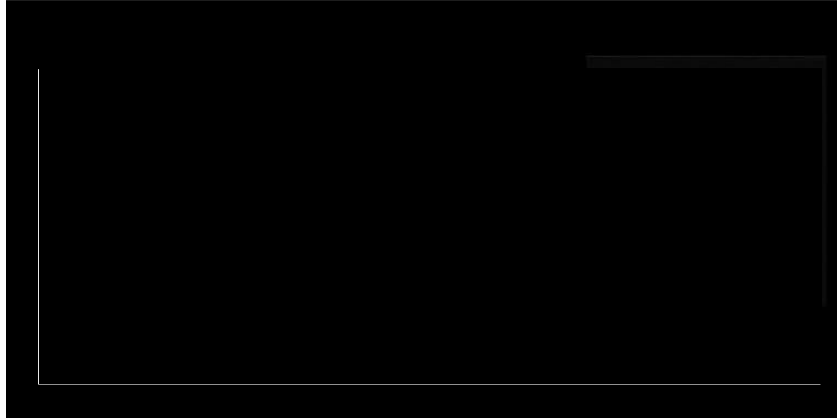


Arboricultural Impact Assessment



Prepared For

[REDACTED]
CPB Contractors, Dragados and Samsung C&T Joint Venture (CDS-JV)
Level 6, Building B, 197-201 Coward Street,
MASCOT, NSW 2020

Site Address

Westconnex New M5
Hoarding Realignment for MOC3
Marsh Street,

Prepared by

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Contents

1	Introduction	4
1.1	Brief.....	4
1.2	Methodology.....	5
1.3	Tree Preservation and Management Guidelines.....	5
2	Observations and Discussion	6
2.1	Summary of Assessed Trees	6
2.2	Threatened Species.....	6
2.3	Proposed Removal of Prescribed Trees.....	6
2.4	Potential Impacts on Trees Proposed for Retention	6
3	Recommendations	10
3.1	Tree Removal.....	10
3.2	Minimising Impacts on Trees to be Retained	10
3.2.1	Tree 1 - <i>Casuarina glauca</i> (Swamp She-Oak).....	10
3.2.2	Tree 2 - <i>Lagunaria patersonia</i> (Norfolk Island Hibiscus).....	10
3.2.3	Tree 3 - <i>Casuarina glauca</i> (Swamp She-Oak).....	10
3.2.4	Tree 4 - <i>Casuarina glauca</i> (Swamp She-Oak).....	10
3.2.5	Tree 5 - <i>Casuarina glauca</i> (Swamp She-Oak).....	11
3.2.6	Tree 6 - <i>Casuarina glauca</i> (Swamp She-Oak).....	11
3.2.7	Tree 7 - <i>Casuarina glauca</i> (Swamp She-Oak).....	11
3.2.8	Tree 8 - <i>Casuarina glauca</i> (Swamp She-Oak).....	11
3.2.9	Tree 9 - <i>Casuarina glauca</i> (Swamp She-Oak).....	12
3.2.10	Tree 10 - <i>Casuarina glauca</i> (Swamp She-Oak).....	12
3.2.11	Tree 11 - <i>Casuarina glauca</i> (Swamp She-Oak).....	12
3.2.12	Tree 12 - <i>Casuarina glauca</i> (Swamp She-Oak).....	12
3.2.13	Tree 13 - <i>Casuarina glauca</i> (Swamp She-Oak).....	13
3.2.14	Tree 14 - <i>Casuarina glauca</i> (Swamp She-Oak).....	13
3.2.15	Tree 15 - <i>Eucalyptus robusta</i> (Swamp Mahogany)	13
3.2.16	Tree 16 - <i>Eucalyptus robusta</i> (Swamp Mahogany)	13
4	Tree Protection Measures	14
4.1	Tree Protection Devices	14
4.2	Stockpiling and Location of Site Sheds	14
4.3	Fill Material.....	14
4.4	Hygiene Practices	14
5	References	15

6	Appendices.....	16
6.1	Appendix A – Terms and Definitions	16
6.2	Appendix B – ULE Guide	17
6.3	Appendix C – STARS.....	18
6.4	Appendix D – Record of Meetings and Design Input	20
6.5	Appendix E – Tree Location Map.....	28
6.6	Appendix F – Site Photographs.....	29
6.7	Appendix G – Schedule of Assessed Trees – M5 Site inspection 6 November 2018.....	33

1 Introduction

1.1 Brief

This Arboricultural Impact Assessment (AIA) was prepared by Treeism Arboricultural Services and was commissioned by [REDACTED] of CPB Contractors, Dragados and Samsung C&T Joint Venture (CDS-JV).

The proposed works are part of the larger WestConnex New M5 project. The scope of work specifically for the discussed area is to facilitate the construction of a retaining wall along the south-western boundary of the Arncliffe Construction Compound. The current hoarding alignment is required to be decommissioned, offset and reinstated to provide necessary access for plant and personnel to construct a new retaining wall as part of the Motorway Operations Complex (MOC) 3 design (see Appendix D).

The retaining wall is required to provide necessary ground stabilisation/integrity to the MOC3 complex situated directly to the north-east. The redesigned hoarding is proposed to extend approximately ninety-four metres southeast from the Marsh Street pedestrian footpath, extend to a height of five metres with a lateral offset of ten metres from the previous alignment.

The purpose of this report is to assess the vigour and condition of the trees, and identify the potential impacts the proposed works may have on those trees in proximity to the works.

Care has been taken to obtain all information from reliable sources. All data has been verified as far as possible; however, I can neither guarantee nor be responsible for the accuracy of information provided by others.

This report is not intended to be a comprehensive tree risk assessment; however, the report may make recommendations, where appropriate, for further assessment, treatment or testing of trees where potential structural problems have been identified, or where below ground investigation may be required.

The author of this report holds an AQF Level 5 Diploma of Horticulture (Arboriculture) and has 25 years in the horticultural industry. 20 of these 25 years have been specifically within the field of arboriculture.

Previous roles varied from working actively as a tree climber in private contracting companies to Tree Management Officer at several local Councils and working with independent Consultants. The author is independent from the project.

This AIA has been commissioned to ensure compliance with the requirements set out by the Department of Planning and Environment (DPE) as per Condition B63 - Table 1 (below/next page).

Table 1 –Condition of Approval B63 Compliance Table

Condition	Requirement	Addressed in:
B63	The Proponent must commission an independent experienced and suitably qualified arborist, to prepare a comprehensive Tree Report(s) prior to removing any trees on the periphery and/or outside the construction footprint as identified in the figures in Section 6 of the document referred to in condition A2(b), including any tree(s) removed along Euston Road. The Tree Report may be prepared for the entire SSI or separate reports may be prepared for individual areas where trees are required to be removed. The report(s) must identify the impacts of the SSI on trees and vegetation within and adjacent to the construction footprint. The report(s) must include:	This Report - Overview & individual area as per Appendix E & F.

B63 (a)	a visual tree assessment with inputs from the design, landscape architect, construction team;	VTA noted in Appendix F & staff inputs as per Appendix D and onsite discussions.
B63 (b)	consideration of all options to amend the SSI where a tree has been identified for removal, including realignment, relocation of services, redesign of or relocation of ancillary components (such as substations, fencing etc.) and reduction of standard offsets to underground services; and	Appendix D, onsite discussion.
B63 (c)	measures to avoid the removal of trees or minimise damage to existing trees and is to ensure the health and stability of those trees to be protected. This includes details of any proposed canopy or root pruning, excavation works, site controls on waste disposal, vehicular access, storage of materials and protection of public utilities.	Section 2 Part 2.3-2.4 & Section 3 - Recommendations
B63	A copy of the report(s) must be submitted to the Secretary for approval prior to the removal, damage and/or pruning of any trees, including those affected by site establishment works. All recommendations of the report must be implemented by the Proponent, unless otherwise agreed by the Secretary.	No tree removal, damage and/or pruning will occur to the subject trees prior to the Secretary's approval of this report.

1.2 Methodology

In preparation for this report, ground-level, visual tree assessment (VTA) ¹, or limited VTA (e.g. where access was limited), were completed by the author of this report on 6th November 2018. Inspection details of these trees are provided in Appendix G —Schedule of Assessed Trees.

The tree heights were visually estimated or measured using a Nikon ForestryPro laser measure. Unless otherwise noted in Appendix G, the trunk Diameter at Breast Height were measured at 1.4 metres above ground level (DBH) using a diameter tape. Tree canopy spreads were stepped out with field observations written down, and photographs of the site and trees were taken using an iPhone 6.

No aerial inspections, root mapping or woody tissue testing were undertaken as part of this tree assessment. Information contained in this report only reflects the condition of the trees at the time of inspection.

Trees are dynamic, living things which can be subject to change without notice in certain circumstances.

Plans and documents referenced for the preparation of this report include:

- AS4970-2009 Protection of trees on development sites, Standards Australia;
- Conditions B63 – (Table 1);
- Survey Plan (marked up survey detailing proposed works location) authored by LandSurveys, undated, Rev A. These marked up plans are attached as Appendix E - Tree Location Map.

1.3 Tree Preservation and Management Guidelines

The proposed works form part of the approved WestConnex New M5 State Significant Infrastructure project (SSI 6788), which overrides the State Environmental Planning Policy (Vegetation in Non-Rural

¹ Visual Tree Assessment (VTA) is a procedure of defect analysis developed by Mattheck and Breloer (1994) that uses the growth response and form of trees to detect defects.

Areas) 2017 'Vegetation SEPP' (which refers to prescribed and non-prescribed trees pursuant to the Rockdale Development Control Plan 2011 (RDCP) Part 4.1.7).

What constitutes a 'tree' as per planning approval is any tree that:

- is equal to or greater than three (3) metres in height; or
- for a single trunk species, a trunk circumference of 300 millimetres at a height of one metre above ground level; or
- for a multi-trunk species, a trunk circumference exceeding 100 millimetres at a height of one metre above ground level.

However, this excludes any species listed under the Biosecurity Act 2015 (this Act overrules Noxious Weed Act 1993).

2 Observations and Discussion

2.1 Summary of Assessed Trees

Seventeen (17) trees/tree groups were assessed and included in this report. Details of these are included in the Schedule of Assessed Trees – Appendix G. Of these trees:

- all seventeen (17) are prescribed (i.e. 'considered a tree' under the DPE approval/conditions);
- fourteen (14) trees have high RV's (RV- see Appendix C) – T1-T5, T7-T14- and T16;
- three (3) trees have medium RV's – T6 and T15 & G17.

2.2 Threatened Species

No species on the subject site are subject to threatened conservation status under Australian and/or State Government legislation (i.e. NSW Biodiversity Conservation Act 2016 and the Commonwealth Environment Protection and Biodiversity Conservation Act 1999).

2.3 Proposed Removal of Prescribed Trees

Part of Group 17 will require removal to accommodate the works. These are recent plantings and, if found practical, have the potential to be replanted back into the site post completion of the subject works (or adjacent to the site in existing gaps in the mass planting prior to the commencement of works).

2.4 Potential Impacts on Trees Proposed for Retention

Under the Australian Standard 4970-2009 Protection of trees on development sites ("AS4970"), encroachments of less than 10% of the Tree Protection Zone (TPZ) are considered to be *minor*. No specifications are provided in AS4970 for potential impacts of 10% or greater. This 10% is taken as the threshold figure, beyond which arboricultural investigations (as set out in clause 3.3.4) need to be considered.

Table 2 below details a summary of disturbance within the Structural Root Zone (SRZ), estimated percentage of encroachment of the TPZ and notes whether the pruning of branches is required for each tree.

Table 2 – The estimated encroachments into the SRZ and TPZ are based on the SRZ and TPZ’s offsets of the trees as calculated under AS4970 and do not necessarily reflect the actual root zones of the trees. Existing below ground structures, site topography and soil hydrology will influence the presence, spread and direction of tree root growth.

Tree No.	Tree Common name	SRZ affected	TPZ affected	TPZ encroachment (approx. %)	Pruning Required
T1	Swamp She-Oak	✗	✗	0	✗
T2	Norfolk Island Hibiscus	✗	✗	0	✗
T3	Swamp She-Oak	✗	✗	0	✓
T4	Swamp She-Oak	✗	✓	7.8	✓
T5	Swamp She-Oak	✗	✗	0	✗
T6	Swamp She-Oak	✗	✗	0	✗
T7	Swamp She-Oak	✗	✓	3.5	✓
T8	Swamp She-Oak	✗	✗	0	✓
T9	Swamp She-Oak	✗	✗	0	✗
T10	Swamp She-Oak	✗	✓	13.9	✓
T11	Swamp She-Oak	✗	✗	0	✗
T12	Swamp She-Oak	✗	✗	0	✗
T13	Swamp She-Oak	✗	✓	0.7	✓
T14	Swamp She-Oak	✗	✗	0	✓
T15	Swamp Mahogany	✗	✗	0	✓
T16	Swamp Mahogany	✗	✗	0	✓

Tree 1 – *Casuarina glauca* (Swamp She-Oak)

All works are proposed outside the calculated SRZ and TPZ for this specimen.

No pruning will be required for vehicular access or to accommodate the hoarding realignment.

Tree 2 – *Lagunaria patersonia* (Norfolk Island Hibiscus)

All works are proposed outside the calculated SRZ and TPZ for this specimen.

No pruning will be required for vehicular access or to accommodate the hoarding realignment.

Tree 3 - *Casuarina glauca* (Swamp She-Oak)

All works are proposed outside the calculated SRZ and TPZ for this specimen.

Pruning will be required for vehicular access (pile driver/CFA pile) however the tree branches are clear for the hoarding placement.

Tree 4 – *Casuarina glauca* (Swamp She-Oak)

All works are outside the calculated SRZ for this specimen but the TPZ has a calculated encroachment of 7.8%. Under the Australian Standard 4970-2009 Protection of trees on development sites (“AS4970”), encroachments of less than 10% of the Tree Protection Zone (TPZ) are considered to be *minor*.

Additionally, given the hoarding will be set on piers with boarded material spanning across, this encroachment calculation is a gross overestimate.

Crown raising to the north-north/west will be required to accommodate equipment and the hoarding to be placed. An estimated 20% total live canopy prune will be required.

Tree 5 – Casuarina glauca (Swamp She-Oak)

All works are proposed outside the calculated SRZ and TPZ for this specimen.

No pruning will be required for vehicular access or to accommodate the hoarding realignment.

Tree 6 – Casuarina glauca (Swamp She-Oak)

All works are proposed outside the calculated SRZ and TPZ for this specimen.

No pruning will be required for vehicular access or to accommodate the hoarding realignment.

Tree 7 – Casuarina glauca (Swamp She-Oak)

All works are outside the calculated SRZ for this specimen.

An estimated 3.5% TPZ encroachment has been calculated, this is considered *minor* encroachment under the Australian Standard 4970-2009 Protection of trees on development sites (“AS4970”). Additionally, given the hoarding will be set on piers this encroachment percentage is an overestimate and the tree is unlikely to suffer any negative impacts due to this encroachment.

Heavy crown raising of branches orientated to the north-north/west will be required to accommodate equipment and for the hoarding to be placed. Two large diameter limbs (250mm & 100mm diameter) will require removal, this is an estimated 20% of the total live canopy.

It is likely the tree will respond with epicormic growth but given the high tolerance this species has to disturbance, it is my opinion the tree will sufficiently recover.

Tree 8 – Casuarina glauca (Swamp She-Oak)

All works are proposed outside the calculated SRZ and TPZ for this specimen.

Minor tip pruning of branches to the north-north/west will be required to accommodate equipment and the hoarding, this pruning will not affect the trees overall health or condition in the long term.

Tree 9 – Casuarina glauca (Swamp She-Oak)

All works are proposed outside the calculated SRZ and TPZ for this specimen.

No pruning will be required for vehicular access or to accommodate the hoarding realignment.

Tree 10 – Casuarina glauca (Swamp She-Oak)

A 13.9% TPZ encroachment to the north/west of the stem has been calculated for this specimen but the proposed trenching works are located outside the SRZ.

Although this encroachment is classed under AS4970 as *major*, given the hoarding will be on piers with spanning boards between this is a gross estimate of the true likely encroachment. Provided the pier locations are hand dug first to ensure large diameter roots are not encountered, no significant root loss is expected.

However, the tree will require heavy pruning to accommodate equipment and the hoarding positioning. Whilst this is far from ideal for tree vigour in the short term, the required pruning is of the lateral branches only. This will allow the branches to be cut cleanly at the stem/branch junction, given the tolerance of this species of disturbance (and readily suckering growth habit) and the optimal growing conditions in which the tree is located, it is my opinion that the tree will recover and produce ample epicormic growth to ensure ongoing longevity.

Tree 11 – *Casuarina glauca* (Swamp She-Oak)

All works are proposed outside the calculated SRZ and TPZ for this specimen.

No pruning will be required for vehicular access or to accommodate the hoarding realignment.

Tree 12 – *Casuarina glauca* (Swamp She-Oak)

All works are proposed outside the calculated SRZ and TPZ for this specimen.

No pruning will be required for vehicular access or to accommodate the hoarding realignment.

Tree 13 – *Casuarina glauca* (Swamp She-Oak)

All works are proposed outside the SRZ and an estimated *minor* 0.7% encroachment of the TPZ for this specimen has been calculated.

Three (3) lateral branches require removal to accommodate the hoarding realignment and vehicular access. The lowest limb is a large diameter limb (250mm in diameter) then two (2) smaller (roughly 80mm diameter) limbs will require pruning to the stem junction. Whilst possible short-term impacts on tree health are expected, as stated previously, long term impacts are not foreseen.

Tree 14 – *Casuarina glauca* (Swamp She-Oak)

All works are proposed outside the calculated SRZ and TPZ for this specimen.

Only minor pruning will be required for vehicular access and/or to accommodate the hoarding realignment, this pruning will not affect the trees overall health or condition in the long term.

Tree 15 – *Eucalyptus robusta* (Swamp Mahogany)

All excavation works are proposed outside the calculated SRZ and TPZ for this specimen.

Whilst only one (1) branch requires removal to accommodate the hoarding realignment, this limb accounts for approximately one third of the total live canopy for this specimen.

Short-term impacts are expected (epicormic growth, loss of vigour) and potential long-term impacts may occur (spread of decay into main stem, die-back of cambium). Given the tree is located within optimal site conditions and away from any but very rare pedestrian access, I believe retention of the tree is viable in this instance.

Tree 16 – *Eucalyptus robusta* (Swamp Mahogany)

All works are proposed outside the calculated SRZ and TPZ for this specimen.

One (1) low 225mm diameter limb will require pruning to accommodate the hoarding realignment.

3 Recommendations

3.1 Tree Removal

Part of Group 17 will require removal to accommodate the proposed works. These trees can either be relocated into existing gaps within the existing mass planting outside the works zone or be replanted following the hoarding installation.

Replanting will be undertaken in accordance with the condition B63 of the Compliance Table.

3.2 Minimising Impacts on Trees to be Retained

All required pruning is to be carried out by a minimally AQF Level 3 Arborist, prior to the start of site works. All pruning shall conform to Australian Standard 4373-2007 (AS4373) Pruning of Amenity Trees and follow Workcover NSW Code of Practice *Amenity Tree Industry* August 1998.

3.2.1 Tree 1 - *Casuarina glauca* (Swamp She-Oak)

- Any ground-level change within 9m of the tree is to be directly supervised by an Arboriculturist with a minimum AQF5 in arboriculture.
- Tree protection fencing (1.8m high mesh or chain-link panels with 50mm metal poles into concrete/weighted feet) is to be placed a minimum 3m from the tree stem where practicable and as per Tree Protection Measures Part 4.1 below, during works.

3.2.2 Tree 2 - *Lagunaria patersonia* (Norfolk Island Hibiscus)

- Any ground-level change within 7.5m of the tree is to be directly supervised by an Arboriculturist with a minimum AQF5 in arboriculture.
- Tree protection fencing (1.8m high mesh or chain-link panels with 50mm metal poles into concrete/weighted feet) is to be placed a minimum 3m from the tree stem where practicable and as per Tree Protection Measures Part 4.1 below, during works.

3.2.3 Tree 3 - *Casuarina glauca* (Swamp She-Oak)

- Any ground-level change within 6m of the tree is to be directly supervised by an Arboriculturist with a minimum AQF5 in arboriculture.
- Pruning as described under Clause 7.3.2 and 7.3.3 of AS4373 with a maximum branch diameter of 100mm and maximum 10% of the total live canopy is to be carried out if required.
- Tree protection fencing (1.8m high mesh or chain-link panels with 50mm metal poles into concrete/weighted feet) is to be placed a minimum 2.5m from the tree stem where practicable and as per Tree Protection Measures Part 4.1 below, during works.

3.2.4 Tree 4 - *Casuarina glauca* (Swamp She-Oak)

- Any ground-level change within 6.5m of the tree is to be directly supervised by an Arboriculturist with a minimum AQF5 in arboriculture.
- Pruning as described under Clause 7.3.2 and 7.3.3 of AS4373 with a maximum branch diameter of 100mm and maximum 10% of the total live canopy is to be carried out if required.
- Tree protection fencing (1.8m high mesh or chain-link panels with 50mm metal poles into concrete/weighted feet) is to be placed a minimum 3m from the tree stem where practicable and as per Tree Protection Measures Part 4.1 below, during works.

3.2.5 Tree 5 - *Casuarina glauca* (Swamp She-Oak)

- Any ground-level change within 6.5m of the tree is to be directly supervised by an Arboriculturist with a minimum AQF5 in arboriculture.
- Tree protection fencing (1.8m high mesh or chain-link panels with 50mm metal poles into concrete/weighted feet) is to be placed a minimum 3m from the tree stem where practicable and as per Tree Protection Measures Part 4.1 below, during works.

3.2.6 Tree 6 - *Casuarina glauca* (Swamp She-Oak)

- Any ground-level change within 4m of the tree is to be directly supervised by an Arboriculturist with a minimum AQF5 in arboriculture.
- Tree protection fencing (1.8m high mesh or chain-link panels with 50mm metal poles into concrete/weighted feet) is to be placed a minimum 2.5m from the tree stem where practicable and as per Tree Protection Measures Part 4.1 below, during works.

3.2.7 Tree 7 - *Casuarina glauca* (Swamp She-Oak)

- Any ground-level change within 7m of the tree is to be directly supervised by an Arboriculturist with a minimum AQF5 in arboriculture.
- Pruning as described under Clause 7.3.2 and 7.3.3 of AS4373, prune one (1) 250mm diameter lowest limb to north and the next 100mm diameter limb back to stem junction. A maximum 15% of the total live canopy is to be carried out.
- Tree protection fencing (1.8m high mesh or chain-link panels with 50mm metal poles into concrete/weighted feet) is to be placed a minimum 3m from the tree stem where practicable and as per Tree Protection Measures Part 4.1 below, during works.

3.2.8 Tree 8 - *Casuarina glauca* (Swamp She-Oak)

- Any ground-level change within 2.5m of the tree is to be directly supervised by an Arboriculturist with a minimum AQF5 in arboriculture.
- Pruning as described under Clause 7.3.2 and 7.3.3 of AS4373 with a maximum branch diameter of 80mm (end of branches only facing north) and maximum 5% of the total live canopy is to be carried out.

- Tree protection fencing (1.8m high mesh or chain-link panels with 50mm metal poles into concrete/weighted feet) is to be placed a minimum 2m from the tree stem where practicable and as per Tree Protection Measures Part 4.1 below, during works.

3.2.9 Tree 9 - *Casuarina glauca* (Swamp She-Oak)

- Any ground-level change within 5m of the tree is to be directly supervised by an Arboriculturist with a minimum AQF5 in arboriculture.
- Tree protection fencing (1.8m high mesh or chain-link panels with 50mm metal poles into concrete/weighted feet) is to be placed a minimum 2.5m from the tree stem where practicable and as per Tree Protection Measures Part 4.1 below, during works.

3.2.10 Tree 10 - *Casuarina glauca* (Swamp She-Oak)

- Any ground-level change within 7m of the tree is to be directly supervised by an Arboriculturist with a minimum AQF5 in arboriculture. Piers within TPZ (7m from tree stem) are to be hand dug in the first instance in the required location to ensure no root damage occurs. If roots are found (in excess of 40mm diameter) and pier location cannot be moved, an AQF Level 5 Arboriculturist is to be consulted prior to further excavation.
- Pruning as described under Clause 7.3.2 and 7.3.3 of AS4373, prune one (1) 250mm diameter lowest limb to north, one (1) 125mm diameter and one (1) 75mm diameter limb back to stem junction. A maximum 20% of the total live canopy is to be carried out.
- Tree protection fencing (1.8m high mesh or chain-link panels with 50mm metal poles into concrete/weighted feet) is to be placed a minimum 3m from the tree stem where practicable and as per Tree Protection Measures Part 4.1 below, during works.

3.2.11 Tree 11 - *Casuarina glauca* (Swamp She-Oak)

- Any ground-level change within 3.5m of the tree is to be directly supervised by an Arboriculturist with a minimum AQF5 in arboriculture.
- Tree protection fencing (1.8m high mesh or chain-link panels with 50mm metal poles into concrete/weighted feet) is to be placed a minimum 2m from the tree stem where practicable and as per Tree Protection Measures Part 4.1 below, during works.

3.2.12 Tree 12 - *Casuarina glauca* (Swamp She-Oak)

- Any ground-level change within 6.5m of the tree is to be directly supervised by an Arboriculturist with a minimum AQF5 in arboriculture.
- Tree protection fencing (1.8m high mesh or chain-link panels with 50mm metal poles into concrete/weighted feet) is to be placed a minimum 3m from the tree stem where practicable and as per Tree Protection Measures Part 4.1 below, during works.

3.2.13 Tree 13 - *Casuarina glauca* (Swamp She-Oak)

- Any ground-level change within 7m of the tree is to be directly supervised by an Arboriculturist with a minimum AQF5 in arboriculture.
- Pruning as described under Clause 7.3.2 and 7.3.3 of AS4373, prune one (1) 250mm diameter lowest limb to north and two (2) 80mm diameter limb back to stem junction. A maximum 20% of the total live canopy is to be carried out.
- Tree protection fencing (1.8m high mesh or chain-link panels with 50mm metal poles into concrete/weighted feet) is to be placed a minimum 3m from the tree stem where practicable and as per Tree Protection Measures Part 4.1 below, during works.

3.2.14 Tree 14 - *Casuarina glauca* (Swamp She-Oak)

- Any ground-level change within 3.5m of the tree is to be directly supervised by an Arboriculturist with a minimum AQF5 in arboriculture.
- Pruning as described under Clause 7.3.2 and 7.3.3 of AS4373, prune one (1) lowest 60mm diameter lowest limb to north back to stem junction. A maximum 5% of the total live canopy is to be carried out.
- Tree protection fencing (1.8m high mesh or chain-link panels with 50mm metal poles into concrete/weighted feet) is to be placed a minimum 2m from the tree stem where practicable and as per Tree Protection Measures Part 4.1 below, during works.

3.2.15 Tree 15 - *Eucalyptus robusta* (Swamp Mahogany)

- Any ground-level change within 3.5m of the tree is to be directly supervised by an Arboriculturist with a minimum AQF5 in arboriculture.
- Pruning as described under Clause 7.3.2 and 7.3.3 of AS4373 prune one (1) approximately 150mm diameter limb in the upper canopy to the north back to branch/stem junction.
- Tree protection fencing (1.8m high mesh or chain-link panels with 50mm metal poles into concrete/weighted feet) is to be placed a minimum 2.5m from the tree stem where practicable and as per Tree Protection Measures Part 4.1 below, during works.

3.2.16 Tree 16 - *Eucalyptus robusta* (Swamp Mahogany)

- Any ground-level change within 6m of the tree is to be directly supervised by an Arboriculturist with a minimum AQF5 in arboriculture.
- Pruning as described under Clause 7.3.2 and 7.3.3 of AS4373, prune one (1) 225mm diameter lowest limb to north back to stem junction. A maximum 10% of the total live canopy is to be carried out.

- Tree protection fencing (1.8m high mesh or chain-link panels with 50mm metal poles into concrete/weighted feet) is to be placed a minimum 3m from the tree stem where practicable and as per Tree Protection Measures Part 4.1 below, during works.

4 Tree Protection Measures

4.1 Tree Protection Devices

The tree protection is to be in accordance with the following:

- Tree Protection Devices (TPD) may include mulching, tree guards and other devices other than fencing.
- The TPD must be in place prior to any site works commencing, including clearing, demolition or grading.
- The most appropriate fencing for tree protection is 1.8m chainlink with 50mm metal pole supports. During installation, care must be taken to avoid damage to significant roots. The practicality of providing this fencing on this site must be addressed by the Arboriculturist.
- Locate large primary roots by careful removal of soil within the fencing area. Do not drive any posts or pickets into tree roots. Replace soil back over tree roots.
- Nothing should occur inside the tree protection fenced areas, so therefore all access is prohibited for personnel and machinery, storage of fuel, chemicals, cement and site sheds.
- Signage should explain exclusion from the area defined by TPD and carry a contact name for access or advice.
- The TPD cannot be removed, altered, or relocated without the project arborist's prior assessment and approval.

4.2 Stockpiling and Location of Site Sheds

- Any ground identified for proposed stockpiling that is within the TPZ of trees to be retained shall be covered with thick, coarse mulch, placement of wooden pallets over the mulch, covering of the pallets with a tarpaulin (or similar), and the placement of materials on top of this device to prevent loose or potentially contaminating materials from moving into the soil profile.

4.3 Fill Material

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

4.4 Hygiene Practices

- No washing or rinsing of tools or other equipment, preparation of any mortars, cement mixing, or brick cutting is to occur within 8m up slope of any palms/trees to be retained.

5 References

Mattheck, C. & Breloer, H. (1994) *The Body Language of Trees: A handbook for failure analysis. Research for Amenity Trees No. 4*, The Stationery Office, London.

Standards Australia AS4373-2007: *Pruning of Amenity Trees*, Standards Australia, Sydney.

Hadlington, P. & Johnston, J. (1988) *Australian Trees: Their Care & Repair*. University of NSW Press, Kensington.

Standards Australia AS4970-2009 *Protection of trees on development sites*, Standards Australia, Sydney.

Barrell, J (1995) *Pre-development Tree Assessment from Trees and Building Sites*, Eds. Watson & Neely, International Society of Arboriculture, Illinois.

Report prepared by [REDACTED] – November, 2018



[REDACTED]
Consulting arboriculturist and horticulturist.
Tree Surgery Certificate
Advanced Certificate Urban Horticulture
Diploma of Horticulture (Arboriculture) *Credit*
Member of the International Society of Arboriculture (ISA)
ISA Tree Risk Assessment Qualification (TRAQ) 2016

6 Appendices

6.1 Appendix A – Terms and Definitions

Age classes

- Y** Young refers to an established but juvenile tree.
- SM** Semi-mature refers to a tree at growth stages between immaturity and full size.
- EM** Early-mature refers to a tree close to full sized still actively growing.
- M** Mature refers to a full sized tree with some capacity for further growth.
- LM** Late-Mature refers to a full sized tree with little capacity for growth that is not yet about to enter decline.
- OM** Over-Mature refers to a full sized tree with little capacity for growth that is entering or has entered decline.

Co-dominant: refers to stems or branches equal in size and relative importance.

Condition/Structure: refers to the tree's form and growth habit, as modified by its environment (aspect, suppression by other trees, soils) and the state of the scaffold (i.e. trunk and major branches), including structural defects such as cavities, crooked trunks or weak trunk/branch junctions. These are not directly connected with health and it is possible for a tree to be healthy but in poor condition/structure.

Deadwood: refers to any whole limb that no longer contains living tissues (e.g. live leaves and/or bark). Some dead wood is common in a number of tree species.

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

Epicormic growth: adventitious branches that are considered to be a weak attachment in the short term due to minimal wood formation. There are generally formed following storm-related branch breakage or poor pruning practices. Should sufficient holding wood form in the long-term this growth is less of an issue.

Hazard: refers to anything with the potential to harm health, life or property.

Health: Refers to the tree's vigour as exhibited by the crown density, leaf colour, presence of epicormic shoots, ability to withstand disease invasion, and the degree of dieback.

Inclusion stem/bark: the pattern of development at branch or stem junctions where bark is turned inward rather than pushed out. This fault is located at the point where the stems/branches meet. This is normally a genetic fault and potentially a weak point of attachment as the bark obstructs healthy tissue from joining together to strengthen the joint.

Scaffold branch/root: a primary structural branch of the crown or primary structural root of the tree.

Secondary Stem: refers to stems or branches with one of unequal size and relative importance.

SRZ: refers to the Structural Root Zone of the tree, this is the area required for tree stability.

TPZ: refers to the Tree Protection Zone of the tree, this is the primary method of protecting trees, it is a combination of the root area and the canopy and the SRZ is located within it.

Visual Tree Assessment (VTA): a procedure of defect analysis developed by Mattheck and Breloer (1994) that uses the growth response and form of trees to detect defects.

Witches Broom: growth abnormality in trees that shows up as a dense cluster of shoots arising from the one spot, often resembling a clump of mistletoe. Causes for these growths may be varied, possibility from infection by rust and other fungi, viruses, bacteria, mite or insect damage.

6.2 Appendix B – ULE Guide

ULE categories (after Barrell 1996, Updated 01/04/01)

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

1. Long ULE - tree appeared retainable at the time of assessment for over 40 years with an acceptable degree of risk, assuming reasonable maintenance:
 - a) Structurally sound trees located in positions that can accommodate future growth
 - b) Trees which could be made suitable for long term retention by remedial care
 - c) Trees of special significance which would warrant extraordinary efforts to secure their long term retention
2. Medium ULE - tree appeared to be retainable at the time of assessment for 15 to 40 years with an acceptable degree of risk, assuming reasonable maintenance:
 - a) Trees which may only live from 15 to 40 years
 - b) Trees which may live for more than 40 years but would be removed for safety or nuisance reasons
 - c) Trees which may live for more than 15 years but would be removed to prevent interference with more suitable individuals or to provide space for new planting
 - d) Trees which could be made suitable for retention in the medium term by remedial care
3. Short ULE - tree appeared to be retainable at the time of assessment for 5 to 15 years with an acceptable degree of risk, assuming reasonable maintenance:
 - a) Trees which may only live from 5 to 15 years
 - b) Trees which may live for more than 15 years but would be removed for safety or nuisance reasons
 - c) Trees which may live for more than 15 years but would be removed to prevent interference with more suitable individuals or to provide space for new planting
 - d) Trees which require substantial remediation and are only suitable for retention in the short term.
4. Removal - trees which should be removed within the next 5 years:
 - a) Dead, dying, suppressed or declining trees because of disease or inhospitable conditions
 - b) dangerous trees through 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 which may live for more than 5 years but would be removed to prevent interference with more suitable individuals or to provide space for new planting
 - f) Trees which are damaging or may cause damage to existing structures within the next 5 years
 - g) Trees that will become dangerous after removal of other trees for the reasons given in (a) to (f)
 - h) Trees in categories (a) to (g) that have a high wildlife habitat value and, with appropriate treatment, could be retained subject to regular review
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
 - c) formal hedges and trees intended for regular pruning to artificially control growth

6.3 Appendix C – STARS – 1 of 2

Significance of a Tree Assessment Rating System (IACA 2010)© (1 of 2)

The landscape significance of a tree is an essential criterion for establishing the importance that a particular tree may have on a site. However, rating the significance of a tree becomes subjective and difficult to ascertain in a consistent and repetitive fashion due to assessor bias. It is therefore necessary to have a rating system utilising structured qualitative criteria to assist in determining the retention value for a tree.

This rating system will assist in the planning processes for proposed works, above and below ground where trees are to be retained on or adjacent a development site. The system uses a scale of *High*, *Medium* and *Low* significance in the landscape. Once the landscape significance and *Useful Life Expectancy* of an individual tree has been defined, the retention value can be determined.

Tree Significance - Assessment Criteria

1. High Significance in landscape.

- The tree is in good condition and good vigour;
- The tree has a form typical for the species;
- The tree is a remnant or is a planted locally indigenous specimen and/or is rare or uncommon in the local area or of botanical interest or of substantial age;
- The tree is listed as a Heritage Item, Threatened Species or part of an Endangered ecological community or listed on Councils significant Tree Register;
- The tree is visually prominent and visible from a considerable distance when viewed from most directions within the landscape due to its size and scale and makes a positive contribution to the local amenity;
- The tree supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group or has commemorative values;
- The tree's growth is unrestricted by above and below ground influences, supporting its ability to reach dimensions typical for the taxa *in situ* - tree is appropriate to the site conditions.

2. Medium Significance in landscape.

- The tree is in fair-good condition and good or low vigour;
- The tree has form typical or atypical of the species;
- The tree is a planted locally indigenous or a common species with its taxa commonly planted in the local area;
- The tree is visible from surrounding properties, although not visually prominent as partially obstructed by other vegetation or buildings when viewed from the street;
- The tree provides a fair contribution to the visual character and amenity of the local area;
- The tree's growth is moderately restricted by above or below ground influences, reducing its ability to reach dimensions typical for the taxa *in situ*.

3. Low Significance in landscape.

- The tree is in fair-poor condition and good or low vigour;
- The tree has form atypical of the species;
- The tree is not visible or is partly visible from surrounding properties as obstructed by other vegetation or buildings;
- The tree provides a minor contribution or has a negative impact on the visual character and amenity of the local area;
- The tree is a young specimen which may or may not have reached dimension to be protected by local Tree Preservation orders or similar protection mechanisms and can easily be replaced with a suitable specimen;
- The tree's growth is severely restricted by above or below ground influences, unlikely to reach dimensions typical for the taxa *in situ* - tree is inappropriate to the site conditions;
- The tree is listed as exempt under the provisions of the local Council Tree Preservation Order or similar protection mechanisms;
- The tree has a wound or defect that has potential to become structurally unsound.

Environmental Pest / Noxious Weed Species:

- The tree is an Environmental Pest Species due to its invasiveness or poisonous/ allergenic properties;
- The tree is a declared noxious weed by legislation.

Hazardous/Irreversible Decline:

- The tree is structurally unsound and/or unstable and is considered potentially dangerous;
- The tree is dead, or is in irreversible decline, or has the potential to fail or collapse in full or part in the immediate to short term.

Appendix C - STARS – 2 of 2

Significance of a Tree Assessment Rating System (IACA 2010)© (2 of 2)

The tree is to have a minimum of three (3) criteria in a category to be classified in that group.

Note: The assessment criteria are designed for individual trees only but can be applied to a monocultural stand in its entirety e.g. hedge.

In the development of this document IACA acknowledges the contribution and original concept of the Footprint Green Tree Significance & Retention Value Matrix, developed by Footprint Green Pty Ltd and Andrew Morton in June 2001.

		Significance				
		1. High		2. Medium		3. Low
		Significance in Landscape	Significance in Landscape	Significance in Landscape	Environmental Pest / Noxious Weed Species	Hazardous / Irreversible Decline
Estimated Life Expectancy	1. Long >40 years					
	2. Medium 15-40 Years					
	3. Short <1-15 Years					
	Dead					

<u>Legend for Matrix Assessment</u>	
	Priority for Retention (High) -These trees are considered important for retention and should be retained and protected. Design modification or re-location of building/s should be considered to accommodate the setbacks as prescribed by the Australian Standard AS4970 <i>Protection of trees on development sites</i> . Tree sensitive construction measures must be implemented e.g. pier and beam etc if works are to proceed within the Tree Protection Zone.
	Consider for Retention (Medium) -These trees may be retained and protected. These are considered less critical; however their retention should remain priority with removal considered only if adversely affecting the proposed building/works and all other alternatives have been considered and exhausted.
	Consider for Removal (Low) -These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.
	Priority for Removal -These trees are considered hazardous, or in irreversible decline, or weeds and should be removed irrespective of development.

Table 1 - Tree Retention Value - Priority Matrix.

IACA, 2010, *IACA Significance of a Tree, Assessment Rating System (STARS)*, Institute of Australian Consulting Arboriculturists, Australia, www.iaca.org.au

6.4 Appendix D – Record of Meetings and Design Input

Roger Posgate (Environmental Advisor), Matthew Re (Graduate Engineer) and Howard Chemney (Environment & Sustainability Manager) attended the site inspection on 6/11/2018 with construction input.

No input from the Landscape Architect has been included as these works are not constrained by any urban design or landscaping requirements.

Below is information on the scope of works/design as sent by Nadir Khan (Project Engineer).

KN

Thu 11/10/2018 8:21 AM

[Redacted]

Approval for Moving fence for MOC3 retaining wall works

[Redacted]

🔔 This message was sent with High importance.

Proposed New Hoarding.pdf
363 KB

MOC3 Works outside site boundary.pptx
2 MB

[Redacted]

We require approval to move western fence 10m away from its current location to construct retaining walls in MOC3(attached proposed new hoarding).

Attached is a presentation of the activities that we will carry out to construct the retaining wall. The presentation also sets out programme and plant used.

Due to the piling involved we will require at least 10m from the west elevation of the retaining wall. This is to allow enough space for the CFA piling rig, excavators and dump trucks to remove material.

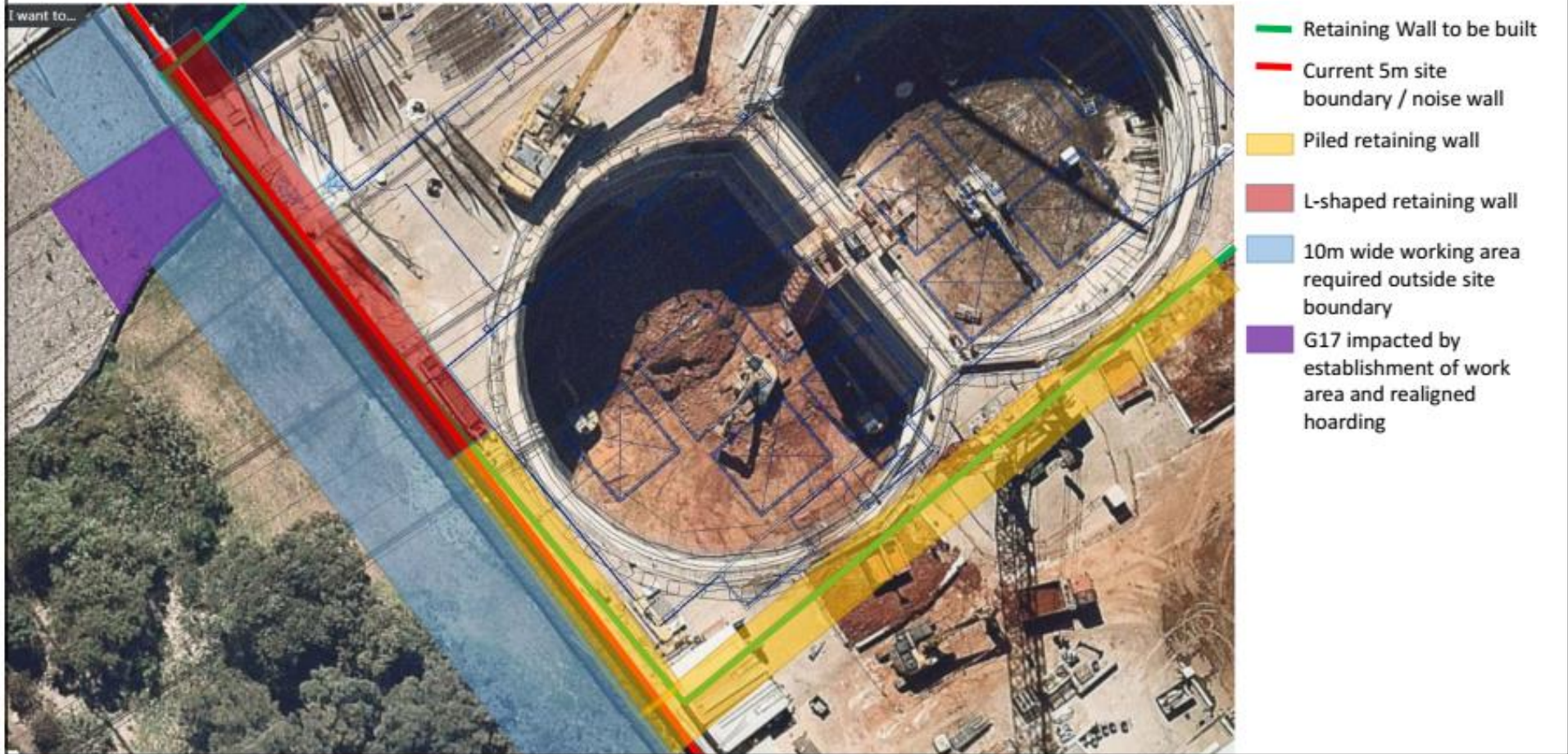
The last slide displays the space we have on the site side of the retaining wall (2m). This is the main reason that we cannot carry out works form inside the boundary. The plant will not fit. Due to this being a retaining wall the outside face will also require back filling and compaction to restore the ground to its original condition. This will involve an excavator and roller to work outside. This would be the case even if we had ample room on the inside.

We will restore/landscape the area as found if required.

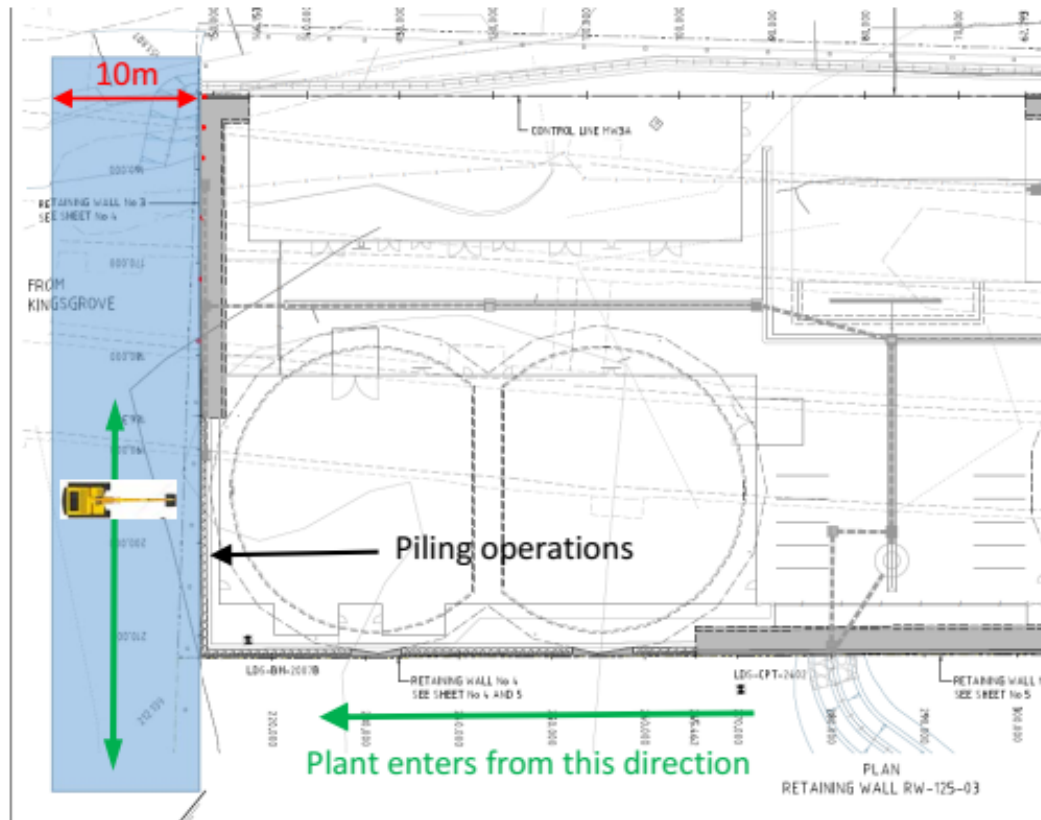
Please let me know if you need further information to get approval for moving fence away.

Will appreciate your prompt response.

MOC3 – Overview of Works outside site boundary



Stage 1: 05/01/19 to 15/02/19

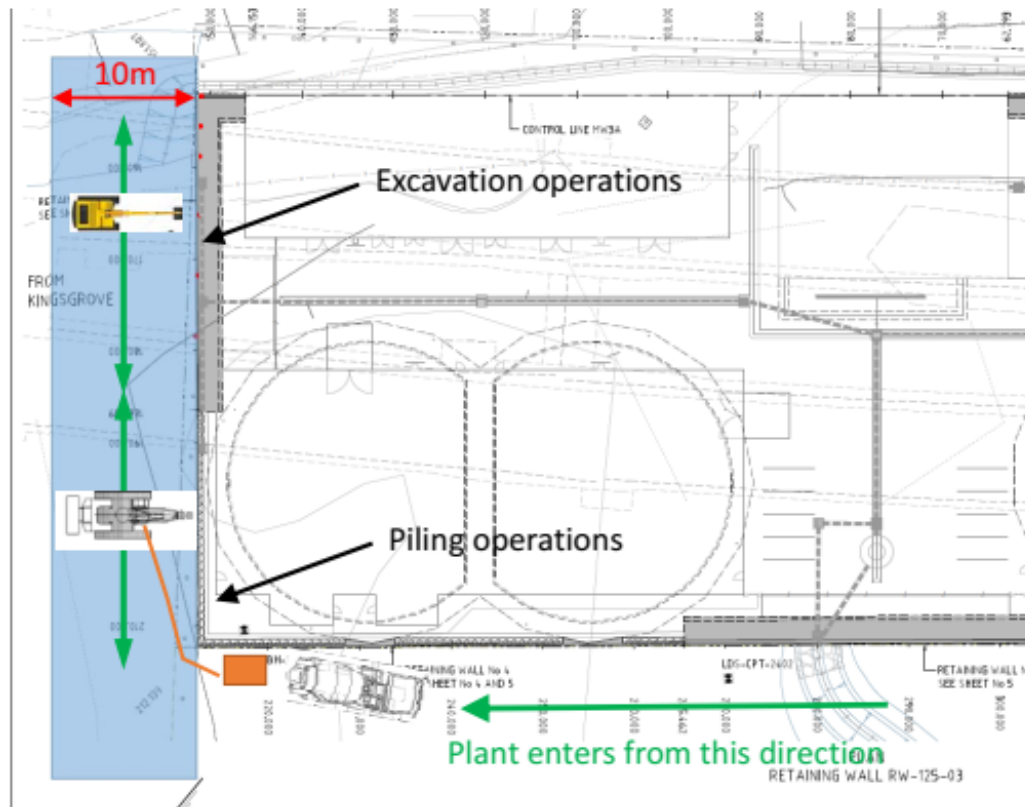


Activities

Piled Wall

- Install piling platform in piles wall area

Stage 2: 16/01/19 to 11/02/19



Activities

Piled Wall

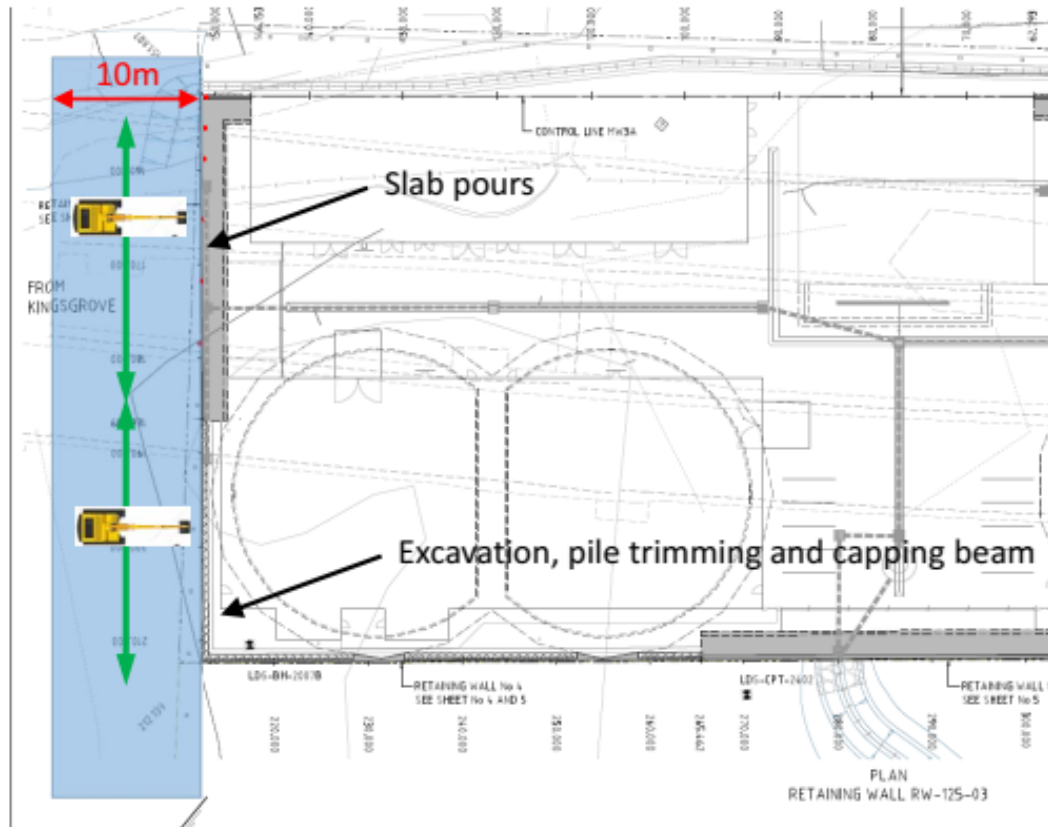
- Install 34no. Bored piles along west elevation

L-shaped wall

- Excavate to formation level of L-shaped retaining wall and pour blinding concrete.

Substation and exhaust building cause obstruction and machinery have to operate from outside of wall

Stage 3: 12/02/19 to 20/02/19



Activities

Piled Wall

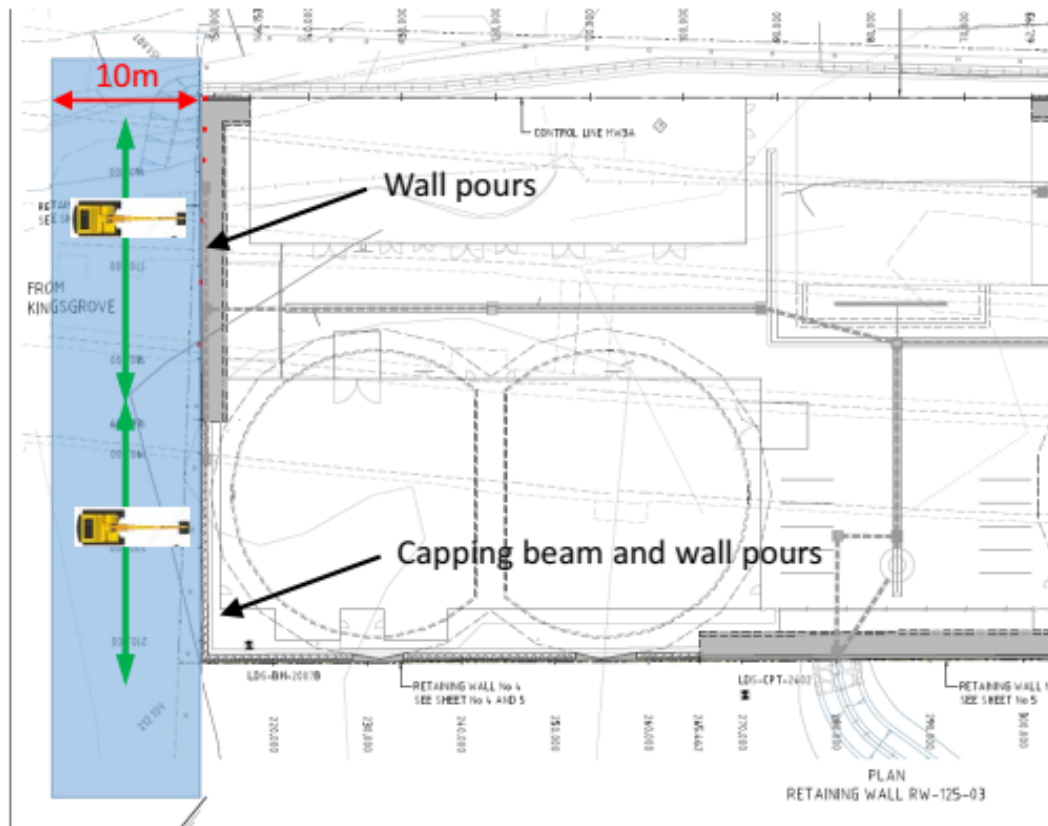
- Excavate to blinding level
- Pour blinding for capping beam
- Trim piles and remove waste concrete
- Begin construction of capping beam

L-shaped wall

- Pour slab of L-shaped retaining wall

Work will occur from both sides of retaining wall. Machinery works from outside and fixing, formwork and pouring form inside.

Stage 4: 21/02/19 to 27/02/19



Activities

Piled Wall

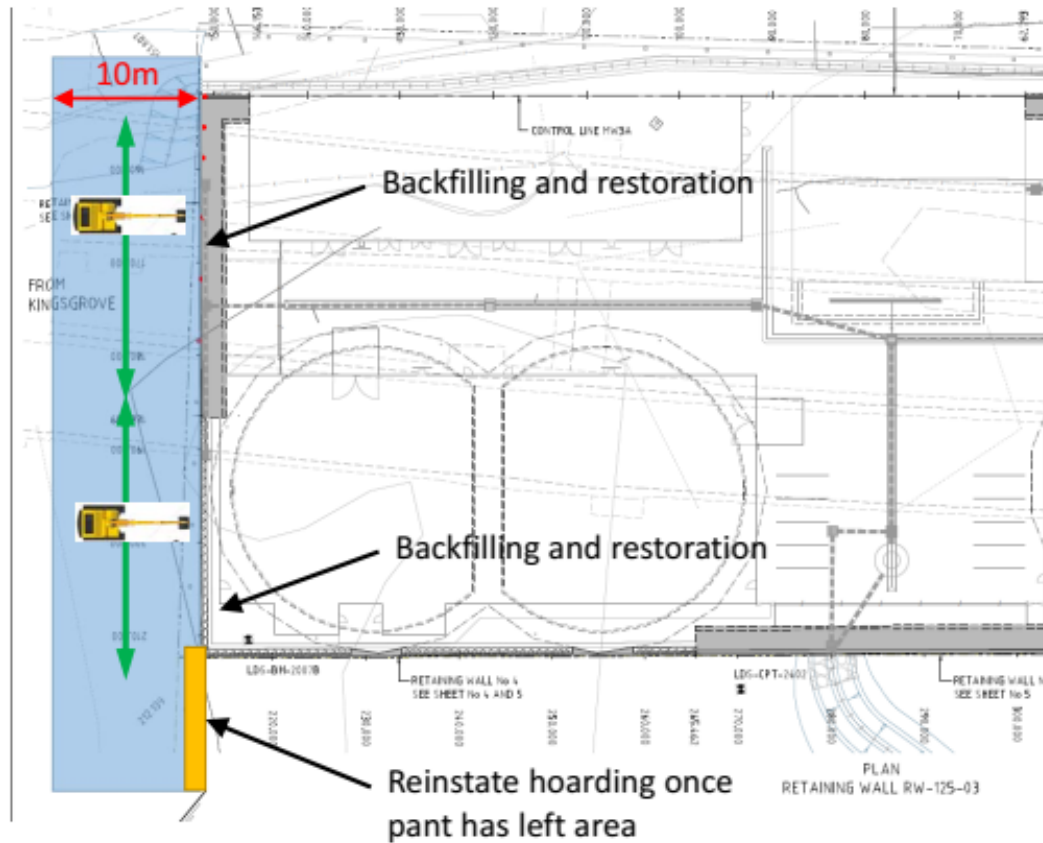
- Complete capping beam construction
- Pour retaining wall to face of piles

L-shaped wall

- Pour walls of L-shaped retaining wall

Work will occur from both sides of retaining wall. Machinery works from outside and fixing, formwork and pouring form inside.

Stage 5: 28/02/19 to 02/04/19

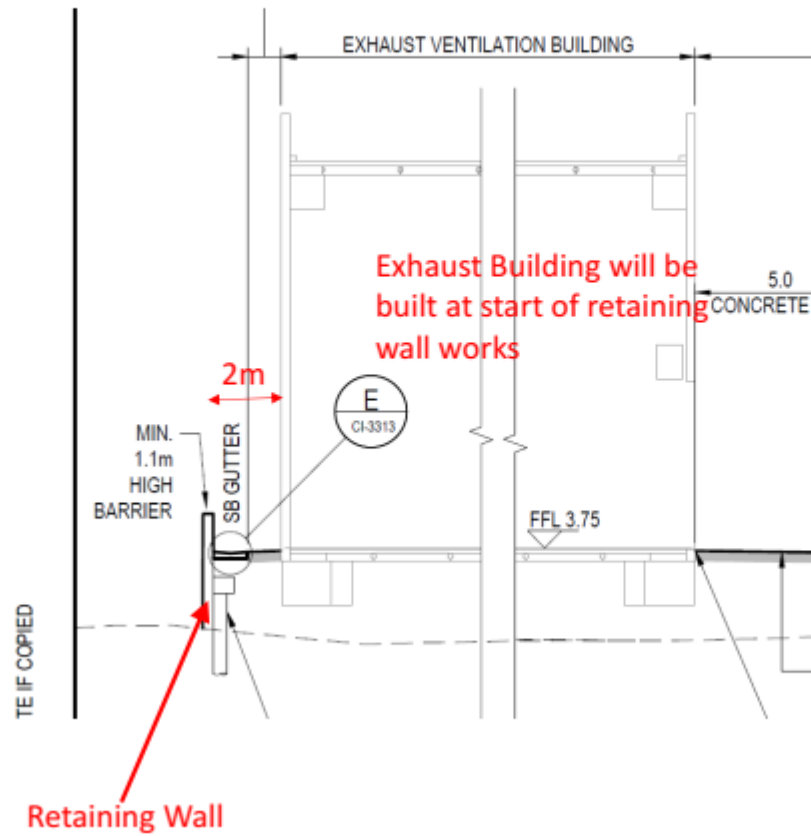


Activities

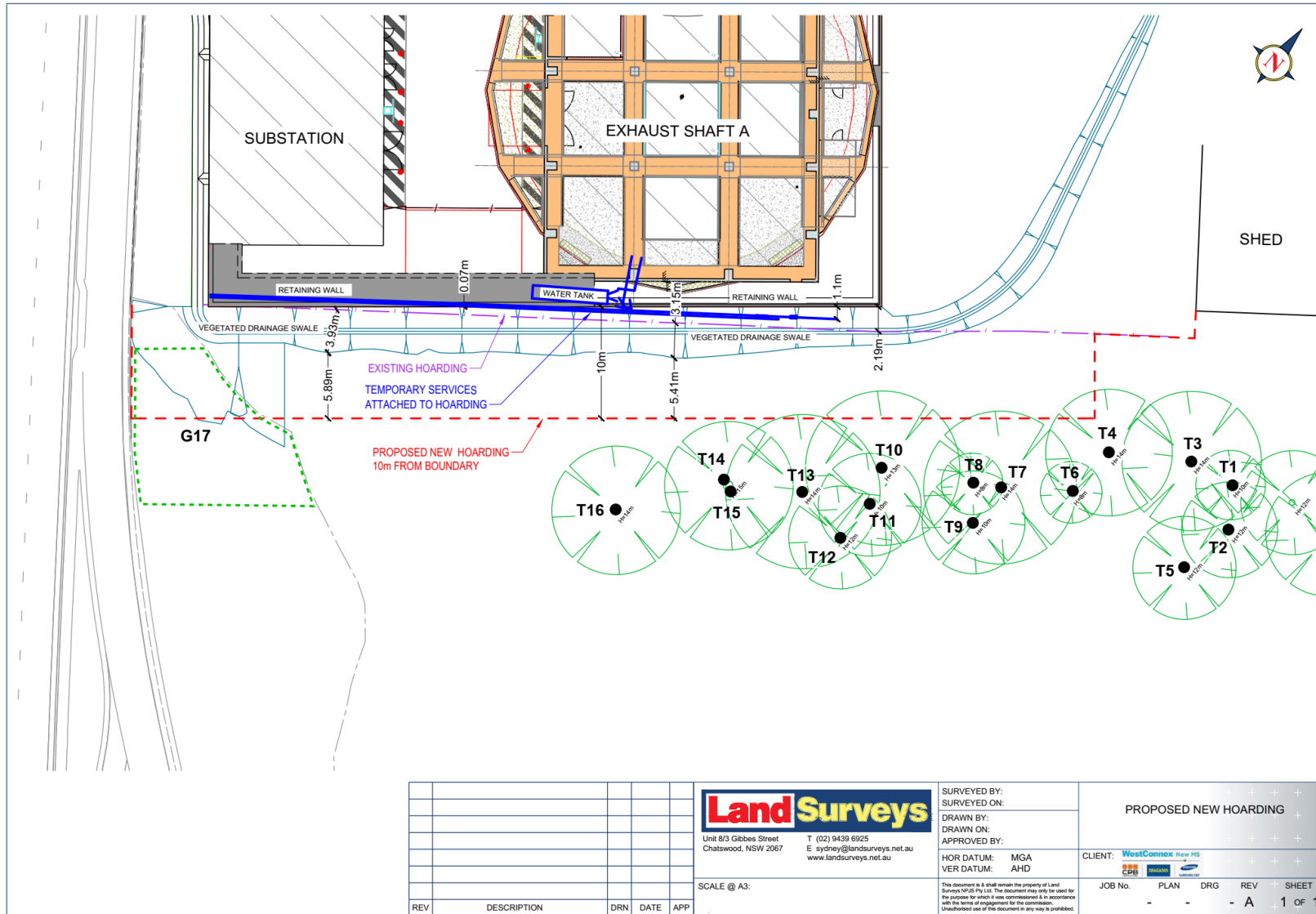
All retaining wall

- Back fill outside of retaining wall and restore / landscape outside area to original condition
- Reinstate 5m site hoarding where plant entered outside area

Sections showing lack of space on site side of retaining wall



6.5 Appendix E – Tree Location Map



6.6 Appendix F – Site Photographs



Plate 1 – Arrow notes G17 that require relocation or removal to accommodate realignment of Hoarding.

Plate 2 – T10 – tree will require heavy pruning with lowest approximately 250mm diameter pruned back to stem junction to accommodate works.





Plate 3 – Arrow notes to large diameter limb on T13 that requires removal to allow Hoarding realignment.



Plate 4 – Overview of site, green Hoarding (with clear sections for light filtration) can be noted to left of photo, arrow notes white marker in location of proposed realignment of Hoarding.

6.7 Appendix G – Schedule of Assessed Trees – M5 Site inspection 6 November 2018.

Tree No.	Genus & species Common Name	Ht (m)	Sp (m)	DBH (mm)	Age	V	C	Comments	ULE	TSR	RV	SRZ (m)	TPZ (m)	TPZ (area)
T1	<i>Casuarina glauca</i> Swamp She-Oak	10	7	750 @ 1m AGL	M	G	G-F	Locally native species. Torn out limb to north. Limbs up to 80mm diameter have been poorly pruned leaving stubs.	1A	M	H	3.1	9.0	255
T2	<i>Lagunaria patersonia</i> Norfolk Island Hibiscus	12	8	625 AB	M	G	G-F	Introduced native species. Co-dominant @ 1m AGL.	1A	M	H	2.8	7.6	180
T3	<i>Casuarina glauca</i> Swamp She-Oak	14	14	470	M	G	F	Locally native species. High percentage of deadwood. 'Witches broom' (growth abnormality) in canopy noted.	1A	M	H	2.6	5.8	104
T4	<i>Casuarina glauca</i> Swamp She-Oak	14	11	550	M	G	G-F	Locally native species. High percentage of deadwood. 'Witches broom' in canopy noted.	1A	M	H	2.8	6.6	137
T5	<i>Casuarina glauca</i> Swamp She-Oak	12	12	525	M	G	G	Locally native species. Small cavity at 1.6m AGL noted.	1A	M	H	2.7	6.4	129
T6	<i>Casuarina glauca</i> Swamp She-Oak	8	6	350	M	G	F-P	Locally native species. Large wound on stem 1.5m to 2.5m AGL, deep in cambium but wound-wood responding well.	2A	M	M	2.3	4.2	55
T7	<i>Casuarina glauca</i> Swamp She-Oak	14	12	575	M	G	G	Locally native species. Co-dominant @ 2.5m AGL. No special problems noted at time of assessment.	1A	M	H	2.8	7.0	152
T8	<i>Casuarina glauca</i> Swamp She-Oak	8	6	200	EM	G	G	Locally native species. Co-dominant @ 0.4m AGL. Minor suppression from neighbouring trees.	1A	M	H	1.8	2.4	18
T9	<i>Casuarina glauca</i> Swamp She-Oak	10	7	425	M	G	G	Locally native species. Minor die-back noted. Stem sweeps to south and is co-dominant @ 2m AGL.	1A	M	H	2.5	5.1	84
T10	<i>Casuarina glauca</i> Swamp She-Oak	13	10	600	M	G	G	Locally native species. Co-dominant @ 1.2m AGL. Heavily affected with 'witches' broom'.	1A	M	H	2.8	7.2	163

Tree No.	Genus & species Common Name	Ht (m)	Sp (m)	DBH (mm)	Age	V	C	Comments	ULE	TSR	RV	SRZ (m)	TPZ (m)	TPZ (area)
T11	<i>Casuarina glauca</i> Swamp She-Oak	10	5	300	EM	G	F-G	Locally native species. Co-dominant @ 0.4m AGL. Heavily crown raised, dead hanger noted.	1A	M	H	2.2	3.6	41
T12	<i>Casuarina glauca</i> Swamp She-Oak	12	8	550 @ 1m AGL	M	G	G	Locally native species. Trifurcate @ 1.2m AGL.	1A	M	H	2.8	6.6	137
T13	<i>Casuarina glauca</i> Swamp She-Oak	14	16	600	M	G	G	Locally native species. Multi-stemmed @ 2m AGL. Suckering at base, growth cracks into main stem.	1A	M	H	2.8	7.2	163
T14	<i>Casuarina glauca</i> Swamp She-Oak	15	5	275 @ 1m AGL	M	G	G	Locally native species. Co-dominant @ 1.1m AGL.	1A	M	H	2.1	3.3	35
T15	<i>Eucalyptus robusta</i> Swamp Mahogany	15	10	300	M	G	G	Locally native species. Shared root crown with T14.	2A	M	M	2.2	3.6	41
T16	<i>Eucalyptus robusta</i> Swamp Mahogany	14	14	500	M	G	G	Locally native species. Tree has lost a large diameter limb to the north previously.	1A	M	H	2.7	6.0	113
G17	<i>Melaleuca sp. & Eucalyptus sp.</i> Group of new plantings	Up to 6	Up to	40-80	Y	G	G	Locally native species. No special problems noted at time of assessment.	1A	L	M	1.6	2	7

KEY



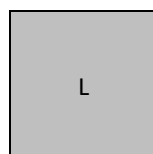
Tree to be retained.



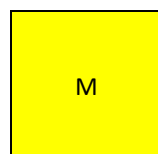
Not classed as 'a tree' under DPE conditions (see Part 1.3).



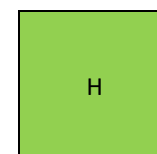
Tree proposed to be removed.



Low Retention Value-These trees are not considered important for retention.



Medium Retention Value-These trees may be retained & protected.



High Retention Value -These trees are considered important for retention and should be retained and protected.

* DBH is visually estimated (usually adjoining trees or those that are hard to access). AB – above *buttress roots*. AGL - above ground level.

** Determined by the largest number found (i.e. broadest branch spread or highest DBH) within a tree group to ensure ample tree protection zone.

H refers to the approximate height of a tree in metres, from base of stem to top of tree crown.

Sp refers to the approximate and average spread in metres of branches/canopy (the ‘crown’) of a tree.

DBH refers to the approximate diameter of tree stem at breast height i.e. 1.4 metres above ground (unless otherwise noted) and expressed in millimetres.

Age refer to Appendix A -Terms and Definitions for more detail.

V refers to the tree’s vigour (health) Refer to Appendix A -Terms and Definitions for more detail.

C refers to the tree’s structural condition. Refer to Appendix A -Terms and Definitions for more detail.

ULE refers to the estimated *Useful Life Expectancy* of a tree. Refer to Appendices A and B for details.

TSR The *Tree Significance Rating* considers the importance of the tree as a result of its prominence in the landscape and its amenity value, from the point of view of public benefit. Refer to Appendix C – Significance of a Tree Assessment Rating for more detail.

RV Refers to the retention value of a tree, based on the tree’s ULE *and* Tree Significance. Refer to Appendix C – Significance of a Tree Assessment Rating for more detail.

SRZ Structural Root Zone (SRZ) refers to the critical area required to maintain stability of the tree. Refer to Appendix A -Terms and Definitions for more detail.

TPZ Tree Protection Zone (TPZ) refers to the *tree protection zones* for trees to be retained. Refer to Appendix A -Terms and Definitions for more detail.