 EW	0.59	CO SYM	Poor	The main leader has died back. A lineal wound with fair wound wood development occurs from the root crown to 4 metres above ground level. A small cavity occurs at the root crown. Extensive tip dieback occurs within the canopy. The tree has been pruned for clearance to overhead wires.	4a	Low	Low	7.1	2.8	0-1m fill required within whole TPZ	REMOVE
25	<i>Cupressus macrocarpa</i> 'Brunniana' (Monterey Cypress)	OM	10	11 NS 10 EW	0.48	CO SYM	Fair	The tree has been pruned for clearance to overhead wires. A cavity occurs to the base of the trunk. Deadwood and deadwood hangers occur within the lower canopy.	2a	Low	Medium	5.8	2.7	0-1m fill required within whole TPZ	REMOVE
26	<i>Eucalyptus crebra</i> (Narrow Leaf Ironbark)	OM	12	8 NS 8 EW	0.8		Poor	Main leader dead. Decay present and potential habitat hollow to be checked by Ecologist.	4a	Low	Low	9.6	3	Located within proposed basin excavation	REMOVE

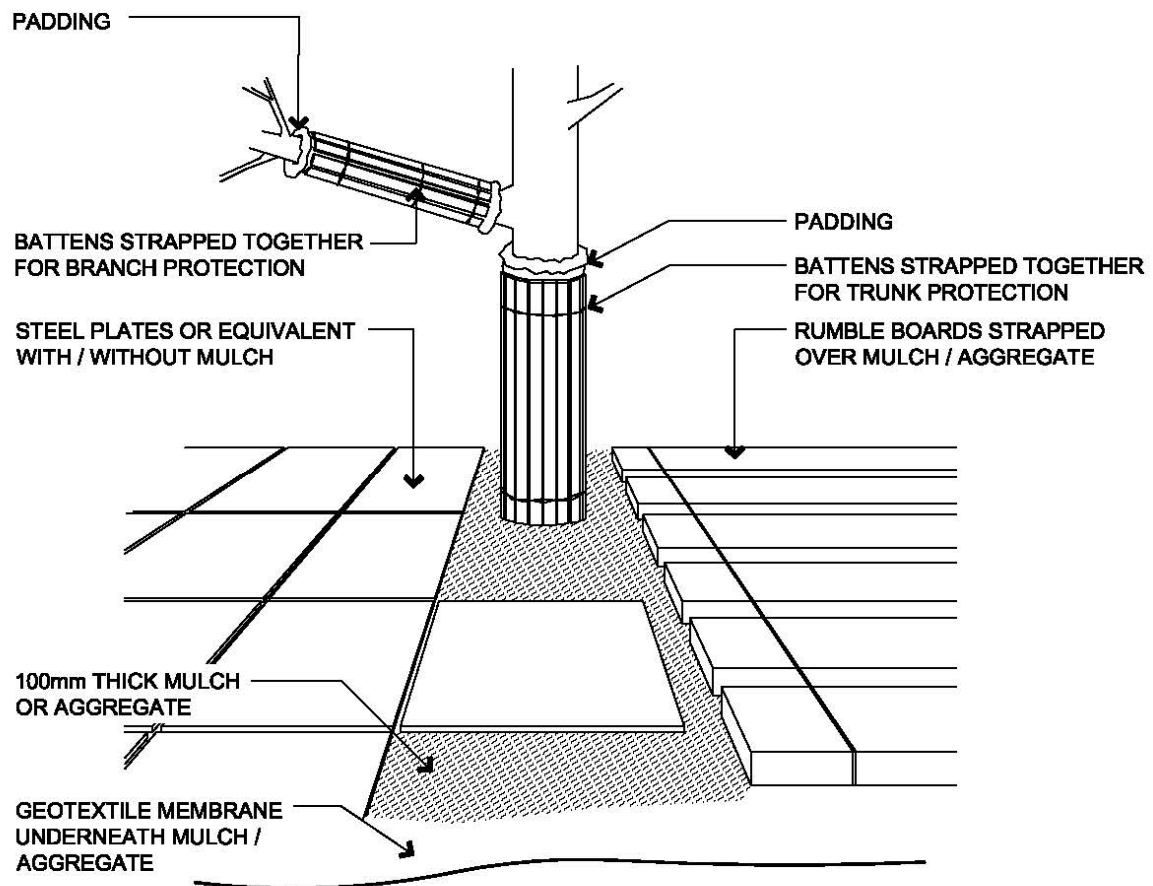
APPENDIX 4: TYPICAL TREE PROTECTION DETAILS



PROTECTIVE FENCING

Based on AS4970-2009

NOT TO SCALE



NOTE:

1. For trunk and branch protection use boards and padding that will prevent damage to bark. Boards are to be strapped to trees, not nailed or screwed.
2. Rumble boards should be of a suitable thickness to prevent soil compaction and root damage.

EXAMPLES OF TRUNK, BRANCH AND GROUND PROTECTION

Based on AS4970-2009

NOT TO SCALE



TREE PROTECTION ZONE SIGN

Based on AS4970-2009

NOT TO SCALE