The University of Sydney
Australia

The University of Sydney: University Ovals 1 & 2

TREE MANAGEMENT PLAN

prepared by

The Tree School
in association with ivm
integrated vegetation management

Executive Summary

In recent years, one large tree has failed and other trees located around the Ovals have lost large branches. The University of Sydney recognizes the risk management issues facing the Ovals' trees and has determined there is a need for a proactive long-term approach to tree management through the preparation of a Tree Management Plan.

The University Ovals are located in the Camperdown Campus of the University of Sydney. Oval 1 is located at the western end of Physics Road. Oval 2 is located to the south of Ross St entrance. Ovals 1 and 2 are significant recreational open space within the campus. The mixed mature tree plantings surrounding the Ovals are an important feature of this open space area.

The trees around the Ovals provide good canopy cover and a shady pleasant environment. However, it appears that the species selection and planting locations have not been guided by a formal design concept or tree planting plan. This has resulted in an ambiguous landscape character.

The University faces significant challenges in managing their trees in a sustainable manner. The tree management issues of most concern with regard to the Ovals are soil compaction, drainage, mechanical damage, grass competition, deadwood, suppression, age and species distribution, poor planting stock, storm damage and branch failures.

Trees have finite life spans and must be removed as they die. In some cases, trees are also removed when their health, appearance or structural integrity declines. Two (2) common tree removal strategies discussed in this report are 'Selective Tree Removal' and 'Block Removal'.

A summary of actions for the required tree works has been listed in Appendix 2. However, with limited resources it is not possible to carry out all works that may be desirable, so essential safety works must always be carried out first. In addition, some works will also arise as a result of unplanned events such as severe weather.

A sustainable and progressive replanting and management program for University Ovals 1 and 2 is necessary to address the issues arising from the ageing tree stock and to provide a clear direction for the future of the Ovals' tree population. Specific planting strategies have been suggested for the different areas of the Ovals. However, these suggestions should not replace the importance of a more holistic tree planting plan that would outline the future vision for the tree planting around the Ovals.

Selecting appropriate tree species and planting sites involves careful evaluation to determine that the species is appropriate given the environmental conditions, the constraints of the planting site and the desired function of the tree. In addition, the supply of quality plant material and the correct installation of new trees will greatly increase the trees' chances for a long, attractive, healthy, and productive life. Appendix 4 contains a general specification for the supply and installation of new trees around the Ovals.

Contents

1.0 INTRODUCTION

1.1 Background

This report has been commissioned in response to concerns regarding the potential hazards caused by the trees around Ovals 1 and 2 at The University of Sydney's Camperdown Campus. One large tree has failed and other trees located around the Ovals have lost large branches. The University of Sydney recognizes the risk management issues facing the Ovals' trees and has determined there is a need for a proactive long-term approach to tree management through the preparation of a Tree Management Plan.

The purpose of this Tree Management Plan is to develop strategies for the effective management of the existing tree resource. This plan will also provide the University's Grounds Management Staff with a clear direction and vision for the future management of the Ovals' trees.

1.2 Aims

- Develop clear strategies and time frames for the removal and replacement of the existing trees.
- Make recommendations regarding remedial works or management options for the trees to be retained.
- Identify any unsuitable planting sites and identify possible locations for the placement of new trees.
- Make recommendations regarding species selection appropriate for the subject site whilst preserving and respecting the existing landscape character.

2.0 METHODOLOGY

- This report was determined as a result of several comprehensive site inspections carried out throughout February 2008. The comments and recommendations in this report are based on findings from these site inspections.

- The subject trees were visually assessed from the ground using the standard visual tree assessment criteria and notes. Information was also used from the Tree Asset Database provided by the University. The inspections were limited to a visual examination of the subject trees without dissection, probing or coring. No aerial (climbing) inspections, woody tissue testing or tree root mapping were undertaken as part of this assessment.

- Tree health was determined by assessing:-

  I. Foliage size and colour
  II. Pest and disease infestation
  III. Extension growth
  IV. Canopy density
  V. Percentage of deadwood
  VI. Presence of epicormic growth

- Tree structure was assessed by:-

  I. Visible evidence of structural defects or instability
  II. Evidence of previous pruning or physical damage

- Tree hazard was assessed with regards to three main components (Harris, Clark & Matheny, 1999):-

  I. The tree's failure potential (the hazard)
  II. The person or object that would be injured or damaged if failure occurred (the target)
  III. The prevailing site conditions that may contribute to failure

- The location of the subject trees was determined from the Site Survey provided by the University.

There is no warranty or guarantee, expressed or implied, that problems or deficiencies regarding the subject trees or the subject site may not arise in the future. Information contained in this report covers only the subject trees at the time of inspection.

3.0 SITE DESCRIPTION

The University Ovals are located in the Camperdown Campus of the University of Sydney. This campus is bound by Parramatta Road to the north, City Road and Carillon Avenue to the south, Missenden Road to the west and Victoria Park to the east.

Oval 1 is located at the western end of Physics Road. Oval 2 is located to the south of Ross St entrance.

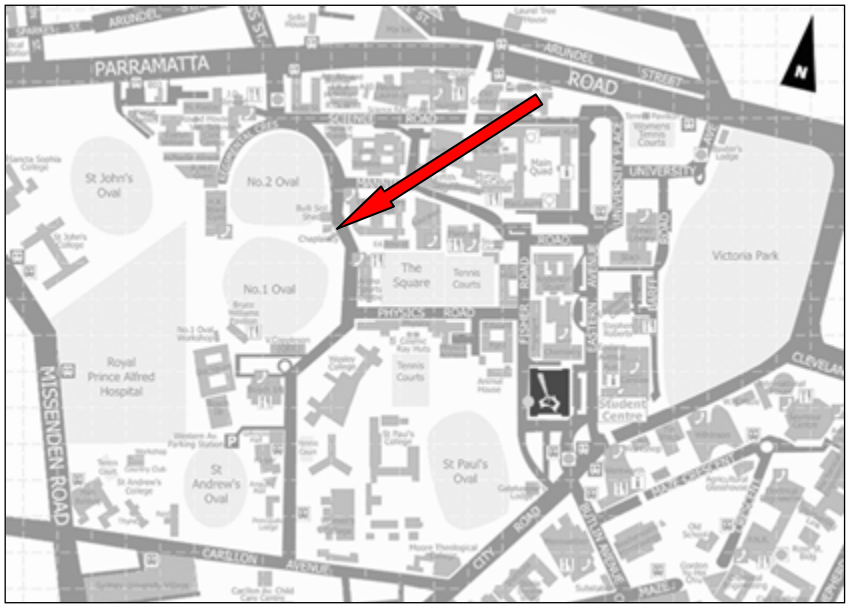

FIGURE 1: Location Map (www.emu.usyd.edu.au/emu/unimap, 2008)

4.0 LANDSCAPE CHARACTER

Ovals 1 and 2 are significant recreational open space within the campus. The mixed mature tree plantings surrounding the Ovals is an important feature of this open space area.

The tree plantings around Oval 1 include an eclectic mix of indigenous and exotic species such as *Grevillea robusta* (Silky Oak), *Eucalyptus camaldulensis* (River Red Gum), *Eucalyptus bicostata* (Southern Blue Gum), *Lophostemon confertus* (Brush Box), *Erythrina x sykesii* (Coral Tree), *Corymbia eximia* (Yellow Bloodwood), *Cinnamomum camphora* (Camphor Laurel) and *Ficus microcarpa* var. *'Hilli'* (Hills Weeping Fig) (Grounds Conservation Plan, 2002).

The tree plantings around Oval 2 are dominated by Eucalyptus, particularly *Eucalyptus bicostata* (Southern Blue Gum) which are predominantly located near the Veterinary Science Faculty. The tree plantings on the Western Avenue side of Oval 2, near Manning Road, include exotic species, particularly *Cedrus deodara* (Deodar), *Cupressus sempervirens* (Mediterranean Cypress), *Cupressus macrocarpa* (Monterey Cypress) and *Cupressus torulosa* (Bhutan Cypress) (Grounds Conservation Plan, 2002).

The trees around the Ovals provide good canopy cover and a shady pleasant environment. However, it appears that the species selection and planting locations have not been guided by a formal design concept or tree planting plan. A wide variety of types and styles of trees have been planted in an irregular fashion resulting in an ambiguous landscape character.

FIGURE 2: Oval 1

FIGURE 3: Oval 2

5.0 SUMMARY OF TREE MANAGEMENT ISSUES

The University faces significant challenges in managing their trees in a sustainable manner. The most significant tree management issues for the Ovals are broadly discussed below.

5.1 Soil Compaction

The soil was compacted throughout the area surrounding the two Ovals, especially adjacent to the footpaths and informal walking tracks. Compaction is the compression of soil, which breaks down soil aggregates. Compaction decreases total pore space as large pores become severely compressed. This results in slower water infiltration, poor aeration, reduced drainage and greater erosion potential. These factors and the increased physical resistance to root penetration can greatly impair root growth and function (Harris, Clark & Matheny, 1999).

Compacted soils can also impact on the potential soil volume available to trees, as roots are unable to penetrate dense soils. If root growth is restricted by compacted soils then a smaller water reservoir is available to the trees, exacerbating drought stress. Additionally, poor aeration is considered a principal result of compacted soils, limiting soil oxygen and gaseous exchange levels. Compacted soils also appear to dramatically reduce shoot growth (Harris, Clark & Matheny, 1999).

One of the most effective methods of treating soil compaction is to place a protective covering such as mulch over the soil surface. The layer of mulch reduces rain and sprinkler impact on the soil surface and disperses the weight of vehicles, people and animals. Thus, it is recommended that mulch is placed under the tree canopies wherever possible.

Coring by hollow-tyne is also an effective treatment for soil compaction. By undertaking hollow-tyne aeration, plugs of soil are physically removed from the soil profile. This allows air, water and nutrients to enter the soil and root zone.

Further, it is recommended that vehicular and pedestrian traffic is restricted in sensitive or compaction-prone areas. This can be partly achieved by redefining existing pathways and constructing new pathways to disperse traffic in areas with recurring compaction trails. However, it should be noted that the construction of new pathways adjacent to trees may have a direct impact on their health and structural stability and therefore planning and construction of new pathways should occur under the guidance of an Arborist.

Refer Section 11.0: Future Works

5.2 Drainage

Areas of poor drainage were noted at the northern end of Oval 2. Tree roots require oxygen to develop and thrive. Poor drainage can result in poor gas exchange which depletes the soil of oxygen, and leads to anaerobic conditions and subsequent root death. Such soil conditions also provide favourable conditions for harmful organisms such as *Phytophthora.* These combined effects can have a detrimental effect on tree health and exacerbate the risk of whole tree failure. In this regard, poor drainage is likely to have contributed to a recent whole tree failure at the northern end of Oval 2.

The reasons for poor drainage should be investigated. Factors may include inadequate grading and leveling, physical limitations imposed by the soil, the climate, the pattern of use or the type of management available. Irrigation systems should also be checked for leaks which might be contributing to the problem. It is also recommended that trees that tolerate poorly drained sites are selected for future planting within these areas.

As discussed above, construction and excavation works can directly impact on tree health and structural stability. Therefore the planning and construction of new drainage lines should occur under the guidance of an Arborist.

5.3 Mechanical Damage

Wounds were noted on some of the trees throughout the site. Generally, the wounds were located on the lower 2m of trunks or on exposed roots. Landscape maintenance equipment, vehicles, vandalism, weather and animals are the common causes of mechanical injury and wounding to the bases of trees and exposed roots. Wounds as a result of previous branch failures were also noted.

The primary effect of wounding is reduced translocation of water, minerals and sugars because of the loss of bark, cambium and sapwood. Long-term effects include the potential development of decay. While the wounds could result in decay and some loss of some structural strength in the future, the extent and speed of such decay is impossible to predict reliably. It is equally likely that a wounded tree with good vigour will compartmentalise the damaged area, that little decay will form and that the wounded tree will remain structurally sound (Harris, Clark and Matheny, 1999, pg 244).

Encouraging tree vigour is the best treatment for wounds. The rate of wound closure is closely correlated with tree vigour, as vigorous trees develop wound-wood more quickly than those of low vigour. Practices that encourage growth not only speed up wound closure but also reduce the possibility and the progress of decay (Harris, Clark & Matheny, 1999).

The best method for protecting trees from landscape maintenance equipment is to limit the opportunity for mechanical damage by creating a protective zone of mulch around the base and root zone of the tree (Bradshaw, Hunt & Walmsley, 1995).

However, in some cases internal diagnostic testing has been recommended to determine the severity of the structural defects. This further investigation is considered justified given the high target area of the subject site and the high landscape significance of the trees.

5.4 Grass Competition

Root competition from grass is likely to be occurring throughout the site. Water supply affects the growth of trees and their consequent ability to exploit more water reserves. Grasses are in an ideal position to exploit the limited supply of water available to trees. Their roots are more abundant than tree roots and have a greater length and total weight. Grass also imposes some minor competition for nutrients. A common method of controlling the growth of grass or weeds around the bases of tree is through the use of mulch (Bradshaw, Hunt & Walmsley, 1995).

5.5 Deadwood

Both large and small diameter deadwood was noted on trees throughout the site. Deadwood is an arboricultural term normally used to describe the presence of dead-branches located within a tree's crown. Most often, the accumulation of deadwood in a tree is a natural process whereby certain branches become shaded out by other, higher, more efficient branches.

A dead branch will at some point decay completely back to the parent stem. This is normally a gradual process whereby the wood decays and slowly falls in small pieces. However, sometimes, and especially in windy conditions, larger pieces can fall which could cause injury or damage. For this reason, deadwood is normally assessed as a safety hazard and, depending upon the situation, removal may be recommended.

The safety of targets, namely pedestrians, is considered the primary basis for deadwood removal. As deadwood has an ecological value, the removal of deadwood is usually only carried out where it is a potential hazard to site users.

5.6 Suppression

Several sections of the Ovals have been over-planted, resulting in trees becoming suppressed by adjacent tree plantings. This suppression has resulted in trees that are in poor health and become poorly formed as they search for light. The suppressed trees also tend to create a sense of overcrowding rather than an uncluttered landscape structure. While the removal of the suppressed trees will have a short-term negative visual impact, this will quickly become less apparent in the medium term as the adjacent trees grow into the space created.

5.7 Age & Species Distribution

The Ovals have an ageing tree population with blocks of single species of the same age. If areas are planted with a single species at one time, a large percentage of the trees will require removal over a short time period as they all arrive at the end of their useful life. This results in a rapid reduction in canopy cover and the loss of many of the benefits provided by the trees. This undesirable situation is less likely to occur if the tree population is composed of a variety of tree age classes and species.

5.8 Poor Planting Stock

Many of the newly planted trees are from poor quality stock that feature girdled roots and included branch junctions. Poorly grown stock will greatly reduce the tree's chances for a long, attractive, healthy and useful life. In some cases, these trees have been recommended for removal and replaced. These works will have a moderate impact on the canopy cover and amenity of the immediate area. However, the benefits of new groups of trees with a life expectancy range in excess of 40 years will outweigh these short-term costs.

5.9 Storm Damage and Branch Failures

Storm damage and branch failures were evident on several trees surrounding the Ovals. As trees begin to senesce, the crown starts to shed redundant parts and accumulate deadwood. The term 'crown retrenchment' is used to describe the way in which peripheral dieback occurs as the tree redirects energy and growth to the formation of a consolidated lower region of the crown. This renders the trees susceptible to damage by storms and strong winds. In addition, when a tree approaches the end of its life cycle, it tends to enter into a spiral of decline that leaves it vulnerable to multiple stresses. These stress factors hasten the tree's decline and increase the likelihood of further mechanical failure and/or death (Matheny & Clark, 1994).

6.0 REMOVAL STRATEGIES

Trees have finite life spans and must be removed as they die. Trees are also removed when their health, appearance or structural integrity declines. Two (2) common tree removal strategies that can be utilized are discussed below.

6.1 Selective Tree Removal

Selective Tree Removal is the removal of individual trees as necessary. However, the removal of individual trees, especially within groups must be carefully considered. Selective removal is not recommended when a new tree is to be planted as a replacement. The competition for light, water and nutrient resources arising from remaining trees in the group can jeopardize the health, form and amenity value of the young replacement tree. However, this strategy can be used where suppressed or hazardous trees are to be removed from a group and replanting is not required. This strategy requires the consultation from an Arborist to determine potential impacts on adjacent trees such as wind loading and residual damage.

6.2 Block Removal

Block removal is the most effective method to remove and replant entire groups of trees. The location and species selection of the replacement trees can then be carefully managed to ensure a long-lived, attractive, healthy and structurally sound tree population.

Removing even sections of a tree group is likely to impact on the canopy cover and amenity of the immediate area in the short term. However, in most cases, the medium and long term benefits of overcoming the difficulties of suppression for replacement trees will far outweigh the short term costs. In addition, block removal can be strategically staged to minimise the visual impact on the site.

7.0 PRIORITIZING TREE WORKS

A summary of actions for the recommended tree works has been listed in Appendix 2. The table below details how tree works have been prioritised according to need. With limited resources, it is not possible to carry out all the works that may be desirable, so essential safety works must always be carried out first. In addition, some works will also arise as a result of unplanned events such as severe weather.

Priority	Description
1	High priority works. Examples include potentially hazardous trees in high target areas, hanging branches and trees causing vehicular obstructions.
2	High-medium priority works. Trees that are a general safety concern but are not imminently dangerous.
3	Medium priority works. Works not usually of a safety nature.
4	Low priority works.
5	No works required at present.

8.0 THE TREES

For the purpose of describing the trees around the Ovals, the trees have been divided into thirteen (13) groups. These groups are shown in Appendix 1: Tree Location Plan.

8.1 Group 1

Trees 1091-1092, 1094, 1096-1097, 1100, 1104, 1109-1110, 1112-1113, 1115-1118, 1121-1128, 2180, 2572-2592.

This group of trees consists mainly of over-mature *Eucalyptus bicostata* (Southern Blue Gum). They are located to the south of the Ross St entrance and, as a group, they are a prominent feature of the Ovals' landscape. The majority of these trees contain defects such as large diameter deadwood, previous branch failures and storm damage. A fungal bracket was also noted on Tree 1121.

This group of trees also contains a number of newly planted *Eucalyptus microcorys* (Tallow-wood). These have been planted to replace several over-mature *Eucalyptus bicostata* (Southern Blue Gum) that have been removed. However, the use of poor quality plant material has resulted in these trees having a number of above- and below-ground defects, such as girdled roots and poor branch attachments. These defects cannot be remediated, and the trees are unlikely to reach their full potential.

All of the trees within this group should be removed. However, as this group of trees is a prominent landscape feature, a staged block removal process should be undertaken. It should be acknowledged that undertaking a staged removal process will exceed the time frame usually given to this priority level. As a result, the retained trees should be monitored during the staged process, especially following strong winds or storm events.

Trees	Action	Priority
1091-1092, 1094, 1096-1097, 1100, 1104, 2572-2573, 2575-2583.	Stage 1 block removal	2 (high-medium)
2584-2587, 1109-1110, 1112 , 2180.	Stage 2 block removal	2 (high-medium)
1115-1118, 2588-2589, 1121-1123.	Stage 3 block removal	2 (high-medium)
2590-2592, 1124-1128.	Stage 4 block removal	2 (high-medium)
1113	Stage 5 block removal	2 (high-medium)

FIGURE 4: Group 1

FIGURE 5: Group 1

8.2 Group 2

Trees 1129-1131, 1133-1140, 1144-1145, 2593-2596.

This group consists of several conifer species, including *Cedrus deodara* (Himalayan Cedar), *Cupressus sempervirens* (Mediterranean Cypress) *Cupressus macrocarpa* (Monterey Cypress) and *Cupressus torulosa* (Bhutan Cypress). These trees are located to the west of the Wallace Theatre and John Woolley Building. Other than normal deadwood, no significant defects were noted on these trees.

Minor grass competition and soil compaction was noted.

There are also smaller *Callistemon viminalis* (Weeping Bottle) planted as understorey. These specimens are either suppressed or dead.

Trees	Action	Priority
Group 2	Undertake deadwood removal	4 (low)
Group 2	Mulch the bases of the of Group 2	4 (low)
Group 2	Undertake coring	4 (low)
N/A (Trees not numbered on plan)	Remove the smaller *Callistemon viminalis* (Weeping Bottle).	4 (low)

FIGURE 6: Group 2

8.3 Group 3

Trees 1088-1089

This group of trees consists of two (2) *Eucalyptus bicostata* (Southern Blue Gum) which are located adjacent to the H.K Ward Gymnasium. These trees are considered over-mature and exhibit similar attributes to the trees described in Group 1. Both trees appear to have declined in health during the period of this assessment and are considered a higher risk than the trees in Group 1.

Trees 1088-1089 have been planted into a retained landscape area which has been finished with a deco-granite surface. The combination of the retained area and granite surface has resulted in a restricted soil volume and a compacted growing media.

Trees	Action	Priority
1088-1089	Remove trees	1 (high)

FIGURE 7: Group 3

8.4 Group 4

Trees 1043-1049

Group 4 mainly consists of the species *Lophostemon confertus* (Brush Box). Tree 1044 is a *Grevillea robusta* (Silky Oak) and Tree 1046 a *Ficus rubiginosa* (Port Jackson Fig). Most of these trees generally have good health and structure and can be retained for approximately 15-40 years.

However, Tree 1044 is a *Grevillea robusta* (Silky Oak) that features an inclusion at the junction of its co-dominant stems. This species generally has a short life expectancy range and decline in health rapidly at approximately 30-40 years old in the Sydney region.

A large wound was also noted on Tree 1048 *Lophostemon confertus* (Brush Box).

Trees	Action	Priority
1044	Remove tree	2 (high-medium)
1048	Monitor	4 (low)
Group 4	Undertake deadwood removal	4 (low)
Group 4	Undertake coring	4 (low)

FIGURE 8: Tree 1044

8.5 Group 5

Trees 1050-1057

This group of trees is located directly south of Group 4 and consists of a mixture of Australian native species. Most of these trees have branch failures.

Tree 1051 is an over-mature *Eucalyptus camaldulensis* (River Red Gum). The poor health and structure of this tree is evidenced by the majority of the canopy being comprised of epicormic growth, the presence of a fungal fruiting body, previous branch failures and large diameter deadwood.

Tree 1050 *Corymbia eximia* (Yellow Bloodwood) is a suppressed specimen. Notable defects include epicormic growth and storm damage. A large wound on a first order branch is likely the result of residual damage from the branch failure from Tree 1051.

Tree 1054 *Eucalyptus camaldulensis* (River red Gum) is located on top of a sandstone retaining wall and drain. This tree has a phototrophic lean to the south-east due to suppression from the adjacent trees. Previous branch failures were also noted.

Trees	Action	Priority
1050 & 1051	Remove trees	1 (high)
1054	Monitor	3 (medium)
Group 5	Undertake deadwood removal	4 (low)

FIGURE 9: Tree 1054

8.6 Group 6

This group consists of Trees 1058-1067 which are located south of the H.K Ward Gymnasium. They mainly consist of the species *Lophostemon confertus* (Brush Box) with the exception of Tree 1066 which is an *Erythrina x sykesii* (Coral tree). The majority of these trees have good to fair health and structure and can be retained for 15-40 years.

It is understood that Tree 1066 has had a branch fail which resulted in damage to a vehicle.

Trees	Action	Priority
1066	Remove tree	3 (medium)
Group 6	Undertake deadwood removal	4 (low)
Group 6	Undertake coring	4 (low)

FIGURE 10: Tree 1066

8.7 Group 7

This group consists of Trees 1068-1077 and 1079-1081 which are located on the western side of Oval 1 adjacent to the Centenary Institute. This group contains *Cinnamomum camphora* (Camphor Laurel), which are positioned closer to the Oval, and *Ficus microcarpa var. 'Hilli'* (Hills Weeping Fig) which are planted adjacent to the boundary fence.

The trees are approximately 15-20m in height and provide excellent canopy cover to the area. This group of trees is in the mature age class and could be retained for 15-40 years. However, wounding with possible decay was noted at the base of Trees 1070 and 1073. Tree 1070 also has a declining branch that extends west towards the adjacent building.

Ivy was also noted growing on several of the *Ficus microcarpa var. 'Hilli'* (Hills Weeping Fig).

Ideally, remedial treatment at the base of the trees should be undertaken in the way of decompaction and mulching. However, the steep gradient leading to the Oval is unsuitable for these works. The mulch is unlikely to be stable on this slope, and any disturbance to the soil such as aeration will likely result in localised erosion.

Trees	Action	Priority
1070	Remove declining branch	2 (high-medium)
1070 & 1073	Undertake internal diagnostic testing	3 (medium)
Group 7	Remove Ivy	4 (low)
Group 7	Undertake deadwood removal	4 (low)

FIGURE 11: Tree 1073

FIGURE12: Tree 1077

8.8 Group 8

This group of trees consists of Trees 937 and 939-947 which are located in the courtyard and garden area adjacent to Bruce Williams Pavilion. This group consists of the species *Lophostemon confertus* (Brush Box), *Eucalyptus paniculata* (Grey Iron Bark), *Eucalyptus sideroxylon* (Mugga Iron Bark) and *Jacaranda mimosifolia* (Jacaranda). These trees are generally in good health and structure and can be retained in excess of 40 years.

Tree 944 *Eucalyptus sideroxylon* (Mugga Iron Bark) has an inclusion at the co-dominant branch junction.

Tree 946 *Cupressus torulosa* (Bhutan Cypress) has an inclusion at the co-dominant branch junction and is suppressed.

Trees	Action	Priority
944 & 946	Remove trees	4 (low)
941	Mulch the base of tree	4 (low)
Group 8	Undertake deadwood removal	4 (low)
Group 8	Undertake coring	4 (low)

FIGURE 13: Group 8

8.9 Group 9

This group consists of Trees 948-953, 955 and 957-958 which are Australian native tree species. They are located on the south-eastern side of Oval 1, adjacent to Western Avenue.

Trees 951 and 953 are *Eucalyptus paniculata* (Grey Ironbark). These trees have been planted too close to the adjacent trees and, as a result, have become suppressed. Notable defects include large diameter deadwood and storm damage. A large wound was also noted on Tree 955 *Lophostemon confertus* (Brush Box).

Trees	Action	Priority
951 & 953	Remove trees	3 (medium)
955	Undertake internal diagnostic testing	4 (low)
Group 9	Undertake deadwood removal	4 (low)
Group 9	Mulch the base of trees	4 (low)
Group 9	Undertake coring	4 (low)

8.10 Area 10

This area consists of one (1) tree which is Tree 956, *Cupressus torulosa* (Bhutan Cypress). This tree has low landscape significance and poor structure evidenced by an included branch junction. The removal of this tree should have negligible impact on the amenity of the immediate area.

This tree is located in an area that can easily accommodate (sustain) two (2) large canopy trees. The removal of this tree in the short term will provide the scope to install two replacement trees. These trees will have the opportunity to become established prior to the removal of the adjacent groups, which should minimize the visual impact of the removal of adjacent trees.

Tree	Action	Priority
956	Remove tree	Low (4)
Area 10	Undertake coring	4 (low)

FIGURE 14: Group 9 & Area 10

8.11 Group 11

This group of trees consists of Trees 959-977, 979 and 981-1000 which are a mixture of both native and exotic species.

Trees 993, 997 (both *Populus deltoides*) and 964 (*Eucalyptus bicostata,* (Southern Blue Gum*)* are mature specimens containing a number of defects such as large and small diameter deadwood, suspect branch attachments and storm damage.

Tree 960 is a *Lophostemon confertus* (Brush Box) which has a large cavity that extends the majority of the length of its main stem and a first order branch.

Tree 961 is a *Cinnamomum camphora* (Camphor Laurel) which has a dead co-dominant stem and a wound with a cavity.

Trees 988, 986, and 966 have been suppressed by the adjacent trees.

There are also several Eucalyptus and Corymbia species positioned adjacent to the western boundary fence. These trees have a phototrophic lean to the east over the car park and road. These trees currently provide shade for vehicles and pedestrians. However, Tree 974 and a small tree to the south of Tree 982 (not shown on plan) are suppressed.

Table (title)

Trees	Action	Priority
964, 960, 961, 993, 997.	Remove trees	2 (high-medium)
966, 974, 986, 988, and small tree to the south of Tree 982.	Remove trees	3 (medium)
Group 11	Undertake deadwood removal	4 (low)

Due to the number of trees that have been recommended for removal and several other trees in this group which are suppressed, consideration should be given to block removal of this group.

FIGURE 15: Tree 961

FIGURE 16: Group 11

8.12 Group 12

This group of trees consists of Trees 1003, 1008-1012, 1014-1016 and 1021 which are located on the north-eastern side of Oval 1. The species within this group are Australian native trees.

Tree 1008 is a *Corymbia eximia* (Yellow Bloodwood) which has been suppressed by the adjacent trees.

Tree 1010 is an over-mature *Eucalyptus bicostata* (Southern Blue Gum). The health of this tree is poor, as is evidenced by the majority of the canopy being comprised of epicormic growth.

The remaining trees within this group have generally good health and structure and could be retained for 15-40 years.

Trees	Action	Priority
1008 &1010	Remove trees	2 (high-medium)
Group 12	Undertake deadwood removal	4 (low)

8.13 Group 13

This group of trees consists of Trees 1019-1020, 1022-1026, 1028-1029 and 1031-1042. These trees are located in between Ovals 1 and 2 which is dissected by Gross Farm Lane. These trees are predominantly Australian native tree species.

Several trees within this group are considered over-mature. These trees include 1020, 1035, 1038, and 1039.

Many of these trees have been planted too close together which has resulted in suppression of some of the trees. Suppressed trees include 1022 and 1026.

Tree 1028 is a *Grevillea robusta* (Silky Oak) which is in the mature age class. This species generally has a short life expectancy range and decline in health rapidly at approximately 30-40 years old in the Sydney region.

Tree 1042, a *Lophostemon confertus* (Brush Box), has a large cavity which extends the majority of the length of its main stem to one of its first order branches.

Trees	Action	Priority
1020, 1035, 1038-1039, 1042.	Remove trees	2 (high-medium)
1022, 1026 & 1028	Remove trees	3 (medium)
1029	Selective pruning (crossing branches and structural defects)	2 (high-medium)
Group 13	Undertake deadwood removal of trees to be retained.	2 (high-medium)

9.0 FUTURE REPLANTING STRATEGIES

A sustainable and progressive replanting and management program for University Ovals 1 and 2 is necessary to address the issues arising from the ageing tree stock and to provide a clear direction for the future of the Ovals' tree population.

Future tree planting should reinforce the existing character of each of the Ovals. However, the tree planting framework should accommodate acceptable amounts of change in planting patterns to strengthen functional aspects such as shade, delineation of pathways and the provision of sufficient seating areas for visitors.

Oval 1 is characterised by the planting of mainly large exotic and Australian rainforest species. Oval 1 is also the most spectator-friendly oval. The tree plantings surrounding this recreational area should allow sufficient space for groups of spectators to view sporting activities and provide a series of more intimate spaces for other visitors. It is therefore suggested that in the medium to long term, when the groups of trees reach the end of their useful life, they are removed as blocks to provide the opportunity to replant in a planned and unified manner.

Both exotic and large native shade trees should be considered for the planting surrounding Oval 1. Accent trees or trees of botanical interest may also be considered. Adequate space between the tree plantings should be provided. This should allow for the development of well-formed trees and permit the increase in size that will occur in the long-term.

Oval 2 is characterized by the dominance of Australian native species, particularly *Eucalyptus bicostata* (Southern Blue Gum). Both native and exotic species which complement this existing theme should be considered. As there is limited area for spectator viewing from this Oval, these trees can be planted more densely without compromising recreational use of the site.

Specific planting strategies have been suggested for the different areas of the Ovals. These are outlined below. However, these suggestions should not replace the importance of a tree planting plan to outline the future vision for the tree planting around the Ovals.

9.1 Group 1

In order to retain the existing character of the area, future planting should include the further use of native trees, particularly *Eucalyptus* species. Tree planting should provide a sense of enclosure to the Ovals and provide some visual barrier between Oval 2 and the surrounding vehicular access. Species to consider include:

Botanical Name	Common Name
Acacia melanoxylon	Blackwood
Eucalyptus camaldulensis	River Red Gum
Eucalyptus elata	River Peppermint
Eucalyptus radiata	Narrow-leaved Peppermint

9.2 Group 2

The existing trees in this group can be retained in the medium-long term. A mixed planting of natives and visually sympathetic exotics should be used to help integrate the landscape character of this section of the Oval with the prevailing character evident in other groups.

Botanical Name	Common Name
Agonis flexuosa	Willow Myrtle
Brachychiton populneus	Kurrajong
Brachychiton ruprestris	Queensland Bottle Tree
Buckinghamia celissima	Ivory Curl Flower
Caesalpinia ferrea	Leopard Tree
Hibiscus tiliaceus 'Rubra'	Bronze Hibiscus*
Maclura pomifera 'Wichita'	Osage Orange
Melaleuca leucadendra	Weeping Paperbark
Schinus areira	Peppercorn

9.3 Group 3

Establishing new trees in the existing site conditions would be expensive and difficult. It is understood that the existing gymnasium is to be demolished and a new building is to be built. Suitable planting conditions should be incorporated into the design of the new building, and the landscaping works should be undertaken following the building's completion. The specific locations of the new trees should also be determined at the design stage of the new building. The species to be used in this area should be appropriate for the site conditions of the new building. However, they should also have a connection with the Oval plantings.

9.4 Groups 4, 12 & 13

Existing trees should be retained in the medium-long term. There is an opportunity to establish a new formal tree planting schedule after the redevelopment of the existing gymnasium. This formal tree planting would provide a prominent north/south axis access between the Ovals. These works may also consider the realignment of the Gross Farm Lane into the centre of the two Ovals. This would limit branches interfering with Oval 2. The habit and style of the tree species is largely dependant upon the type of renovation works undertaken in this area. However, species may include:

Botanical Name	Common Name
Agathis robusta	Queensland Kauri
Ginko biloba 'Fastigiata' -	Maidenhair Tree
Carpinus betulus 'Fastigiata'	Upright European Hornbeam
Lophostemon confertus	Brush Box
Zelkova serrata 'Green Vase'	Japanese Elm
Ulmus parvifolia 'Burnley Select'	Chinese Elm
Betula nigra 'Heritage'	River Birch
Nyssa sylvatica	Tupelo

9.5 Groups 5, 6, 7, 8, 9 & 11

Existing trees should be retained in the medium-term. Large, broad-domed shade trees should be considered. Accent trees or trees of botanical interest may also be considered. Adequate space between the tree plantings should be provided to allow for the development of well-formed trees and permit the increase in size that will occur in the long-term. The provision of sufficient seating areas combined with well-planned plantings will be beneficial for potential spectators. Species may include:

Botanical Name	Common Name
Quercus ilex	Holm Oak
Syzygium francisii	Giant Water Gum
Alphitonia excelsa	Red Ash
Cinnamomum oliveri	Oliver's Sassafras
Populus yunnanensis	Yunnan Poplar
Ficus superba var. *henneana*	Deciduous Fig
Cordyline australis	Cabbage Tree (NZ)
Dracaena draco	Dragons Blood Tree

9.6 Area 10

This tree is located in an area that can easily accommodate (sustain) two large canopy trees. These trees will have the opportunity to become established prior to the removal of the adjacent groups, which should minimize the visual impact of the removal of adjacent trees.

Botanical Name	Common Name
Populus deltoides	Cottonwood
Argyrodendron actinophyllum	Booyong
Liriodendron tulipifera	Tulip Tree
Ficus religiosa	Boddhi Tree

10.0 TREE SUPPLY AND INSTALLATION

Selecting appropriate tree species and planting sites involves careful evaluation to determine that the species is appropriate given the environmental conditions and the constraints of the planting site and meets its desired function. In addition, the supply of quality plant material and the correct installation of new trees will greatly increase the trees' chances for a long, attractive, healthy, and productive life.

Appendix 3 contains a general specification for the supply and installation of new trees around the Ovals.

11.0 FUTURE WORKS

11.1 Pruning

Pruning works should be undertaken in accordance with *AS4373: Pruning of Amenity Trees* (2007) and to the minimum standards outlined in the *Workcover Code of Practice for the Amenity Tree Industry* (1998). Reference shall be made to any relevant legislation including Tree Preservation Orders, i.e. consent to undertake removal should be obtained from Council.

Tree surgery work should be carried out by an experienced and qualified Arborist. The Arborist should hold a minimum qualification equivalent (using the Australian Qualifications Framework) of NSW TAFE Certificate Level 3 or above, in Arboriculture.

11.2 Tree Removals

The trees to be removed should be marked with a red cross by the Tree Removal Contractor. The Grounds Manager should inspect and approve these trees for removal prior to the felling operation commencing.

Tree removal work should be undertaken in accordance with the minimum standards outlined in the *Workcover Code of Practice for the Amenity Tree Industry* (1998). Reference should be made to any relevant legislation including Tree Preservation Orders, i.e. consent to undertake removal should be obtained from Council.

The trees to be retained should not be damaged during the tree removal work.

Where possible, trees should be chipped on-site and the material should be retained for mulch.

11.3 Mulching

The areas should be mulched, and the mulch maintained to a depth of 70mm. The mulch should be spread by hand to avoid soil disturbance and compaction within the root zone.

11.4 Coring

Coring operations should be undertaken with a hollow tyne to a depth of 100mm. Coring should be avoided during high temperature periods or when the soil is wet.

11.5 Construction Activities

Trees are regularly subject to damage both above and below ground from civil works. It is understood that several construction works will be undertaken in close proximity to the Ovals' trees. Within the University, there is a particular need for those planning and implementing works to buildings and services to be tree-sensitive and to seek advice and guidance from the Grounds Maintenance section of Campus Infrastructure Services.

11.6 Internal Diagnostic Testing

There are a number of instruments used to assess wood defects in trees. All methods should be approached with caution and testing should only be carried out when necessary to establish the 'physical' size/ width of remaining supportive tissue to allow a calculable risk analysis of the trees' stability to be made. Both the testing and the interpretation of the testing data should always be undertaken to an appropriately qualified consultant.

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14.0 APPENDICES

14.1 Tree Location Plan

Tree Location Map

THE UNIVERSITY OF SYDNEY

0 5 10 15 20 25 50 METRES

prepared by

The Tree School
in association with

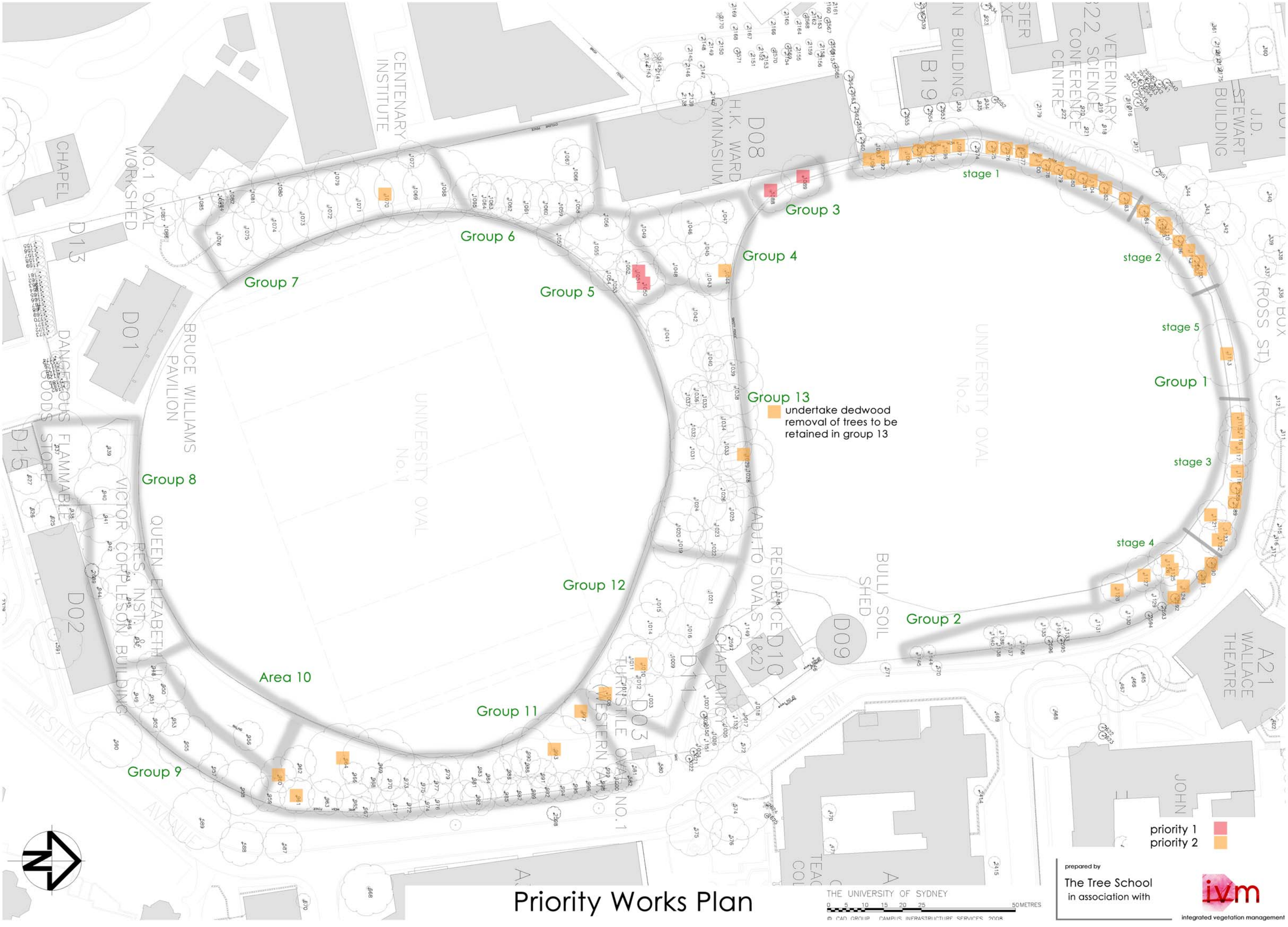
ivm
integrated vegetation management

14.2 Summary of Actions

Trees	Action	Priority
GROUP 1		
1091-1092, 1094, 1096-1097, 1100, 1104, 2572-2573, 2575-2583.	Stage 1 block removal	2 (high-medium)
2584-2585, 1109-1110, 1112, 2586-2587, 2180.	Stage 2 block removal	2 (high-medium)
1115-1118, 2588-2589, 1121-1123.	Stage 3 block removal	2 (high-medium)
2590-2592, 1124-1128.	Stage 4 block removal	2 (high-medium)
1113	Stage 5 block removal	2 (high-medium)
GROUP 2		
Group 2	Undertake deadwood removal	4 (low)
Group 2	Mulch the bases of the of Group 2	4 (low)
Group 2	Undertake coring	4 (low)
N/A (Trees not numbered on plan)	Remove the smaller *Callistemon viminalis* (Weeping Bottle).	4 (low)
GROUP 3		
1088-1089	Remove trees	1 (high)
GROUP 4		
1044	Remove tree	2 (high to medium)
1048	Monitor	4 (low)
Group 4	Undertake deadwood removal	4 (low)
Group 4	Undertake coring	4 (low)
GROUP 5		
1050 & 1051	Remove trees	1 (high)
1054	Monitor	3 (medium)
Group 5	Undertake deadwood removal	4 (low)
GROUP 6		
1066	Remove tree	3 (medium)
Group 6	Undertake deadwood removal	4 (low)
Group 6	Undertake coring	4 (low)
GROUP 7		
1070	Remove declining branch	2 (high to medium)
1070 & 1073	Undertake internal diagnostic testing	3 (medium)
Group 7	Remove Ivy	4 (low)
Group 7	Undertake deadwood removal	4 (low)

Trees	Action	Priority
GROUP 8		
946 & 1044	Remove trees	4 (low)
941	Mulch the base of tree	4 (low)
Group 8	Undertake deadwood removal	4 (low)
Group 8	Undertake coring	4 (low)
GROUP 9		
951 & 953	Remove Tree	3 (medium)
955	Undertake internal diagnostic testing	4 (low)
Group 9	Undertake deadwood removal	4 (low)
Group 9	Mulch the base of trees	4 (low)
Group 9	Undertake coring	4 (low)
AREA 10		
956	Remove tree	Low (4)
Area 10	Undertake coring	4 (low)
GROUP 11		
993, 997, 964, 960, 961	Remove trees	2 (high-medium)
966, 986, 988, 974 and small tree to the south of Tree 982.	Remove trees	3 (medium)
Group 11	Undertake deadwood removal	4 (low)
GROUP 12		
1008 &1010	Remove trees	2 (high-medium)
Group 12	Undertake deadwood removal	4 (low)
GROUP 13		
1020, 1035, 1038-1039 & 1042	Remove trees	2 (high-medium)
1022, 1024, 1026 & 1028	Remove trees	3 (medium)
1029	Selective pruning (crossing branches and structural defects)	2 (high-medium)
Group 13	Undertake deadwood removal of trees to be retained.	2 (high-medium)

14.3 Priority Works Plan



Priority Works Plan

THE UNIVERSITY OF SYDNEY

0 5 10 15 20 25 50 METRES

prepared by

The Tree School

in association with

ivm

integrated vegetation management

14.4 Appendix 3: Tree Supply & Installation Specifications

1.0 SCOPE OF WORK

These specifications are for the purpose of the supply and installation of new trees for University Ovals 1&2.

The works shall include but not be definitive of the following:

- Familiarization of site conditions to carry out the nominated works
- Verification of the location of underground services
- Protection of utilities and services throughout the contract period
- Protection of trees to be retained
- Supply of trees as specified
- Installation of new trees as specified
- Removal of all deleterious material from the subject site and its disposal at a licensed waste management centre.

2.0 EXPERTISE

Tree installation work shall be carried out by qualified Horticulturists with a minimum of three years experience in the horticultural/landscape industry. The site supervisor shall hold a minimum qualification equivalent (using the Australian Qualifications Framework) of NSW TAFE Certificate Level 3, or above in Horticulture and shall have demonstrated experience in similar projects.

3.0 STANDARDS

The following standards are referred to in this specification:

- AS4454: Composts, Soil Conditioners and Mulches (1997)
- AS4373: Pruning of Amenity Trees (2007)

4.0 TREE SUPPLY

4.1 Labelling

Labels shall be weather proof and fixed securely to the tree. The label shall not cause damage to the tree. Ensure that supplied trees are labelled with the following information:

- Genus
- Species
- Supplier
- Cultivar, where applicable

4.2 Plant Containers

Supply trees in weed-free containers. The containers shall be sufficiently rigid to hold the rootball shape and to protect the root mass.

4.3 Health

Supply trees: -

- with foliage size and colour consistent with that shown in healthy specimens of the species
- that are free from pest and disease
- with extension growth consistent with that shown in healthy specimens of the species
- that have been grown in similar climatic conditions to that of the subject site
- that are free from mechanical wounds and sunburnt areas

4.4 Trunk Position

Supply trees where the distance from the centre of the trunk to the extremity of the rootball does not vary by plus or minus 10%.

4.5 Stem Taper

Supply trees where the calliper at any given point on the stem is greater than the calliper at any higher point on the stem.

4.6 Self-Supporting

Supply trees that are self-supporting.

4.7 Crown Symmetry

Supply trees where the crown bulk does not vary by plus or minus 10% on opposite sides.

4.8 Apical Dominance

Supply trees where the central stem is not divided at any point lower than the clean stem height nominated.

4.9 Included Bark

Supply trees where the branch/stem bark ridges are convex.

4.10 **Pruning**

Supply trees free from recent pruning cuts. All pruning cuts shall have been executed in accordance with proper arboricultural practices as detailed in *AS4373: Pruning of Amenity Trees* (2007).

4.11 **Height of Root Crown**

Supply trees where the root crown is at the surface of the rootball.

4.12 **Rootball Depth**

Supply trees where the depth of the rootball in the container is greater than or equal to the stem diameter at soil grade.

4.13 **Root Direction**

Supply trees that are free from girdling, circling and kinked roots. The roots shall grow radially or downwards from the point of initiation. Any deviation from the radial or downward direction shall be less than 45°.

4.14 **Rootball Occupancy**

Supply trees where the root distribution is uniform throughout the growing media and root growth is typical for healthy specimens of the species. When the unsupported rootballs are handled, at least 90% of the soil volume remain shall remain intact.

9.16 **Rejection of Non-conforming Specimens**

Any supplied trees not conforming to this standard will be rejected and replacement specimens shall be provided.

5.0 TREE INSTALLATION

5.2 **Delivery, Handling & Protection of Plant Material**

Ensure that plants are delivered to site on the same day as installation. Plants shall be handled in such a manner so as to avoid damage. Protect plants throughout the installation works. Ensure that no planting is undertaken in unsuitable weather conditions such as extreme heat, cold, wind or rain. Planting operations shall be suspended should adverse weather prevail.

5.3 **Rootball Preparation**

Remove the container completely from the rootball without damaging the plants. Trim the outer 5mm of the rootball with a clean and sharp blade to ensure that roots will grow laterally. Avoid excessive disturbance to the roots during trimming.

5.4 **Placement of Plant Material**

Ensure the plants are placed in the planting hole with their stems set vertically. The top of the rootball shall be set at equal height to the finished level of the surrounding soil.

5.5 **Backfilling**

Ensure that the planting holes are backfilled with site topsoil in layers not greater than 200mm. Each layer shall be lightly consolidated before the next layer is added to prevent excessive settlement after planting. Ensure all voids around and under rootballs are filled and that no air pockets are retained.

5.6 **Mulching**

Mulch the trees to a depth of 50mm with a coarse grade recycled mulch conforming to *AS 4454: Composts, Soil Conditioners & Mulches* (1997). The mulch shall be pulled back from the plants' stem by 50mm.

10.7 **Watering**

The planted trees shall be watered immediately after planting. Prevent the rootballs from drying out during the planting phase. Ensure that watering is directed into the rootball. Provide temporary irrigation as required to maintain the trees in peak condition at all times.