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TREE PROTECTION PLAN

CHARLESTOWN LEISURE CENTRE
DICKINSON STREET
CHARLESTOWN

Prepared for

PEDDLE THORPE ARCHITECTS

10TH MAY 2016

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1. INTRODUCTION

The purpose of this report is to provide the developers with a Tree Protection Plan (TPP) that can be implemented so that the trees identified for retention can be protected during all stages of the development.

The main area of concern in relation to tree preservation is damage and/ or substantial changes to natural ground levels that may have an adverse impact on root systems of trees.

The trees identified for retention have been based on the Overland Flow Path Plan provided by Peddle Thorpe Architects Project No. 33-0107 Drawing No. DA004 Revision C Sheet Dated 15/10/15 (Attachment 1).

This document is not intended for use for any other purposed other than that proposed. Assessments and recommendations are not provided for in regards to the management of these trees in relation to their existing health and vitality or structural condition.

2. TREE PRESERVATION

Tree preservation is synonymous with root preservation, for the tree will die if the main root structure is adversely impacted upon.

The root system of a typical tree can be described as shallow, widespread and horizontally oriented. A root system can extend far beyond the edge of the canopy. A trees root system is to supply the crown with water and nutrients absorbed from the soil. Tree roots anchor the tree and their continued function is an important factor in a tree's survival during any construction.

Any development /disturbance within the root zone can reduce the ability of roots to grow and function properly.

3. TREE PROTECTION ZONES

Tree Protection Zones (TPZ) are the principle means of protecting trees on development sites. The TPZ is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable. The TPZ incorporates the Structural Root Zone (SRZ) (Figure 1).

The method used to determine the TPZ and SRZ for these trees have been based on Australian Standard 4970 – 2009 Protection of Trees on Development Sites 3.3.5.

Table 1 outlines both the Tree Protection Zones and Structural Roots Zone distances for these trees.

3.1 TPZ - Tree Protection Zones

Australian Standard 4970 – 2009 Protection of Trees on Development Sites requires that the Diameter at Breast Height (DBH) of the trunk measured 1.4m above ground be multiplied by 12 to obtain the radius of a Tree Protection Zones (TPZ).

It is possible that minor encroachments can be established for these trees provided that encroachment is less than 10% and outside their Structural Root Zone and that the area lost to encroachment can be compensated for elsewhere and contiguous with the TPZ.

3.2 SRZ – Structural Root Zones

Where major encroachment into the TPZ is expected the Structural Root Zone (SRZ) requires to be calculated. **The SRZ considers the trees structural stability only.**

The method used to determine the SRZ for these trees have been based on Australian Standard 4970 – 2009 Protection of Trees on Development Sites3.3.5.

The woody root growth and soil cohesion in this area are necessary to hold the tree upright.

Figure 1 – Indicative Tree Protection Zones

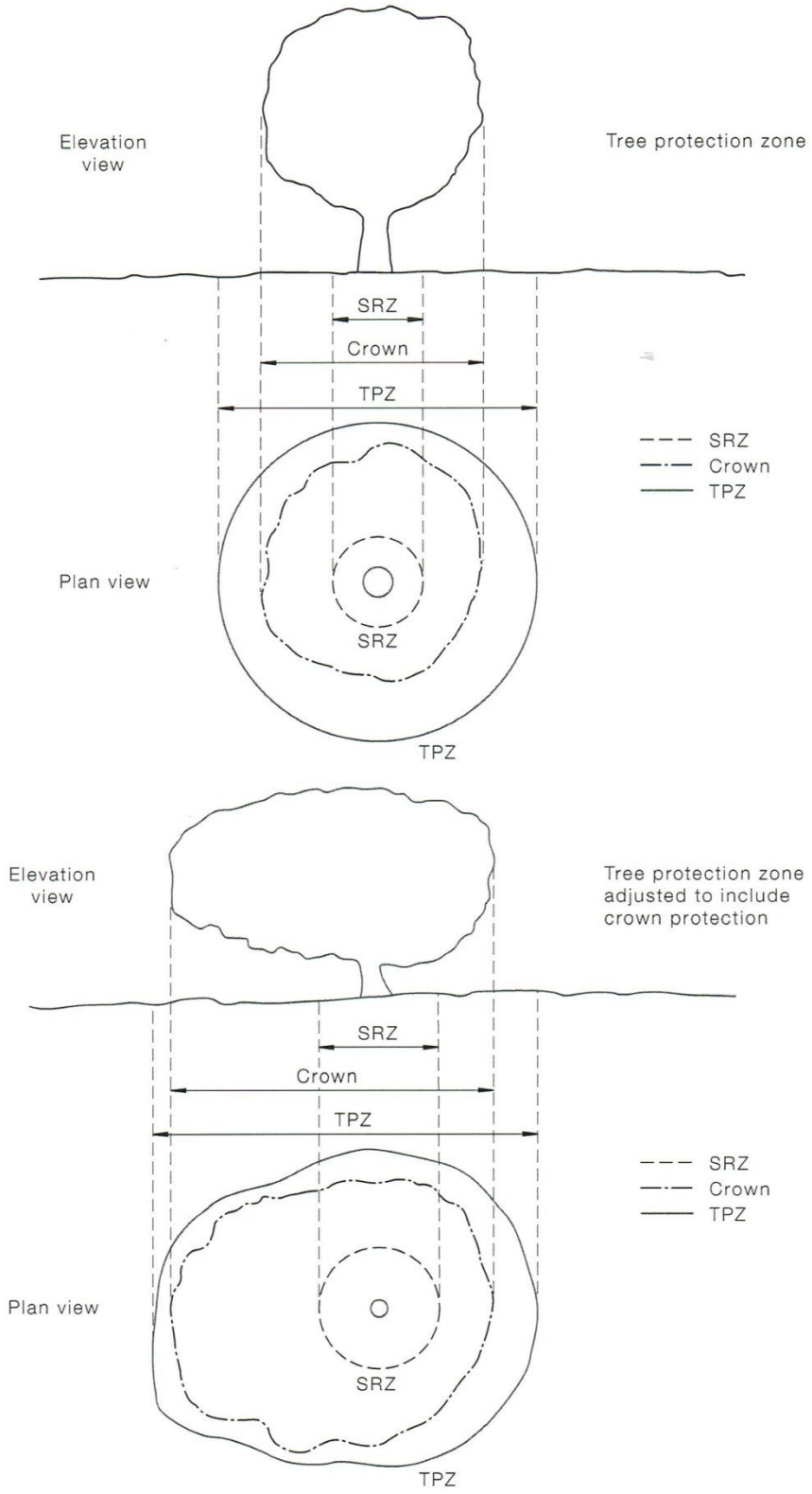


Table 1
Optimal Tree protection Zones
Structural Root Zones

Tree No.	DBH mm	DGL mm	Optimal TPZ Radius (m)	Minimum TPZ Radius (m)	SRZ Radius (m)
2	500	540	**6.0**	**5.4**	**2.55**
3	340	440	**4.0**	**3.6**	**2.34**
7	370	420	**4.4**	**3.9**	**2.29**
8	560	600	**6.7**	**6.0**	**2.67**
10	280	330	**3.3**	**2.9**	**2.07**
11	230 200	390	**5.0**	**4.5**	**2.22**
18	460	580	**5.5**	**4.9**	**2.63**
23	300	400	**3.6**	**3.2**	**2.25**
24	550	660	**6.6**	**5.9**	**2.77**
25	230	300	**2.7**	**2.4**	**1.99**
26	540	600	**6.4**	**5.7**	**2.67**
27	270 100	450	**4.8**	**4.3**	**2.36**
28	220	300	**2.6**	**2.3**	**1.99**
30	680	820	**8.1**	**7.3**	**3.04**
31	420	550	**5.0**	**4.5**	**2.57**
32	200	300	**2.4**	**2.1**	**1.99**
33	240	320	**2.8**	**2.5**	**2.05**
34	380	470	**4.5**	**4.0**	**2.41**
35	330	450	**3.9**	**3.5**	**2.36**
36	330	450	**3.9**	**3.5**	**2.36**
40	Avg. 120	Avg. 160	**To be incorporated within TPZ of Tree Nos. 26 & 27 but no less than 2.5m from outer edges**		

4. TREE PROTECTION PLAN

The purpose of the Tree Protection Plan (TPP) is to provide the developers with a guide so that trees to be retained during the development of this site can be protected during all stages of the development.

Based on the Site Plan it is possible that encroachment by machinery and other associated construction activity will occur within the TPZ of some trees and as such optimal TPZ's that would comply with Australian Standard 4970 – 2009 Protection of Trees on Development Sites may not be achievable for all trees.

A Tree Protection Plan Specification has also been prepared to give trees the best possible chance to survive the impacts of construction so that they can be retained in their current condition during and after construction has been completed (Appendix 1).

Tree Protection Measures in conjunction with the Tree Protection Zone Specification must be adhered to before any construction activity occurs within the nominated TPZ of trees to be retained.

4.1 Construction Phases

4.1.1 Pre –Construction

- Trees identified for removal should be undertaken at this stage prior to erection of protection fencing.
- The project arborist should be appointed supervise and certify works on completion
- Tree Protection Zones to be established and Protective Measures implemented on completion of tree works

4.1.2 Construction Stage

- Regular inspection (to be predetermined) should be undertaken to ensure compliance with the TPP is maintained.
- Project arborist should monitor impacts of construction work on trees to be retained. Monitoring should be undertaken at regular intervals or in consultation with the site supervisor
- The project arborist should supervise any works within an established TPZ
- On practical completion of development tree condition should be assessed and tree protection measure can be removed.

4.1.3 Post – Construction

- Completion of any outstanding works must not injure trees
- The project arborist should assess condition of trees and make recommendations for any remedial actions.
- Following completion of any remedial works the project arborist should certify (as appropriate) compliance with the Tree Protection Plan. Certification should include a statement on the condition of trees and impacts any deviations from the Tree Protection Plan may have on trees

4.2 Tree Protection Measures

- Tree Protection Measures and works within nominated Tree Protection Zones must comply with Australian Standard 4970 – 2009 Protection of Trees on Development Sites

    - The optimal limits of nominated Tree Protection Zones shall be staked where possible and 1800mm high chain link temporary fencing installed (Table 1 Item 3) (Figures 3 & 4).

    - Where optimal Tree Protection Zones cannot be achieved due to site or construction constraints the minimum TPZ should be no less than nominated. (Item 3Table 1)

    - Where a minimum TPZ cannot be achieved the project arborist or a suitably qualified arborist should be consulted to determine if the TPZ can be further reduced and tree retention remains viable.

    - Where fencing may not be appropriate or practical boards and padding should be used for trunk and branch protection that will help to prevent damage to bark when maneuvering and operating machinery near surrounding trees. Boards must be strapped to trees not nailed (Figure 5).

- Protection areas are to be clearly marked as Tree Protection Zone - NO GO AREA (figure 2).

- Protection measures to be inspected and certified by the project arborist.

- No activity allowed within TPZ's without first consulting the project manager or project arborist.

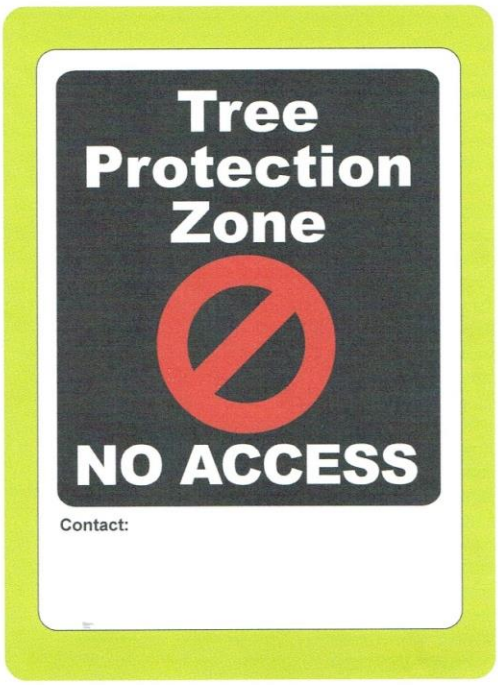
- Tree Protection Zone Specification to be adhered to (Appendix 1).

Figure 2
Example of TPZ signage

TREE PROTECTION ZONE SIGN EXAMPLE

(Informative)

A TPZ sign provides clear and readily accessible information to indicate that a TPZ has been established. Figure C1 provides an example of a suitable sign.



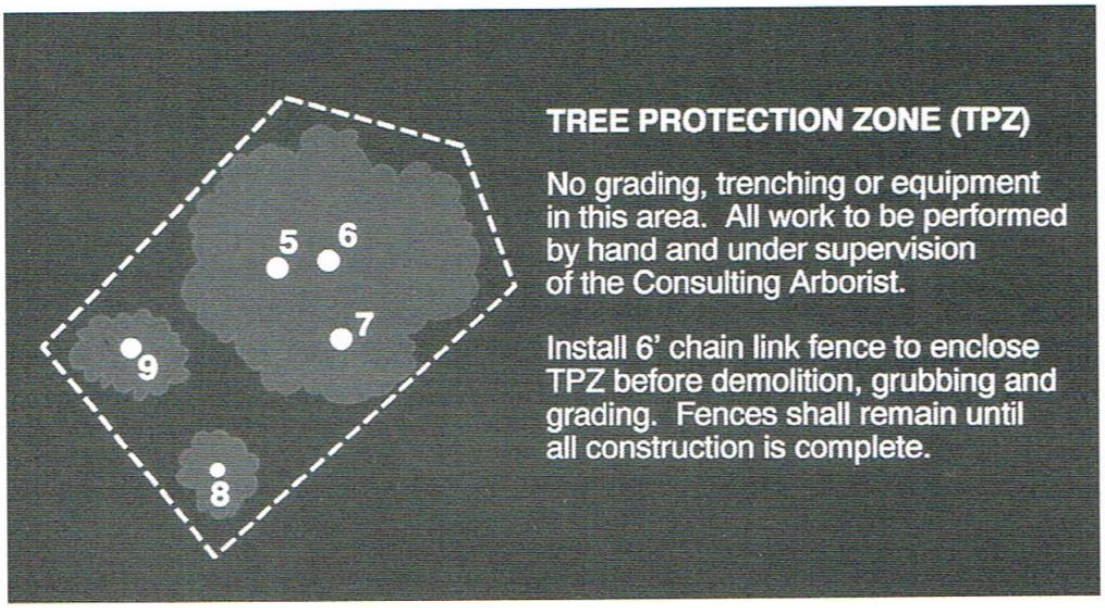
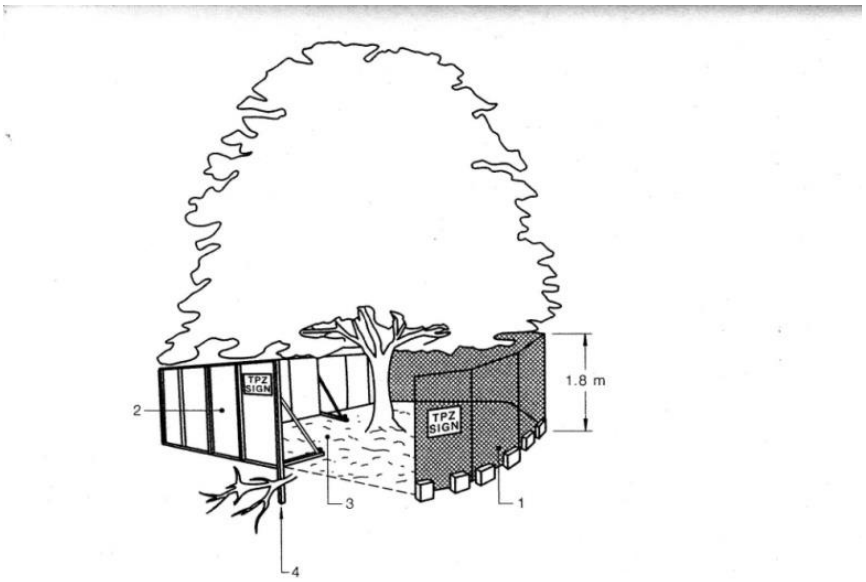


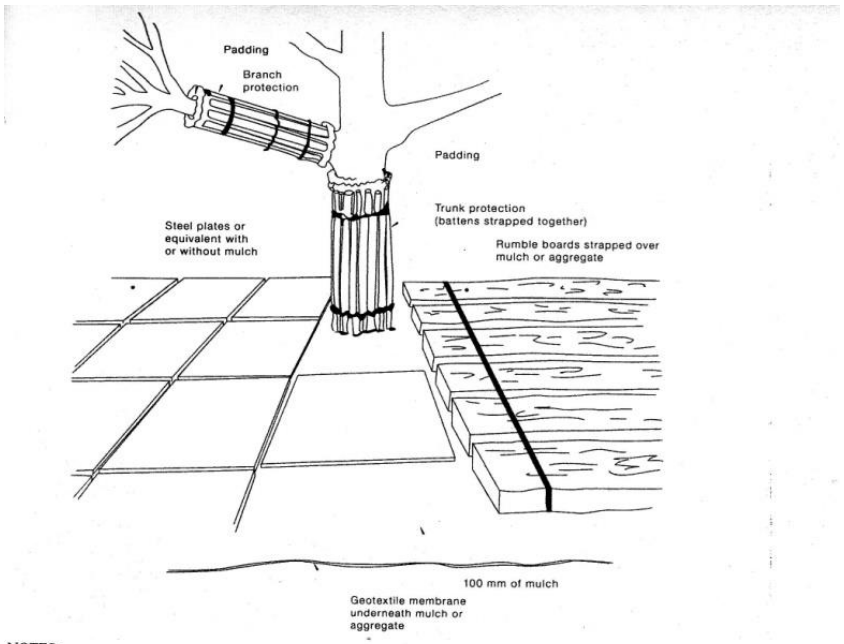
Figure 3
Indicative TPZ incorporating stand or group of trees

Figure 4 – Indicative TPZ incorporating a single tree



LEGEND:

1 Chain wire mesh panels with shade cloth (if required) attached, held in place with concrete feet.
2 Alternative plywood or wooden paling fence panels. This fencing material also prevents building materials or soil entering the TPZ.
3 Mulch installation across surface of TPZ (at the discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.
4 Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots.



NOTES:

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

Figure 5
Trunk & branch protection

Rumble boards to prevent soil compaction

4.3 Excavation within TPZ

Typically, most roots are found within the top 900mm of soil, and most of the fine roots active in water and nutrient absorption are in the top 300mm of soil.

Any excavation within the root zone must be carried out carefully to avoid excessive damage to roots. The cutting of roots over 25mm could be critical to the stability and future condition of a tree.

The cutting of roots can severely reduce the structural integrity of a tree and /or exposes torn roots to attack from pest and disease creating an unhealthy tree and a weak root system that will further increase the risk of tree failure. The cutting of large roots close to the trunk inflicts much more structural injury than cutting smaller roots near or beyond the drip line.

The only reliable way to estimate root disturbance is to determine the location of the roots in relation to where construction will occur. The most effective method is to carefully remove the soil around the root zone and expose them.

This can be achieved by digging using hand tools only or by through other non-destructive means of excavation such as pneumatic or hydraulic methods.

This does not mean however that excavation can take place without regard to the damage that might be caused to the root system. Extreme care regardless of excavation method must be taken when working within nominated TPZ and SRZ not to damage the bark or tear wood of any roots. Equipment that pulls or shatters roots should not be used (e.g. backhoes or excavators).

Excavation should be undertaken around the area of the tree where works are expected to encroach into the TPZ to the depth that is expected for the required excavation works. If only a few or no roots over 25mm in diameter are found, the tree will probably tolerate the impact.

However if more than two or three large roots are found, evaluation of the impact of damage or cutting of these roots should be assessed taking into consideration species sensitivity and condition. A qualified arborist should be consulted to determine the amount of roots that can removed and still retain the tree or whether re-assessment is necessary.

Upon exposure of roots within the TPZ:

- **Roots greater than 25mm in diameter should be retained where possible.**
- **Roots between 25 – 60mm in diameter should only be cut if absolutely necessary.**
- **Roots over 60mm in diameter should only be cut after consultation with a suitably qualified arborist.**
- **No roots shall be cut within the calculated SRZ of the tree.**
- **Roots to be removed should have the soil removed and cut cleanly with a sharp saw or secateurs flush with the edge of excavation.**

5. INSPECTION PERIODS

Despite careful planning and implementation of adequate tree protection measures it is possible that the changed surrounding conditions may inadvertently affect their condition in the future.

Ongoing inspection is a necessary and important part of future tree management. On completion of the development inspections should be carried out to ensure that trees have not developed any serious defects or attack from pest and disease.

Close monitoring of trees should detect any changes and appropriate action that can be taken to minimize the risk of tree or branch failure.

After an initial inspections on completion of the development re-inspections should be undertaken over a two year period as outlined below:

- 3 months after completion of development
- 6 months after completion of development
- 12 months after completion of development
- 24 months after completion of development

This may be subject to change depending on the condition of trees after each inspection.

In the event of extreme weather conditions, such as severe wind storms, or changes to site and soil conditions an inspection of trees would be necessary to determine if any structural damage has or may occur as a result of unexpected changes.

6. CONCLUSION

The report concludes that with the implementation of the Tree Protection Management Plan in combination with the Tree Protection Zone Specification it is considered that the trees to be retained will be provided with the best possible chance to survive the impacts of construction in good condition.

7. RECOMMENDATIONS

Based on the results of a visual inspection of these trees the following outcomes are recommended.

1. **All works within nominated Tree Protection Zones must comply with Australian Standard 4970 – 2009 Protection of Trees on Development Sites.**
   Reason:
   To ensure the principles for protecting trees on the land to be developed are followed.

2. **Implementation of Tree Protection Plan**
   Reason:
   To provide the developers with a guide so that trees that to be retained during the development of this site can be protected during all stages of the development.

3. **Implementation of Tree Protection Zone Specification**
   Reason:
   - To provide an area isolated from construction disturbance, so that tree retention remains viable.
   - To reduce the risk of possible damage to trees

4. **Where a minimum TPZ cannot be achieved the project arborist or a suitably qualified arborist should be consulted**
   Reason:
   To determine if the TPZ can be further reduced and tree retention remains viable.

5. **Project arborist (AQF level 5 or equivalent) to be consulted before any activity in undertaken within an established TPZ.**
   Reason:
   - To assess possible impacts on trees
   - To ensure that works within the TPZ & SRZ are carried out carefully to avoid damage to roots or trees

6. **Ongoing inspection should be undertaken by the project arborist**
   Reason:
   - To monitor impacts of development and ensure compliance with TPM is maintained.

7. **Tree work should be carried out by a qualified arborist.**
   Reason:
   - To ensure tree contractors work to Australian Standard 4373 –2007 and in accordance with the Code of Practice Amenity Tree Industry August 1998.

8. REFERENCES

Australian Standards AS 4970 – 2009 Protection of Tree on Development Sites Standards Australia Sydney

Matheny, Nelda and Clark, James R. 1998, Trees and Development: A Technical Guide to Preservation of Trees During Land Development, International Society Of Arboriculture Champaign, USA.

Jim Clarke and Nelda Matheny April 1999, Care and Management of Trees on Development Sites

9. DISCLAIMER

The report is to be read and considered in its entirety. All care has been taken using the most up to date arboricultural information in the preparation of this report. No guarantee can be given nor can it be predicted that branch failure or uprooting (windthrow) would not occur as a result of high winds and /or excessive rainfall and other unpredictable events. Tree health and environmental conditions can change at any time due to unforeseen circumstances.

Report by

Diploma of Arboriculture

APPENDIX 1

TREE PROTECTION ZONE SPECIFICATION

The following specification must be adhered to before any site activity occurs within Protection Zones of trees to be retained.

1. All works within nominated Tree Protection Zones must comply with Australian Standard 4970 – 2009 Protection of Trees on Development Sites.

2. Site supervisors are required to meet with the project arborist at the site prior to beginning work to review all work procedures, access and haul routes and tree protection measures.

3. Where temporary haul or access is required within the nominated TPZ of a tree to be retained a geotextile fabric beneath a layer of mulch approximately 150mm thick or crushed rock below rumble boards shall be created to protect the soil.

   Rumble boards should be strapped over mulch or gravel. This will help to reduce the impacts of soil disturbance and compaction that may be caused by machinery. Mulch or gravel shall be replenished as necessary to maintain a 150mm depth.

4. Tree Protection Zones to be established prior to the commencement of any construction works. The limits of nominated Tree Protection Zones shall be staked and 1800mm high chain link temporary fencing installed.

   - Where fencing may not be appropriate or practical boards and padding should be used for trunk and branch protection that will help to prevent damage to bark when maneuvering and operating machinery near surrounding trees. Boards must be strapped to trees not nailed.

5. Tree Protection Plan as outlined in Item 4 to be implemented and followed for trees to be retained.

6. Protection areas are to be clearly marked with the appropriate signage and inspected by the project arborist.

7. Prior to construction contractors and machine operators are to be instructed in the requirements for the prevention of damage to trees and tree roots. Operators must be instructed to proceed with care to avoid the impacts of mechanical damage

8. No roots shall be cut or encroachment occur within the calculated SRZ of a tree unless confirmed by a suitably qualified arborist.

9. Any excavation activity within a nominated TPZ of a tree to be retained is to be carried out as outlined in Item 4.3 Excavation within TPZ

10. The project arborist must monitor any grading, construction, demolition or other work within a TPZ.

11. If excavation must occur within a TPZ the project arborist will determine where tunneling, handwork and root pruning are required.

12. No materials, equipment, spoils, waste water or chemicals of any description may be disposed of or stored within this area.

13. No parking of vehicles, trailers or machinery is allowed within the Tree Protection Zones.

14. Any electrical cables, gas pipes, sewer pipes or other plumbing services to be routed outside the Tree Protection Zones.

15. Trees to be removed that have branches extending into trees of tree to remain must be removed by a qualified arborist and not by demolition or construction contractors. A qualified arborist shall remove the tree in a manner that causes no damage to the trees and understory to remain.

16. Any brush clearing required with the Tree Protection Zones shall be accomplished with hand-operated equipment.

17. Trees to be removed shall be felled so as to fall away from Tree Protection Zones and to avoid pulling and breaking of roots of trees to remain. If roots are entwined, the consultant may first require severing the major woody root mass before extracting the trees.

18. Trees to be removed from within a Tree Protection Zone shall be removed by a qualified arborist. The trees shall be cut near ground level and the stump ground out.

19. All downed brush and trees shall be removed from the Tree Protection Zones either by hand or by machinery sitting outside the Tree Protection Zones. Extraction shall occur by lifting the material out not by dragging or skidding across the ground.

20. No soil disturbance is permitted and natural grade shall be retained within a nominated Tree Protection Zone.

21. The consulting arborist must be on site where any foundations, footings and pavement designs are within the Tree Protection Zones.

22. If injury to the tree should occur during construction it should be reported to the project arborist and be evaluated as soon as possible so that appropriate treatments can be applied if necessary.

23. If excavation must occur within a nominated Tree Protection Zones the project arborist will determine where tunneling, handwork and root pruning are required.

24. Any roots damaged during construction shall be exposed to sound tissue and cut cleanly with as saw.

25. Erosion control devises such as silt fencing shall be installed to prevent siltation and or erosion within the Tree Protection Zones.

26. Surface drainage is not to be altered so as to direct water into or out of the Tree Protection Zones.

27. Any herbicides placed under paving material must be safe for use around trees and labeled for that use. Any pesticides used on site must be tree safe and not easily transported by water.

28. Fences are to remain until all site work has been completed. Fences may not be relocated or removed without the written permission of the project arborist.

29. All tree work to be carried out by a qualified arborist working to Australian Standard 4373 –2007 and in accordance with the Code of Practice Amenity Tree Industry August 1998.