

Arboricultural Impact Assessment

Kent Road Public School, Marsfield



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1. Summary

The purpose of this report is to provide an Arboricultural Impact Assessment (AIA) for the trees located inside and within 5 metres of the property boundaries of Kent Road Public School, Marsfield. There are 213 established tree specimens within and adjacent to this school's boundaries. In light of planned construction activity within the school an assessment of the trees' retention value and the implementation of protection measures is necessary.

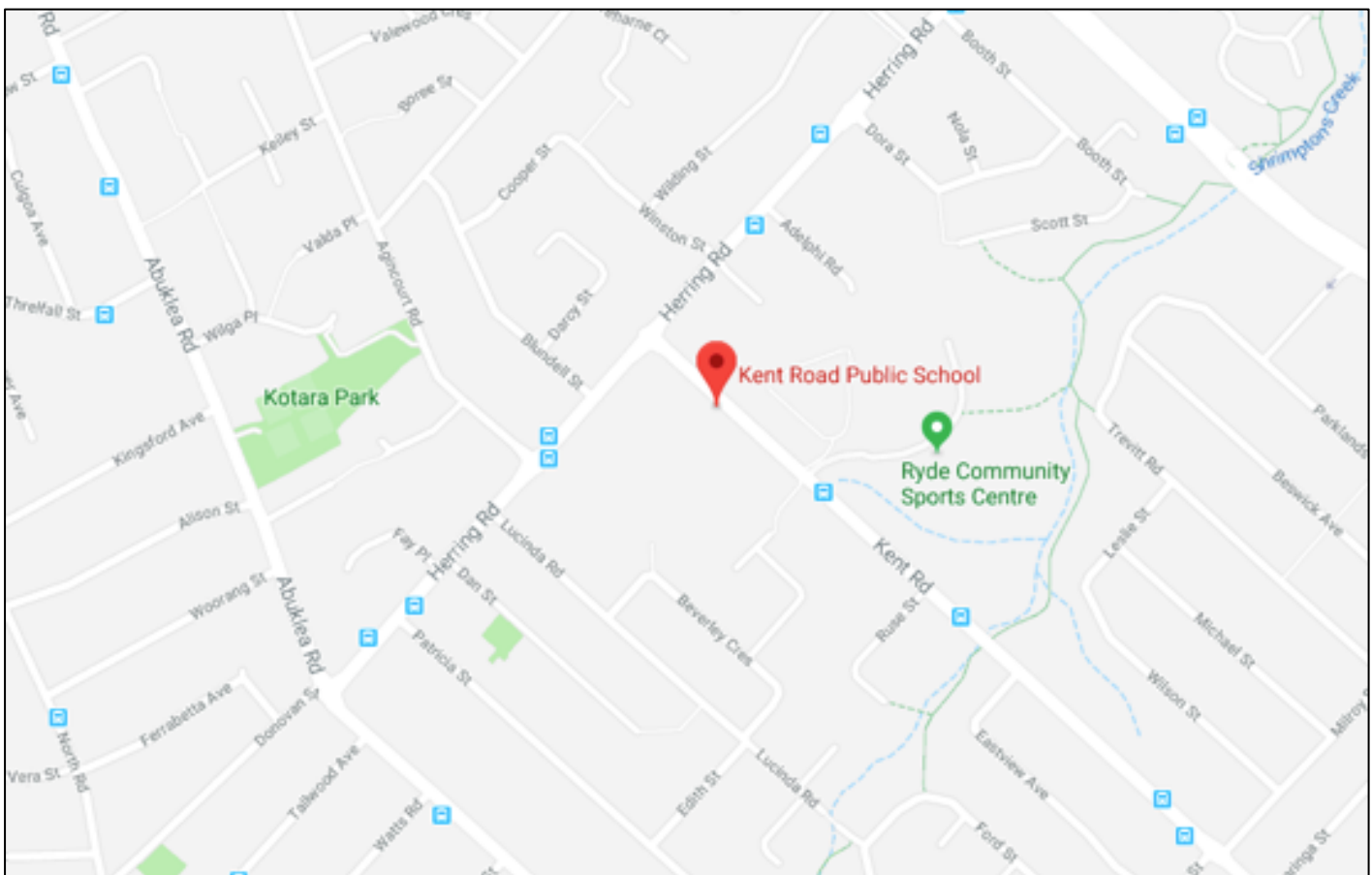
The trees were located, identified and assessed on 12/09/2018. The retention value of each tree was determined using the TreeAZ model (10.10 NZ), which was created by Barrell Tree Consultancy in 2012. One-hundred and five trees within the school were determined to be of high retention value. Twenty six high retention trees are positioned within close proximity of the proposed works. For the purpose of efficient arboricultural management these trees were separated within four tree impact zones. Tree protection measures are allocated and described for each tree within their proposed zone.

Tree protection measures were drawn from and relating to the *Australian Standard for the Protection of Trees on Development Sites* (AS 4970 2009). The information provided in this report should be used to assist in planning, design and construction for future development on this site.

2. Location

2.1. Site Location

Kent Road Public School is located at the intersection of Kent and Herring Roads in Marsfield (Map 1). The surrounding land use is a mixture of residential and commercial. While this local area is well developed, its high density of medium and large trees provides a characterising feature. Kotara Park, ELS Hall and the Shrimptons Creek bush land are large green spaces located close to Kent Road Public School. The large tree population within this school plays an important role in maintaining the ecological connectivity within this area. This highlights the need for effective management of the its tree population throughout the proposed development for this site.



Map 1. Site location is at the intersection of Kent and Herring Road in Marsfield. Image sourced from Google (2018).

2.2. Relevant Environmental Overlays

Kent Road Public School is located within Ryde City Council. All trees within this site are protected under the Ryde City Council Tree Preservation Order, which is Part 9.5 of the City of Ryde Development Control Plan 2014 (Ryde City Council 2016). The canopy tree assemblage within this site also contains a number of species that comprise the Blue Gum High Forest ecological community, which is listed as endangered in Part 2 of Schedule 1A of *the Threatened Species Conservation Act 1995* (NSW Office of Environment and Heritage 2016). The retention of the emergent indigenous trees is therefore considered a high priority within this assessment.

2.3. Tree Locations

There are 213 trees within and directly adjacent to the property boundaries of Kent Road Public School. No tags or physical marks have been used. The location of all 213 trees assessed in this report is summarized in Map 2. There are a number of trees within the subject site that are likely to be impacted upon both directly and indirectly by the proposed development plans. These trees are separated into four tree impact zones in Section 3.



3. Site Development Plans

Development plans for this site are currently at the final design stage. There are various stages of construction activity associated with the proposed development for this site. Due to the spatial variability of these various construction activities there will be areas with similar impacts on portions of the school's tree population. For this reason the description and management of impacts on the trees within the site have been separated into four zones (A – D) (Figure 1).

Due to the size and significance of this project the primary works are proposed to be carried out as a State Significant Development (SSD). Construction of a new learning centre and staff facilities is proposed, which will consist of three buildings connected by a covered walkway and a new covered entryway within the central portion of the school (Figure 1).

The position of the works proposed under the SSD is restricted by a range of overlays within this site including flood risk zoning within the western and central portions of the school, RMS land within the northern portion of the school and an established Blue Gum High Forest ecological community within the southern portion. Hoarding will be constructed to create a builder's compound for these works in order to isolate them from the remaining parts of the school. A temporary access point to the builder's compound from Kent Road will also be established at this time. The trees within the SSD site and builder's compound are described under tree impact zone D (Figure 1).

To facilitate and compliment the works proposed under the SSD there are also a number of early works associated with this project. The arboricultural impacts of these early works are an important component of this assessment. New and existing demountable classrooms will be installed within the northern portion of the subject site to maintain the school's function for the duration of the project. This portion of the development is contained within tree impact zone A (Figure 1).

A new sports court will be built on the northern side of the existing sports court within the central western portion of the school. These works are within tree impact zone B (Figure 1).

Demolition of four existing buildings (F, G, K and L) and the existing COLA will be required as part of the proposed early works to facilitate the new buildings' construction. The upgrading of three buildings (I, J and N) have also been proposed for this early stage of the project. The extension of the new covered walkway from the new buildings to existing buildings within the north-western portion of the school (A, B, C, D and E) will also commence at this time. These works are contained within tree impact zone A (Figure 1).

Also proposed as part of the early development stage is the refurbishment of buildings I, J and N, which are located within the central eastern portion of the school. The refurbishments will primarily involve the southward extension of the existing administration office and the replacement of the existing hall's roof. These works are contained within tree impact zone C (Figure 1).

The one-hundred and twenty-one trees positioned within the four tree impact zones are likely to be impacted upon by the proposed development. Trees within or adjacent to the proposed new and refurbished building envelopes will sustain direct impacts that may require their removal. Trees positioned close to proposed work zones, access points and demountable positions may be indirectly impacted upon by physical root disturbance or contamination. The ninety-two trees outside these zones may also be impacted upon indirectly. An accurate assessment of the two-hundred and thirteen trees' retention value is therefore necessary.

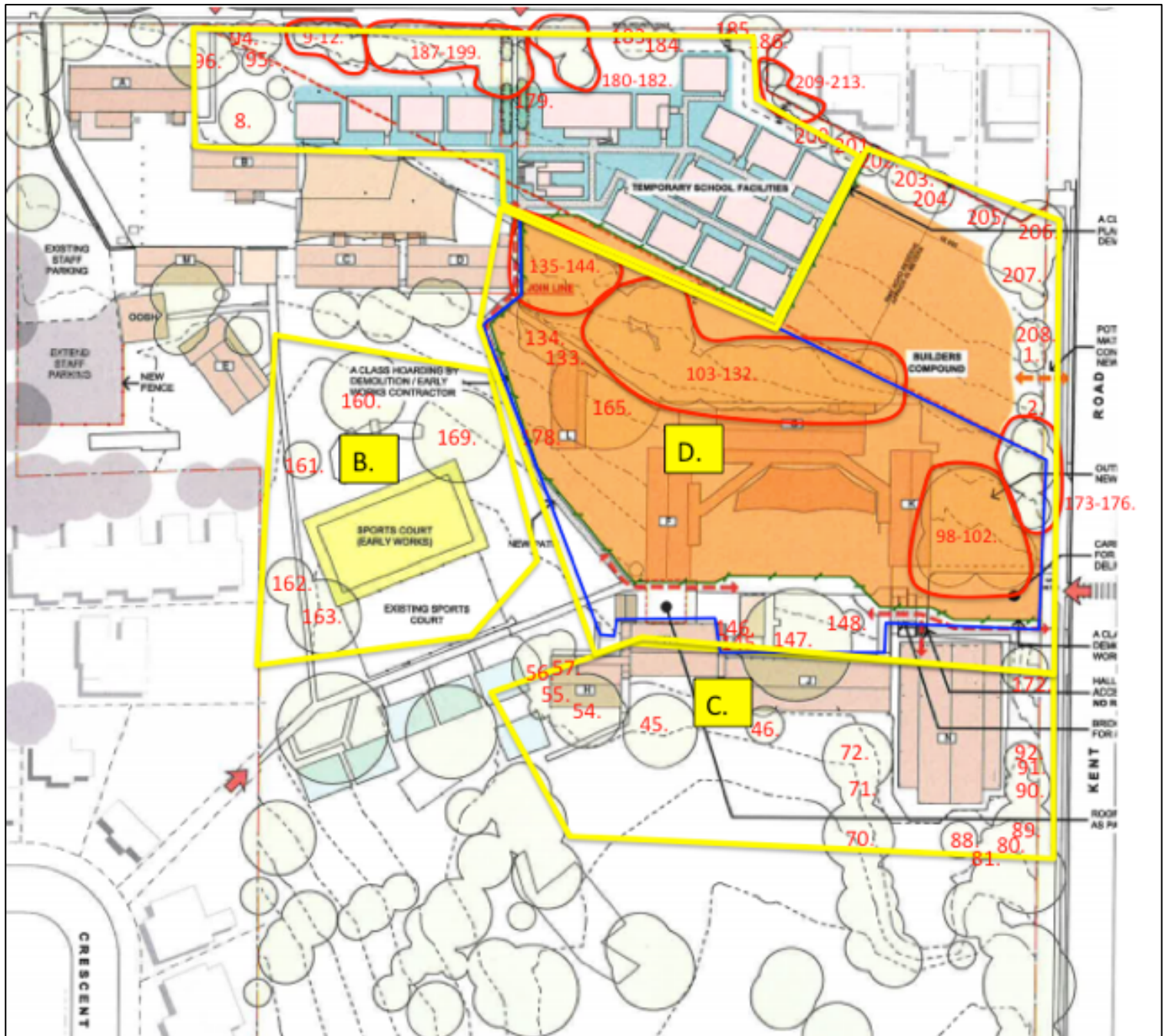


Figure 1. Proposed SSD area (blue bordered) within central portion of school. Trees located within four tree impact zones (yellow bordered) that are likely to be impacted upon by the proposed development at Kent Road Public School. Site drawing provided by *Gardner and Wetherill Associates* and annotated by *Temporal Tree Management* (21/09/2018).

4. Preliminary Assessment

4.1 Assessment Methodology

After being located and numbered a visual assessment was carried out for each tree. Visual assessment of trees' health and structure was underpinned by the Visual Tree Assessment method established by Mattheck and Breloar (1994) and the Visual Vitality Index method established by Johnston et al. (2012). The data collected for each individual was used in simple characterisation models for age, origin, health, structure, life expectancy and retention value. Simple characterisations were used to ensure outcomes remained clear and consistent. The format for data collection included:

Ø Tree Number: Trees over 5 metres in height were included in the assessment (Map 2).

Ø Botanical Name: Vegetation was identified and described using botanical names to avoid confusion associated with common name descriptions.

Ø Age: Juvenile, Semi – mature, Mature or Dead. Judgement on these five categories was determined by professional knowledge and research on the species present.

Ø Origin: Exotic, Native or Indigenous. It was important to differentiate between Australian native vegetation and locally indigenous vegetation, as native trees are not necessarily protected by the Ryde City Council TPO while many indigenous species are. Similarly some native trees may become invasive in non – indigenous areas.

Ø Health: Dead, Poor, Fair, Good or Excellent. Professional experience along with the visual vitality index established by Johnston et al. (2012) was used to underpin these categories.

Ø Structure: Failed, Very Poor, Poor, Fair, Good or Excellent. Professional experience along with tree risk assessment formatting established by Matheny and Clark (1994) was used to underpin these categories.

Ø Useful Life Expectancy (ULE): Long (greater than 40 years), Medium (40 years – 15 years), Short (15 – 5 years) or Remove (less than 5 years). These categories were established by Barrell Tree Consultancy (2010) and provide an important estimate of a tree's remaining safe life span based on species knowledge and an individual's structure and health.

Ø Retention Value: Retention value was split into two categories as defined by the TreeAZ method; A or Z (Barrell Tree Consultancy 2012). Category A stipulates that a tree should be retained and efforts made in the design planning and construction to ensure its survival. Category Z determines that a tree's retention is not a priority and it need not constrain design, planning or construction. Categories were determined using the tree assessment data and TreeAZ model criteria (Figure 3) (Barrell Tree Consultancy 2012).

Additional information was collected for fourteen trees that were determined to be of high retention value and requiring the establishment of tree protection measures. This information is summarise in section 6.4. This included:

Ø Tree Protection Zone (TPZ): This radial measure provides the principle means of protecting trees on construction sites. A TPZ radius may be calculated using the equation from *the Australian Standard for the Protection of Trees on Development Sites (AS 4970 2009)*:

$$\text{TPZ} = \text{Diameter at Breast Height (DBH)} \times 12.$$

A TPZ was calculated for trees determined to be suitable for retention. Once a TPZ is established all construction activity should be excluded from within its borders. Encroachments may occur under further arboricultural assessment and advice.

Ø Structural Root Zone (SRZ): This radial measure provides an indication of the portion of a tree's root plate that is considered fundamentally important for the maintenance of

structural integrity. An SRZ radius may be calculated using the equation from the *Australian Standard for the Protection of Trees on Development Sites* (AS 4970 2009):

$$R_{(SRZ)} = (\text{Diameter at Root Flare ((DRF) x 50)}^{0.42} \times 0.64$$

TreeAZ: Detailed guidance on its use Australia and New Zealand (Version 10.10-ANZ)

4 DETAILED EXPLANATION OF SUBCATEGORY ALLOCATION

Photographic examples and further explanations for each of the following subcategories are set out below (click on the underlined hyperlink to go directly to each sub category).

- [Z1 Young or insignificant small trees, i.e. below the local size threshold for legal protection, etc](#)
- [Z2 Too close to a building, i.e. exempt from legal protection because of proximity, etc](#)
- [Z3 Species that cannot be protected for other reasons, i.e. scheduled noxious weeds, out of character in a setting of acknowledged importance, etc](#)
- [Z4 Dead, dying, diseased or declining](#)
- [Z5 Severe damage and/or structural defects where a high risk of failure cannot be satisfactorily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, overgrown and vulnerable to adverse weather conditions, etc](#)
- [Z6 Instability, i.e. poor anchorage, increased exposure, etc](#)
- [Z7 Excessive, severe and intolerable inconvenience to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. dominance, debris, interference, etc](#)
- [Z8 Excessive, severe and intolerable damage to property to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. severe structural damage to surfacing and buildings, etc](#)
- [Z9 Severe damage and/or structural defects where a high risk of failure can be temporarily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, vulnerable to adverse weather conditions, etc](#)
- [Z10 Poor condition or location with a low potential for recovery or improvement, i.e. dominated by adjacent trees or buildings, poor architectural framework, etc](#)
- [Z11 Removal would benefit better adjacent trees, i.e. relieve physical interference, suppression, etc](#)
- [Z12 Unacceptably expensive to retain, i.e. severe defects requiring excessive levels of maintenance, etc](#)

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

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Figure 2. TreeAZ model 10.10.NZ criteria as used by Barrell Tree Consultancy (2012). (Access via <http://www.treeaz.com/downloads/Document-06-311210.pdf> 2016)

4.2. Tree Data

Table 1. Summarised retention data collected for thirty-three specimens within tree impact zone A. High retention value specimens (A) are coloured in blue while low retention value specimens (Z) are coloured in red.

Zone	Tree#	Location	Species	Age	Health	Structure	ULE	Origin	Retention
A	8	Herring Road boundary.	<i>Lophostemon confertus</i>	Mature	Fair	Fair	Long	Native	A1
A	9	Herring Road boundary.	<i>Eucalyptus botryoides</i>	Semi-mature	Fair	Poor	Short	Native	Z10
A	10	Herring Road boundary.	<i>Eucalyptus tereticornis</i>	Semi-mature	Fair	Poor	Short	Native	Z10
A	11	Herring Road boundary.	<i>Eucalyptus tereticornis</i>	Semi-mature	Fair	Fair	Medium	Native	Z10
A	12	Herring Road boundary.	<i>Eucalyptus tereticornis</i>	Semi-mature	Fair	Poor	Short	Native	Z10
A	179	Adjacent to Herring Rd pathway.	<i>Angophora floribunda</i>	Semi-mature	Fair	Poor	Medium	Native	Z10
A	180	Herring Road boundary.	<i>Eucalyptus botryoides</i>	Semi-mature	Poor	Poor	Short	Native	Z10
A	181	Herring Road boundary.	<i>Eucalyptus punctata</i>	Semi-mature	Fair	Poor	Short	Native	Z10
A	182	Herring Road boundary.	<i>Eucalyptus paniculata</i>	Semi-mature	Poor	Poor	Short	Native	Z10
A	183	Herring Road boundary.	<i>Pinus radiata</i>	Semi-mature	Fair	Fair	Medium	Exotic	Z10
A	184	Herring Road boundary.	<i>Corymbia maculata</i>	Semi-mature	Poor	Fair	Medium	Native	Z10
A	185	Herring Road boundary.	<i>Pinus radiata</i>	Mature	Fair	Fair	Medium	Exotic	Z10
A	186	Herring Road boundary.	<i>Pinus radiata</i>	Mature	Fair	Fair	Medium	Exotic	Z10
A	187	Adjacent to Herring Rd pathway.	<i>Acacia longifolia</i>	Semi-mature	Fair	Poor	Medium	Native	Z10
A	188	Adjacent to Herring Rd pathway.	<i>Angophora floribunda</i>	Semi-mature	Poor	Poor	Short	Native	Z10
A	189	Herring Road boundary.	<i>Callistemon citrinus</i>	Semi-mature	Fair	Poor	Medium	Native	Z10
A	190	Herring Road boundary.	<i>Angophora costata</i>	Semi-mature	Fair	Fair	Medium	Indigenous	Z10
A	191	Herring Road boundary.	<i>Casuarina littoralis</i>	Semi-mature	Fair	Poor	Medium	Native	Z10
A	192	Herring Road boundary.	<i>Casuarina littoralis</i>	Semi-mature	Fair	Poor	Medium	Native	Z10
A	193	Herring Road boundary.	<i>Casuarina littoralis</i>	Semi-mature	Fair	Poor	Medium	Native	Z10
A	194	Herring Road boundary.	<i>Corymbia maculata</i>	Semi-mature	Fair	Fair	Medium	Native	Z10
A	195	Adjacent to Herring Rd pathway.	<i>Acacia sp.</i>	Semi-mature	Fair	Fair	Medium	Native	Z10
A	196	Herring Road boundary.	<i>Eucalyptus racemosa</i>	Semi-mature	Fair	Fair	Medium	Native	Z10
A	197	Herring Road boundary.	<i>Casuarina littoralis</i>	Semi-mature	Fair	Poor	Medium	Native	Z10
A	198	Herring Road boundary.	<i>Casuarina littoralis</i>	Semi-mature	Fair	Poor	Medium	Native	Z10
A	199	Herring Road boundary.	<i>Eucalyptus tereticornis</i>	Semi-mature	Poor	Poor	Short	Native	Z10

A	200	Northern boundary, north of oval.	<i>Liquidambar styraciflua</i>	Mature	Fair	Fair	Medium	Exotic	Z10
A	201	Northern boundary, north of oval.	<i>Liquidambar styraciflua</i>	Mature	Fair	Fair	Medium	Exotic	Z10
A	209	Outside north-east school boundary	<i>Melaleuca bracteata</i>	Mature	Fair	Fair	Medium	Native	A1
A	210	Outside north-east school boundary	<i>Cupressus spp. (2)</i>	Semi-mature	Fair	Fair	Medium	Exotic	A1
A	211	Outside north-east school boundary	<i>Archontophoenix cunninghamiana</i>	Mature	Fair	Fair	Medium	Native	A1
A	212	Outside north-east school boundary	<i>Archontophoenix cunninghamiana</i>	Mature	Fair	Fair	Medium	Native	A1
A	213	Outside north-east school boundary	<i>Archontophoenix cunninghamiana</i>	Mature	Fair	Fair	Medium	Native	A1

Table 2. Summarised tree retention data collected for five specimens within tree impact zone B. High retention value specimens (A) are coloured in blue while low retention value specimens (Z) are coloured in red.

Zone	Tree#	Location	Species	Age	Health	Structure	ULE	Origin	Retention
B	160	Infants' play area, adjacent to play equipment.	<i>Eucalyptus saligna</i>	Mature	Fair	Fair	Long	Indigenous	A4
B	161	Infants' play area.	<i>Schinus molle</i>	Semi-mature	Fair	Poor	Medium	Exotic	Z10
B	162	Infants' play area.	<i>Angophora floribunda</i>	Mature	Fair	Fair	Medium	Native	A1
B	163	South-west corner of tennis court.	<i>Eucalyptus globoides</i>	Mature	Fair	Poor	Medium	Native	A1
B	169	Infants' play area.	<i>Eucalyptus saligna</i>	Mature	Fair	Fair	Long	Indigenous	A4

Table 3. Summarised tree retention data collected for seventeen specimens within tree impact zone C. High retention value specimens (A) are coloured in blue while low retention value specimens (Z) are coloured in red.

Zone	Tree#	Location	Species	Age	Health	Structure	ULE	Origin	Retention
C	45	Lawn area adjacent to office building and path.	<i>Eucalyptus saligna</i>	Mature	Fair	Poor	Long	Indigenous	A4
C	46	Lawn area adjacent to office building.	<i>Eucalyptus saligna</i>	Semi-mature	Fair	Poor	Medium	Indigenous	A4
C	54	Lawn area adjacent to office building and path.	<i>Eliocarpus reticulatus</i>	Mature	Fair	Fair	Medium	Native	Z12
C	55	Grassed area south of classroom.	<i>Eucalyptus saligna</i>	Mature	Fair	Poor	Long	Indigenous	A4
C	56	South of computer lab.	<i>Melaleuca decora</i>	Mature	Fair	Fair	Medium	Native	A1
C	57	South of computer lab.	<i>Eucalyptus scoparia</i>	Mature	Poor	Poor	Short	Native	Z10
C	70	Grassy area, close to pathway behind admin building.	<i>Eucalyptus saligna</i>	Mature	Fair	Fair	Medium	Native	A1
C	71	Grassy area, close to pathway behind admin building.	<i>Corymbia maculata</i>	Mature	Fair	Fair	Long	Native	A1
C	72	Grassy area, close to pathway behind admin building.	<i>Eucalyptus scoparia</i>	Mature	Fair	Fair	Long	Native	A1
C	80	East of school hall, close to north-east corner of school.	<i>Eucalyptus saligna</i>	Mature	Fair	Fair	Long	Indigenous	A4
C	81	East of school hall, close to north-east corner of school.	<i>Ficus rubiginosa</i>	Semi-mature	Fair	Poor	Medium	Native	A1
C	88	North of school hall, adjacent to Kent Rd.	<i>Corymbia maculata</i>	Mature	Fair	Fair	Long	Native	A1
C	89	North of school hall, adjacent to Kent Rd.	<i>Corymbia maculata</i>	Mature	Fair	Fair	Long	Native	A1
C	90	North of school hall, adjacent to Kent Rd.	<i>Corymbia maculata</i>	Mature	Fair	Fair	Long	Native	A1
C	91	North of school hall, adjacent to Kent Rd.	<i>Waterhousea floribunda</i>	Semi-mature	Fair	Fair	Medium	Native	Z10
C	92	North of school hall, adjacent to Kent Rd.	<i>Waterhousea floribunda</i>	Semi-mature	Fair	Fair	Medium	Native	Z10
C	172	Northern school boundary, north of admin building.	<i>Eucalyptus scoparia</i>	Mature	Fair	Fair	Medium	Native	A1

Table 4. Summarised tree retention data collected for sixty-six specimens within tree impact zone D. High retention value specimens (A) are coloured in blue while low retention value specimens (Z) are coloured in red.

Zone	Tree#	Location	Species	Age	Health	Structure	ULE	Origin	Retention
D	1	Adjacent to Kent Rd boundary.	<i>Angophora costata</i>	Semi-mature	Fair	Poor	Short	Indigenous	Z10
D	2	Adjacent to Kent Rd boundary.	<i>Corymbia maculata</i>	Semi-mature	Fair	Very Poor	Short	Native	Z10
D	202	Northern boundary, north of oval.	<i>Liquidambar styraciflua</i>	Mature	Fair	Fair	Medium	Exotic	Z10
D	203	Northern boundary, north of oval.	<i>Eucalyptus sieberi</i>	Mature	Poor	Poor	Short	Native	Z10
D	204	Northern boundary, north of oval.	<i>Callistemon viminalis</i>	N	Fair	Poor	Medium	Native	Z10
D	205	Northern corner of school boundary.	<i>Habitat tree</i>	N/A	N/A	N/A	N/A	N/A	N/A
D	206	Northern corner of school boundary.	<i>Eucalyptus saligna</i>	Mature	Fair	Fair	Long	Indigenous	A4
D	207	Northern corner of school boundary.	<i>Eucalyptus saligna</i>	Mature	Fair	Fair	Long	Indigenous	A4
D	208	Adjacent to Kent Rd boundary.	<i>Corymbia eximia</i>	Semi-mature	Fair	Poor	Medium	Native	Z10
D	98	North of Kent Rd carpark.	<i>Corymbia citriodora</i>	Mature	Poor	Fair	Medium	Native	Z10
D	99	North of Kent Rd carpark.	<i>Eucalyptus microcorys</i>	Mature	Fair	Fair	Medium	Native	Z10
D	100	North of Kent Rd carpark.	<i>Eucalyptus microcorys</i>	Mature	Fair	Fair	Medium	Native	Z10
D	101	North of Kent Rd carpark.	<i>Eucalyptus microcorys</i>	Mature	Fair	Fair	Medium	Native	Z10
D	102	North of Kent Rd carpark, adjacent to gas meter.	<i>Callistemon viminalis</i>	Mature	Fair	Fair	Medium	Native	Z10
D	103	West of Library building.	<i>Liquidambar styraciflua</i>	Mature	Fair	Fair	Medium	Exotic	Z10
D	104	West of Library building.	<i>Liquidambar styraciflua</i>	Mature	Fair	Fair	Medium	Exotic	Z10
D	105	West of Library building.	<i>Liquidambar styraciflua</i>	Mature	Fair	Fair	Medium	Exotic	Z10
D	106	West of Library building.	<i>Liquidambar styraciflua</i>	Mature	Fair	Fair	Medium	Exotic	Z10
D	107	West of Library building.	<i>Liquidambar styraciflua</i>	Mature	Fair	Fair	Medium	Exotic	Z10
D	108	West of Library building.	<i>Liquidambar styraciflua</i>	Mature	Fair	Fair	Medium	Exotic	Z10
D	109	Garden bed south-west of Library.	<i>Eucalyptus saligna</i>	Semi-mature	Fair	Poor	Short	Indigenous	Z10
D	110	Garden bed south-west of Library.	<i>Eucalyptus saligna</i>	Semi-mature	Fair	Fair	Medium	Indigenous	Z10
D	111	Garden bed south-west of Library.	<i>Melaleuca quinquenervia</i>	Semi-mature	Fair	Poor	Medium	Native	Z10
D	112	Garden bed south-west of Library.	<i>Melaleuca quinquenervia</i>	Semi-mature	Fair	Poor	Medium	Native	Z10
D	113	Garden bed south-west of Library.	<i>Melaleuca quinquenervia</i>	Semi-mature	Fair	Poor	Medium	Native	Z10
D	114	Garden bed south-west of Library.	<i>Melaleuca quinquenervia</i>	Semi-mature	Fair	Poor	Medium	Native	Z10
D	115	Garden bed south-west of Library.	<i>Eucalyptus saligna</i>	Semi-mature	Fair	Fair	Medium	Indigenous	Z10
D	116	Garden bed south-west of Library.	<i>Casuarina littoralis</i>	Semi-mature	Fair	Fair	Medium	Native	Z10
D	117	Garden bed south-west of Library.	<i>Casuarina littoralis</i>	Semi-mature	Fair	Fair	Medium	Native	Z10
D	118	Garden bed south-west of Library.	<i>Casuarina littoralis</i>	Semi-mature	Fair	Fair	Medium	Native	Z10

D	119	Garden bed south-west of Library.	<i>Eucalyptus saligna</i>	Semi-mature	Fair	Poor	Short	Indigenous	Z10
D	120	Garden bed south-west of Library.	<i>Melaleuca quinquenervia</i>	Semi-mature	Fair	Poor	Medium	Native	Z10
D	121	Garden bed south-west of Library.	<i>Melaleuca quinquenervia</i>	Semi-mature	Fair	Poor	Medium	Native	Z10
D	122	Garden bed south-west of Library.	<i>Eucalyptus saligna</i>	Semi-mature	Fair	Fair	Medium	Indigenous	Z10
D	123	Garden bed south-west of Library.	<i>Eucalyptus saligna</i>	Semi-mature	Fair	Poor	Medium	Indigenous	Z10
D	124	Garden bed south-west of Library.	<i>Corymbia maculata</i>	Semi-mature	Fair	Fair	Medium	Native	Z10
D	125	Garden bed south-west of Library.	<i>Corymbia maculata</i>	Semi-mature	Fair	Fair	Medium	Native	Z10
D	126	Garden bed south-west of Library.	<i>Corymbia maculata</i>	Semi-mature	Fair	Poor	Medium	Native	Z10
D	127	Garden bed south-west of Library.	<i>Eucalyptus saligna</i>	Semi-mature	Fair	Poor	Medium	Indigenous	Z10
D	128	Garden bed south-west of Library.	<i>Corymbia citriodora</i>	Semi-mature	Fair	Fair	Medium	Native	Z10
D	129	Garden bed south-west of Library.	<i>Corymbia citriodora</i>	Semi-mature	Fair	Fair	Medium	Native	Z10
D	130	Garden bed south-west of Library.	<i>Grevillea robusta</i>	Semi-mature	Poor	Fair	Short	Native	Z10
D	131	Garden bed south-west of Library.	<i>Eucalyptus saligna</i>	Semi-mature	Poor	Fair	Short	Indigenous	Z10
D	132	Garden bed south-west of Library.	<i>Corymbia citriodora</i>	Semi-mature	Fair	Poor	Medium	Native	Z10
D	133	Garden bed west of primary toilets.	<i>Eucalyptus paniculata</i>	Mature	Poor	Poor	Short	Native	Z10
D	134	Garden bed west of primary toilets.	<i>Eucalyptus saligna</i>	Mature	Poor	Poor	Short	Indigenous	Z12
D	135	Garden bed west of primary toilets.	<i>Casuarina littoralis</i>	Semi-mature	Poor	Poor	Short	Native	Z10
D	136	Garden bed west of primary toilets.	<i>Casuarina littoralis</i>	Semi-mature	Fair	Poor	Medium	Native	Z10
D	137	Garden bed west of primary toilets.	<i>Casuarina littoralis</i>	Semi-mature	Poor	Poor	Short	Native	Z10
D	138	Garden bed west of primary toilets.	<i>Eucalyptus botryoides</i>	Semi-mature	Poor	Poor	Short	Native	Z10
D	139	Garden bed west of primary toilets.	<i>Casuarina littoralis</i>	Semi-mature	Fair	Poor	Short	Native	Z10
D	140	Garden bed west of primary toilets.	<i>Ficus rubiginosa</i>	Semi-mature	Fair	Poor	Medium	Native	Z10
D	141	Garden bed west of primary toilets.	<i>Ficus rubiginosa</i>	Semi-mature	Fair	Poor	Medium	Native	Z10
D	142	Garden bed west of primary toilets.	<i>Casuarina littoralis</i>	Semi-mature	Fair	Poor	Medium	Native	Z10
D	143	Garden bed west of primary toilets.	<i>Corymbia maculata</i>	Semi-mature	Fair	Fair	Medium	Native	Z10
D	144	Garden bed west of primary toilets.	Removed tree	N/A	N/A	N/A	N/A	N/A	N/A
D	145	Adjacent to basketball courts and office building.	<i>Callistemon viminalis</i>	Semi-mature	Fair	Poor	Medium	Native	Z12
D	146	West of bitumen carpark and ramps.	<i>Acer sp.</i>	Semi-mature	Fair	Fair	Medium	Native	Z12
D	147	Adjacent to basketball courts and office building.	<i>Eucalyptus saligna</i>	Mature	Fair	Fair	Long	Indigenous	A4
D	148	Adjacent to basketball courts and office building.	<i>Callistemon viminalis</i>	Semi-mature	Fair	Poor	Medium	Native	Z12
D	165	North of primary toilets.	<i>Eucalyptus saligna</i>	Mature	Fair	Poor	Medium	Indigenous	Z12
D	173	Adjacent to Kent Rd boundary.	<i>Angophora floribunda</i>	Mature	Fair	Poor	Medium	Native	Z10
D	174	Adjacent to Kent Rd boundary.	<i>Angophora floribunda</i>	Mature	Fair	Poor	Medium	Native	Z10
D	175	Adjacent to Kent Rd boundary.	<i>Eucalyptus racemosa</i>	Mature	Fair	Poor	Medium	Native	Z10
D	176	Adjacent to Kent Rd boundary.	<i>Angophora costata</i>	Mature	Fair	Poor	Medium	Indigenous	Z10
D	178	South of primary toilet block.	<i>Angophora costata</i>	Semi-mature	Poor	Poor	Short	Indigenous	Z10

Table 5. Summarised tree retention data collected for ninety-one specimens outside of the tree impact zones. High retention value specimens (A) are coloured in blue while low retention value specimens (Z) are coloured in red.

N/A	3	West of school after care.	<i>Jacaranda mimmosifolia</i>	Mature	Fair	Poor	Medium	Exotic	A1
N/A	4	North-west of school after care.	<i>Jacaranda mimmosifolia</i>	Mature	Fair	Poor	Medium	Exotic	A1
N/A	5	South-western corner of school.	<i>Liquidambar styraciflua</i>	Mature	Poor	Poor	Short	Exotic	Z4
N/A	6	South-western corner of school.	<i>Eucalyptus albens</i>	Mature	Fair	Fair	Medium	Native	A1
N/A	7	South-western corner of school.	<i>Liquidambar styraciflua</i>	Mature	Good	Fair	Medium	Exotic	A1
N/A	13	Herring Road boundary.	<i>Eucalyptus tereticornis</i>	Semi-mature	Fair	Poor	Short	Native	Z10
N/A	14	South-eastern school boundary.	<i>Melia azedarach</i>	Mature	Fair	Fair	Medium	Exotic	A1
N/A	15	Veg area in south-eastern portion of school.	<i>Eucalyptus resinifera</i>	Mature	Fair	Fair	Medium	Native	A1
N/A	16	Veg area in south-eastern portion of school.	<i>Syncarpia glomulifera</i>	Mature	Fair	Poor	Medium	Native	A1
N/A	17	South-eastern school boundary.	<i>Allocasuarina torulosa</i>	Mature	Fair	Poor	Medium	Indigenous	A4
N/A	18	South-eastern school boundary.	<i>Jacaranda mimmosifolia</i>	Semi-mature	Fair	Poor	Short	Exotic	Z10
N/A	19	South-eastern corner of school.	<i>Jacaranda mimmosifolia</i>	Mature	Fair	Poor	Medium	Exotic	A1
N/A	20	South-eastern corner of school.	<i>Melaleuca decora</i>	Mature	Fair	Poor	Medium	Native	A1
N/A	21	South-eastern corner of school.	<i>Eucalyptus saligna</i>	Mature	Fair	Fair	Long	Indigenous	A4
N/A	22	South-eastern school boundary.	<i>Corymbia maculata</i>	Mature	Fair	Fair	Medium	Native	A1
N/A	23	Veg area in south-eastern portion of school.	<i>Eucalyptus saligna</i>	Mature	Fair	Poor	Medium	Indigenous	A4
N/A	24	Veg area in south-eastern portion of school.	<i>Eucalyptus saligna</i>	Mature	Fair	Poor	Medium	Indigenous	A4
N/A	25	Veg area in south-eastern portion of school.	<i>Eucalyptus saligna</i>	Mature	Fair	Poor	Medium	Indigenous	A4
N/A	26	Veg area in south-eastern portion of school.	<i>Syncarpia glomulifera</i>	Mature	Fair	Poor	Medium	Native	A1
N/A	27	Veg area in south-eastern portion of school.	<i>Syncarpia glomulifera</i>	Mature	Fair	Poor	Medium	Native	A1
N/A	28	Veg area in south-eastern portion of school.	<i>Eucalyptus resinifera</i>	Mature	Fair	Poor	Medium	Native	A1
N/A	29	Veg area	Removed tree	N/A	N/A	N/A	N/A	N/A	N/A
N/A	30	Veg area in south-eastern portion of school.	<i>Syncarpia glomulifera</i>	Mature	Fair	Poor	Medium	Native	A1
N/A	31	Veg area in south-eastern portion of school.	<i>Eucalyptus saligna</i>	Mature	Fair	Poor	Long	Indigenous	A4
N/A	32+33	Veg area in south-eastern portion of school.	<i>Eucalyptus resinifera</i>	Mature	Fair	Poor	Medium	Native	A1
N/A	34	Veg area in south-eastern portion of school.	<i>Eucalyptus resinifera</i>	Mature	Fair	Poor	Medium	Native	A1
N/A	35	Eastern corner of veg area.	<i>Eucalyptus saligna</i>	Mature	Fair	Poor	Medium	Indigenous	A4
N/A	36	Veg area in south-eastern portion of school.	<i>Eucalyptus saligna</i>	Mature	Fair	Poor	Long	Indigenous	A4
N/A	37	Adjacent to cricket nets.	<i>Eucalyptus saligna</i>	Mature	Fair	Poor	Medium	Indigenous	A4
N/A	38	Grassy area, east of cricket nets.	<i>Eucalyptus saligna</i>	Mature	Fair	Poor	Long	Indigenous	A4

N/A	39	Grassy area, east of cricket nets.	<i>Eucalyptus saligna</i>	Mature	Fair	Poor	Medium	Indigenous	A4
N/A	40	Grassy area, east of cricket nets.	<i>Eucalyptus saligna</i>	Mature	Fair	Poor	Medium	Indigenous	A4
N/A	41	Grassy area, north-east of cricket nets.	<i>Eucalyptus paniculata</i>	Mature	Fair	Poor	Medium	Native	A1
N/A	42	Grassy area, north-east of cricket nets.	<i>Eucalyptus saligna</i>	Mature	Fair	Poor	Long	Indigenous	A4
N/A	43	Grassy area, north-east of cricket nets.	Removed tree	N/A	N/A	N/A	N/A	N/A	N/A
N/A	44	Grassy area, north-east of cricket nets.	<i>Eucalyptus saligna</i>	Mature	Fair	Poor	Long	Indigenous	A4
N/A	47	Grassy area, adjacent to metal benches	<i>Eucalyptus saligna</i>	Mature	Fair	Poor	Medium	Indigenous	A4
N/A	48	Grassy area, adjacent to metal benches	<i>Eucalyptus saligna</i>	Mature	Fair	Poor	Medium	Indigenous	A4
N/A	49	Grassy area, along eastern boundary.	<i>Eucalyptus saligna</i>	Mature	Fair	Poor	Long	Indigenous	A4
N/A	50	Grassy area, along eastern boundary.	<i>Eucalyptus saligna</i>	Mature	Fair	Poor	Long	Indigenous	A4
N/A	51	North-eastern corner of school over Kent Rd.	<i>Eucalyptus saligna</i>	Mature	Fair	Poor	Long	Indigenous	A4
N/A	52	East of school hall, close to north-east corner of school	<i>Syncarpia glomulifera</i>	Mature	Fair	Poor	Long	Native	A1
N/A	53	Northern school boundary adjacent to Kent Rd.	<i>Eucalyptus resinifera</i>	Mature	Fair	Poor	Long	Native	A1
N/A	58	Grassy area, along eastern boundary.	<i>Eucalyptus saligna</i>	Mature	Fair	Poor	Long	Indigenous	A4
N/A	59	Grassy area, close to north - eastern boundary.	<i>Eucalyptus saligna</i>	Mature	Fair	Fair	Long	Indigenous	A4
N/A	60	Grassy area, close to north - eastern boundary.	<i>Eucalyptus tereticornis</i>	Mature	Fair	Poor	Medium	Native	A1
N/A	61	Grassy area, close to north - eastern boundary.	<i>Corymbia eximia</i>	Mature	Fair	Fair	Medium	Native	A1
N/A	62	Grassy area, close to north - eastern boundary.	<i>Eucalyptus tereticornis</i>	Mature	Fair	Poor	Medium	Native	A1
N/A	63	Grassy area, close to north - eastern boundary.	<i>Eucalyptus saligna</i>	Mature	Fair	Poor	Long	Indigenous	A4
N/A	64	Grassy area, close to north - eastern boundary.	<i>Syncarpia glomulifera</i>	Mature	Fair	Poor	Medium	Native	A1
N/A	65	Grassy area, close to north - eastern boundary.	<i>Syncarpia glomulifera</i>	Mature	Fair	Poor	Medium	Native	A1
N/A	66	Grassy area, close to north - eastern boundary.	<i>Eucalyptus tereticornis</i>	Mature	Fair	Poor	Medium	Native	A1
N/A	67	Grassy area, close to north - eastern boundary.	<i>Eucalyptus scoparia</i>	Mature	Fair	Poor	Medium	Native	A1
N/A	68	Grassy area, close to north - eastern boundary.	<i>Eucalyptus saligna</i>	Mature	Fair	Poor	Medium	Indigenous	A4
N/A	69	Grassy area, close to north - eastern boundary.	<i>Eucalyptus saligna</i>	Mature	Fair	Poor	Long	Indigenous	A4
N/A	73	East of school hall, close to north-east corner of school	<i>Eucalyptus saligna</i>	Mature	Fair	Fair	Long	Indigenous	A4
N/A	74	East of school hall, close to north-east corner of school	<i>Eucalyptus saligna</i>	Mature	Fair	Fair	Long	Indigenous	A4
N/A	75	North-eastern corner of school over Kent Rd.	<i>Allocasuarina torulosa</i>	Mature	Fair	Fair	Long	Indigenous	A4
N/A	76	Northern school boundary adjacent to Kent Rd.	<i>Eucalyptus saligna</i>	Mature	Fair	Fair	Long	Indigenous	A4
N/A	77	Northern school boundary adjacent to Kent Rd.	<i>Eucalyptus saligna</i>	Mature	Fair	Fair	Long	Native	A4
N/A	78	East of school hall, close to north-east corner of school	<i>Eucalyptus saligna</i>	Mature	Fair	Poor	Long	Native	A4
N/A	79	East of school hall, close to north-east corner of school	<i>Eucalyptus resinifera</i>	Mature	Fair	Fair	Long	Native	A1

N/A	82	Northern school boundary adjacent to Kent Rd.	<i>Eucalyptus saligna</i>	Mature	Fair	Fair	Long	Indigenous	A4
N/A	83	East of school hall, close to north-east corner of school	<i>Corymbia maculata</i>	Mature	Fair	Fair	Long	Native	A1
N/A	84	East of school hall, close to north-east corner of school	<i>Corymbia maculata</i>	Mature	Fair	Fair	Long	Native	A1
N/A	85	East of school hall, close to north-east corner of school	<i>Allocasuarina torulosa</i>	Mature	Fair	Fair	Long	Indigenous	A4
N/A	86	East of school hall, close to north-east corner of school	<i>Glochidion ferdinandii</i>	Semi-mature	Poor	Poor	Short	Native	Z10
N/A	87	Northern school boundary adjacent to Kent Rd.	<i>Eucalyptus saligna</i>	Mature	Fair	Fair	Long	Indigenous	A4
N/A	93	Herring Road boundary.	<i>Lophostemon confertus</i>	Mature	Fair	Fair	Medium	Native	A1
N/A	94	Herring Road boundary.	Removed tree	N/A	N/A	N/A	N/A	N/A	N/A
N/A	95	Herring Road boundary.	<i>Eucalyptus racemosa</i>	Semi-mature	Fair	Fair	Medium	Native	Z10
N/A	96	Herring Road boundary.	<i>Lophostemon confertus</i>	Mature	Fair	Poor	Medium	Native	A1
N/A	97	Herring Road boundary.	Removed tree	N/A	N/A	N/A	N/A	N/A	N/A
N/A	149	North of school after care.	<i>Callistemon citrinus</i>	Mature	Fair	Poor	Medium	Native	A1
N/A	150	North of school after care.	<i>Callistemon viminalis</i>	Mature	Fair	Poor	Medium	Native	A1
N/A	151	North of school after care.	<i>Callistemon citrinus</i>	Mature	Fair	Poor	Medium	Native	A1
N/A	152	Behind infants' toilets.	<i>Alnus jorulensis</i>	Mature	Fair	Fair	Medium	Exotic	A1
N/A	153	Behind infants' toilets.	<i>Corymbia maculata</i>	Mature	Fair	Fair	Long	Native	A1
N/A	154	Behind infants' toilets.	<i>Corymbia maculata</i>	Mature	Fair	Fair	Long	Native	A1
N/A	155	West of primary classroom.	<i>Casuarina littoralis</i>	Mature	Fair	Poor	Medium	Native	A1
N/A	156	West of primary classroom.	<i>Ficus macrophylla</i>	Semi-mature	Fair	Poor	Medium	Native	A1
N/A	157	West of primary classroom.	<i>Ficus rubiginosa</i>	Semi-mature	Fair	Poor	Medium	Native	A1
N/A	158	West of primary classroom.	Removed tree	N/A	N/A	N/A	N/A	N/A	N/A
N/A	159	West of primary classroom.	<i>Corymbia eximia</i>	Mature	Fair	Fair	Medium	Native	A1
N/A	164	North of tennis courts.	<i>Eucalyptus resinifera</i>	Mature	Fair	Poor	Medium	Native	A1
N/A	166	Adjacent to uniform shop.	<i>Callistemon citrinus</i>	Mature	Fair	Fair	Medium	Native	A1
N/A	167	Adjacent to uniform shop.	<i>Melaleuca decora</i>	Mature	Poor	Fair	Medium	Native	A1
N/A	168	Adjacent to uniform shop.	<i>Acmena smithii</i>	Mature	Fair	Fair	Medium	Native	A1
N/A	170	South of computer lab.	<i>Eucalyptus microcorys</i>	Mature	Fair	Fair	Medium	Native	A1
N/A	171	South of computer lab.	<i>Corymbia eximia</i>	Semi-mature	Poor	Poor	Short	Native	Z10
N/A	177	Infants' play area, adjacent to water tank.	<i>Grevillea 'Moonlight'</i>	Mature	Fair	Fair	Medium	Native	Z10

5. Summary and Recommendations.

While the individual retention of trees within this site varied there were clear patterns observed in the various zones established as part of this assessment. This reflects spatial similarities in the trees' condition, age and species for the various portions of the subject site. It is also a reflection of the current and changing use of the school's grounds, which will influence the trees' ULE and therefore their retention value.

Zone A, which is not part of the SSDA application, is positioned in the RMS land within the northern portion of the school. This zone contains thirty-three trees. Of these only six were determined to be of high retention value. The primary reason for this is the relatively young age of the tree population along the Herring Road boundary and the generally poor health and structure observed across the majority of specimens. Tree 8 was deemed to be of A1 retention value for its good condition and long ULE. While Trees 209 – 2013 are not specimens of high significance they are positioned outside the school's boundaries and are therefore also considered to be of A1 retention value. Efforts should be made to ensure the protection of these specimens during works required to install the demountable classrooms within this zone.

Zone B, which is not part of the SSDA application, surrounds the playground and existing sports court within the central western portion of the school. This zone contains five trees. Of these five specimens four were determined to be of high retention value. Two of the trees (Trees 160 and 169) are large Sydney Blue Gums that are in good condition and were determined to be of A4 retention value. Trees 162 and 163 are both mature native specimens in relatively good condition that were determined to be of A1 retention value. Efforts should be made to ensure the protection of these four specimens during the construction of the new sports court within this zone.

Zone C, which is not part of the SSDA application, surrounds the existing school hall and staff administration building in the central eastern portion of the school. This zone contains seventeen trees. Of these twelve were determined to be of high retention value. The trees within this zone were observed to have optimal size, species value and be in generally good condition. Efforts should be made to ensure the protection of these specimens during the

construction works associated with the school hall and staff office building upgrades within this zone.

Zone D, which contains the SSDA works area and the proposed builder's compound in the central portion of the school, contains sixty-six trees. While this zone contained the largest group of trees only four specimens were determined to be of high retention value (Trees 147, 172, 206 and 207). This reflects the dense population of young native and indigenous trees within the planted garden bed adjacent to the existing infants toilet block. Despite the value of many of these specimens' species their smaller size, less optimal condition and lower replacement cost underpinned their low retention value scores. For these reasons the majority of trees within this zone were determined to be of Z10 retention value.

The exceptions were Trees 134 and 165, which are mature Sydney Blue Gum specimens. These two specimens are less easily replaced and are both important to the school's tree population. However, both showed signs of poor structure and declining health, which underpinned their reduced ULE estimates. The environmental and zoning restrictions within this site limit the possible location for the proposed development. These trees are in poorer condition with a shorter ULE when compared with the other mature Sydney Blue Gums. Altering the position of the proposed buildings or establishing protection measures for these two trees is therefore considered an unreasonable cost. For these reasons these two larger specimens were determined to be of Z12 retention value and were not considered to be suitable for protection under the proposed development.

There were ninety-one trees positioned outside of the four tree impact zones established as part of this arboricultural assessment. Within this large population of trees are a considerable number of high retention value trees. This group contains the population of mature trees within the southern portion of the school that make up the established Blue Gum High Forest ecological community. These trees along with the others that were not included in the four zones can be easily protected from the proposed development by their distance from the proposed works. Efforts should be made to ensure that these trees are isolated and thus effectively protected from the proposed works within this school.

6. Tree Protection Plan

The proposed location of the new building complex is considered to be the most suitable in terms of minimising overall impact on the tree population within the school. In its current position the seventy-nine high retention trees that are outside of the four tree impact zones will entirely avoid being negatively impacted.

Tree protection measures are only allocated to trees of high retention value within the four tree impact zones. Twenty-six high retention trees within the four tree impact zones will require tree protection measures to ensure their long-term success post-development. The tree protection measures are drawn from *the Australian Standard for the Protection of Trees on Development Sites (AS 4970 2009)*.

6.1. Pre – Construction Vegetation Management

Any approved tree pruning or removal that is required to facilitate the proposed development should occur prior to the commencement of works at this site.

Fifty-two trees within Zone D will require removal to facilitate the construction of the new learning centre, office and driveway / loading bay (Figure 3). These trees are all positioned inside the SSD zone and are within the proposed new buildings' footprint. All fifty-two trees were not determined to be of high retention value in section 4.2. Trees 99-133, 135-144, 173-175 and 178 were all determined to be of Z10 retention value. The native and indigenous specimens within this densely populated planted garden were observed to be with poor health or structure. The lower retention value determined for these specimens was also underpinned by their semi-mature age, which allows for more cost and time effective replacement strategies to be employed.

It is a key recommendation of this arboricultural impact assessment that all Blue Gum High Forest trees (11 x *Eucalyptus saligna* specimens and 2 x *Angophora costata* subsp.

***costata* specimens) be replaced within 6 months of project completion in a suitable location within the school that will allow for their long term ability to thrive.**

Two trees (Trees 134 and 165) were determined to be of Z12 retention value. Their size and species value would usually render them of high retention value. However, these mature Sydney Blue Gums were observed to have declining poor health and poor structure, which reduced their estimated ULE. Trees 165 and 134 were observed to be the only mature Sydney Blue Gums within the school with Short ULE estimates. The expense of protecting these two trees is therefore not considered to be a reasonable long-term option for the development of this site. The positioning of the new building within this location of the school is considered to be the most suitable to avoid the disturbance or removal of specimens of the same size and species that are in better condition and with longer ULE estimates in other parts of the subject site.

It is a key recommendation of this report that Trees 134 and 165 be aerially inspected by an ecologist prior to their removal. This inspection should investigate the presence of faunal habitats within their canopy and hollowed stems. All fauna within these trees should be safely captured and / or dispersed prior to their removal. Once evacuated all hollows should be covered to ensure they are not reoccupied prior to the trees' removal.

No further tree work is required to facilitate the planned construction work within this site.



Figure 3. Fifty-two tree removals required within the builder's compound (Zone D). Site drawing provided by *Gardner and Wetherill Associates* and annotated by *Temporal Tree Management* (21/09/2018).

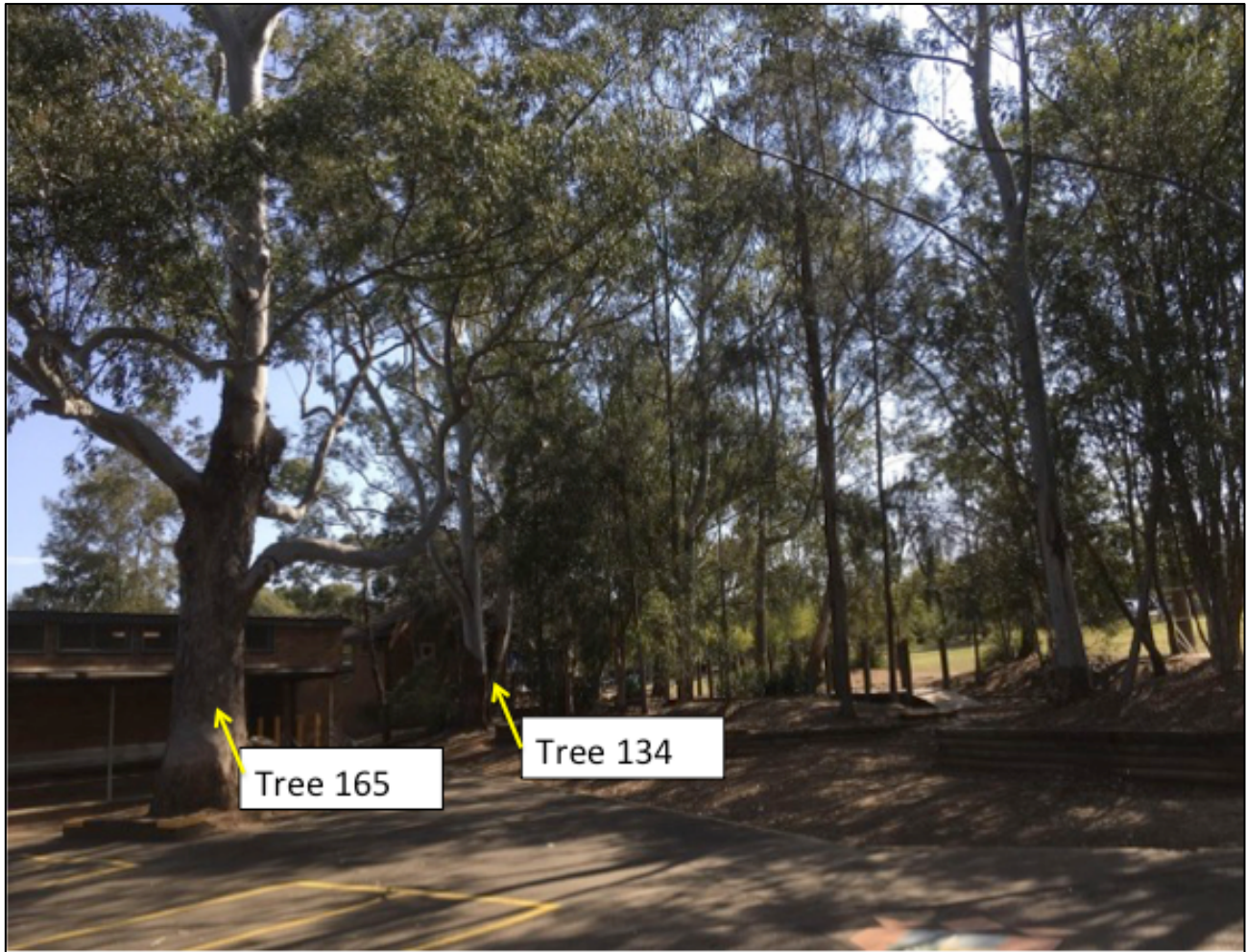


Figure 4. Position of Trees 165 and 134 adjacent to the existing infants toilet block.

6.2. Tree Protection Measures

All tree protection measures must be established in accordance with the *Australian Standard for the Protection of Trees on Construction Sites* (AS4970 2009). Tree protection zones (TPZs) and structural root zones (SRZs) have been calculated from the diameter at breast height (DBH) and diameter of the root flare (DRF) for fourteen trees in section 6.4. These zones are aimed at preventing soil compaction, contamination and physical damage to trees above and below ground (Matheny and Clark 1994). As such all construction activity is excluded from designated TPZ areas. The TPZ and SRZ measurements are provided as a radial measurement that determines the circular areas of above and below ground exclusion (Figure 5).

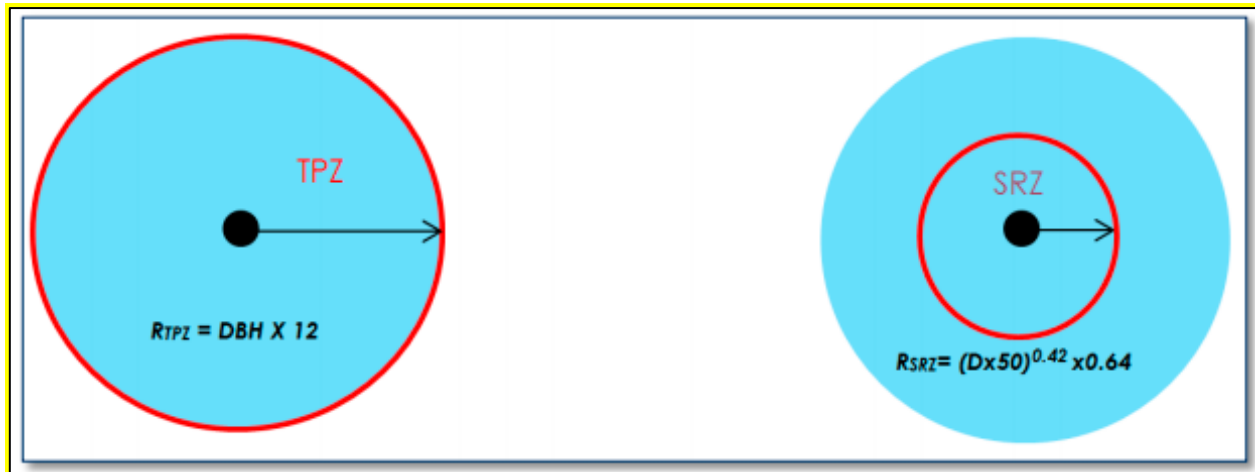


Figure 5. TPZ and SRZ radial measurement equations.

6.3. Tree Protection Zones

The tree protection zone is an above and below – ground area that excludes any construction activity and is the principal means of protecting trees on construction sites (Matheny and Clark 1994). The area contained within the TPZ is fundamentally important in trees' long – term survival.

The area established by the radial measurement should be enclosed by 1.8 metre steel fencing that is securely fixed to the ground as stated in section 4.3 of the *Australian Standard for the Protection of Trees on Construction Sites* (AS4970 2009) (Figure 6). Signage stating the purpose of these exclusion zones should be fixed to the fencing so that it is visible from all points within the site.

The structural root zone is the predicted area in which roots that ensure a trees' stability are located (Day et al. 2009). The SRZ is typically located within the TPZ. Under no circumstances should construction activity occur within the SRZ without the presence and consultation of the project arborist.

Encroachments of construction activity may only occur with the consultation and permission of the project arborist. As defined in section 5 of the *Australian Standard for the Protection of Trees on Construction Sites* (AS4970 2009) encroachments of less than 10% of the total TPZ area may occur without the site presence of the project arborist providing there is an equal

compensation of area elsewhere within the TPZ. Major encroachments of 10 – 20% require added consultation from the project arborist. Suitability for major encroachments are site specific and depend on the vitality of the tree and extent of the encroachment. A root mapping report may be required to determine if the tree will be able to sustain the level of encroachment. The presence of the project arborist during all such construction activity is required. An equal amount of compensated area should also be added to the TPZ elsewhere.

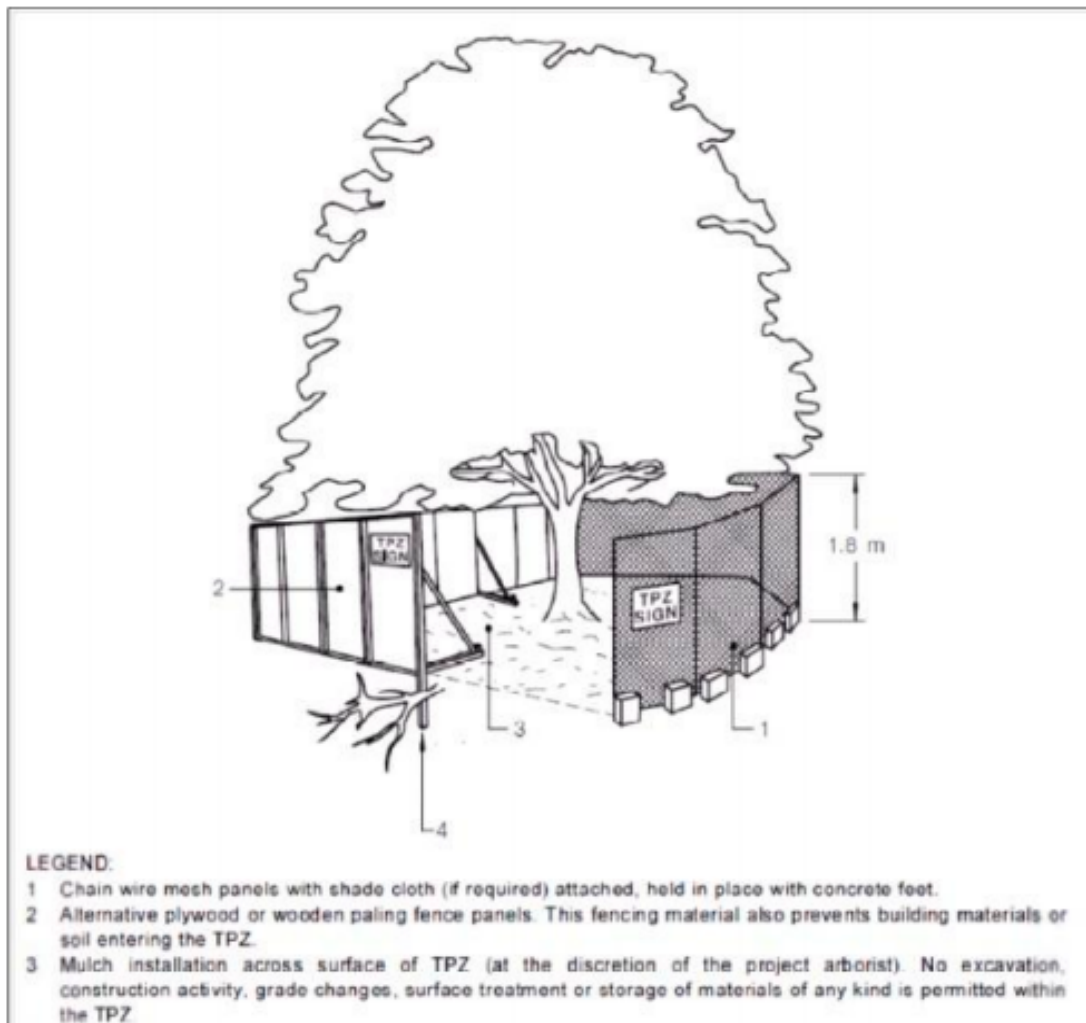


Figure 6. Steel fencing should be erected around the perimeter of TPZs in accordance with AS4970.

6.4 Site Specific Protection Measures

Tree protection measures have only been allocated to trees positioned within the four tree impact zones. Fourteen trees within the four zones were determined to be of high retention value and require tree protection measures to ensure their long-term success and survival. The TPZ and SRZ radii were calculated in metres for fourteen trees from their DBH and DRF measurements (Table 6).

All radial measures used to establish TPZ boundaries must be measured from the specified tree's stem.

Table 6. Radial TPZ and SRZ measurements for fourteen high retention trees.

Tree#	Species	Zone	Health	Structure	ULE	TPZ(m)	SRZ(m)
8	<i>Lophostemon confertus</i>	A	Fair	Fair	Long	7.2	2.87
160	<i>Eucalyptus saligna</i>	B	Fair	Fair	Long	11.52	3.52
162	<i>Angophora floribunda</i>	B	Fair	Fair	Long	4.44	2.37
163	<i>Eucalyptus globoidea</i>	B	Fair	Poor	Medium	5.52	2.65
169	<i>Eucalyptus saligna</i>	B	Fair	Fair	Long	12.24	3.59
45	<i>Eucalyptus saligna</i>	C	Fair	Poor	Long	11.04	3.43
70	<i>Eucalyptus scoparia</i>	C	Fair	Fair	Long	5.04	2.57
72	<i>Eucalyptus scoparia</i>	C	Fair	Fair	Long	4.56	2.43
88	<i>Corymbia maculata</i>	C	Fair	Fair	Long	3	2.07
89	<i>Corymbia maculata</i>	C	Fair	Fair	Long	3.6	2.28
90	<i>Corymbia maculata</i>	C	Fair	Fair	Long	5.04	2.63
147	<i>Eucalyptus saligna</i>	C	Fair	Fair	Long	14.76	3.88
172	<i>Eucalyptus scoparia</i>	C	Fair	Fair	Long	4.92	2.59
207	<i>Eucalyptus saligna</i>	D	Fair	Fair	Long	7.8	3.12

6.4.1. Zone A

There were six trees within zone A determined to be of high retention value. However, tree protection measures were not deemed relevant for these specimens. Trees 209 – 213 are positioned outside the school's boundary and are positioned far enough from the new demountable locations that they will be adequately protected without management efforts. Similarly, Tree 8 is positioned adjacent to existing demountable classrooms. It too was therefore determined to be adequately protected without management efforts.

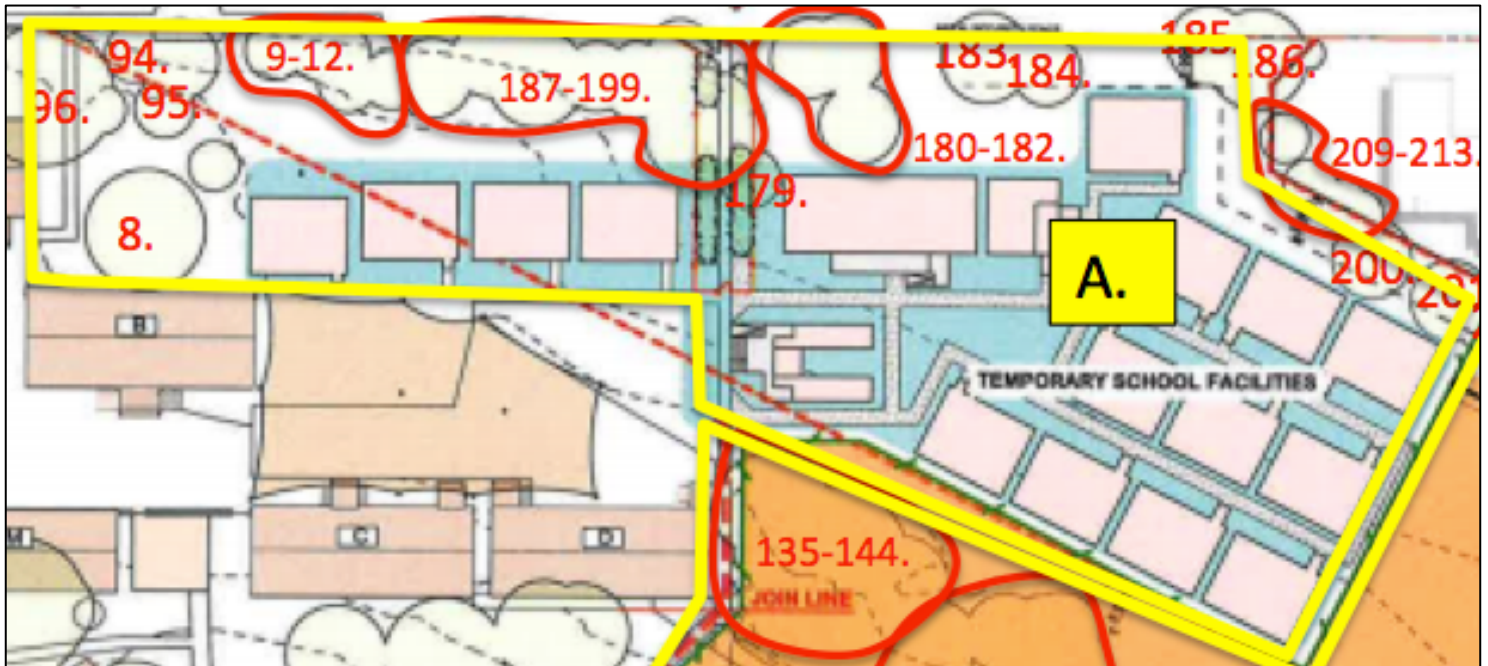


Figure 7. There are no tree protection measures required within tree impact zone A. Zone A is contained within the yellow bordered area. Site drawing provided by *Gardner and Wetherill Associates* and annotated by *Temporal Tree Management* (21/09/2018).

6.4.2. Zone B

There were four trees within zone B determined to be of high retention value. Due to the small size of this zone and the trees' close proximity to the proposed location of the new sports court they will each require protection measures to be established.

Due to their size and close proximity to one another a joint TPZ should be established around Trees 160 and 169. The radial TPZ measure of 12.24 metres for Tree 160 should be used to establish the north-western, western and south-western boundaries of this joint TPZ. The radial TPZ measure of 11.52 metres for Tree 160 should be used to establish the north-eastern and eastern boundaries of this joint TPZ. The southern edge of the TPZ will have to be adjusted to accommodate the new sports court. The southern boundary fence of this TPZ should be no further than 300 mm from the northern edge of the new sports court (Figure 8). All fencing and signage requirements stipulated in section 6.3 must be complied with in the construction of this TPZ.

It is a key recommendation of this report that the northern edge of the new sports court be no closer than 5.5 metres from the stem of Tree 169. This will ensure that the encroachment sustained to this tree remains minor (less than 10% of its total TPZ area).

Due to their close proximity to one another a joint TPZ should also be established around Trees 162 and 163. The radial TPZ measure of 4.44 metres for Tree 162 should be used to establish the northern and western boundaries of this joint TPZ. The radial TPZ measure of 5.52 metres for Tree 163 should be used to establish the southern and eastern boundaries of this joint TPZ. The northern edge of the TPZ will have to be adjusted to accommodate the new sports court. The northern boundary fence of this TPZ should be no further than 300 mm from the southern edge of the new sports court (Figure 8). All fencing and signage requirements stipulated in section 6.3 must be complied with in the construction of this TPZ.

It is a key recommendation of this report that the northern edge of the new sports court be no closer than 3.5 metres from the stem of Tree 163. This will ensure that the

encroachment sustained to this tree remains minor (less than 10% of its total TPZ area).

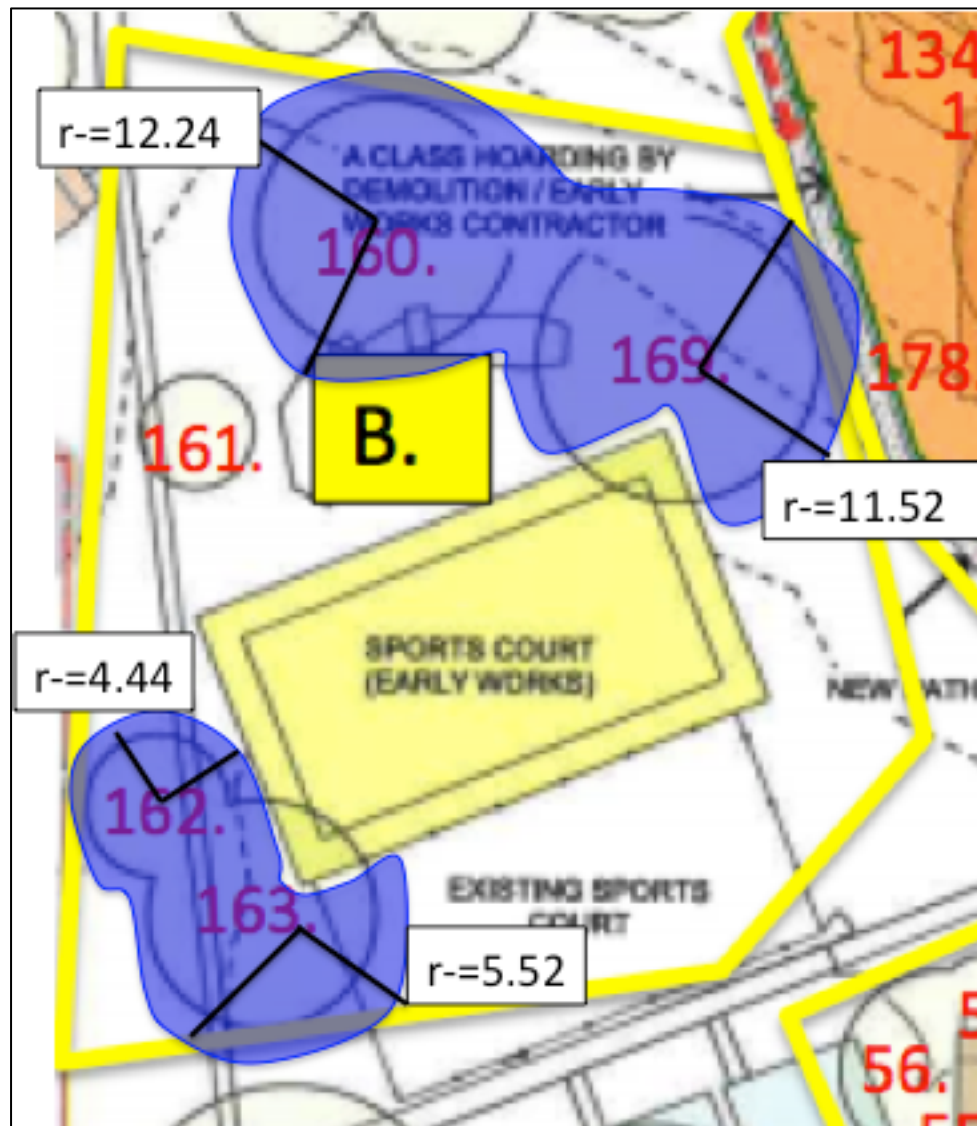


Figure 8. TPZ arrangement for four high retention trees within tree impact zone B. Zone B is contained within the yellow bordered area. Site drawing provided by *Gardner and Wetherill Associates* and annotated by *Temporal Tree Management* (21/09/2018).

6.4.3. Zone C

There were thirteen trees within zone C determined to be of high retention value. However, due to the dense grouping of a number of these trees the majority can be protected within a combined TPZ.

A customized TPZ should be established around Tree 172. The eastern and western boundaries of this TPZ should be established by a radial measurement of 3.6 metres, which was established for this tree. The northern and southern boundaries of this tree's TPZ should be established by the wall of the school hall and the Kent Road boundary (Figure 9). All fencing and signage requirements stipulated in section 6.3 must be complied with in the construction of this TPZ.

A conventional TPZ with a radial measure of 11.04 metres should be established for Tree 45 (Figure 9). All fencing and signage requirements stipulated in section 6.3 must be complied with in the construction of this TPZ.

Due to their close proximity a large group exclusion zone should be established around eight high retention trees within the southern portion of this zone. This exclusion zone only requires a fence on one side to exclude construction activity on the northern side. The radial TPZ measure of 4.56 for Tree 72 should be used to establish the north-eastern edge of this protection zone. The radial measurements of Tree 70, Tree 80 and Tree 89 should be used to establish the northern edge of this protection zone around the south-eastern side of the school hall (Figure 9). The radial TPZ measure of 5.04 metres for Tree 90 should be used to establish the protection zone boundary on the north-eastern side of the school hall. All fencing and signage requirements stipulated in section 6.3 must be complied with in the construction of this TPZ.

It is a key recommendation of this report that the group exclusion zone be extended in the western direction towards Tree 45. Additional signage should be added stating that 'No construction activity is permitted beyond this point. This must ensure that no construction activity of any kind take place on the southern side of this fence. The high

retention value trees within southern portion of the school that are not within the tree impact zones will therefore remain protected.

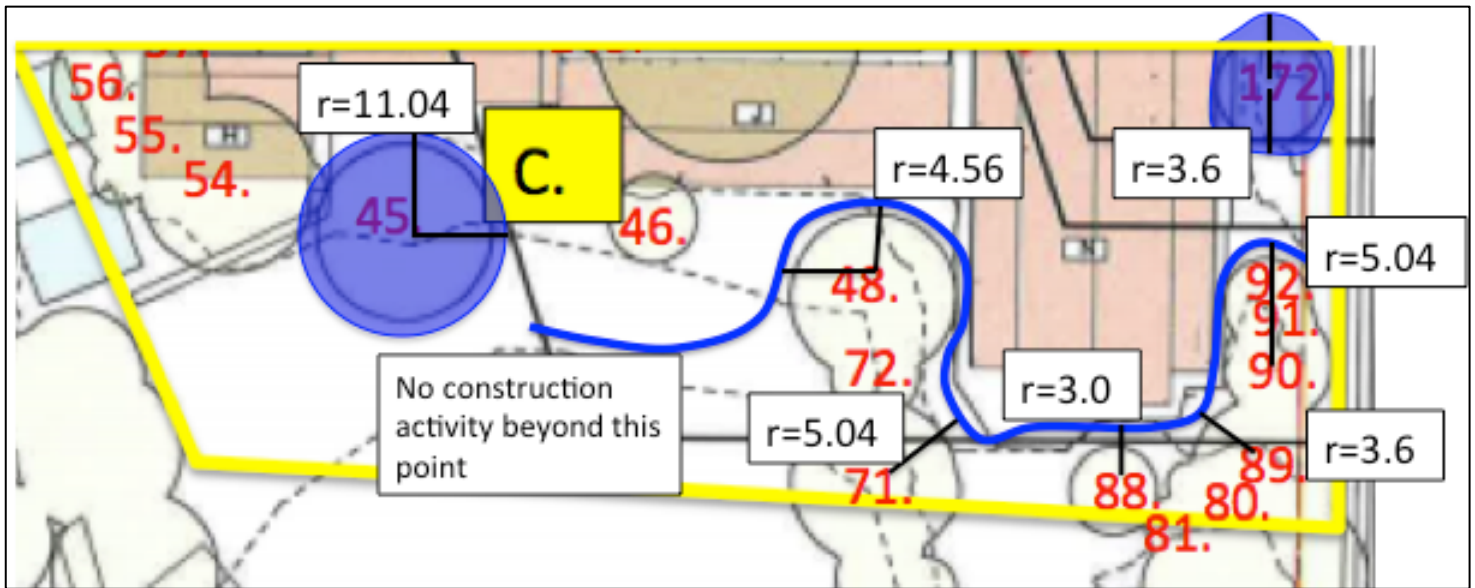


Figure 9. TPZ arrangement for thirteen high retention tree within tree impact zone C. Zone C is contained within the yellow bordered area. Site drawing provided by *Gardner and Wetherill Associates* and annotated by *Temporal Tree Management* (21/09/2018).

6.4.4. Zone D

There were three trees within zone D that were determined to be of high retention value. These three specimens are all large Sydney Blue Gum specimens with medium-long ULE estimates. The major construction works associated with the SSD component of the development within this site will be contained within zone D. Efforts must therefore be made to ensure that the three high retention trees identified within it are adequately protected.

Tree 147 is one of the largest and most significant trees within the school. Due to its close proximity to J block this tree's TPZ shape must be customised. The radial TPZ measure for Tree 147 of 14.76 metres should be used to establish the northern and eastern boundaries of its protection zone. The adjacent existing buildings will restrict the southern boundaries (Figure 9). All fencing and signage requirements stipulated in section 6.3 must be complied with in the construction of this semi-circular TPZ.

The radial TPZ measure of 7.8 metres for Tree 207 should be used to establish the entire southern and eastern boundary of this TPZ. The northern and western boundaries will be constrained by the school's north-eastern boundary. This joint TPZ will effectively protect Tree 207 and 206 from the intense construction activities within the builder's compound (Figure 10). All fencing and signage requirements stipulated in section 6.3 must be complied with in the construction of this TPZ.

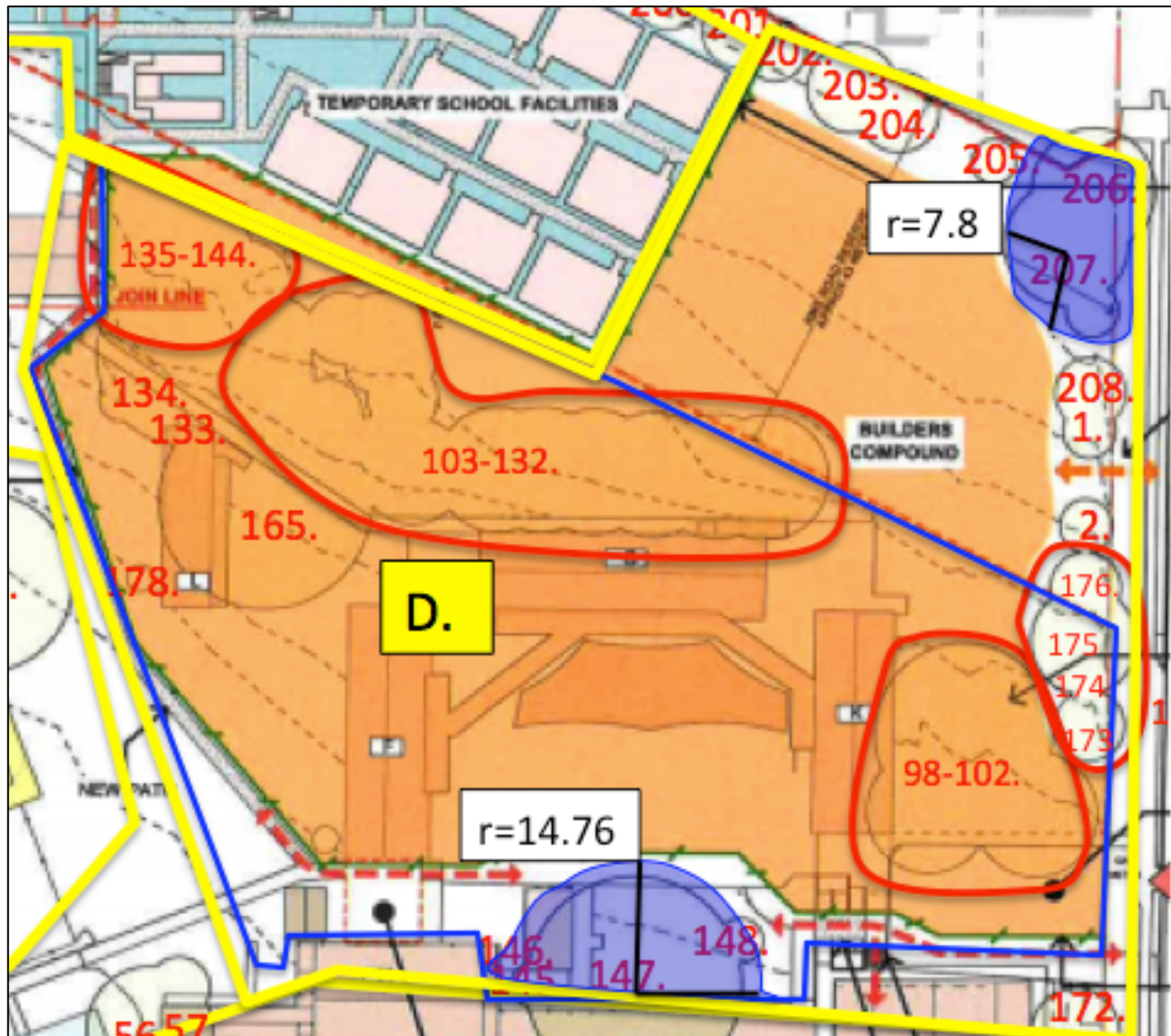


Figure 10. TPZ arrangement for three high retention tree within tree impact zone D. The SSD zone is contained within the blue bordered area, zone D is contained within the yellow bordered area. Site drawing provided by *Gardner and Wetherill Associates* and annotated by *Temporal Tree Management* (21/09/2018).

6.5. Tree Impacts and Protection Measures within the SSD Area

The SSD works will be entirely contained within zone D (Figure 1 and Figure 10). This portion of the site contains fifty-six specimens. This includes Trees 98 – 148, Tree 165, Trees 173 – 175 and Tree 178.

The only tree determined to be of high retention value within the SSD area was Tree 147. A semi-circular TPZ with a radial measurement of 14.76 metres was prescribed for this specimen in Section 6.4.4 due to its position close to the existing staff administration building (Figure 10 and Figure 11).

All trees that were determined in Section 6.1 to require removal as part of the development of Kent Road Public School are positioned within the SSD area. As described in Section 6.1 this includes fifty-two trees, which were all determined not to be of high retention value. These include Trees 99-144, Tree 165, Trees 173-175 and Tree 178

The remaining three trees within the SSD area include Tree 145 and Trees 147-148. These three specimens do not require removal to facilitate the construction of the new buildings within the SSD area. However, they were not determined to be of high retention value, so no protection measures have been allocated to them.

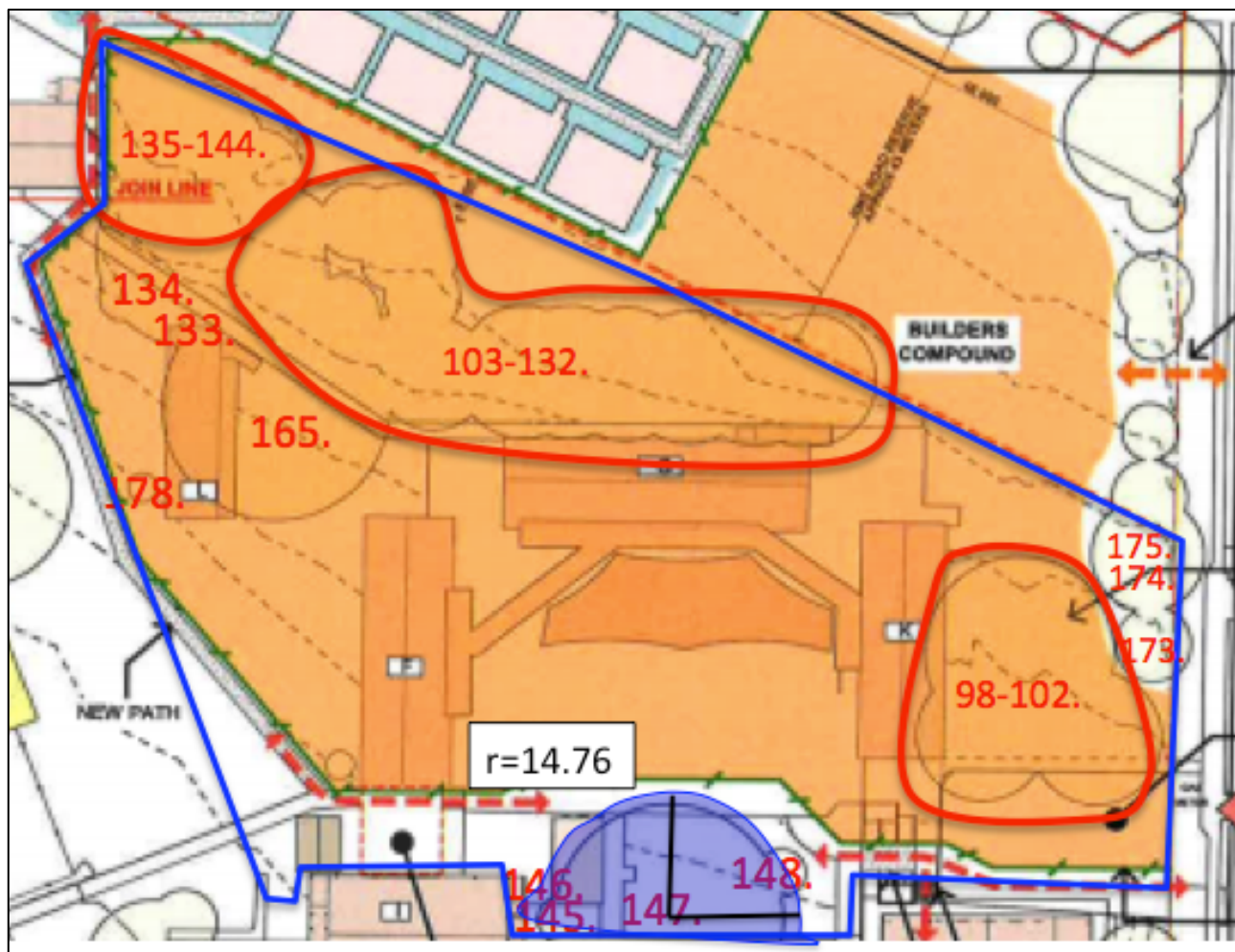


Figure 11. Fifty-six specimens area positioned within the SSD area inside the blue border. One tree (Tree 147) requires protection within this area while fifty-two specimens require removal. Site drawing provided by *Gardner and Wetherill Associates* and annotated by *Temporal Tree Management* (01/10/2018).

6.6. Certification

Monitoring, reporting and certification should be carried out at the following critical stages of construction:

- Pre-construction
- Site establishment
- Irrigation installation and construction work
- Landscape and irrigation operation works
- Practical completion.

Once approved, this tree management plan must be available onsite prior to the commencement of, and during works. To ensure the survival of the trees defined in this report as result of the stipulated TPP measures a final certification will be required once construction activity has been completed at this site. In line with *AS4970* this certification should determine if the TPP measures were adequately followed and whether the relevant trees were successfully protected. This certification may be given by either the project arborist or separate arborist who must hold an AQF Qualification of level 5 or higher.

References:

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