

# OBSERVATORY HILL Tree Management Plan

Adopted 12/12/2008



*city of villages*



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## Executive Summary

The *Observatory Hill Park Tree Management Plan* was prepared as part of a suite of Tree Management Plans for the City of Sydney's iconic and 19th century parks.

The Plan includes a survey of all of the existing trees within the Park (42 trees) and contains relevant heritage, environmental and arboricultural data relating to individual trees as well as distinct groups of trees.

A major focus of the Plan is to implement a program of tree removal and replacements, in a planned and managed way, which will maintain a viable tree population in Observatory Hill Park.

A Safe Useful Life Expectancy (SULE) analysis of the tree population was prepared. From this assessment the following removal and replacement strategies were recommended:

- Staged removal and replacement of the over mature Moreton Bay Figs located throughout the Park, over the next twenty years;
- Planting of four (4) mature Moreton Bay Figs into NW, SW and SE corners of the Park;
- Removal and replacement of the small and self-sown trees around the Cahill Expressway cutting;
- Planting of six (6) advanced Jacarandas to replace the Poplars on Upper Fort Street;
- Relocation of seven (7) Jelly Palms from the NE corner of the Park into the open space areas on the northern and southern side of the exercise area;
- Relocation of one (1) semi mature Moreton Bay Fig further down slope to the north-west; and
- Planting of one (1) advanced Moreton Bay Fig into the NE corner of the Park to replace the relocated Jelly Palms.

The Tree Management Plan recommends a series of improved techniques to ensure best practice tree monitoring and arboricultural maintenance.

Comprehensive management and maintenance requirements are to be incorporated into the Parks and Open Space contract specifications and include details relating to:

- electronic tree database;
- disease monitoring;
- pruning programmes;
- soil improvements; and
- nurturing of young trees

## 1 Introduction

The *Observatory Hill Park Tree Management Plan* forms part of a suite of tree management plans prepared for the City's iconic and 19th century parks. The Plan was initiated as part of the City's commitment to best practice tree management.

### 1.1 Purpose of the Observatory Hill Park Tree Management Plan

The purpose of the *Observatory Hill Park Tree Management Plan* is to develop proactive strategies for the effective management; maintenance and conservation of the tree population and to give the community and Council's management staff a clear direction and vision for the future management of the Park's trees.

The aims are to:

- describe the special qualities of the Park's trees, their significance and the landscape character that they create;
- assess the health and condition of all existing trees;
- develop a consistent proactive management approach for the existing tree population; and
- provide strategies for the long term removal/replacement of all of the Park's trees;

### 1.2 Scope of the Plan

The Plan focuses on the trees in Observatory Hill Park and the trees in close proximity to its boundaries. It includes a survey of all of the existing trees in the Park and contains relevant heritage, environmental and arboricultural data relating to individual trees as well as distinct groups of trees.

## 2 Methodology

Preparation of the *Observatory Hill Park Tree Management Plan* involved the mapping of the existing tree population within the Park and comprehensive studies of the issues that affect these trees.

Council's Tree Management Team conducted visual assessments from the ground, of each and every tree within the Park. Field notes, observations and photographs were recorded during the assessment period and a Safe Useful Life Expectancy (SULE) analysis of the tree population was prepared.

Andrew Morton from Earthscape Horticultural Services were engaged in May 2007 to prepare a Tree Assessment Report for the mature Moreton Bay Figs within the Park. Potential hazards were identified and remedial works were recommended where necessary.

A design analysis of the Park identified significant vistas and planting patterns and the general landscape character of the Park. An historical perspective of significant tree plantings in relation to viewing corridors and vistas was considered.

The *Sydney Observatory Conservation Plan* (2002 Revised Edition) was reviewed. Informal discussions were conducted with the Manager of the Sydney Observatory to consider the low trajectory viewing corridors required from the north-western and south-western dome telescopes and the visual link between Fort Phillip and South Head signal stations.

The current arboriculture practices and tree management methods used by the City's Parks and Open Space Service Providers were assessed to identify any opportunities to improve the existing techniques.

Specific tree issues, such as inappropriate tree plantings, hazardous trees, poor performance and over-mature trees were documented.



### 3 The Park

#### 3.1 Site Description

Observatory Hill Park occupies an area of approximately two (2) hectares of open space on Upper Fort Street at Millers Point. The Park is bounded by buildings fronting Kent Street on the west, the southern approach to the Harbour Bridge on the east, the Cahill expressway cutting on the south and Watson Road on the north.

The Park is classified as Crown Land. The management of the Park was taken over by the Municipal Council of Sydney in 1909 (*State Records of NSW*) and continues to be managed by the City of Sydney under the provisions of Part 5 of the Crown Lands Act, 1989.



Figure 1 Site plan



### 3.2 History

Observatory Hill Park is set on a commanding hill-top vantage point surrounding the historic Sydney Observatory.

In 1797 Observatory Hill Park became the site of the first windmill in NSW. In 1803 a fort was constructed on the site for defence purposes and in 1825 the eastern wall was converted to a signal station for ships in various parts of Sydney Harbour. At this time the site became known as “Flagstaff Hill”.

In 1848 a new signal station was built and in 1858 the building was further modified to become an observatory. The site subsequently became known as Observatory Hill. In 1982 the Observatory was converted to an educational facility and museum of astronomy and related fields. It is a tourist destination for approximately 150,000 visitors per annum.

The Park was formerly dedicated as a public recreation reserve in 1884 and became officially known as Observatory Hill Park in 1887 (*Observatory Hill Park Draft Plan of Management 1997*).

Today Observatory Hill Park remains an important resource for passive recreation and provides a highly valued green retreat where visitors of all ages can enjoy panoramic views of the Harbour and the city, from one of the most pleasing environments in contemporary Sydney.

### 3.3 Significance of the Trees

Many of the trees in Observatory Hill Park were planted c.1880 and as remnants of the Victorian era of Park trees should be recognised for their historic significance.

Nineteen (19) Moreton Bay Figs (*Ficus macrophylla*) have achieved exceptional proportions, being amongst the largest of this species to be found in the City of Sydney (*Register of Significant Trees 2004*).

These trees are integral components of the City's cultural heritage of civic planting schemes dating from the 1880s and are significant components of the Millers Point landscape. The 19 Figs are grouped in four separate and distinctive clusters. They are clearly visible from many vantage points and are the most prominent plantings on the site. These Figs have been listed on the City's *Register of Significant Trees* and where possible shall be retained and protected.



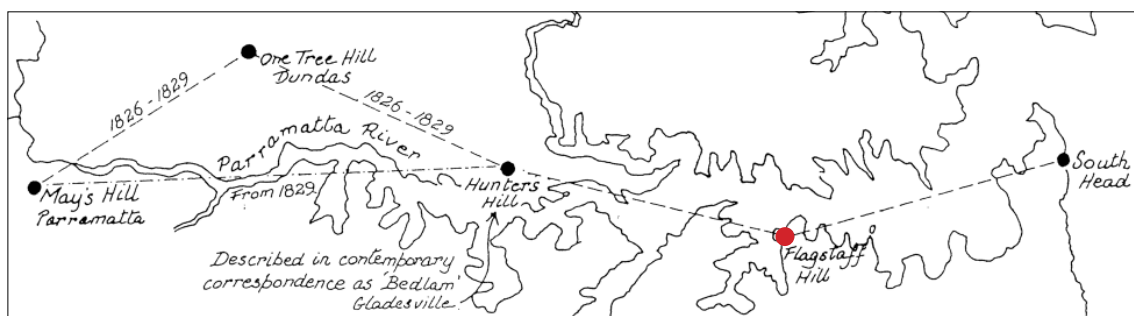
Figure 2 NW group of significant Moreton Bay Figs

The second main period of planting occurred in 1932 in conjunction with the opening of the Harbour Bridge. This included the grove of Palm trees at the north-east corner of the site and the Oleanders and Redgums planted as part of the Cahill Expressway works (*Observatory Hill Park Draft Plan of Management 1997*).

The most recent significant plantings were in 1992 with five (5) Moreton Bay Fig trees planted near the Rotunda on the NE corner of the Observatory boundary. This was carried out to commemorate the visit by Japan Junior Chamber Inc. to promote "The Age of Global Citizenship".

### 3.4 Design Analysis

Successive uses of Observatory Hill required its upper slopes to have an open aspect (*Sydney Observatory Conservation Plan 2002*). As a windmill site, the crown was completely cleared. Later as a signal station, completely uninterrupted visual alignments were required to and from South Head Signal Station, the city and repeater stations on the way west to Parramatta.



**Figure 3** Signal Station network between South Head and Parramatta from 1826.

The construction of the Observatory in 1857-1859 and 1876 meant that surrounding views and visual alignments had to remain open. The dome telescopes required low trajectory sweeps and the time ball on its tower was to be viewed from the ships in the Harbour.

For these reasons the 1880 planting map of Observatory Hill that was included in the *Astronomical Observations* of 1893, contained only shrub planting. However, the planting did not adhere to this plan. A civic planting scheme, initiated during the 1880s and 1890s featured areas of open lawn scattered with large shade trees, primarily Figs, with fenced garden beds and shrubbery around the Observatory precinct.

Today, the Moreton Bay Figs, planted circa 1880s, have their own cultural and heritage significance; their age and visual impact being representative of an area of park plantings.

The *Sydney Observatory Conservation Plan 2002* (Policy 33.2) recommends: "Plantings that obscure the views and vistas within, to and from the grounds should be modified or removed and any plantings chosen to fit the requirements of these policies."

A major focus of the Tree Management Plan is to implement a program of tree removal and replacements that will reinforce the historic quality of the Park, sympathetic to the needs of the Observatory and maintaining viewing corridors to the Harbour and city.

The Tree Planting Plan (Figure 14) provides details of new and replacement tree species and their proposed locations.

## 4 Soil Assessments

Soils on Observatory Hill are typical of the GyMEA Landscape Group (as classified in the Soil Landscapes of the Sydney 1:100,000 Sheet). Soil materials are derived from Hawkesbury Sandstone and may be discontinuous with localized rock outcrop.

The soil maps suggest that the soil is relatively shallow, sandy and very low in nutrient status and water holding capacity. Early photographs show exposed rock patches (*Draft Plan of Management 1997*).

In July 2007 Soilsmart Horticulture took representative soil samples from the root plates of a number of the Moreton Bay Figs located within the Park and prepared a Soil Biology and Chemical Analysis (Attachment 4).

### Results

The results indicate that there are some significant imbalances in the nutrient status of the soil which will affect tree health. Key aspects include:

- High levels of Calcium, Manganese and Potassium;
- Low availability of Phosphorous;
- Significant imbalance in the Calcium:Magnesium ratio;
- Low Nitrogen (Nitrate and Ammonium) and Sulphur levels; and
- High trace element levels (with the exception of Manganese).

### Conclusions

The high Magnesium to Calcium ratio is likely to be contributing to the compacted soil conditions which are evident around the trees. The initial focus for the soil in the Park should be to correct the imbalance between Calcium and Magnesium thus compensating for the likely deficiency in plant Phosphorous levels.

Improving the biological status of the soil within the root plates (as with the recently completed aeration and mulching) will build Nitrogen levels naturally and encourage the cycling of 'tied-up' nutrients (particularly Phosphorous and Iron).

Corrections should be made to nutrient levels of the soil to eliminate the possibility of deficiencies causing additional stress on the trees.

### Recommendations

1. Apply Soilsafe Activated P at 100 grams/sq. metre, in conjunction with Granoverm at 100 grams/sq. metre to improve the Calcium and Phosphorous status and cation balance.
2. Apply OC Manganese as a soil drench throughout the root plate area, at a rate equivalent to 500 grams/hectare, once only in Spring.
3. Apply Soil and Plant Tonic and Biogrow as per biological report, to rejuvenate soil micro-organisms, build soil structure and assist in cycling available nutrients.

## 5 The Trees

### 5.1 Tree Survey

In order to gain a clear picture of the condition of the trees in Observatory Hill Park, an inventory was prepared. All of the trees were inspected and their locations, tree number and species documented on a Tree Location Plan (Figure 4).

Graphic representations were prepared, indicating the projected Safe Useful Life Expectancy of each tree (SULE Analysis, Figure 5).

### 5.2 Analysis of Results

The data collected for the *Observatory Hill Park Tree Management Plan* provides a valuable tool to analyse the numbers, distribution, age and the overall health and condition of the current tree population in Observatory Hill Park (Attachment 1: Tree Assessment Schedule).

The inventory indicates that there is currently a total of 42 trees, over three (3) metres tall, located in Observatory Hill Park. The total includes eight (8) different species (Appendix 3: Summary of Tree Population).

The findings indicate that *Ficus macrophylla* (Moreton Bay Fig) is by far the most dominant species in the Park accounting for 57.2% of the total tree population.

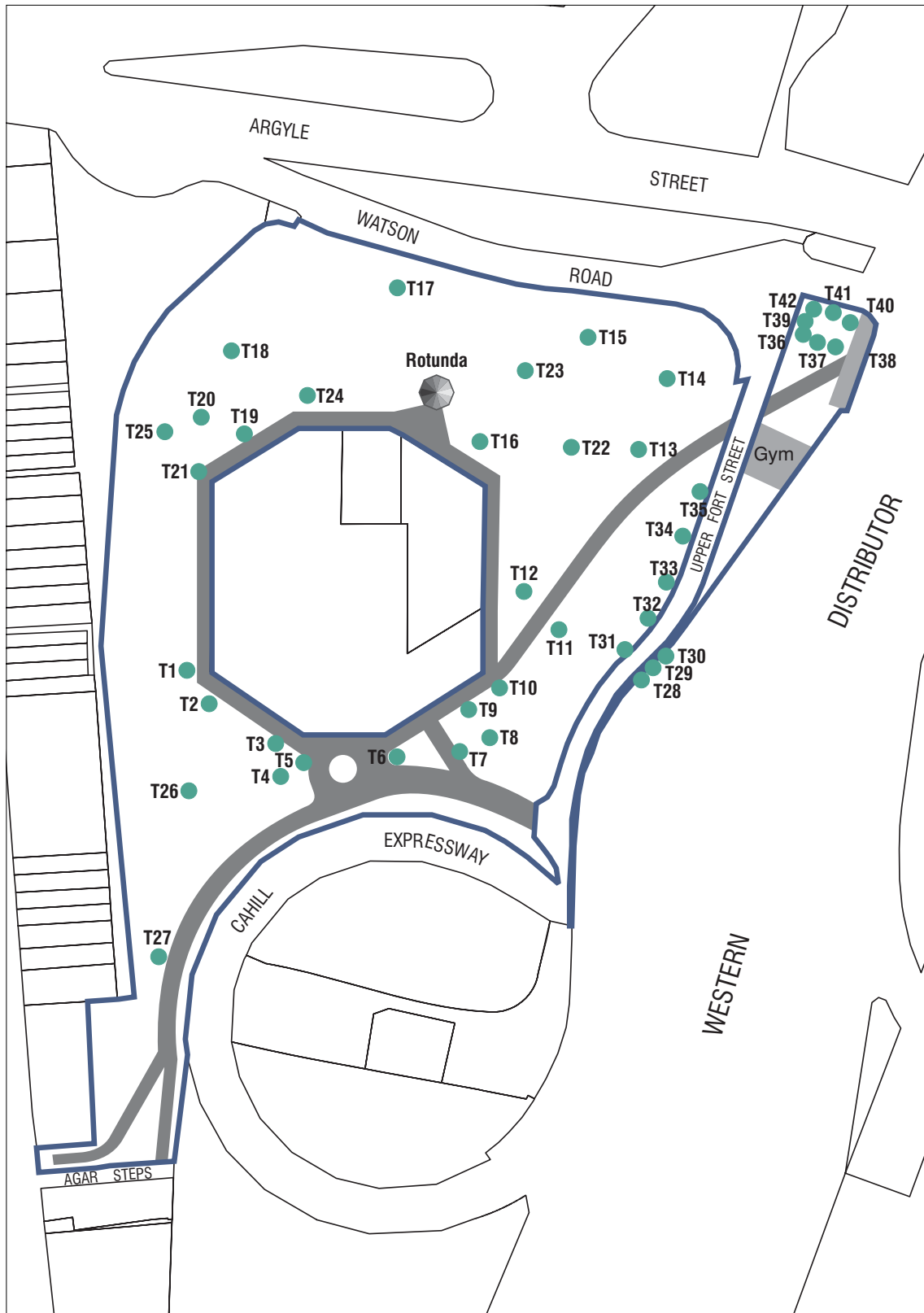


Figure 4 Observatory Hill Park Tree Location Plan showing existing trees

### 5.3 SULE Analysis

SULE is an acronym for Safe Useful Life Expectancy (Sule categories: Appendix 4). It is a system that was developed by Jeremy Barrell<sup>1</sup> in 1996, to assess tree life expectancy and how long trees can be expected to be retained safely and usefully near people.

In all situations safety has to be considered the absolute priority. Important secondary objectives are reasonable management costs and sustaining amenity. The priority when managing trees with a high hazard potential should be to reduce the risk to an acceptable level. This can be achieved by removing the tree, removing the targets or treating the tree.

A major role of trees in an urban environment is to provide visual amenity. Healthy trees have the potential to provide visual amenity in the future in a way that does not lead to injury/damage to people or property. Trees become less useful as maintenance costs become excessive and they begin to have a negative effect on amenity by interfering with better trees or inhibiting the establishment of new trees.

Mature and over-mature trees, particularly in stressful urban settings such as Observatory Hill Park, have greatly reduced recuperative powers compared with younger trees. The SULE categories were estimated for each and every tree in Observatory Hill Park.

Thirteen (13) trees were assessed as having a **Long SULE** (ie. appeared retainable for more than 40 years). This represents 31% of the total population. Eight (8) of these are recommended to be relocated within the Park.

Seventeen (17) trees were assessed as having a **Medium SULE** (ie. appeared retainable for up to 40 years). This represents 40% of the total population.

Eight (8) trees were assessed as having a **Short SULE** (ie. appeared retainable for up to 15 years). This represents 19% of the total population.

Four (4) trees were assessed as being due for **removal within the next five (5) years**. This represents 10% of the total population.

The SULE results indicate that 69% of the total tree population in Observatory Hill Park will require removal/replacement within the next 40 years.

The SULE categories for each of the trees in Observatory Hill Park are included in the Tree Assessment Schedule (Attachment 1).

<sup>1</sup> Jeremy Barrell is a consulting arborist from Hampshire in the United Kingdom. He developed the concept of SULE as a method of systematically assessing trees on proposed development sites. In essence trees with the longest SULE would be the ones most worthy of retention.



Figure 5 Safe Useful Life Expectancy (SULE) Analysis

Key:

- 13 trees appeared retainable for more than 40 years (Long SULE 1)
- 17 trees appeared retainable for 15-40 years (Medium SULE 2)
- 8 trees appeared retainable for 5-15 years (Short SULE 3)
- 4 trees to be removed within 5 years (SULE 4)
- 8 trees with Long SULE to be transplanted to new locations within the Park



## 6 Tree Management Strategies

Observatory Hill Park has an aging but culturally significant tree population that requires periodic monitoring as part of a programme of responsible tree management.

Increasing visitation and changing patterns of use of the Park are issues that have impacted on tree management. Direct mechanical damage to unprotected trees from pedestrians and vehicles is a problem that has contributed to the decline of the trees.

Tree management includes more than just tree maintenance. In addition to the usual remediation operations such as mulching, fertilizing and the pruning of dead limbs, it also includes strategies for the removal/replacement of dead trees, species selection of new/replacement planting, regular inspection of trees for disease and/or damage and selective removal of trees planted at very close spacing.

It is essential that tree management is integrated into the overall landscape planning, design and management framework for Observatory Hill Park and that Sydney City's various disciplines work together and coordinate their activities. In addition to landscape managers and arborists, it is imperative that landscape architects are involved in the process so that the aesthetic dimension of tree management is adequately presented and future planting designs are formulated to provide a coherent future landscape.

It is essential for future planning purposes that the Observatory Hill Park Tree Planting Plan (Figure 14) is used to effectively guide the selection and placement of any future tree planting and provide guidelines for tree protection in relation to any proposed upgrades for locations in close proximity to existing trees.

Future tree planting in Observatory Hill Park could impact on the Millers Point landscape for the next 100 years and therefore it is essential that the *Observatory Hill Park Tree Management Plan* (including the Tree Planting plan) is ratified by Council and becomes an integral part of Council's Tree Management Policy, rather than the views of the current landscape management officers.

Future tree management strategies must include a proactive maintenance program that includes a detailed monitoring and record-keeping system. As part of this record keeping system, the Tree Planting Plan and Tree Schedule shall be amended (on an annual basis or as required) to reflect any tree removals or replacements.

### 6.1 Health and Condition of the Existing Trees

The overall health of the trees growing in the Park appears to be good, with reasonable branching structure and minimal physical defects.

A number of the *over mature* Moreton Bay Figs exhibit signs of stress and decline, indicated by sparse crowns and a proliferation of *epicormic* growth. A number of the trees have significant cavities in the trunk and root crown areas.

The majority of the Figs have been selectively pruned over a number of years, to remove dead or dying limbs and to raise the crowns for better public access. In some cases large lateral limbs have been reduced. Whilst this type of removal leaves large wounds and may have a considerable impact on the tree's health, it is sometimes necessary to maintain mature and significant trees at an acceptable level of risk.

Most of the Figs show low to moderate infestations of Fig Psyllid (*Mycopsylla fica*) but there is no evidence of recurrent or severe defoliation.

A number of the trees exhibit relatively poor health and vigour, indicated by sparse foliage cover, small leaf size, poor extension growth, slightly chlorotic foliage and 10-30% *epicormic* growth (Earthscape Tree Assessment Report 2007 - Attachment 3)

The trees growing in lawn areas have suffered basal injuries caused by heavy mowers and weed whippers. This type of damage which is evident on the thick-barked buttresses of many mature specimens, can allow the entry and development of decay fungi.

An informal pedestrian pathway extends from the north-eastern corner of the site towards the rotunda. This path passes in close proximity to the Tree 14. Compaction of this nature can cause damage and death of fine absorbing roots, contributing to the tree's decline.

It may be feasible to correct the problem by extending the fence further south to meet the existing pathway. Alternatively a new pathway linking the two points, at a minimum distance of six (6) metres from the tree's trunk, could be considered as part of any future park improvement.



Figure 6 Worn compacted area in close proximity to Tree 14

The mature Poplars (*Populus deltoides*) growing adjacent to Upper Fort Street are suckering, causing uplifting of the pedestrian pathway.

Three (3) of the seven (7) Jelly Palms (*Butia capitata*) growing in the NE corner of the site are growing close to wall of the underpass and are gradually being suppressed.

The relatively poor soil conditions, previous lack of mulch and leaf litter and the recent drought conditions are all factors that have contributed to decline in health of the mature trees in Observatory Hill Park.

## 6.2 Management of the Existing Trees

### Tree Protection

Tree Protection Zones shall be implemented around all trees, located in activity areas, during major events. Vehicles, structures and waste materials shall be prohibited from the within the trees' driplines at all times.

### **Mulching & Aeration**

A 50mm layer of organic mulch shall be maintained in concentric circles around the base of all trees to a minimum distance of one (1) radial metre for young trees and two (2) radial metres for mature trees (except in the case of large Fig trees where the mulch extends to a greater distance). The mulch shall comply with AS4454 *Composts, soil conditioners and mulches*.

An annual root plate decompaction programme, including coring, topdressing and mulching shall be conducted by the Parks Service Provider. Where trees show evidence of nutrient deficiency, a soil analysis and report shall be prepared to identify the deficiency and provide remedies.

### **Tree Monitoring**

A proactive monitoring and maintenance regime shall be developed for all of the Park's trees. A qualified arborist shall inspect all trees on an annual basis and after any major storm event. Arborists undertaking the inspections shall have a minimum AQF level 5 qualification in Arboriculture or a minimum of five (5) years experience as approved by the City.

The site inspections shall include detailed monitoring and data management including an annual reassessment of the SULE ratings. All relevant observations, data (including dated photographs) and recommendations are to be recorded and made available to the City's Tree Management Team.

The City's Tree Management Team shall be consulted prior to any excavation for hardworks or services within the root zones of any trees within Observatory Hill Park.

The Tree Management Team shall regularly inspect the Park to ensure that the trees are being managed in accordance with the Tree Management Plan.

### **Tree Pruning**

Some of the mature Figs may be compromised before their safe useful life expectancy has been reached because their poorly attached epicormic branches may fail. Management of these trees requires pruning works to maintain their branch architecture in a safe manner while allowing the epicormic shoots to form part of the canopy.

All pruning work within Observatory Hill Park is to be carried out by a qualified arborist who has the appropriate AQF qualification (Level 3 in Arboriculture) and industry experience.

Pruning methods and techniques shall be in accordance with the Australian Standard AS4373 2007 *Pruning of Amenity Trees*. A copy of this document must be available and held on site by the Contract Supervisor.

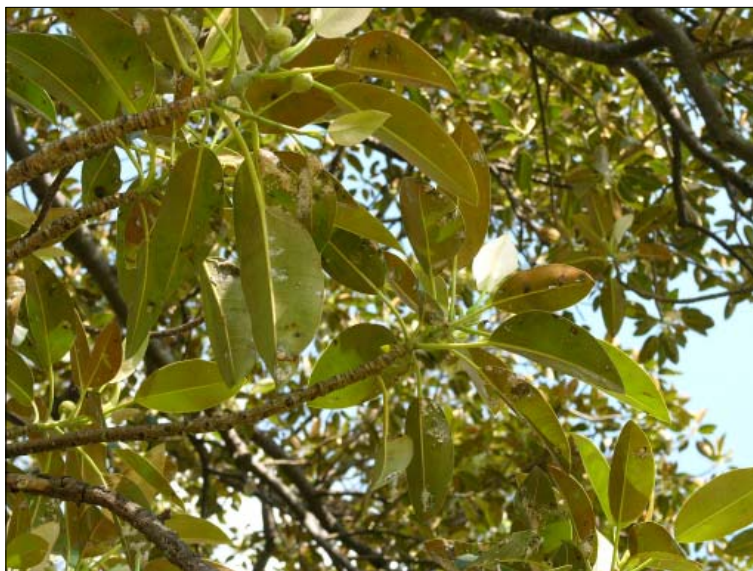
### **Pests and Diseases**

Detailed monitoring and control of pests and diseases, including termite infestations, shall be undertaken continuously by the Parks Service Providers, with inspections including the following actions;

- Identification
- Assessment of damage
- Immediate action undertaken (if required)
- Reporting details

All inspections shall be undertaken by a qualified arborist with minimum AQF level 5 qualification in Arboriculture or demonstrated equivalent industry experience.

Natural predators and parasites shall be encouraged by retaining fallen leaves within the mulched area around the base of the trees. This is a particularly effective method to help alleviate Fig Psyllid infestations.



**Figure 7** Fig Psyllid

Chemical control of Fig Psyllid is not recommended in this busy pedestrian environment.

### **Watering**

All trees and particularly the significant Moreton Bay Figs shall be constantly monitored during periods of extensive dry weather to ensure that they receive adequate moisture to maintain their health and vigour.

### **Electronic database**

The Tree Assessment Schedule and Tree Planting Plan shall be amended on an annual basis to reflect any tree removals or changes to individual trees.

## **6.3 Tree Removal/Replacement Strategies**

Many of the trees in Observatory Hill Park were planted c.1880 and therefore are similar in size and maturity. It is inevitable that as the trees become over-mature, they will need to be progressively removed and replaced.

In order to maintain a viable tree population it is vital to plant new trees and to replant declining trees in a planned and managed way with the support of the community. Sustained amenity can only be achieved by establishing a range of age classes (young, semi-mature, mature and over-mature).

An approximate time frame has been proposed for the removal and replacement of all of the trees in the Park based on their Safe Useful Life Expectancy (refer to SULE analysis, Figure 5). This will ensure that the visual loss is evenly distributed over time.

For the most part, tree removal in Observatory Hill Park, will occur by natural attrition, except in situations where a tree or trees are posing a risk to public safety or compromise the amenity of other trees.

A number of trees will not be replaced in their existing locations in order to maintain viewing corridors into and out of the site and to ensure unobstructed visual alignments from the Observatory and the South Head signal station.

The City of Sydney has a duty, as the manager of Observatory Hill Park, to ensure that the public are not exposed to unreasonable levels of risk from the mechanical failure of the trees within the Park. At the same time, there is an expectation to maintain the amenity provided by the existing tree population.

New and replacement planting shall be carried out in accordance with the Tree Planting Plan (Figure 14).

#### 6.4 Removal and Replacement Planting

The current planting in Observatory Hill Park consists predominantly of Moreton Bay Fig trees planted in groups around the perimeter of the Observatory.

##### FIGS

The mature Figs shall be retained and protected in their current locations until they need to be removed to ensure the safety of the Park users.

Five (5) semi-mature Figs that were planted in 1992 will help to sustain the visual amenity of the Park during any removal and replacement transition period. One of these Figs, tree 24, shall be transplanted further down slope and to the NW of the Observatory, in an attempt to limit interference with the telescope trajectories.



**Figure 8** T24 *Ficus macrophylla* to be transplanted further down the slope

The City's Register of Significant Trees recommends a successional planting program of Moreton Bay Figs (*Ficus macrophylla*) to retain the historic scale and integrity of the trees in Observatory Hill Park.



Whilst this species has a broad spreading habit, the canopies “frame” the views out of the Park and create a more open framework than the canopies of the Port Jackson Fig (*Ficus rubiginosa*).

The opportunity exists to plant 4 (four) new Moreton Bay Figs in selected locations that maintain views into and out of the Park. (Tree Planting Plan - Figure 14).

### CORAL TREE

The Coral Tree growing on the northern boundary of the Park is considered beyond remedial treatment and has been recommended for removal (*Earthscape Tree Assessment Report 2007*). This tree was planted in the 1940s but “is not considered an appropriate species for this location” (*Draft Plan of Management 1997*). The tree limits views to the harbour and northern foreshore and therefore will not be replaced in its current location.

### POPLARS

The row of mature Poplars (*Populus deltoides*) growing on the western side of Upper Fort Street are gradually declining with dieback in their upper canopies and suckering from the basal areas of their trunks. The roots of these trees are lifting the adjacent pedestrian footpath, causing trip issues.

### JACARANDAS

The short term removal of the Poplars from Upper Fort Street shall be managed by planting six (6) Jacarandas between and to the south of the Poplars. The new trees shall be planted further to the west of the Poplars to limit the possibility of the roots lifting the pedestrian pathway. The canopies of the Jacarandas will be below the sightlines from the Signal Station to South Head. Once the Jacarandas have become established the existing row of Poplars will be removed.

### JELLY PALMS

The 1997 Observatory Hill Draft Plan of Management recommends the removal and relocation of the Jelly Palms (*Butia capitata*) from the NE corner of the Park to another City park. The Palms were considered incongruous with the other vegetation within the Park. However, as these Palms are believed to be part of a civic landscaping program associated with the Harbour Bridge opening in 1932, it may be inappropriate to remove them from the Park.



**Figure 9** It is recommended that these Jelly Palms (*Butia capitata*) be relocated to another area within the park.

Three (3) of the Palms are planted in close proximity to the wall of the subway to Cumberland Street and are gradually being suppressed.

It is recommended that the Palms are relocated further along this boundary to the open space areas on the northern and southern sides of the exercise area. The newly created space would be approximately 17 square metres and would provide the perfect location to plant an advanced Moreton Bay Fig that can grow to magnificent proportions to fill this corner without interrupting views into or out of the Park.

### CAMELLIAS

Small Leafed Camellia trees (*Camellia sasanqua*) planted at approximately 2m centres and espaliered against the wall of the eastern boundary will visually soften the exposed concrete wall and create a psychological barrier to the noise from the Bradfield Highway.



**Figure 10** *Camellia sasanqua* to be planted at approximately 2 metre centres and espaliered along face of unattractive concrete wall.

### MIXED PLANTING

The Cahill Expressway cutting boundary has a variety of trees and shrubs growing in a garden bed between the boundary fence and roadway. This screen planting has become ineffective because there are a number of gaps in the planting and some of the trees and shrubs have become “woody” with little remaining foliage.

Remove the mixed planting of Olive (*Olea europaea*) Celtis (*Celtis sp.*) Oleander (*Nerium oleander*) Italian Cypress (*Cupressus sempervirens*) and pink Diosma (*Coleonema pulchrum*) from the Cahill Expressway boundary and replant with a monoculture of Oleanders planted @ 1.5 m centres to create a solid informal hedge.

### OLEANDERS

The Oleander hedge shall be maintained to an approximate height of two (2) metres to create a visual and psychological barrier to traffic noise from the expressway and the undesirable views out of the Park.





Figure 11 Screen planting has become 'woody' and ineffective



Figure 12 Replant Oleanders to create an informal hedge

## BOUNDARY PLANTING

The trees growing out of the wall on the outside of the western boundary fence, at the rear of the properties fronting Kent Street, shall be removed or pruned to below fence height to maintain sightlines out of the Park to the signal stations west of the Park. The 1997 Draft Plan of Management recommended that these sightlines should be maintained for heritage purposes.

The *Ficus pimelia* growing on the face of the northern wall facing Watson Road shall be pruned annually to remove any long woody branches.

The self-sown *Celtis* sp. growing from the top of the wall on the eastern boundary shall be removed.



**Figure 13** Self sown trees growing along the Kent Stree boundary to be removed to maintain sightlines out of the Park

### 6.5 Selection Criteria for Replacement Trees

The overriding landscape character of Observatory Hill Park is that of a late nineteenth, early twentieth century urban park. It is therefore desirable that the size and form of the canopies of the trees selected for replacement planting reinforces the character of this period. (refer to Figure 14 - Tree Planting Plan for species selection).

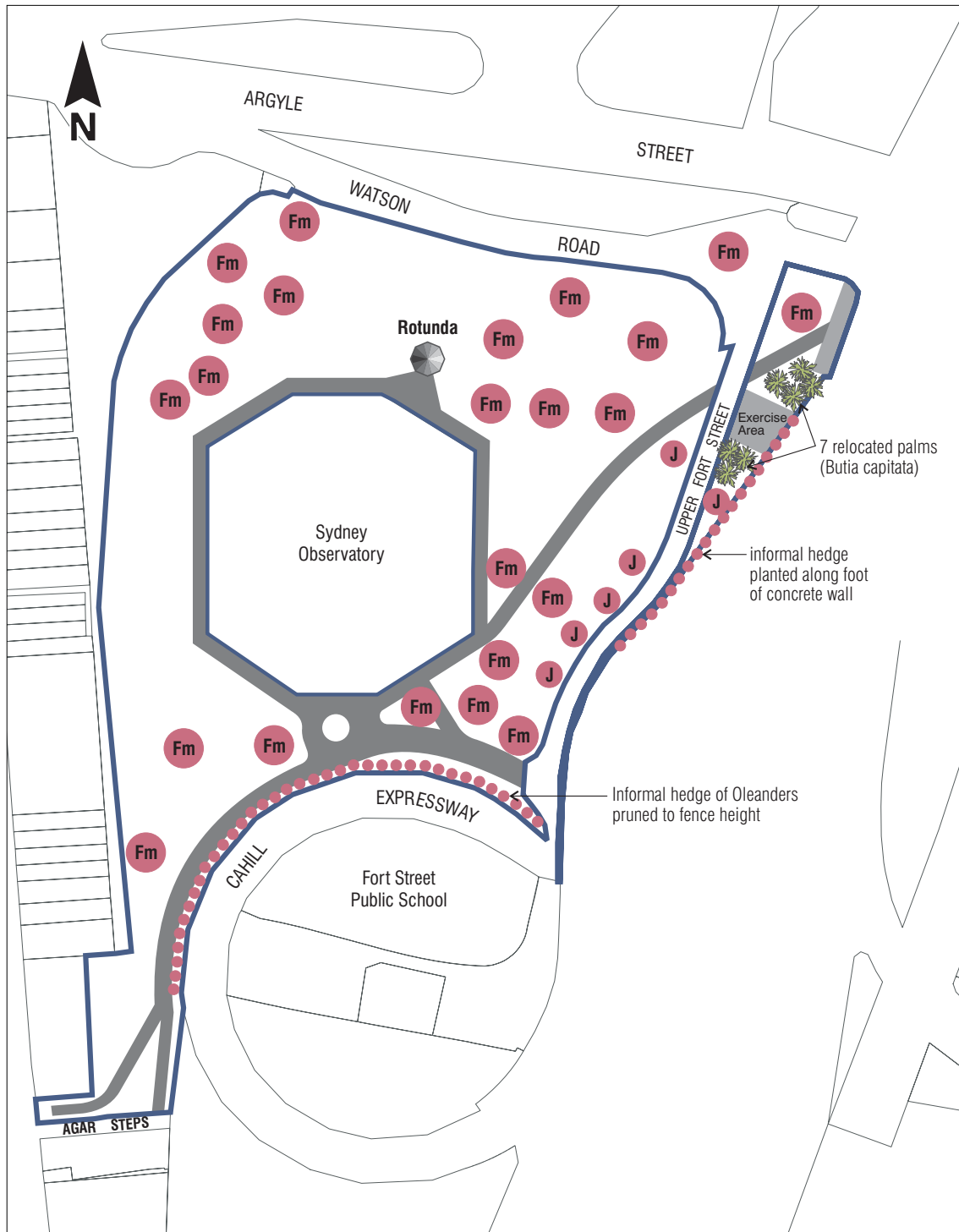


Figure 14 Tree Planting Plan

Key:

- Proposed tree locations
- Fm** *Ficus macrophylla*
- J** *Jacaranda mimosifolia*

## **6.6 Management of Replacement Trees**

### **Stock Selection and Size**

Plant quality is most critical with long lived, large growing woody plants. Selection of quality stock is imperative to ensure the best chance of survival and to reduce the potential for growth defects. Select all stock using the Natspec Guidelines for Specifying Trees (Clark, 1996)

### **Site Preparation and Planting**

Planting of the nursery stock can be considered as the plant's final "potting on". Attention to planting detail is essential to maximize the chances of successful establishment of the new plant. (Appendix 5: Tree Planting Detail). It is imperative that the diameter of the planting hole for all new or replacement trees shall be a minimum of 2-3 times the diameter of the root ball and no deeper than the root crown.

The selected trees will hopefully survive for over 100 years therefore sufficient space must be provided to permit the increase in size that will occur in the long term.

### **Regular Inspections**

Newly planted trees require more intensive maintenance than trees that are well established. A qualified arborist shall inspect young trees every twelve months (maximum) to ensure that potential structural defects are detected early, in time for appropriate remedial treatment. Lift all tree canopies as required, to allow head clearance for pedestrians.

### **Watering**

Water all trees, as required, during the first two (2) years after planting. During dry summer conditions, new trees may need to be watered twice a week. At other times, watering might not be required for a month or longer. Use a "water budget" to calculate the amount of water required to sustain growth.

### **Tree Guards**

Install ornamental tree guards around all newly planted trees during the establishment phase (approx. 2 years). Tree guards provide protection from casual acts of vandalism as well as accidental damage. Periodically inspect all trees fitted with tree guards for signs of chafing or constriction so that adjustments or removal of the guards can be carried out if necessary.

### **Fertilising**

An annual maintenance program of root plate remediation shall include aeration and soil improvement with detailed monitoring for evidence of disease and/or pathogens. Where trees show evidence of nutrient deficiency, a soil analysis report shall be prepared to identify the deficiency and provide remedies.

### **Formative Pruning**

Formative pruning is the selective pruning of a young tree to promote good form and branching structure. Formative pruning is most critical in the early stages of growth of a tree, in particular the first five to ten years. Limit pruning to the second or third year of growth, because newly planted trees need their leaves and shoot tips to provide food and substance to stimulate root production.

The goal in training young trees is to establish a strong trunk with sturdy well-spaced branches. Lateral branches contribute to the development of a sturdy well tapered trunk. These branches, known as temporary branches, help to protect the trunk from sun and mechanical injury while

aiding with the tree's photosynthesis. Temporary branches should be kept short enough not to be an obstruction or compete with permanent branches.

Pruning shall be carried out in accordance with Australian Standard No 4373- 2007 *Pruning of Amenity Trees*, by a skilled and experienced arborist, with a minimum Australian Qualification Framework (AQF) Level 3.

### **Mulching**

Mulching is an alternative to turf around trees and its use eliminates the potential for mechanical damage caused by mowers and whipper snippers®, that may lead to the development of decay and cracking.

Benefits of organic mulch material include:-

- Mulch improves soil structure over time, reducing compaction over the root zone and improving soil aeration by increasing microbial activity in the soil;
- Improves fertility and foliage cover, reducing susceptibility to sunscald and the production of epicormic growth and in turn provides more energy for plant processes (growth, greater resistance to pest and disease);
- Improves moisture holding capacity improving greater tolerance to dry periods, reducing stress; and
- Enables leaf litter to be retained under trees, increasing numbers of predatory wasps and allowing Fig Psyllid populations to be kept in check.

Place a 50mm layer of organic mulch around the base of all newly planted trees to a distance of one (1) radial metre from the trunk in a concentric circle. The area of mulch shall be increased to two (2) metres at maturity.

The mulch must comply with AS4454 – “Composts, soil conditioners and mulches.”

## 7 Implementation, Monitoring And Review

### 7.1 Implementation

It is expected that the *Observatory Hill Park Tree Management Plan* will be implemented over several decades, as the longevity of the existing trees is unknown. The Plan provides a framework by which tree removals and replacements may be guided and controlled.

The Tree Management Plan provides operational guidance and detailed ground maintenance specifications. It is to be used as a dynamic and responsive document that may change when circumstances require it.

Any proposed changes to the Tree Management Plan should be assessed before they are implemented, to ensure that they are sympathetic with the overall objectives and do not have an adverse affect on the character of Observatory Hill Park.

### 7.2 Monitoring and Review

The success of the *Observatory Hill Park Tree Management Plan* will require effective communication. Different disciplines such as engineering, landscape design and landscape management will need to coordinate their activities.

Regular inter-departmental reviews should be conducted between those officers responsible for the programming, coordination and implementation of any works in Observatory Hill Park. This includes those parties responsible for security, lighting, building maintenance, service installations, landscape maintenance or improvements and any new project work. All proposed works shall be related to the Tree Management Plan.

The Planting Plan and the Tree Assessment Schedule shall be reviewed and amended on an annual basis to ensure that any changes are documented and any history relating to tree failures is monitored and recorded.

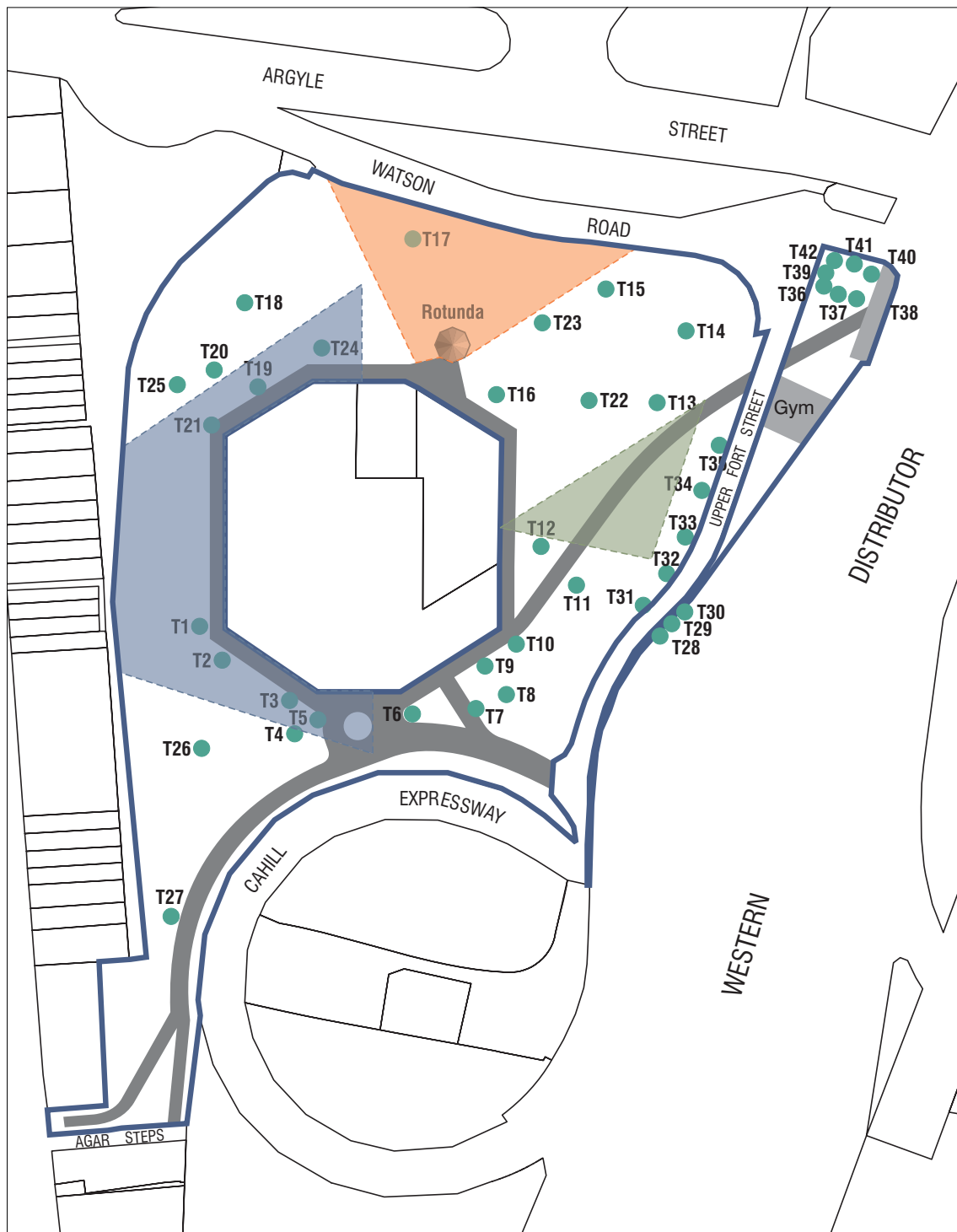
The Tree Management Plan shall be reviewed for its effectiveness on a regular basis.

## References

- Barrell, J. (2001) "SULE: Its use and status in the new millennium" in *Management of Mature Trees*, Proceedings of the NAAA Tree Management Seminar, NAAA, Sydney.
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- Kerr, J. (1991) *Sydney Observatory*. Revised edition 2002. *A Conservation Plan for the site and its structures*. Prepared for the Museum of Applied Arts & Sciences.
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## APPENDIX 1: Viewing Corridors



Key:

- Existing tree locations
- Do not plant in viewing corridor to harbour
- Viewing area for N&S telescopes - do not plant in this area
- Viewing corridor from signal station to South Head

## APPENDIX 2: Glossary of Terms

The following is a list of definitions relating to the terms and abbreviations that have been used in this report:

### Age Classes

- (Y) Young refers to a well established but juvenile tree
- (SM) Semi mature refers to a tree at growth stages between immaturity and full size.
- (M) Mature refers to a full sized tree. Trees can have a Mature Age Class for > 90% of their life span.
- (O) Over mature refers to a tree showing symptoms of irreversible decline.

**Condition** refers to the general form and structure of the scaffold (ie. trunk and major branches) It includes structural defects such as cavities, crooked trunks or weak trunk/branch unions and canopy skewness. Generally described as Good (G), Fair (F) or Poor (P).

**Diameter at Breast Height (DBH)** refers to the tree trunk diameter at breast height (1.4 metres above ground level).

**Epicormic Shoots** arise from adventitious or latent buds. These shoots often have a weak point of attachment. They are generally produced in response to stress in the tree.

**Espaliered** - Trees grown on a flat plane such as a trellis or attached to a wall.

**Hazard** refers to anything with the potential to cause harm/damage to life or property.

**Health** refers to a tree's vigour as exhibited by the crown density, leaf colour, presence of epicormic shoots, ability to withstand disease and the extent of dieback.

**Included/Inclusion-Stem/Bark** refers to a potentially weak point of attachment.

**Scaffold Branch** is a primary structural branch of the crown.

**Senescence** is the process of aging and death of trees.

### APPENDIX 3: Summary of Tree Population

Botanical Name	Common Name	Number
<i>Butia capitata</i>	Jelly Wine Palm	7
<i>Callistemon sp.</i>	Bottlebrush	2
<i>Celtis sp</i>	Chinese Nettle Tree	1
<i>Erythrina x sykesii</i>	Coral Tree	1
<i>Eucalyptus tereticornis</i>	Forest red Gum	1
<i>Ficus macrophylla</i>	Moreton Bay Fig	24
<i>Ficus rubiginosa</i>	Port Jackson Fig	1
<i>Populus deltoides</i>	American Cottonwood	5

## APPENDIX 4: SULE Categories

(After Barrell 1996, updated 01.04.2001)

The five categories and their sub-groups are as follows:

**1. Long SULE:** Trees that appeared to be retainable at the time of assessment for more than 40 years with an acceptable level of risk, assuming reasonable maintenance.

- (a) Structurally sound trees located in positions that can accommodate future growth.
- (b) Trees that could be made suitable for retention in the long term by remedial tree care.
- (c) Trees of special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to secure their long term retention.

**2. Medium SULE:** Trees that appeared to be retainable at the time of assessment for 15-40 years with an acceptable level of risk.

- (a) Trees that may only live between 15 and 40 more years.
- (b) Trees that could live for more than 40 years but may be removed for safety or nuisance reasons.
- (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.
- (d) Trees that could be made suitable for retention in the medium term by remedial tree care.

**3. Short SULE:** Trees that appeared to be retainable at the time of assessment for 5-15 years with an acceptable level of risk.

- (a) Trees that may only live between 5 and 15 more years.
- (b) Trees that could live for more than 15 years but may be removed for safety or nuisance reasons.
- (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.
- (d) Trees that require substantial remedial tree care and are only suitable for retention in the short term.

**4. Remove:** Trees that should be removed within the next 5 years.

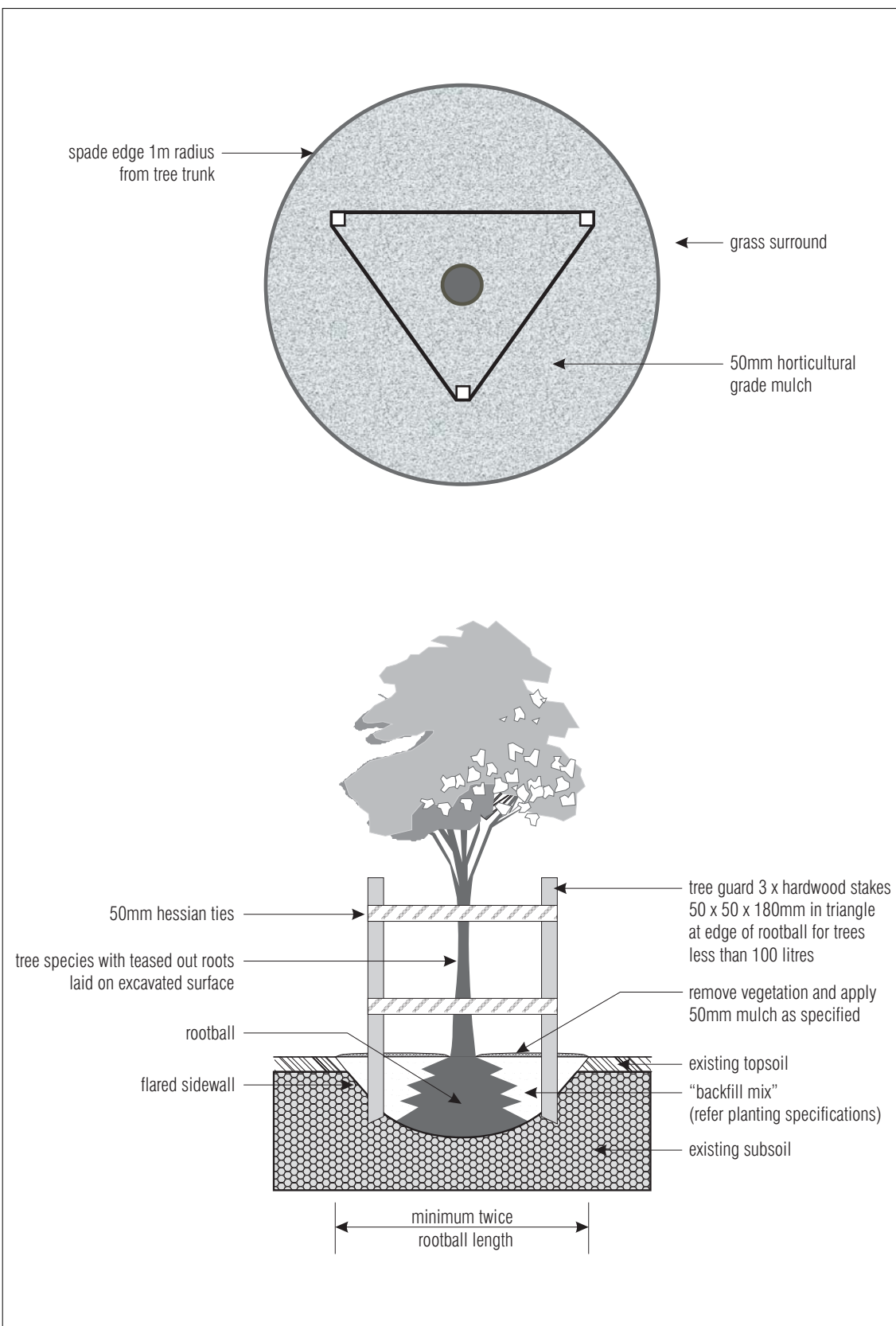
- (a) Dead, dying, suppressed or declining trees because of disease or inhospitable conditions.
- (b) Dangerous trees because of instability or recent loss of adjacent trees.
- (c) Dangerous trees because of structural defects including cavities, decay, included bark, wounds or poor form.
- (d) Damaged 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 that with appropriate treatment, could be retained subject to regular review.

**5. Small, young or regularly pruned:** Trees that can be reliably moved or replaced.

- (a) Small trees less than 5m in height.
- (b) Young trees less than 15 years old but over 5m in height. Formal hedges and trees.
- (c) intended for regular pruning to artificially control growth.

## APPENDIX 5: Tree Planting Detail



## APPENDIX 6: Tree Planting Specifications

### Services

- Establish the location of all service lines before excavation
- Service lids, vents and hydrants to be left uncovered.

### Tree Planting

- Avoid planting in unsuitable weather conditions such as extreme heat, cold wind or rain. During hot weather ensure that the planting site is at field capacity.
- Thoroughly water rootballs before planting and immediately after planting.
- Prevent the rootballs from drying out during the planting phase.
- Remove topsoil.
- Remove subsoil to the depth of the rootball and two to three times the diameter of the rootball.
- Remove stones over 50mm diameter and heavy clay lumps.
- Remove tree from the container, lightly tease out the roots and use a sharp knife to prune the roots at the outside edge of the rootball. Place the tree into the planting hole making sure the root crown is at natural ground level.
- Backfill using "Backfill Mix" as specified and tamp gently. Do not cover the rootball.
- Water in thoroughly applying water directly to the rootball.
- Lay mulch to a nominal 50mm depth around the base of the tree. Mulch must comply with AS4454 Composts, Soil Conditioners and Mulches. Feather mulch away from the trunk at the root crown.
- Plants to be planted in locations indicated on the Tree Planting Plan (Attachment 2).

### Backfill Mix

- Sandy well drained mix to provide aeration at depth and nutritional as well as water holding capacity
- Some soil must be present to obtain the chemical properties required as sands do not have sufficient cation exchange capacity.

#### Particle Size Distribution

Size Fraction	% by Weight
>2mm	<5%
1-2mm	<10%
0.5-1mm	20-40%
0.25-0.5mm	30-50%
0.1-0.25mm	20-30%
<0.1mm	<10%
pH	5.5-6.8
Organic matter	2-5% (nominally 10-20% by volume subject to testing)



## ATTACHMENT 1: Tree Assessment Schedule

## ATTACHMENT 2: Tree Photos



T1



T2



T3



T4 and T5



T6



T7





T8



T9



T10



T11



T13



T14





T15



T16



T17



T18



T19



T20 and T21