ARBORICULTURE IMPACT ASSESSMENT

MELBOURNE METRO RAIL PROJECT

PREPARED FOR

Melbourne Metro Rail Authority

MMR-JPT-PWAA-RP-NN-000829

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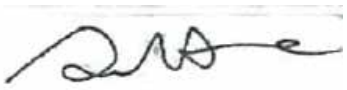
Author signature		**Approver signature**	
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GLOSSARY AND ABBREVIATIONS

Abbreviation	Term	Definition
DBH	Diameter at breast height	The diameter of a tree's stem typically measured with a diameter tape at 1.4 metres height
MLTV	Medium and long term viability tree	Semi-mature, mature and over-mature trees which are considered to be viable beyond the anticipated time frame of delivery of the project (10 years or more)
PRZ	Protected root zone	The area around a tree required to protect roots and ensure the on-going viability of the tree. (City of Stonnington only)
TPP	Tree protection plan	A plan showing the location of any tree protection measures such as fencing and specifying the extent of such protection
ULE	Useful life expectancy (of a tree)	The expected timeframe from the present that a tree would contribute to the landscape while requiring a reasonable level of management inputs, as assessed by a consulting arborist
VHR	Victorian Heritage Register	
VTA	Visual tree assessment	A method of assessing trees from the ground to determine tree health and structure and to identify hazards, as used by consulting arborists

EXCUTIVE SUMMARY

The Melbourne Metro Rail Project (Melbourne Metro) boundary extends from the connection to existing railway infrastructure at Kensington and the western portal, under the inner portions of the City of Melbourne, including Arden, Parkville, the CBD and Domain Parklands to the south-east, connecting with exiting rail infrastructure at South Yarra. The project also includes a western turnback at West Footscray. The study area lies within or under land that contains some of Melbourne's most noted parks and gardens, treed avenues, as well as other areas where trees are prominent components of the urban landscape.

This impact assessment provides an assessment of potential impacts to trees associated with the construction and operation of Melbourne Metro. It includes trees managed by the City of Melbourne and the City of Port Phillip, the University of Melbourne as well as other trees located within publicly owned (VicTrack) land at Arden (City of Melbourne). No trees are located within the western turnback study area at West Footscray (Maribyrnong City Council). Trees within the Eastern Portal (South Yarra) precinct in the City of Stonnington have been assessed by Tree Dimensions in a separate impact assessment (Technical Appendix S). Other aspects, including terrestrial ecology, landscape and visual, groundwater and the heritage value of trees and landscape, are covered in other impacts assessments, in particular:

- Technical Appendix J *Historical Cultural Heritage*
- Technical Appendix L *Landscape and Visual*
- Technical Appendix O *Groundwater*
- Technical Appendix T *Terrestrial Flora and Fauna*

ARBORICULTURAL CONTEXT

The Melbourne Metro alignment and associated infrastructure potentially interacts with trees at locations where works at, or close to, ground level would occur, including proposed stations, emergency access shafts and construction work sites. The arboricultural contexts of these locations can generally be described as follows:

Western Portal (Kensington) area characterised with road reserves recently planted with juvenile species, and maturing brush box (*Lophostemon confertus*), and scattered larger specimens, such as a narrow-leaved peppermint (*Eucalyptus nicholii*) and spotted gum (*Corymbia maculata*). JJ Holland Park is dominated by spotted gum and river she-oak (*Casuarina cunninghamiana*) with a number of substantial exotic trees such as golden elm (*Ulmus glabra* 'Lutescens') and poplar (*Populus* sp.*).*

Arden station. Tree plantings within the publicly owned (VicTrack) land reflect the industrial landscape, with older trees such as scattered peppercorns typical of railway land. Many of these are naturalised (likely self-sown), as well as weedy Monterey pines (*Pinus radiata*) and suckering Lombardy poplars (*Populus nigra* var *italica*) at various locations. Smaller scale native vegetation has been planted within some sites, of limited overall value. A large river red gum (*Eucalyptus camaldulensis*) is located near the Laurens Street frontage. Road reserves in surrounding streets contain scattered plane trees, paperbarks (*Melaleuca styphelioides*) and juvenile small-leaved linden (*Tilia cordata*).

Parkville station. Large elms of late 19th and early 20th century origin form avenues within the Royal Parade and Grattan Street road reserves. Modestly scaled and recently planted groups of crabapples (*Malus* sp.) and cedars (*Cedrus atlantica*) are planted within the contemporary landscape of the northern portion of University Square, and developing horse chestnuts (*Aesculus hippocastanum*) in the central median of Barry Street. The elms located within the entire width

of the Royal Parade road reserve are included with the Victorian Heritage Register (VHR) listed H2198 and are specifically mentioned in the statement of significance for the place.

CBD North and South stations. London plane trees are common across the CBD and form a vegetative spine along Swanston Street. In contrast, plantations of kurrajong (*Brachychiton populneus*) and firewheel tree (*Stenocarpus sinuatus*) have been recently established in the north of the CBD. Individual specimens of elm and spotted gum (City Square) and lilly pIlly (*Syzygium smithii*) occur along the Swanston Street spine and surrounding streets.

Domain station. The St Kilda Road avenue consists of plane trees (*Platanus ×acerifolia*) within the central median with an outer row of elms (*Ulmus* spp.) to each side of the road reserve. Divided down the centre between two local government areas, trees in this area are managed by the City of Melbourne (east side) and the City of Port Phillip (west side).

Tunnels precinct, Domain Parklands. This area is defined by perimeter avenues of large, deciduous trees with central areas of lawns planted with a diverse array of deciduous and evergreen trees and scattered large palms, such as Canary Island palm (*Phoenix canariensis*) and a cotton palm (*Washingtonia filifera*) at Queen Victoria Gardens. Many of the trees within Domain Parklands are of 19th century origin. Domain north and central survey areas include trees located within the VHR listed place *Domain Parklands* VHR H2304, Domain south includes a portion of *Shrine Reserve* VHR H0848.

Tunnels precinct, Fawkner Park. Formal avenues planted along main pedestrian paths consisting of oaks (*Quercus* spp.), elms and Moreton Bay figs (*Ficus macrophylla*) form significant components within this sub-precinct. A notable, well-established row of Canary Island palms (*Phoenix canariensis*) inter-planted with pin oak (*Quercus palustris*) is located to the Toorak Road West boundary. Extensive new avenue plantings have been recently undertaken within the park.

METHODOLOGY

The methodology for this arboriculture impact assessment included:

- A desktop review of applicable statutory controls as they relate to tree removal and protection, including a review of obligations within the VHR and Melbourne, Port Phillip and Maribyrnong Planning Schemes. The main finding from this review is that there are trees within land on the VHR that may require approval for removal and works within their proximity, specifically at:
  - Royal Parade, VHR H2198 (City of Melbourne)
  - Gatekeeper's Cottage, University of Melbourne, VHR H0919 (City of Melbourne)
  - Domain Parklands, VHR H2304 (City of Melbourne)
  - Marquis of Linlithgow Memorial, VHR H0366 (City of Melbourne)
  - Shrine of Remembrance, VHR H0848 (City of Melbourne)
  - Albert Road Reserve, VHR H1374 (City of Port Phillip).

  There are otherwise no specific planning scheme controls over non-native trees within the project boundary.
- A visual tree assessment was undertaken for trees to identify species, size and condition data for each tree (as contained in Appendix A to this report).

RISK ASSESSMENT

A risk assessment has been prepared that considers the potential impact to trees within the project boundary by various construction activities and the potential consequences that might arise. For the purposes of assessment, the level of

consequence was rated for trees in the public realm that already contribute to the urban landscape (semi-mature, mature and over-mature trees) and which are considered to be viable beyond the anticipated time frame of delivery of the project, that is trees with an assessed useful life expectancy (ULE) of 10 years or more. This category is described as medium and long-term viability (MLTV) trees. Conversely, removal of juvenile trees or those with very limited ULEs was assumed to have a low impact.

The construction activities associated with the project that might impact on trees are generally well separated by bored and mined tunnels into discrete precincts. The potential risks are localised and summarised as follows.

- **Tunnels precinct**. The greatest numbers of trees within Precinct 1 that would require removal are located in the proposed Fawkner Park construction area with a total of 62 trees. Most of these trees are juvenile specimens and can be readily replaced as part of the project delivery, with 11 MLTV trees identified. Of the 11 MLTV trees, four potentially impacted large palms within the precinct can be temporarily relocated and reinstated at the end of works. The overall impact to Fawkner Park in terms of loss of MLTV trees would be limited.

  The shallow tunnelled section above CityLink tunnels would result in the removal of trees from Domain Parklands as a result of ground stabilisation works rather than as a direct result of tunnel boring. A number of trees, up to 30 MLTV trees, identified out of a total of 55 trees would potentially require removal. While this not a large number of trees within the overall extent of Domain Parklands, Tom's Block is located close to St Kilda Road and contains a number of notable specimens. This impact could be mitigated by use of an Earth Pressure Balance Tunnel Boring Machine (TBM) and careful monitoring, negating the requirement for ground stabilisation and resultant tree loss.

  The alternative tunnel location under the CityLink tunnels would remove the potential for substantial loss or damage of trees within this portion of the VHR listed Domain Parklands.

  A limited number of trees would require removal for the proposed emergency access shafts in Queen Victoria Gardens (four MLTV trees of five in total) and Fawkner Park (six MLTV trees of seven in total). Mature palms at these locations, two each at Queen Victoria Gardens and Fawkner Park, could be temporarily relocated and reinstated at the end of works.

  The alternative location for the Fawkner Park emergency access shaft is at the Fawkner Park TBM launch site. This would limit the numbers of trees to be removed from the public realm by effectively concentrating works within a single zone where trees would already require removal for the launch site and access to the construction work site. This would spare seven trees in total (six identified as MLTV trees) from removal or development impact.

  The alternative location for the emergency access shaft in Tom's Block would result in the loss of a greater number of trees than the Queen Victoria Gardens Concept Design location. This loss would constitute 14 trees in total, of which six are MLTV trees. However these trees may already require removal due to ground stabilisation works over the shallow tunnel. Permanent access requirements to the emergency access shaft from Linlithgow Avenue would potentially limit the ability for long-term re-establishment of one tree along this road frontage.

- **Western portal** (Kensington). The trees proposed to be removed from the public realm within this precinct are predominantly located within the Childers Street road reserve and at the south eastern end of Ormond Street. The proposed construction area associated with the Concept Design would not require the removal of trees from JJ Holland Park. A total of 47 trees, including one row of large shrubs, would require removal within the precinct, however only nine of these have been identified as MLTV trees.

  The alternative design option within this precinct that places the decline structure further to the west, is not anticipated to require the removal of any additional trees from the public realm.

- **Arden station**. One street tree located within the Laurens Street road reserve would require removal for construction of the station box, with an additional four street trees within the road reserve to the immediate east of

the Langford Street Intake Substation (ISS) site potentially requiring removal to facilitate construction access. This amounts to five trees in total including three MLTV trees potentially requiring removal from the public realm in this precinct.

All other trees proposed to be removed, 116 individual specimens or tree groups within the precinct,are contained within the publicly owned (VicTrack) land holding on the west side of Laurens Street, with no specific vegetation controls (except for native vegetation which addressed in Technical Appendix T *Terrestrial Flora and Fauna*). The majority of trees within the preferred Langford Street ISS location are environmental weeds, predominantly groups of naturalised desert ash.

- **Parkville station**. Construction of the station box and associated entries would require the removal of 22 trees within the Grattan Street road reserve between Royal Parade and Leicester Street, nine of which are large elms identified as MLTV trees. Ten elms would also require removal from the VHR listed Royal Parade immediately north and south of the Grattan Street intersection, though only two of these are MLTV trees. Six of these trees require removal to accommodate changes to the road functional layout of Royal Parade. The total removal of trees from a 250 m section of Grattan Street and additional trees from Royal Parade would have a significant impact on the precinct streetscape.

  Thirty nine trees within the southern boundary of the University of Melbourne (all but one are MLTV trees) and 73 trees in total in the northern end of University Square above the underground car park and Barry Street road reserve would also require removal. Of these, 59 of the University Square trees are identified as MLTV trees due to their assessed ULE and age, however the plantings within University Square are modestly scaled and many have generally performed poorly.

- **CBD North station**. The mined station box and adits substantially reduce the direct potential impact to street trees within Swanston Street. Up to six trees (all MLTV trees) may require removal to facilitate vehicular access at Swanston and Latrobe streets. All trees would be removed from Franklin Street, east of Swanston Street and a section to the west side for a construction work site, as well as the eastern end of A'Beckett Street. An additional 40 trees would require removal for these construction areas, including 18 MLTV trees.

- **CBD South station**. The proposed mined station box would significantly reduce the requirement for tree removals from Swanston Street in this precinct. However all trees within the City Square, 19 in total with 16 MLTV trees, would require removal for a construction area, with a limited number of plane trees from Swanston Street (five MLTV trees) anticipated to require removal to facilitate vehicular access to construction areas on the west side of Swanston Street. In total, 24 trees (21 MLTV trees) would be removed from this precinct.

- **Domain station**. A substantial number of trees would require removal from St Kilda Road and the VHR listed Albert Road Reserve to facilitate construction of the station box, tram and traffic diversions and for a construction area within the road reserve. In addition, trees would require removal from the south west corner of the Shrine of Remembrance Reserve for the station entry and for vehicular access to Edmund Herring Oval, a portion of which lies within the curtilage of the Shrine of Remembrance Reserve.

  A total of 223 trees would potentially require removal, with 134 identified as MLTV trees. Removal of these trees from a 700 m long section of St Kilda Road as well as associated removals from the Albert Road Reserve would have a significant impact on the this section of St Kilda Road, creating a large, albeit temporary gap, in a prominent Melbourne boulevard. The proposed tram super stop above the station box would be likely to prevent the re-planting of up to 12 plane trees in the central median. However, changes to the road functional layout would allow for new trees to be established immediately north of the Domain Road intersection, at the existing gap in the St Kilda Road plantation, with no anticipated net long-term loss of canopy cover within the precinct.

- **Western Turnback** (West Footscray). There are no trees located at West Footscray station, with all works contained within the existing rail corridor.

BENEFITS AND OPPORTUNITIES

The majority of the project is proposed to be located underground. The proposed alignment would limit the number of trees that need to be removed above the proposed tunnel alignment, except for the CityLink tunnels crossing in the Domain Parklands. The benefit of siting of stations and mined construction methodology under Swanston Street would significantly limit the requirements to remove trees. The primary opportunities in these and other areas where trees would be removed to facilitate work would be to replant in accordance with the City of Melbourne's *Urban Forest Strategy*, the City of Port Phillip *Greening Port Phillip* and the requirements of any relevant cultural heritage conservation management plan.

ENVIRONMENTAL PERFORMANCE REQUIREMENTS

The following Environmental Performance Requirements are recommended:

Environmental Performance Requirements
AR1. During detailed design, review potential tree impacts and provide for maximum tree retention where possible. Prior to construction of main works or shafts, develop and implement a plan in consultation with the relevant local council that identifies all trees in the project area which covers: • Trees to be removed or retained • Condition of the trees to be removed • Options for temporary re-location of palms and reinstatement at their former location or another suitable location.
AR2. Reinstate quality soils to sufficient volumes to support long-term viable growth of replacement trees.
AR3. Re-establish trees to replace loss of canopy cover and achieve canopy size equal to (or greater than) **healthy, mature** examples of the species in Melbourne. Consult with the City of Melbourne, the City of Port Phillip, the City of Stonnington, the Shrine of Remembrance and Shrine Trustees and Heritage Victoria as applicable. Policy documents that must be followed to re-establish trees and valued landscape character include: • The City of Melbourne's Tree Retention and Removal Policy and Urban Forest Strategy • The City of Port Phillip's Community Amenity Local Law No. 1 and Greening Port Phillip - An Urban Forest Approach • Any associated precinct plans • Specific policies of the Domain Parklands Conservation Management Plan (CMP), for trees within Domain Parklands • Shrine of Remembrance: Shrine of Remembrance CMP (Lovell Chen, 2010) or any future review and the Shrine of Remembrance Landscape Improvement Plan (rush Wright Associates, 2010) • South African Soldiers Memorial: Any relevant CMP for the South African Soldiers Memorial • Fawkner Park Conservation Analysis (Hassell, 2002) and the Fawkner Park Masterplan (City of Melbourne, 2005) • The preferred future character of the University of Melbourne, for trees in the grounds of the University of

Environmental Performance Requirements
Melbourne.
AR4. Prior to construction commencing of main works or shafts in affected areas, prepare and implement Tree Protection Plans for each Precinct in accordance with AS4970-2009 Protection of Trees on Development Sites, addressing the detailed design and construction methodology of the project. Within precincts 1, 4 and 7, a Tree Protection Plan must be developed for each heritage place as relevant to the satisfaction of Heritage Victoria or the responsible authority.
AR5. For City of Melbourne trees that are to be retained and protected, a bank guarantee or bond of the trees value will be held against the approved Tree Protection Plan for the duration of the works in accordance with the City of Melbourne Tree Retention and Removal Policy.

1 INTRODUCTION

This report provides an assessment of the potential impacts of the Melbourne Metro Rail Project (Melbourne Metro) to trees within the Cities of Melbourne, Port Phillip and Maribyrnong.Trees within the eastern portal (South Yarra) precinct in the City of Stonnington have been assessed by Tree Dimensions in a separate impact assessment (Technical Appendix S). Other aspects, including terrestrial ecology, landscape and visual, groundwater and the heritage value of trees and landscape, are covered in the following impact assessments:

- Technical Appendix J *Historical Cultural Heritage*
- Technical Appendix L *Landscape and Visual*
- Technical Appendix O *Groundwater*
- Technical Appendix T *Terrestrial Flora and Fauna.*

1.1 PROJECT DESCRIPTION

The proposed Melbourne Metro comprises two nine-kilometre long rail tunnels from Kensington to South Yarra, travelling underneath Swanston Street in the Central Business District (CBD), as part of a new Sunbury to Cranbourne/Pakenham line.

The infrastructure proposed to be constructed as part of Melbourne Metro broadly comprises:

- Twin nine-kilometre rail tunnels from Kensington to South Yarra connecting the Sunbury and Cranbourne/ Pakenham railway lines (with the tunnels to be used by electric trains)
- Rail tunnel portals (entrances) at South Kensington and South Yarra
- New underground stations at Arden, Parkville, CBD North, CBD South and Domain with longer platforms to accommodate longer High Capacity Metro Trains (HCMTs). The stations at CBD North and CBD South will feature direct interchange with the existing Melbourne Central and Flinders Street Stations respectively
- Train/tram interchange at Domain station.

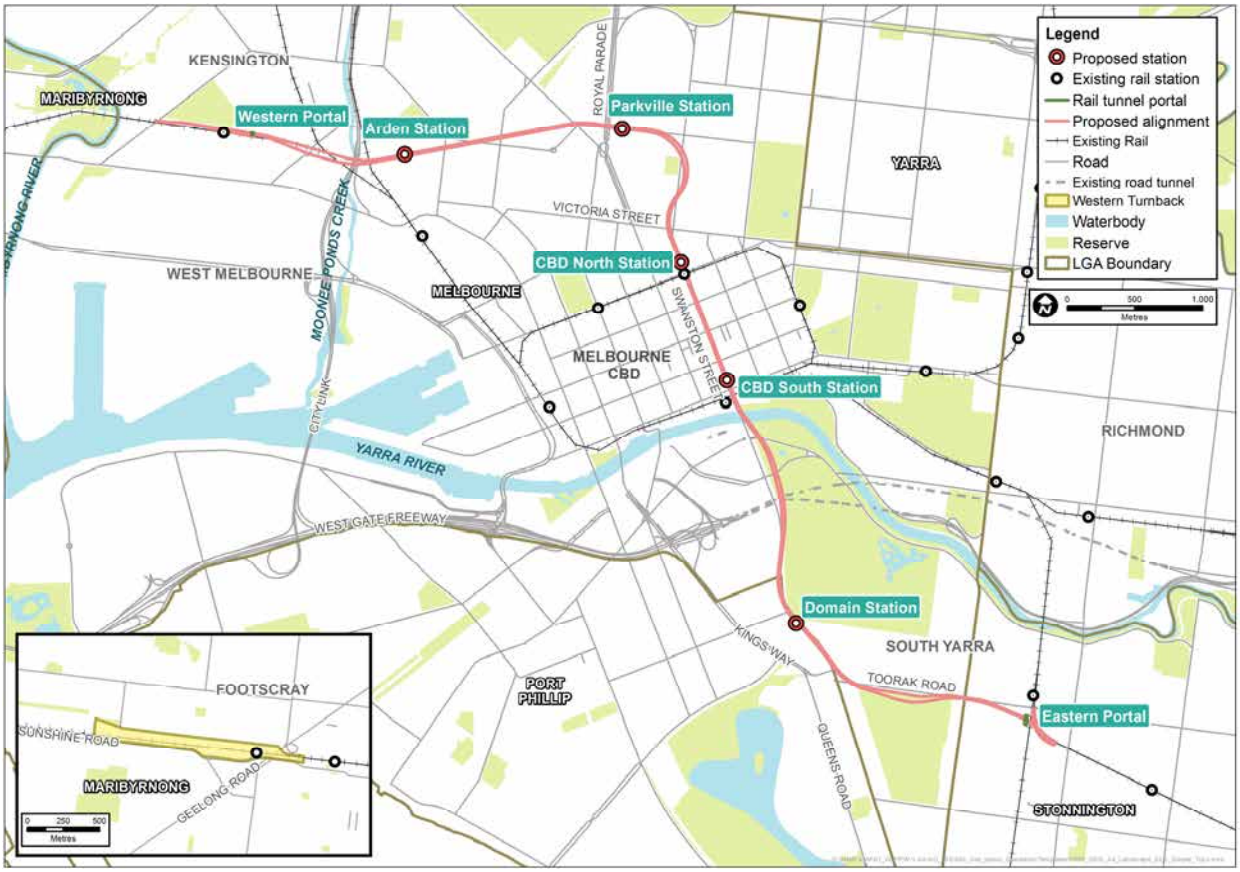

FIGURE 1-1 MAP OF THE PROPOSED MELBOURNE METRO ALIGNMENT AND FIVE UNDERGROUND STATIONS

Proposed construction methods involve bored and mined tunnels, cut and cover construction of station boxes at Arden, Parkville and Domain and portals, and cavern construction at CBD North and South. Melbourne Metro would require planning, environmental and land tenure related approvals to proceed.

1.2 PURPOSE OF THIS REPORT

This study provides an assessment of potential impacts to trees within the Melbourne Metro project boundary including trees managed by the City of Melbourne, the City of Port Phillip, the University of Melbourne as well as other trees located within the publicly owned (VicTrack) land at Arden and West Footscray.

Trees within the Eastern Portal (South Yarra) precinct in the City of Stonnington have been assessed by Tree Dimensions in a separate impact assessment (see Technical Appendix S *Aboriculture*).

1.3 PROJECT PRECINCTS

For assessment purposes, the project boundary has been divided into precincts as outlined below. The precincts have been defined based on the location of project components and required construction works, the potential impacts on local areas and the character of surrounding communities.

The proposed precincts are:

- Precinct 1: Tunnels (outside other precincts)
- Precinct 2: Western Portal (Kensington)
- Precinct 3: Arden station (including substations)

- Precinct 4: Parkville station
- Precinct 5: CBD North station
- Precinct 6: CBD South station
- Precinct 7: Domain station
- Precinct 8: Eastern Portal (South Yarra)
- Precinct 9: Western Turnback (West Footscray).

A plan showing the location of the nine precincts is contained in Figure 1-1.

1.4 STUDY AREA

The study area includes Precincts 1 to 7 as well as Precinct 9: Western Turnback. The study area is limited to sites where trees are present within the landscape, and where there is potential for loss or damage to trees as a consequence of construction and operation of the Concept Design and alternative design options. Surveys have been completed along sections of the tunnels alignment, at the western portal (Kensington) and each of the station locations and associated construction zones.

In relation to Precinct 1: Tunnels, with the exception of the proposed rail tunnels above the CityLink tunnels in the Domain Parklands, the proposed rail tunnels would be too deep to have any impact on trees located above the tunnels. Trees would only be impacted on and need to be removed at areas of the proposed surface emergency and other access shafts (including alternative design option), and potential Fawkner Park tunnel boring machine (TBM) southern launch site.

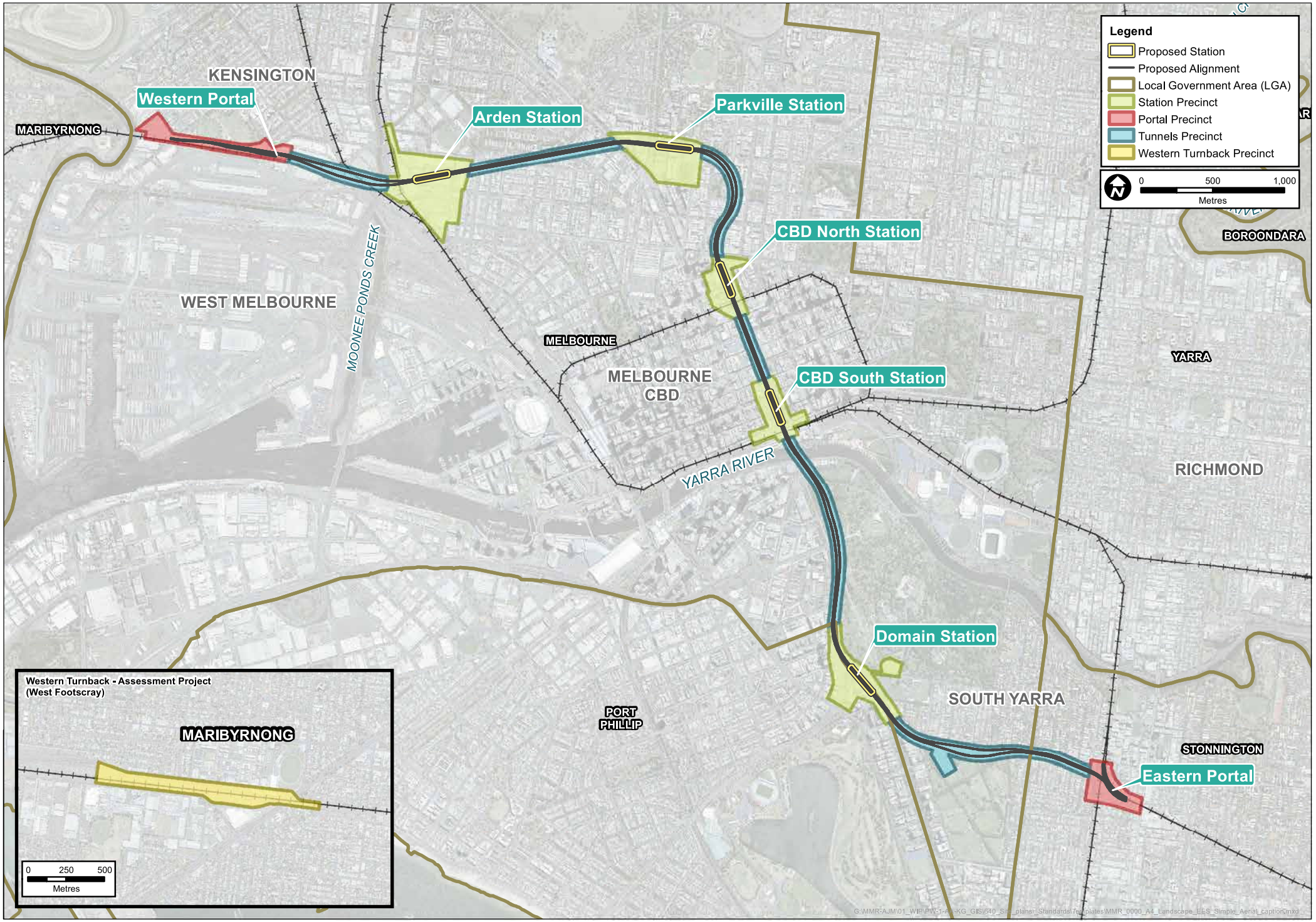

FIGURE 1-2 MAP OF THE PROPOSED MELBOURNE METRO PRECINCTS

2 SCOPING REQUIREMENTS

2.1 EES OBJECTIVES

The following draft EES evaluation objectives (Table 2-1) are relevant to arboriculture and identify the desired outcomes in the context of potential project effects. The draft EES evaluation objectives provide a framework to guide an integrated assessment of environmental effects of the project, in accordance with the *Ministerial guidelines for assessment of environmental effects under the Environment Effects Act 1978*.

TABLE 2-1 LANDSCAPE, VISUAL AND RECREATIONAL VALUES

Draft EES evaluation objective	Key legislation
Landscape, visual and recreational values - To avoid or minimise adverse effects on landscape, visual amenity and recreational values as far as practicable	*Planning and Environment Act 1987*

2.2 EES SCOPING REQUIREMENTS

The following extracts from the Scoping Requirements, issued by the Minister for Planning, are relevant to the landscape, visual and recreational values draft EES evaluation objective (Table 2-2).

TABLE 2-2 SCOPING REQUIREMENTS FOR LANDSCAPE, VISUAL AND RECREATION

Landscape, visual and recreational values	Requirements for the assessment of effects
Key Issues	• Potential adverse effects on highly valued urban landscapes, resulting from construction phase works or inappropriate siting of permanent new works • Potential temporary or permanent effects on public open space and recreational areas, affecting access to or enjoyment of recreational opportunities, especially during the construction phase.
Priorities for characterising the existing environment	• Identify key visual and landscape features and values in the area or broader vicinity of proposed project works • Identify condition and uses of public open space and facilities, which could be occupied or otherwise adversely affected by project construction works.
Design and mitigation measures	• Identify project design and construction management measures to avoid or minimise adverse effects on landscape character and visual values, especially with regard to long-term effects.
Assessment of likely effects	• Assess likely extent and duration of residual adverse effects on landscape and visual values, including use of photo-montages or other suitable methods for depicting predicted landscape changes, and available measures to manage or offset those effects • Identify and assess likely residual effects on recreational activities, including with regard to public land to be used or occupied for project works.

Landscape, visual and recreational values	Requirements for the assessment of effects
Approach to manage performance	• Identify principles to be adopted to develop measures to monitor adverse effects on landscape and visual values and contingency measures to be implemented if required • Describe the approach to identifying proposed methods to monitor effects on recreational opportunities and the effectiveness of mitigation measures that have been put in place.

3 LEGISLATION, POLICY AND GUIDELINES

Table 3-1 summarises the relevant primary legislation that applies to the project as well as the implications, required approvals and interdependencies and information requirements associated with obtaining approvals.

TABLE 3-1 PRIMARY LEGISLATION AND ASSOCIATED INFORMATION

Legislation / policy / guideline	Key policies / strategies	Implications for this project	Approvals required	Timing / interdependencies / information requirements
Commonwealth				
None noted				
State				
Heritage Act 1995	Victorian Heritage Register (VHR)	Trees within a registered place may require permits for removal / works within defined zones, as defined in the Extent of Registration for the place or exempted under Permit Exemptions. Statements of significance for many places specifically refer to trees being part of the significance of a place.	Heritage Victoria approvals for tree removals / works in proximity to trees within a registered place.	Permit applications should be accompanied by a Heritage Impact Statement as well as a current arboricultural assessment of impacted, and potentially impacted trees. The Ministers assessment under the *Environment Effects Act 1978* will inform decision making by Heritage Victoria under the *Heritage Act 1995*. Applications for approval from Heritage Victoria would be made after the release of this assessment.

The following places within the arboricultural study area are included on the VHR:

- **Royal Parade, VHR H2198 (City of Melbourne)**
- **Gatekeeper's Cottage, University of Melbourne, VHR H0919 (City of Melbourne)**

Legislation / policy / guideline	Key policies / strategies	Implications for this project	Approvals required	Timing / interdependencies / information requirements
- **Domain Parklands, VHR H2304 (City of Melbourne)** - **Marquis of Linlithgow Memorial, VHR H0366 (City of Melbourne)** - **Shrine of Remembrance, VHR H0848 (City of Melbourne)** - **South African Soldiers Memorial, VHR H1374 (City of Port Phillip)**				
Local				
Melbourne, Port Phillip, and Maryibynong Planning Schemes	Clause 43.01 Heritage Overlay	A planning approval is required to remove, destroy or lop a tree if the schedule to the overlay identifies the heritage place as one where tree controls apply.	Planning approval, unless place is included on the VHR Where a site is listed on the VHR, the requirements of the Heritage Act override the requirements of the planning scheme and no planning approval is required. All the trees in the study area affected by the project are on land listed on the VHR.	n/a
Local policies and guidelines				
City of Melbourne **Urban Forest Strategy**		The Urban Forest Strategy 2012-2032 is a strategic document that sets to achieve the following goals: **1: Increase canopy cover** from 22 at present to 40% by 2040 **2: Increase urban forest diversity** to no more than 5% of any tree species, no more than 10% of any genus and no more than 20% of any one family **3: Improve vegetation health** 90% of the City of Melbourne's		The *Major Transport Projects Facilitation Act 2009* provides that a local law permit would not be required for Melbourne Metro.

Legislation / policy / guideline	Key policies / strategies	Implications for this project	Approvals required	Timing / interdependencies / information requirements
		tree population will be healthy by 2040 **4: Improve soil moisture and water quality** **5: Improve urban ecology** **6: Inform and consult the community.** The strategy provides a basis for replacement and future tree plantings within the City of Melbourne, including trees located within the proposed project boundary. It contains detailed planting and species plans for all areas across the City of Melbourne.		
City of Melbourne Tree Retention and Removal Policy 2012		The policy sets out standards for the priority status and approval of tree removals from Council managed land in the context of development, as well as tree protection requirements for the successful retention of trees as part of development.	N/A	'Prior to commencement of a development project, a property owner or representative shall prepare a Tree Protection Management Plan if any activity is within the tree protection zone of a public tree' defined in accordance with the Australian *Standard"1 AS4970 Protection of Trees on Development Sites*. The Policy sets out bonds for tree protection adjacent to works as well as costs for removal and replacement.
City of Melbourne Urban Forest Tree Valuations		Where removal of a public tree is approved by Council's arborist for a development, the associated cost of the tree and its removal shall be paid by the property owner or representative prior to the removal.		Valuation for each tree based on the following four costs / calculated values: A – Removal Costs B – Amenity Value (Calculated in accordance with Council's Amenity Formula C – Ecological Services Value (Calculated in accordance with the i-Tree valuation tool D – Reinstatement Costs.

[1] City of Melbourne *Tree Retention and Removal Policy* 2012 p. 6

Legislation / policy / guideline	Key policies / strategies	Implications for this project	Approvals required	Timing / interdependencies / information requirements
Port Phillip - Community Amenity Local Law No. 1	Clause 44	A permit is required to prune or remove a significant tree or palm, located on private land.	N/A	The *Major Transport Projects Facilitation Act 2009* provides that a local law permit would not be required for Melbourne Metro.
Greening Port Phillip. An Urban Forest Approach 2010	Tree Policy	A strategic document that includes policies for tree protection on private and public land, tree planting and selection, tree removal and replacement, climate change adaptation (including water sensitive urban design), tree root management, tree asset management and urban character.		
Greening Port Phillip. An Urban Forest Approach 2010	Tree Valuation	Amenity value should be sought for a tree if the tree is significant (due to its size, prominence in the landscape, rarity, or other highly esteemed social value) and is to be removed as a result of a development application for removal.		The City of Melbourne – Amenity Value Formula, is used for the purposes of calculating the monetary value of a public tree. There is also a charge for tree and stump removal, tree replacement, planting and 24 months maintenance. Young trees with a 5 cm trunk diameter or less would be replaced by another tree and there would be no amenity value charge.
Greening Port Phillip. Street Tree Planting Guide 2010 - 2015	Tree Planting Guide – 5 (Windsor and Melbourne)	The guide outlines street tree replacement and new plantings within Precinct 5 that includes a portion of the area.	No street tree planting activities are prioritised for streets within the study area.	
Other guidelines				
AS4970-2009 Protection of Trees on Development Sites		AS4970-2009 describes best practice for the planning and protection of trees on development sites.		Tree management and protection should be considered at all stages of development from planning, demolition and other early works, construction and post-construction activities. Tree protection would be guided by a Tree Protection Plan prepared in accordance with AS4970-2009, based on detailed design and construction documentation.

Given the siting of the works in the City of Maribyrnong, no relevant legislation, policy or guidelines have been identified.

4 METHODOLOGY

4.1 EXISTING CONDITIONS

4.1.1 DESKTOP ASSESSMENT

The following desktop assessment was undertaken during the preparation of the arboricultural baseline study:

- Acquisition and review of City of Melbourne's Urban Forest Tree data, retrieved 19 May 2015 and City of Port Phillip's street tree data supplied by Council, 25 August, 2015
- Review of the VHR and identification of VHR places within the proposed project boundary
- Review of the Melbourne, Port Phillip and Maribyrnong Planning Schemes as they relate to vegetation controls, and identification of places where planning controls apply to trees within the proposed project boundary
- Incorporation of City of Melbourne, City of Port Phillip and University of Melbourne tree assessment data into the baseline arboricultural database
- Preparation of field mapping to form the basis of on-site investigations for City of Melbourne managed trees, trees within the University of Melbourne, and City of Port Phillip managed trees.

It is noted that the City of Melbourne's Urban Forest Data is limited to species, location, age, trunk diameter and ULE of trees.

4.1.2 SITE INVESTIGATIONS

Arboricultural assessments were undertaken for each tree or tree group within the nominated study area between July and September 2015.

A ground-based, visual tree assessment (VTA) was undertaken for each tree or tree group. This included size (diameter of trunk at breast height, tree height and width) and condition (health and structure) data, and an estimate for the anticipated useful life expectancy of each tree.

The majority of trees within the study area are managed by the City of Melbourne, City of Port Phillip and the University of Melbourne. Existing tree assessment data from those authorities was used as a basis for determining the location of trees and the records were updated as required based on the outcome of the field surveys so that an assessment could be made of how they might be impacted by Melbourne Metro.

The following information was collected for each tree or tree group and is included in the tree assessment data tables included in Appendix A:

- Taxon i.e. genus, species, sub-specific identifiers (as applicable)
- Common name, derived from taxon
- DBH (Diameter at breast height), by default measured, otherwise estimated as noted in tree data tables
- Height, as measured with a laser rangefinder
- Width, estimated
- Age estimate
- Health

- Structure
- Crown class
- ULE.

Detailed assessment data for each tree / tree location is included in Appendix A of this report. Definitions for each of these arboricultural descriptors are included in Appendix B of this report.

Unique identifiers allocated to trees managed by the City of Melbourne, City of Port Phillip and University of Melbourne have been referenced, where available. As comprehensive data exists for trees within the proposed project boundary, an objective of the baseline report was to identify where trees have been removed or are missing from the proposed project boundary. On this basis, and only for the purposes of this report, the tree assessment tables included within Appendix A utilise each authority's unique identifier as a planting location with or without a tree, regardless of the presence of a tree. Trees that have been removed or are unable to be located (potentially as a mapping) are noted in the comments field for each tree.

4.2 RISK ASSESSMENT

4.2.1 OVERVIEW

An environmental risk assessment has been completed for potential impacts of Melbourne Metro in relation to arboricultural considerations. The risk-based approach is integral to the EES. Importantly, an environmental risk is different from an environmental impact. Risk is a function of the likelihood of an adverse event occurring and the consequence of the event. Impact relates to the outcome of an action in relation to values of a resource or sensitivity of a receptor and its ability to recover or impacts to be managed. Benefits are considered in impact assessment but not in risk assessment. Impact assessment must be informed by risk assessment so that the level of action to manage an impact relates to the likelihood of an adverse impact occurring.

The overall risk assessment process adopted was based on AS/NZS ISO 31000:2009, as illustrated in Figure 4-1.

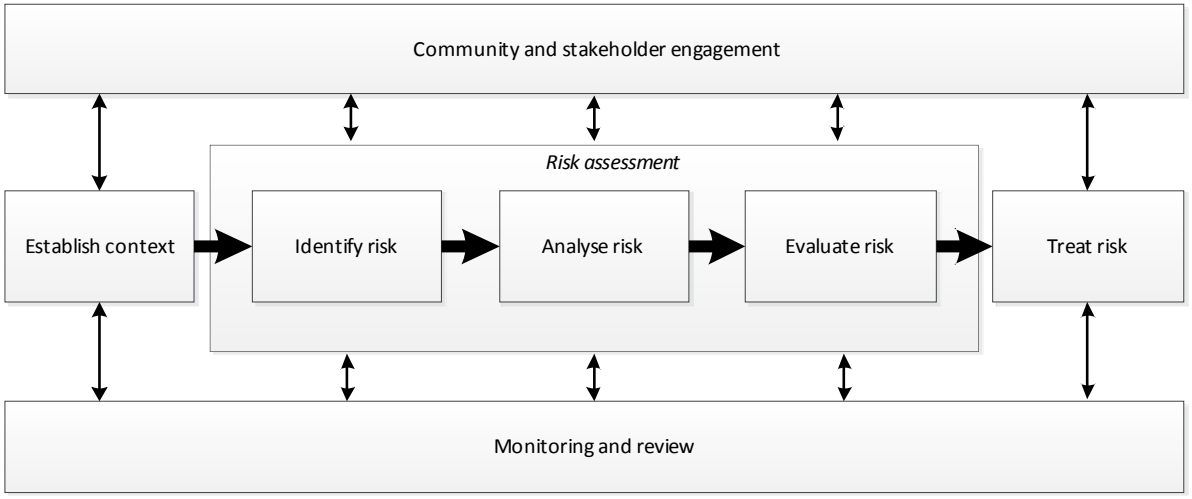

FIGURE 4-1 OVERVIEW OF AS/NZS ISO 31000-2009 RISK PROCESS

The following tasks were undertaken to determine the impact pathways and assess the risks:

- Setting of the context for the environmental risk assessment
- Development of consequence and likelihood frameworks and the risk assessment matrix
- Review of project description and identification of impact assessment pathways

- Allocation of consequence and likelihood categories and determination of preliminary initial risks
- Workshops with specialist team members from related discipline areas focussing on very high, high and moderate initial risks to ensure a consistent approach to risk assessment and to identify possible interactions between discipline areas
- Follow-up liaison with specialist team members and consolidation of the risk register.

A more detailed description of each step in the risk assessment process is provided in Technical Appendix B *Environmental Risk Assessment Report.*

4.2.2 CONTEXT

The overall context for the risk assessment and a specific context for each specialist study is described in Technical Appendix B *Environmental Risk Assessment Report*. The context describes the setting for evaluation of risks arising from Melbourne Metro. The specific context for the arboricultural impact assessment follows:

> *The study area lies within and under some of Melbourne's most noted parks and treed avenues, as well as other areas where trees are prominent components of the public realm and are valued by the community. The Melbourne Metro alignment and associated infrastructure potentially interacts with trees at discrete locations, including parks and treed avenues, for the construction of stations, emergency access shafts and construction work sites. Melbourne Metro would be constructed in a manner that minimised tree loss during construction and was aligned with the requirements and outcomes of the following strategies:*
>
> - *Urban Forest Tree Protection Guidelines (City of Melbourne)*
> - *Greening Port Phillip: An urban forest approach*
> - *Conservation Management Plans for significant trees and avenues where applicable.*

The likelihood rating criteria used in the risk assessment by all specialists is shown in Table 4-1.

TABLE 4-1: LIKELIHOOD RATING CRITERIA

Level	Description
Rare	The event is very unlikely to occur but may occur in exceptional circumstances.
Unlikely	The event may occur under unusual circumstances but is not expected.
Possible	The event may occur once within a five-year timeframe.
Likely	The event is likely to occur several times within a five-year timeframe.
Almost certain	The event is almost certain to occur one or more times a year.

The consequence criteria framework used in the risk assessment follows. Each specialist has used this framework to develop criteria specifically for their assessment.

TABLE 4-2 CONSEQUENCE FRAMEWORK

Level	Qualitative description of biophysical / environmental consequence	Qualitative description of socio-economic consequence
Negligible	No detectable change in a local environmental setting.	No detectable impact on economic, cultural, recreational, aesthetic or social values.
Minor	Short term, reversible changes, within natural variability range, in a local environmental setting.	Short term, localised impact on economic, cultural, recreational, aesthetic or social values.
Moderate	Long term but limited changes to local environmental setting that are able to be	Significant and/or long-term change in quality of economic, cultural, recreational, aesthetic or

Level	Qualitative description of biophysical / environmental consequence	Qualitative description of socio-economic consequence
	managed.	social values in local setting. Limited impacts at regional level.
Major	Long term, significant changes resulting in risks to human health and/or the environment beyond the local environmental setting.	Significant, long-term change in quality of economic, cultural, recreational, aesthetic or social values at local, regional and State levels. Limited impacts at national level.
Severe	Irreversible, significant changes resulting in widespread risks to human health and/or the environment at a regional scale or broader.	Significant, permanent impact on regional economy and/or irreversible changes to cultural, recreational, aesthetic or social values at regional, State and national levels.

The consequence rating criteria used in the risk assessment specifically for arboriculture is shown in Table 4-3.

TABLE 4-3 CONSEQUENCE RATING CRITERIA

Level of Consequence	Consequence criteria
Negligible	Within a single precinct, no loss or significant disturbance to Mature Long Term Viable[2] trees in the public realm.
Minor	Within a single precinct, limited removals or significant disturbance to Mature Long Term Viable trees in the public realm with scope within the affected project area to re-establish healthy replacement trees within 5 years of project completion.
Moderate	Within a single precinct, significant removals or disturbance to Mature Long Term Viable trees in the public realm with scope within the affected project area to re-establish healthy replacement trees within 5 years of project completion.
Major	Within a single precinct, significant removals or disturbance Mature Long Term Viable trees in the public realm with limited scope within the affected project area to re-establish healthy replacement trees within 5 years of project completion.
Severe	Within a single precinct, near complete removal or significant disturbance to Mature Long Term Viable trees in the public realm with significant permanent loss of canopy cover.

The environmental risk assessment matrix used by all specialists to determine levels of risk from the likelihood and consequence ratings is shown below.

TABLE 4-4 RISK ASSESSMENT MATRIX

		Consequence (C) ratings				
		Negligible	**Minor**	**Moderate**	**Major**	**Severe**
Likelihood (L) rating	**Rare**	Very Low	Very Low	Low	Medium	Medium
	Unlikely	Very Low	Low	Low	Medium	High
	Possible	Low	Low	Medium	High	High
	Likely	Low	Medium	Medium	High	Very High
	Almost Certain	Low	Medium	High	Very High	Very High

[2] Mature Long Term Viable Tree is a semi mature to over-mature tree with a Useful Life Expectancy greater than 10 years

Section 6 provides a summary of the arboricultrural risks assessed as part of the EES.

4.3 ASSUMPTIONS

The assessment of the potential impact on trees in the urban environment by Melbourne Metro and the outline in this report has been undertaken at a level appropriate to address the EES Scoping Requirements. However, this report is not a complete arboricultural impact assessment as defined in AS4970-2009 *Protection of Trees on Development Sites*, which should be undertaken with final detail design drawings.

Based on the Concept Design (and alternative design options), the following assumptions have been made in the preparation of this report:

- All trees located within proposed construction areas are assumed to require removal. This is a conservative assumption, as in some cases the recommended Environmental Performance Requirements provide an opportunity to retain some trees within construction areas
- Trees located in road reserves adjacent to, but outside, construction areas are assumed to be retained
- Methodologies for early works (services relocations) can be implemented using tree sensitive construction measures, such as horizontal boring for underground services
- No inspection of trees on private property except for the publicly owned (VicTrack) land at Arden.
- The assessments in this report against the draft EES evaluation objectives and assessment criteria are based on and have been prepared within the context of the Concept Design and alternative design options that John Patrick Pty Ltd has been instructed to assess.

4.4 STAKEHOLDER ENGAGEMENT

Stakeholder consultation has been undertaken by Melbourne Metro to obtain approvals and information for on-site arboricultural assessments with the following bodies:

- City of Melbourne
- City of Port Phillip
- Shrine of Remembrance Trustees
- University of Melbourne
- Hytec Industries, located on publicly owned (VicTrack) land at Laurens Street, North Melbourne.

The City of Melbourne has also provided advice regarding their tree valuation and assessment processes.

In addition to the specific agency and Technical Reference Group (TRG) engagement and the engagement listed above, general engagement and consultation with the community was also conducted as part of this assessment. Written feedback was obtained through feedback forms and the online engagement platform, and face-to-face consultation occurred at the drop-in sessions (refer to Technical Appendix C *Community and Stakeholder Feedback Summary Report* for further information).

Feedback related to arboriculture focused primarily on the impact that removing trees would have on landscape values. In line with these concerns, the recommended Environmental Performance Requirements would ensure that, where possible, trees would be replaced in accordance with local government guidelines and policies (EPR A3). Additionally, the Technical Appendix M *Urban Design Strategy* outlines a range of measures that incorporate local considerations and precinct specific guidance for maintenance or enhancement of landscape values.

4.5 LIMITATIONS

The limitations associated with this assessment are as follows:

- The arboricultural assessment undertaken as part of this study was limited to documenting the existing baseline conditions for the trees, in terms of location, quantity, species, size, structure and health. It does not account for the heritage, environmental or ecological values of each tree. It does not include any net gain assessment.
- Assessment for trees within the City of Melbourne and City of Port Phillip public realm relies on GPS sourced positional data. This data was provided by the relevant councils. In some instances, the field survey recorded the location of trees that was not consistent with the councils' GPS records. This is likely due to the inherent inaccuracy of utilising GPS beneath established tree canopies
- At a number of locations, works were being undertaken that restricted close inspection of trees.
- The impact assessment is based upon a concept design, with alternative design options. While the degree of assessment presented in this report is appropriate to address the EES Scoping Requirements, a full arboricultural impact assessment, in accordance with AS4970-2009 *Protection of Trees on Development Sites*, is recommended as a deliverable of the detailed design and documentation of the Melbourne Metro.

Trees located within the City of Stonnington (eastern portal) are outside the scope of this report.

5 REGIONAL CONTEXT

The following key issues are noted, having arisen following completion of the field assessments and analysis of the assessment data.

The study area encompasses locations in the local government areas of Melbourne, and Port Phillip and Maribyrnong (for the western turnback). The most intensive construction activities, which have the greatest potential impact on the urban landscape and result in the consequential loss of or damage to trees, would occur in the cities of Melbourne and Port Phillip. There are no trees located at the proposed western turnback (West Footscray) location.

Because much of the tunnelling associated with the project occurs at depth, no impacts are anticipated to trees above tunnels at ground level. The primary impacts would occur at discrete locations where works at ground surface level are proposed to be carried out, that is, the proposed stations, emergency access shafts and construction work sites. These areas are generally well separated from each other. The impact in terms of tree loss (or potential damage to trees) would therefore occur in localised areas, rather than along the entire proposed project boundary.

The Table 5-1 provides a summary of the key issues within the study area.

TABLE 5-1 SUMMARY OF KEY ISSUES WITHIN THE STUDY AREA

Precinct	Key issues	Commentary
Regional context	Removal of trees from the public realm.	Melbourne is noted as a garden city, with large numbers of mature trees through its inner urban streetscapes. Its Victorian and Edwardian era public parks and gardens provide a high level of amenity to residents and visitors alike. The majority of trees assessed are located in some of Melbourne's most highly prized streetscapes and parks. Where practicable, project design, construction techniques and ongoing management options which minimise the extent of tree loss is recommended.
	Removal of trees from established avenues.	Two of the proposed station locations, Parkville and Domain, are located within established avenue plantations, Royal Parade and St Kilda Road respectively. Gaps within the continuity of the avenues would develop as a consequence of construction. As well as carefully considering and mitigating construction impacts to minimise overall tree losses from established avenues, mitigation should also seek to re-establish canopy cover within the avenue as part of overall design goals.
	Integration with the City of Melbourne's Urban Forest Strategy and City of Port Phillip's Greening Port Phillip urban forest plan.	The advanced age, and limited life expectancy, of many of the trees within the proposed project boundary, especially elms, was a notable finding of the field assessment. The City of Melbourne is actively replacing trees with limited ULEs and diversifying its urban tree population as part of its Urban Forest Strategy. Replacement and new tree plantings that occur as part of the project should integrate with the objectives of the City of Melbourne Urban Forest Strategy and Greening Port Phillip, as well as the vision of both Councils.

Precinct	Key issues	Commentary
	Tree removal costs.	The City of Melbourne and City of Port Phillip have defined methodologies for costing trees located on public land that require removal for the purposes of development. These include the cost of removal, the amenity value of the tree, the ecological services value for the tree, cultural significance and reinstatement costs. An evaluation of the costs of trees that would require removal to facilitate construction would be required and should be undertaken in conjunction with the City of Melbourne and City of Port Phillip to ensure accuracy of costing due to the potentially large number of trees that would require removal.
	Transplanting of existing trees	Due to the difficulties in successfully transplanting established trees from a highly urbanised environment, especially in such close proximity to services, the long re-establishment period and likelihood of eventual tree death, transplanting of existing street or park trees is generally not considered to be viable. The exception are palms such as Canary Island palm and cotton palm which transplant readily, even at mature sizes, and given sufficient root balls, can be temporarily stored and maintained and re-established at the end of construction.
	Assessed tree ULE.	It is noted that there was divergence (in some cases significant) between the existing City of Melbourne ULE assessments for many plane trees within the proposed project boundary, against the field assessment undertaken as part of this study. In many cases, the field assessment revealed much longer ULEs than those recorded by City of Melbourne, possibly a response to more favourable growing conditions in recent years, exhibiting improved health characteristics. As the trees were dormant at the time of assessment, limited sampling of these particular trees is recommended once the trees are in leaf, to confirm the updated ULE. The ULE of each tree contributes to its monetary value as calculated by City of Melbourne.
	Tree location data.	Many of the tree locations mapped from existing GIS coordinates did not closely correlate to the tree's position on site. In some instances where canopy cover is heavy, such as Alexandra Park (Tom's Block) and Fawkner Park, it was not always possible to match a tree to an existing COM record. This is a consequence of the inherent difficulties in establishing an accurate GPS reading under dense tree cover. Inaccurate mapped tree locations would reduce the accuracy of the impact assessment. Ideally, where trees are located in the vicinity of construction works within the study area, these should be accurately surveyed as a priority for detailed design and prior to construction.

6 RISK ASSESSMENT

Table 6-1 presents the arboricultural risks associated with the project, based on a precinct basis. The environmental risk assessment methodology is outlined in Section 4.2.

Existing controls were identified to inform the assessment of initial risk ratings. These existing controls are based on statutory requirements, aspects that are inherent in the project design and standard requirements that are typically incorporated into construction contracts for rail projects. The potential impacts of the identified risks have been assessed, the findings of which are summarised in the subsequent chapters.

For the purposes of assessment, the level of consequence was rated for trees in the public realm that already contribute to the urban landscape (semi-mature, mature and over-mature trees) and which are considered to be viable beyond the anticipated time frame of delivery of the project, that is trees with an assessed useful life expectancy (ULE) of 10 years or more. This category is described as medium and long-term viability (MLTV) trees. Conversely, removal of juvenile trees or those with very limited ULEs was assumed to have a low impact.

The potential risks are localised with the primary identified risks for the construction relating to the removal of trees within the Parkville, Domain and Tunnels (Domain Parklands, Tom's Block) precincts. In these areas the initial risk was assessed as high and the residual risk also remains high as the level of consequence, significant removal of MLTV trees within these precincts and replanting to re-establish 40 per cent canopy cover, cannot be further mitigated with Environmental Performance Requirements.

The residual risks elsewhere (Western Portal, Arden, CBD North, CBD South and the balance of the Tunnels Precinct), where trees are potentially to be removed for portals, station boxes, access shafts and associated construction, are medium. The residual risks for potential damage to trees to be retained on the periphery of construction areas is low, as these impacts can be managed within the scope of specific Tree Protection Plans prepared for each precinct.

As a result of the risk assessment, project-specific performance requirements (Environmental Performance Requirements) have been recommended to reduce risks and hence determine the residual risk rating. The Environmental Performance Requirements are outlined in the following sections of the impact assessment and collated in Table 15-1. All Environmental Performance Requirements are incorporated into Chapter 23 *Environmental Management Framework* of the EES.

For further details, refer to Technical Appendix B *Environmental Risk Assessment Report* which includes the full risk register, with existing controls and recommended Environmental Performance Requirements assigned to each risk.

TABLE 6-1 RISK REGISTER FOR IMPACT ASESSMENT

Impact pathway		Precinct	Initial risk			Residual risk			Risk no.
Category	**Event**		**C**	**L**	**Risk**	**C**	**L**	**Risk**	
Construction									
Construction of station boxes and entries and associated construction zones	Removal of trees from the public realm Damage to trees on periphery of excavation (crown, trunk and roots)	4 – Parkville 7 – Domain	Moderate	Almost Certain	High	Moderate	Almost Certain	High	AR001
Soil grout injection / soil mixing for soil stabilisation over shallow tunnel alignments	Removal of trees from Domain Parklands	1 – Tunnels	Moderate	Almost Certain	High	Moderate	Almost Certain	High	AR002
Construction of portals, station boxes, entries, access shafts and associated construction zones	Removal of trees from the public realm Damage to trees on periphery of excavation (crown, trunk and roots)	1 – Tunnels 2 – Western Portal 3 – Arden 5 – CBD North 6 – CBD South	Minor	Almost Certain	Medium	Minor	Almost Certain	Medium	AR003
Removal and/or installation of underground services	Damage to tree roots resulting in reduced health, tree death or destabilisation	All	Moderate	Possible	Medium	Moderate	Unlikely	Low	AR004
Chemical spill, including as a result of refuelling of construction equipment	Damage to trees resulting in reduced health or death	All	Minor	Possible	Low	Minor	Possible	Low	AR005
Deep tunnel boring, mined station boxes	Tree destabilisation	1 – Tunnels 5 – CBD North 6 – CBD South	Moderate	Rare	Low	Moderate	Rare	Low	AR006

Impact pathway		Precinct	Initial risk			Residual risk			Risk no.
Category	Event		C	L	Risk	C	L	Risk	
Modification to adjacent soil profiles and modification to existing run-off	Droughting / waterlogging tree root zones resulting in reduced health or death	All	Moderate	Possible	Medium	Minor	Possible	Low	AR007
Installation of fill over root zones	Deoxygenation of soil and modification to water infiltration resulting in reduced health or death	1 – Tunnels 2 – Western Portal 3 – Arden 7 – Domain	Moderate	Possible	Medium	Minor	Possible	Low	AR008
Vehicular and pedestrian access through parkland, including use as set down areas	Soil compaction resulting in reduced tree health	1 – Tunnels 2 – Western Portal 4 – Parkville 7 – Domain	Moderate	Likely	Medium	Minor	Possible	Low	AR009
Piling / crane access / high load access within construction zones	Damage to tree crowns as a result of mechanical damage from machinery or loads	All	Minor	Likely	Medium	Minor	Possible	Low	AR010
Vehicular access to construction areas	Damage to tree crowns as a result of mechanical damage from trucks or high loads	All	Minor	Likely	Medium	Minor	Possible	Low	AR011
Clearance pruning to tree crowns and installation of temporary aerial services	Damage to trees by poor pruning practices	All	Minor	Possible	Low	Minor	Possible	Low	AR012
Station and tunnel ventilation	Desiccation of adjacent tree canopies resulting in leaf loss and reduced vigour	All	Minor	Unlikely	Low	Minor	Unlikely	Low	AR013

7 PRECINCT 1: TUNNELS

7.1 PROJECT COMPONENTS

INFRASTRUCTURE

The relevant project components of the Concept Design for this assessment are:

CityLink Tunnels Crossing – Above CityLink Tunnels

Tunnels beneath the Domain Parklands above the CityLink tunnels within 3.1 m of the surface, primarily within the area known as Tom's Block, also known as Alexandra Park (see Figure 7–1).

TBM Southern Launch Site

Fawkner Park open space and tennis courts

Excavation of the TBM southern launch site near the northern park boundary including aerial access for craning in large machinery components from Toorak Road West.

Domain launch

Excavation of the Domain TBM launch site, including aerial access for craning in large machinery components occurring within the Domain station construction zone.

Emergency Access Shafts

Fawkner Park north east location

Excavation of an emergency access shaft in the north-east of Fawkner Park, close to the Toorak Road West boundary, with a permanent above ground structure.

Queen Victoria Gardens, adjacent to Linlithgow Avenue

Excavation of an emergency access shaft on the north side of Linlithgow Avenue, with a permanent above ground structure.

ALTERNATIVE DESIGN OPTIONS

The relevant project components for the alternative design options include:

CityLink Tunnels Crossing – Below CityLink Tunnels

Deep tunnels under the CityLink tunnels below Tom's Block (see Figure 7–1).

Emergency Access Shafts

Option 2 – using the location of the Fawkner Park TBM launch site

Excavation of an emergency access shaft in the north of Fawkner Park, close to the Toorak Road West boundary, with a permanent above ground structure. This site would be contained within the proposed TBM southern launch site and associated construction work site sub-precinct.

Located in Tom's Block

Excavation of an emergency access shaft on the east side of Tom's Block, close to Linlithgow Avenue, with a permanent above ground structure.

CONSTRUCTION

The relevant considerations for construction include:

CityLink Tunnels Crossing – Above CityLink Tunnels

Ground stabilisation (grouting/soil mixing) may be required through Tom's Block above the bored tunnel to limit the impact of surface settlement, which would be anticipated to be up to 50 mm, and the potential for ground subsidence during tunnelling. The shallowest point below existing ground level (-3.1 m) would be below the zone of anticipated root growth.

TBM Southern Launch Site

Fawkner Park open space and tennis courts

Construction activities would include excavation for the TBM southern launch site, aerial access for craning in large machinery components and the establishment of a construction work site in the western portion of Fawkner Park. Vehicular access would be provided through the northern park boundary to Toorak Road West.

Domain Launch Site

The Domain launch site would be contained within the Precinct 7: Domain Station construction work site.

Emergency Access Shafts

Fawkner Park North East Location

Excavation for the emergency access shaft and provision of a small construction zone in the east of Fawkner Park. Vehicular access would be provided to Toorak Road West from the proposed construction zone.

Queen Victoria Gardens, adjacent to Linlithgow Avenue

A small construction zone is proposed to be established next to the shaft and structure on the south side of Queen Victoria Gardens as well as to the south within the Linlithgow Avenue road reserve, either side of the central median rockery.

ALTERNATIVE DESIGN OPTIONS

Emergency Access Shafts

Option 2 – using the location of the Fawkner Park TBM launch site

Construction of the emergency access shaft in this location would be within the proposed TBM launch site construction work area atFawkner Park.

Located in Tom's Block

A small temporary construction zone is proposed to be established within Tom's Block next to the shaft and structure, on the west side of Linlithgow Avenue, including provision of vehicular access.

OPERATION

There would be no impacts as a result of ongoing operations.

7.2 EXISTING CONDITIONS

Although encapsulated within a single precinct, Precinct 1: Tunnels includes a number of proposed built interventions and other activities at ground level that are generally well-separated from each other. These discrete sub-precincts are discussed below.

Queen Victoria Gardens Emergency Access Shaft and CityLink Tunnel Crossing

This sub-precinct is identified as the Domain north and Domain central arboricultural assessments. The Domain north and central areas include trees located within the VHR listed place *Domain Parklands* VHR H2304.

Avenues, rows and specimen trees through the parklands are a fundamental component of, and are described in, the VHR statement of significance for the place.

FIGURE 7-1 QUEEN VICTORIA GARDENS PROPOSED EMERGENCY ACCESS SHAFT LOCATION

Domain TBM Launch Site

Trees in this sub-precinct were assessed as part of the Domain (southern section) and St Kilda Road tree assessments. These consist predominantly of plane trees (*Platanus ×acerifolia*) within the central St Kilda Road median, with an outer row of elms (*Ulmus* spp.) to each side of the St Kilda Road reserve. Divided down the centre between two local government areas, trees in this sub-precinct are managed by the Cities of Melbourne (east side) and Port Phillip (west side).

Trees at the proposed Domain TBM launch site would need to be removed to facilitate construction of the station, including temporary traffic and tram diversions within the precinct.

FIGURE 7-2 TOM'S BLOCK, DOMAIN PARKLANDS

Fawkner Park

All trees located within this sub-precinct are located within Fawkner Park on the south side of Toorak Road West, and are managed by the City of Melbourne. Because of the dense canopy cover and variations between mapped trees and on-site locations, a number of trees could not be properly verified in the field. However, these are located to the east of the tennis court pavilion and are not affected by the Concept Design.

The greater number of trees within the sub-precinct are located in formal avenues planted along main pedestrian paths, as well as a formal boundary row to the northern street frontage. Oaks (*Quercus* spp.) form a significant component of the taxa within this sub-precinct, including a well-established row to the Toorak Road West boundary inter-planted with Canary Island palms (*Phoenix canariensis*), as well as extensive new avenue plantings located within the park.

Establishment of the Fawkner Park construction work site to the west of the tennis club pavilion would require the removal of all trees internal to the construction work site, as well as trees on the Toorak Road West boundary to allow vehicular access.

Trees would also need to be removed to facilitate construction works in the north east of Fawkner Park for the emergency access shaft, including for the provision of vehicular access to Toorak Road West.

FIGURE 7-3 FAWKNER PARK NORTHERN BOUNDARY

FIGURE 7-4 FAWKNER PARK OPEN SPACE, WEST OF THE TENNIS CLUB

FIGURE 7-5 EASTERN SECTION OF FAWKNER PARK, PROPOSED NORTH EAST I EMERGENCY ACCESS SHAFT LOCATION

ALTERNATIVE DESIGN OPTIONS

Tom's Block Emergency Access Shaft

Trees within this sub-precinct were assessed as part of the Domain north and Domain central arboricultural assessments, and are described above. Trees would need to be removed to accommodate the emergency access shaft in this location.

FIGURE 7-6 TOM'S BLOCK, EMERGENCY ACCESS SHAFT LOCATION

ASSET VALUES

The asset/values for the tunnels precinct are summarised in Table 7-1.

TABLE 7-2 ASSET/VALUES FOR PRECINCT 1: TUNNELS

Asset / value	Details
Trees in St Kilda Road, near the intersection of Government House Drive	St Kilda Road is planted as a double avenue of elms in the outer row flanking the roadway, and an inner avenue of plane tress in medians dividing the vehicle running lanes. The elms are of late 19th century / early 20th century origin with the planes were planted c.1960. The double avenue is of very high landscape value. A gap exists on the east side of the double avenue at Government House Drive to visually unify the Shrine of Remembrance Avenue with St Kilda Road in longer views between Swanston Street and the Shrine.
Trees in the Domain Parklands	Domain Parklands (VHR H2304) are among the most highly valued and extensive areas of public open space within the City of Melbourne. Parts of the parklands that are potentially impacted by the proposed project are at Queen Victoria Gardens and Tom's Block. The parklands are defined by perimeter avenues of large, deciduous trees with central areas of lawns planted with a diverse array of deciduous and evergreen trees and scattered large palms, such as Canary Island palm (*Phoenix canariensis*) and a cotton palm (*Washingtonia filifera*) at Queen Victoria Gardens. Many of the trees within Domain Parklands are of 19th century origin. At the intersection of Anzac Avenue and Government House Drive is a triangle of land forming the VHR listed Marquis of Linlithgow Memorial, VHR H0366. The triangle is planted with groups of Canary Island palms and are not a significant component of the registered place.
Trees in Fawkner Park	Fawkner Park forms a large, highly valued expanse of public open space in the south of the City of Melbourne. Developed in the 19th century, the Park features mature avenues of elms and Moreton Bay Figs (*Ficus macrophylla*), with a mixed plantation of Canary Island palms and pin oaks (Quercus palustris) along the northern boundary to Toorak Road West. Individual and clustered specimen trees, including notable groupings of Moreton Bay figs and Bunya-bunya pines (*Araucaria bidwillii*) are located in the lawn areas created between the crossing avenue alignments. A substantial number of juvenile trees have been recently planted through the park by the City of Melbourne, as lawn specimens and as part of an avenue replacement program.

No naturally occurring indigenous trees were assessed within Precinct 1. The ecological values and impacts to trees within this Precinct are addressed in Technical Appendix T *Terrestrial Flora and Fauna*.

The cultural heritage values of trees and landscape within Precinct 1, and potential impacts, are addressed in Technical Appendix J *Historical Cultural Heritage*.

Based on a review of the existing conditions described in Technical Appendix O *Groundwater*, root growth of trees within this precinct is well above, and therefore not reliant on, existing groundwater levels.

7.3 KEY ISSUES

As identified in the risk assessment (Table 6-1), the key issues associated with the concept design are listed in Table 7-3.

TABLE 7-3 KEY ISSUES ASSOCIATED WITH THE CONCEPT DESIGN

Concept Design	Issue	Risk no.
CityLink tunnels crossing – above CityLink tunnels	Removal of trees above the proposed tunnels alignment due to potential need for grouting and soil mixing to limit the impact of ground settling and potential for major subsidence.	AR002
Southern TBM launch site		
Fawkner Park open space and tennis courts	Loss of trees from the public realm to facilitate construction of the TBM launch site and establishment of the Fawkner Park construction work site.	AR004 AR005 AR007 AR008 AR009 AR010 AR011 AR012
Domain TBM launch site	Loss of trees from the public realm, within Precinct 7: Domain Station construction work site – see section 13 Precinct 7: Domain station.	AR001
Emergency Access shafts		
Fawkner Park north east location	Additional loss of trees from Fawkner Park away from the concentrated activity zone at the TBM launch site and construction work site.	AR003 AR004 AR005 AR007 AR008 AR009 AR010 AR011 AR012
Queen Victoria Gardens, adjacent to Linlithgow Avenue	Loss of trees from the public realm to facilitate construction and for vehicular access to the construction work site.	AR003 AR004 AR005 AR007 AR008 AR009 AR010 AR011 AR012

ALTERNATIVE DESIGN OPTIONS

The key issues associated with the alternative design options are identified in Table 7-4.

TABLE 7-4 KEY ISSUES ASSOCIATED WITH ALTERNATIVE DESIGN OPTIONS

Alternative Design Options	Issue	Risk no.
Emergency access shafts		
Option 2 – using the location of the Fawkner Park TBM launch site	Limits the overall loss of trees from the public realm (Fawkner Park) by concentrating works into a single zone within the park.	AR003 (in addition to those for Fawkner Park open space and tennis courts)
Located in Tom's Block	This option may result in the loss of larger numbers of trees from the public realm (Domain Parklands) than the Queen Victoria Gardens concept design location. This would be dependent on mitigation measures to limit or negate the use of grouting / soil mixing that would require the removal of trees above the shallow tunnel alignment. The requirement for access to the emergency access shaft from Linlithgow Avenue may potentially require the permanent loss of trees in the parkland for emergency vehicle access to the shaft.	AR003 AR004 AR005 AR007 AR008 AR009 AR010 AR011 AR012

7.4 BENEFITS AND OPPORTUNITIES

Table 7-5 provides the benefits and opportunities associated with this part of Concept Design.

TABLE 7-5 BENEFITS AND OPPORTUNITIES ASSOCIATED WITH CONCEPT DESIGN

Concept Design	Benefits	Opportunities
Vertical alignment	The alignment would limit the number of trees that would need to be removed above the proposed tunnel alignment, except for the CityLink tunnels crossing in the Domain Parklands.	None noted.
CityLink tunnels crossing – above CityLink tunnels	None noted.	Replace trees removed to facilitate works in accordance with City of Melbourne's *Urban Forest Strategy* and the requirements of the Domain Parklands Conservation Management Plan.
TBM Southern launch site		
Fawkner Park open space and tennis courts	None noted.	Replace trees removed to facilitate works in accordance with City of Melbourne's Urban Forest Strategy.
Domain TBM launch site	Trees would already be removed due to station works and traffic diversions within St Kilda Road – see section 13 Precinct 7: Domain station.	Replace trees removed to facilitate works in accordance with the City of Melbourne and City of Port Phillip urban forest guidelines.

Concept Design	Benefits	Opportunities
Emergency access shafts		
Fawkner Park north east location	None noted.	Replace trees removed to facilitate works in accordance with City of Melbourne's *Urban Forest Strategy.*
Queen Victoria Gardens, adjacent to Linlithgow Avenue	Fewer trees would be anticipated to require removal than the Tom's Block alternative design option.	Re-establish trees in accordance with City of Melbourne's *Urban Forest Strategy* and the requirements of the Domain Parklands Conservation Management Plan.

TABLE 7-6 BENEFITS AND OPPORTUNITIES ASSOCIATED WITH THE ALTERNATIVE DESIGN OPTIONS

Alternative Design Options	Benefits	Opportunities
CityLink tunnels crossing – below CityLink tunnels	Removes the possibility of loss or damage to trees as a consequence of ground stabilisation works (grouting). The greater depth of the tunnels means there would be no need for grouting/soil mixing where the tunnels cross beneath the CityLink tunnels. Consequently, there would be no potential for loss of, or damage to, trees within the Domain Parklands at this location.	None noted.
Emergency Access shafts		
Option 2 – using the location of the Fawkner Park TBM launch site	Would limit removals from a single portion of the park where other activities (TBM launch and construction work site) would already require the removal of the same trees.	Re-establish trees in accordance with City of Melbourne's *Urban Forest Strategy.*
Located in Tom's Block	None noted.	Re-establish trees in accordance with City of Melbourne's *Urban Forest Strategy.*

7.5 IMPACT ASSESSMENT

The following draft EES evaluation objectives and assessment criteria (and indicators where relevant) are relevant to this assessment.

Draft EES evaluation objectives	Assessment criteria
Landscape, visual and recreational value - To avoid or minimise adverse effects on landscape, visual amenity and recreational values as far as practicable.	Assess likely extent and duration of residual adverse effects on landscape values and available measures to manage or offset those effects.
	Minimise impacts on valued places, including public open space and recreation reserves.

A number of locations within the tunnels precinct as shown on the following plans *Precinct 1 Tunnels AA01.01 – AA01.0804* have the potential to impact trees which contribute significantly to the urban landscape. These include a potential location for undertaking ground stabilisation within the Domain Parklands where the tunnels would cross over

the CityLink tunnels, the emergency access shafts at Queen Victoria Gardens and Fawkner Park east, and the Fawkner Park TBM launch site and construction work site.

The potential for damage or loss of trees within the Domain Parklands for the shallow section above CityLink tunnels would occur as a consequence of ground stabilisation (grouting / soil mixing) to limit the impact of surface settlement and the potential for ground collapse during boring (**Risk #AR002**). The shallowest point below existing ground level (-3.1 m) would be below the zone of anticipated root growth.

Grout injection and soil mixing into the soil profile would require the removal of all trees within a band above the alignment of the shallow tunnel section to facilitate ground stabilisation works, a total of 55 trees within Tom's Block. This would result in significant removal of semi-mature to over-mature trees within the public realm with ULEs >= 10 years, 30 MLTV trees. Whilst this is not a large number of trees within the overall curtilage of the Domain Parklands, Tom's Block is located close to St Kilda Road and contains a number of individually large, notable trees. This would be a significant impact within the precinct. However there is the potential to mitigate against this impact through careful control of volume loss, TBM operations and ground monitoring during construction, so that surface ground stabilisation works are not required and there is no associated requirement for tree removals.

The potential impacts elsewhere within the Tunnels precinct would relate to the need to remove trees to accommodate excavation and the built form of emergency access shafts, as well as associated construction areas (**Risk #AR003**). The requirement for the removal of trees at the Queen Victoria Gardens (four MLTV trees out of five trees in total) and Fawkner Park east (six MLTV trees of seven trees in total) emergency access shaft locations would be relatively limited in number and well separated from other interventions. The potential removal or damage to trees on the periphery of these sub-precincts could be mitigated against with implementation of appropriate tree protection measures. Two large palms (a Canary Island palm and a cotton palm) at Queen Victoria Gardens could be temporarily relocated and re-instated at the end of works. Mature palms can be readily transplanted due to their fine, fibrous roots that do not undergo secondary growth and regenerate readily when cut compared to woody, dicotyledonous trees.

The potential to retain and protect a large Bunya-bunya pine (Tree F238) on the west side of the Fawkner Park east emergency access shaft should be investigated as it is part of a notable group planting of this species within Fawkner Park.

The Fawkner Park TBM southern launch site and construction work site would occupy a large section of the parkland, however the greater number of tree removals are relatively recently planted juvenile specimens and the overall removals of semi-mature to over-mature trees with a ULE >=10 years is minor, being 11 MLTV trees of a total 62 trees. In the overall context of Fawkner Park represents a low impact in terms of tree loss. Included amongst these removals are four MLTV trees at the northern, Toorak Road West frontage at the TBM launch site to provide vehicle access to the construction work site internal to the park.

The potential to retain and protect the substantial lemon-scented gum (*Corymbia citriodora*, Tree F169) on the east side of the proposed Fawkner Park construction work site should be investigated, as this is a notable specimen within the precinct. This would depend on the spatial requirements within the construction work site, to later detail. Four large Canary Island palms in the north and east of the construction work site could be temporarily relocated and reinstated at the conclusion of works, further mitigating against tree removals.

As well as tree removals, there would be the potential for damage to adjacent trees located on the periphery of construction areas by soil compaction, craning of building materials or high load access as well as by installation of services to the construction area, including temporary services above and below ground (**Risks #AR004-005** and **#AR007-012**). The potential impact of these activities could be substantially mitigated by implementing a Tree Protection

Plan, prepared in accordance with AS4970-2009 *Protection of Trees on Development Sites*. The Tree Protection Plan should address final design plans and construction management plans formulated for the precinct.

A summary of the proportion of MLTV trees and ULEs of other trees proposed to be removed from Queen Victoria Gardens and Tom's Block is shown in Figure 7-7.

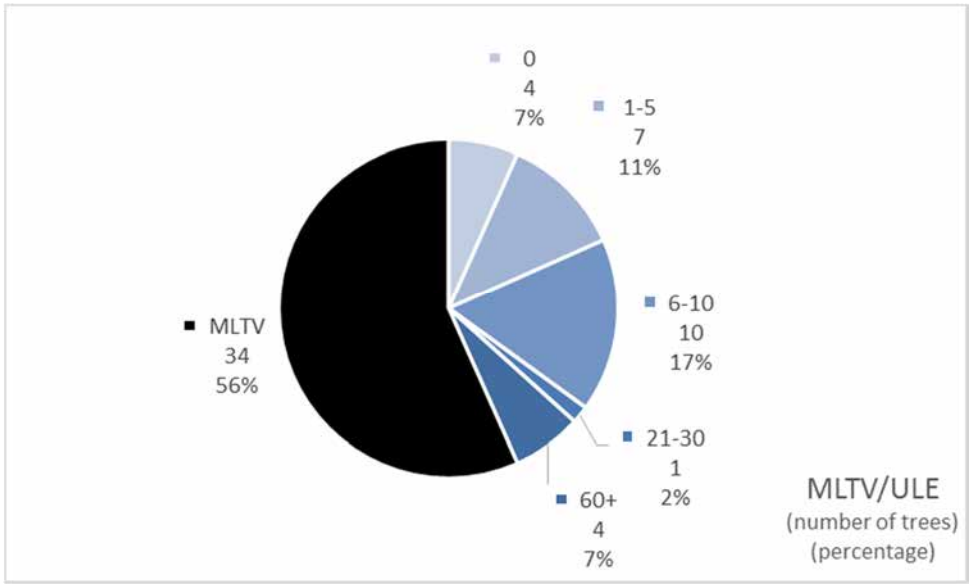

FIGURE 7-7 ULES OF TREES PROPOSED TO BE REMOVED, QUEEN VICTORIA GARDENS AND TOM'S BLOCK

A summary of the proportion of MLTV trees and ULEs of other trees proposed to be removed for the Fawkner Park construction work site and Fawkner Park east emergency access shaft is shown in Figure 7-8.

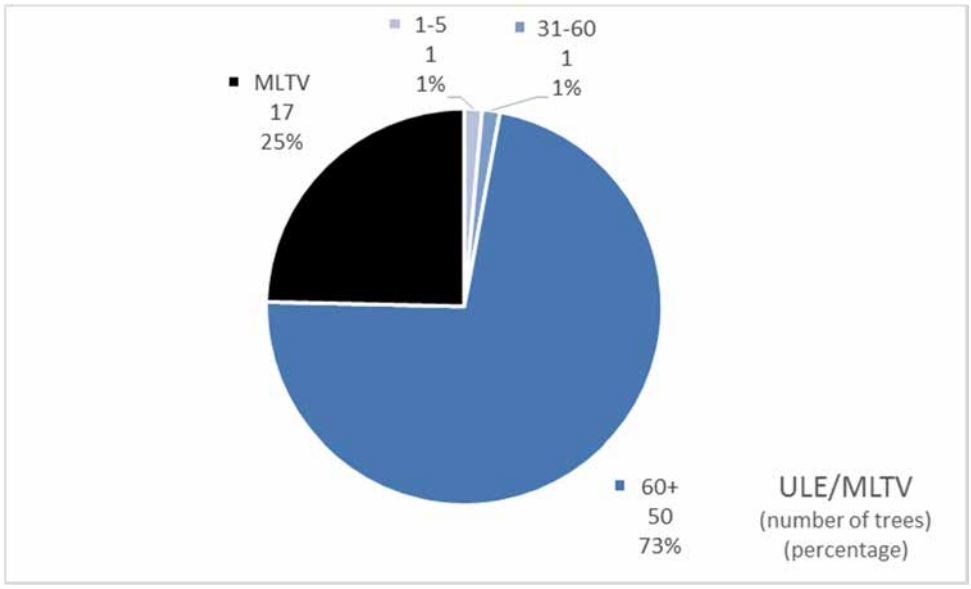

FIGURE 7-8 ULES OF TREES PROPOSED TO BE REMOVED, FAWKNER PARK CONSTRUCTION WORK SITE AND FAWKNER PARK EAST EMERGENCY ACCESS SHAFT

Duration of Impact

As well as the immediate impact of tree removals to facilitate construction, there would be longer term impacts on the urban forest as juvenile replacement trees grow before re-establishing a high level of amenity to the public realm. The six to seven year period during construction would have the greatest impact on the urban landscape. At the conclusion of works, new tree plantings would be undertaken as part of landscaping and detailed urban design.

Appropriate management of replacement tree plantings, especially during the initial two year establishment period, would be necessary to ensure the ongoing viability of replacement trees. Contract propagation and nursery establishment should be undertaken to ensure a ready supply of replacement trees that meet accepted standards, such as AS2303:2015 *Tree Stock for Landscape*, can be provided as part of project delivery.

The period from replanting to reestablishment of a high quality landscape is difficult to quantify and would be dependent upon a number of factors including:

- Species selection
- Rainfall, drought and summer heat events
- Competition from established trees in the vicinity of replacement specimens
- Soil type and use of structured soils
- Provision of irrigation
- Size of planting stock.

As they mature, replanted trees would progressively mitigate impacts and contribute to the landscape and, as an estimate, it is considered that within 20-30 years following planting, a high quality semi-mature canopy can be established.

On the basis that for non-arboricultural reasons, the deep tunnel alignment under Domain Parklands would not be practical, the project is consistent with the draft EES evaluation objective to avoid or minimise adverse effects on landscape, visual amenity and recreational values as far as practicable as:

- The vertical tunnel alignment would limit the locations where trees would require removal from the public realm, including parkland directly adjacent to the Yarra River crossing
- The Domain TBM launch site would concentrate activities within a zone where trees are already proposed for removal due to station construction works and traffic diversions
- The Queen Victoria Gardens emergency access shaft location would limit the number of trees that would require removal compared to the Tom's Block alternative design option, and sites the access point in a location where permanent tree loss is not required for ongoing emergency vehicle access.

IMPACTED TREES

The following trees have been identified that would require removal, as shown on the following plans *Precinct 1 Tunnels AA01.01 – AA01.0804*. Palms indicated with (†) could be relocated and reinstated at the end of works.

CityLink Tunnels Crossing – Above CityLink Tunnels

TABLE 7-7 TREES TO BE REMOVED – CITYLINK TUNNELS CROSSING

No	Species	Common name	ULE	Age
Trees highlighted grey are semi-mature to over ma**ture trees in the public realm with a ULE > 10years (MLTV Trees)**				
DC004	*Ulmus* sp.	Elm	1-5	Juvenile
DC006	*Tilia cordata*	Small-leaved linden	60+	Juvenile
DC007	*Ulmus* sp.	Elm	1-5	Semi-mature
DC008	*Corymbia ficifolia*	Red-flowering gum	6-10	Semi-mature
DC009	*Corymbia ficifolia*	Red-flowering gum	21-30	Semi-mature
DC010	*Ulmus* sp.	Elm	60+	Juvenile
DC011†	*Phoenix canariensis*	Canary Island date palm	31-60	Mature
DC012	*Corymbia ficifolia*	Red-flowering gum	6-10	Semi-mature
DC018	*Corymbia ficifolia*	Red-flowering gum	6-10	Semi-mature
DC023	*Ulmus* sp.	Elm	60+	Semi-mature
DC024†	*Phoenix canariensis*	Canary Island date palm	31-60	Mature
DC025	*Corymbia ficifolia*	Red-flowering gum	6-10	Semi-mature
DC026	*Pinus canariensis*	Canary Island pine	31-60	Over mature
DC030	*Corymbia ficifolia*	Red-flowering gum	21-30	Mature
DC036	*Ficus macrophylla*	Moreton Bay fig	31-60	Over mature
DC037	*Cupressus torulosa*	Bhutan cypress	31-60	Mature
DC039	*Corymbia ficifolia*	Red-flowering gum	6-10	Semi-mature
DC040†	*Phoenix canariensis*	Canary Island date palm	31-60	Mature
DC041	*Corymbia ficifolia*	Red-flowering gum	11-20	Mature
DC042	*Angophora floribunda*	Rough-barked apple	31-60	Mature
DC050	*Corymbia ficifolia*	Red-flowering gum	21-30	Mature
DC051	*Corymbia ficifolia*	Red-flowering gum	11-20	Semi-mature
DC052	*Ulmus* sp.	Elm	31-60	Semi-mature
DC053	*Ulmus procera*	English elm	31-60	Semi-mature
DC054	*Lophostemon confertus*	Brush box	60+	Mature
DC055	*Ulmus* sp.	Elm	11-20	Mature
DC056†	*Phoenix canariensis*	Canary Island date palm	31-60	Mature
DC057	*Corymbia ficifolia*	Red-flowering gum	21-30	Mature
DC060	*Pinus halepensis*	Aleppo pine	60+	Juvenile
DC061	*Pinus pinea*	Stone pine	60+	Juvenile
DC065	*Araucaria cunninghamii*	Hoop pine	31-60	Mature
DC066	*Pinus radiata*	Monterey pine	11-20	Mature
DC067	*Ulmus* sp.	Elm	11-20	Semi-mature
DC068	*Ulmus* sp.	Elm	11-20	Semi-mature
DC069	*Ulmus* sp.	Elm	6-10	Mature
DN123	*Ulmus* sp.	Elm	0	Mature

No	Species	Common name	ULE	Age
Trees highlighted grey are semi-mature to over ma**ture trees in the public realm with a ULE > 10years (MLTV Trees)**				
DN124	*Ulmus* sp.	Elm	6-10	Mature
DN126	*Ulmus* sp.	Elm	1-5	Mature
DN127	*Ulmus* sp.	Elm	1-5	Mature
DN128	*Ulmus* sp.	Elm	6-10	Mature
DN129	*Ulmus* sp.	Elm	1-5	Mature
DN130	*Ulmus* sp.	Elm	0	Over mature
DN131	*Ulmus* sp.	Elm	6-10	Mature
DN132	*Ulmus* sp.	Elm	11-20	Mature
DN133	*Ulmus* sp.	Elm	31-60	Semi-mature
DN139	*Quercus canariensis*	Algerian oak	31-60	Mature
DN141	*Grevillea hilliana*	White silky oak	6-10	Mature
DN144	*Myrsine howittiana*	Muttonwood	1-5	Over mature
DN145	*Ulmus* sp.	Elm	31-60	Semi-mature
DN146	*Tilia cordata*	Small-leaved linden	31-60	Semi-mature
DN150	*Ulmus* sp.	Elm	21-30	Semi-mature
DN151	*Ulmus* sp.	Elm	0	Over mature
DN152	*Ulmus* sp.	Elm	1-5	Over mature
DN153	*Ulmus* sp.	Elm	0	Over mature
DN165	*Ulmus* sp.	Elm	21-30	Semi-mature
Total number of trees				**55**
Number of MLTV trees				30

† = Palm that can be temporarily relocated and reinstated.

Emergency Access Shaft - Queen Victoria Gardens, Adjacent to Linlithgow Avenue

TABLE 7-8 TREES TO BE REMOVED - EMERGENCY ACCESS SHAFT, QUEEN VICTORIA GARDENS

No	Species	Common name	ULE	Age
Trees highlighted grey are semi-mature to over mature trees in the public realm with a ULE > 10years (MLTV Trees)				
DN108	*Jacaranda mimosifolia*	Jacaranda	31-60	Semi-mature
DN109†	*Washingtonia filifera*	American cotton palm	21-30	Mature
DN110†	*Phoenix canariensis*	Canary Island date palm	31-60	Mature
DN111	*Malus floribunda*	Japanese flowering crabapple	21-30	Juvenile
DN112	*Ulmus glabra*	Scotch elm	21-30	Mature
Total number of trees				**5**
Number of MLTV trees				**4**

† = Palm that can be temporarily relocated and reinstated.

Fawkner ParkOpen Space and Tennis Courts

TABLE 7-9 TREES TO BE REMOVED - FAWKNER PARK OPEN SPACE AND TENNIS COURTS

No	Species	Common name	ULE	Age
Trees highlighted grey **are semi-mature to over mature trees in the public realm with a ULE > 10years (MLTV Trees)**				
F085	*Quercus phellos*	Willow oak	60+	Juvenile
F086	*Quercus phellos*	Willow oak	60+	Juvenile
F087	*Quercus phellos*	Willow oak	60+	Juvenile
F088	*Quercus phellos*	Willow oak	60+	Juvenile
F089	*Quercus phellos*	Willow oak	60+	Juvenile
F090	*Quercus phellos*	Willow oak	60+	Juvenile
F091	*Quercus phellos*	Willow oak	60+	Juvenile
F092	*Quercus phellos*	Willow oak	60+	Juvenile
F169	*Corymbia citriodora*	Lemon-scented gum	31-60	Mature
F170	*Acer* sp.	Maple	31-60	Mature
F171†	*Phoenix canariensis*	Canary Island date Palm	31-60	Mature
F172†	*Phoenix canariensis*	Canary Island date palm	31-60	Mature
F173	*Casuarina cunninghamiana*	River she-oak	21-30	Mature
F176	*Quercus phellos*	Willow oak	60+	Juvenile
F177	*Quercus phellos*	Willow oak	60+	Juvenile
F178	*Quercus phellos*	Willow oak	60+	Juvenile
F179	*Quercus phellos*	Willow oak	60+	Juvenile
F180	*Quercus phellos*	Willow oak	60+	Juvenile
F181	*Quercus phellos*	Willow oak	60+	Juvenile
F182	*Quercus phellos*	Willow oak	60+	Juvenile
F183	*Quercus phellos*	Willow oak	60+	Juvenile
F184	*Quercus phellos*	Willow Oak	60+	Juvenile
F185	*Quercus phellos*	Willow oak	60+	Juvenile
F186	*Quercus phellos*	Willow oak	60+	Juvenile
F187	*Quercus phellos*	Willow oak	60+	Juvenile
F188	*Quercus phellos*	Willow oak	60+	Juvenile
F189	*Quercus phellos*	Willow oak	60+	Juvenile
F190	*Quercus phellos*	Willow oak	60+	Juvenile
F191	*Quercus phellos*	Willow oak	60+	Juvenile
F192	*Quercus phellos*	Willow oak	60+	Juvenile
F193	*Fraxinus excelsior*	Golden ash	21-30	Mature
F194	*Quercus palustris*	Pin oak	31-60	Mature
F195†	*Phoenix canariensis*	Canary Island date palm	31-60	Mature
F196†	*Phoenix canariensis*	Canary Island date palm	31-60	Mature
F197	*Quercus palustris*	Pin oak	31-60	Mature
F201	*Fraxinus excelsior*	Golden ash	31-60	Juvenile
F202	*Quercus canariensis*	Algerian oak	60+	Juvenile
F203	*Quercus robur*	English oak	60+	Juvenile
F204	*Quercus cerris*	Turkey oak	60+	Juvenile
F205	*Fraxinus excelsior*	Golden ash	21-30	Mature

No	Species	Common name	ULE	Age
Trees highlighted grey **are semi-mature to over mature trees in the public realm with a ULE > 10years (MLTV Trees)**				
F206	*Quercus cerris*	Turkey oak	60+	Juvenile
F207	*Quercus canariensis*	Hybrid oak	60+	Juvenile
F208	*Quercus canariensis*	Algerian oak	60+	Juvenile
F210	*Quercus phellos*	Willow oak	60+	Juvenile
F211	*Quercus phellos*	Willow oak	60+	Juvenile
F212	*Quercus phellos*	Willow oak	60+	Juvenile
F213	*Quercus phellos*	Willow oak	60+	Juvenile
F214	*Quercus phellos*	Willow oak	60+	Juvenile
F215	*Quercus phellos*	Willow oak	60+	Juvenile
F216	*Quercus phellos*	Willow oak	60+	Juvenile
F217	*Quercus phellos*	Willow oak	60+	Juvenile
F218	*Quercus phellos*	Willow oak	60+	Juvenile
F219	*Quercus phellos*	Willow oak	60+	Juvenile
F220	*Quercus phellos*	Willow oak	60+	Juvenile
F221	*Quercus phellos*	Willow oak	60+	Juvenile
F222	*Quercus phellos*	Willow oak	60+	Juvenile
F223	*Quercus phellos*	Willow oak	60+	Juvenile
F224	*Quercus phellos*	Willow oak	60+	Juvenile
F225	*Quercus canariensis*	Algerian oak	60+	Juvenile
F226	*Quercus canariensis*	Algerian oak	60+	Juvenile
F227	*Quercus canariensis*	Algerian oak	60+	Juvenile
F228	*Quercus canariensis*	Algerian oak	60+	Juvenile
Total number of trees				**62**
Number of MLTV trees				11

† = Palm that can be temporarily relocated and reinstated.

Emergency Access Shaft – Fawkner Park, North East Location

TABLE 7-10 TREES TO BE REMOVED - EMERGENCY ACCESS SHAFT, FAWKNER PARK, NORTH EAST LOCATION

No	Species	Common name	ULE	Age
Trees highlighted grey are semi-mature to over mature trees in the public realm with a **ULE > 10years (MLTV Trees)**				
F231	*Quercus robur*	English oak	1-5	Over-mature
F238	*Araucaria bidwillii*	Bunya-bunya pine	31-60	Mature
F241	*Catalpa bignonioides*	Indian bean tree	11-20	Mature
F232†	*Phoenix canariensis*†	Canary Island date palm	31-60	Mature
F233	*Quercus palustris*	Pin oak	31-60	Mature
F234	*Phoenix canariensis*†	Canary Island date palm	31-60	Mature
F240	*Ulmus* sp.	Elm	31-60	Semi-mature
Total number of trees				**7**
Number of MLTV trees				**6**

ALTERNATIVE DESIGN OPTIONS

The impact assessment of alternative design options within Precinct 1 reveals that the proposed crossing below the CityLink Tunnels would be preferred from an arboricultural perspective as no ground settlement mitigation measures would be required that would require the removal of trees in the Domain Parklands.

The alternative location of the Fawkner Park emergency access shaft at the Fawkner Park TBM launch site would also be preferred from an arboricultural perspective as works would be concentrated into one zone of the park and the trees would already be being removed for other project components.

The potential loss of trees for the proposed emergency access shaft in Tom's Block would depend on the implementation or otherwise of soil stabilisation above a proposed shallow tunnel alignment. If soil stabilisation is required, trees would be removed from this sub-precinct regardless of the emergency access shaft in this location. However if the suggested mitigation measure could be implemented, that is careful control of volume loss, TBM operations and ground monitoring during construction to mitigate against more widespread tree removals within Tom's Block, then localised tree removals would only be required to accommodate the form of the emergency access shaft and provide for a construction work site (**Risks #AR003-005** and **#AR007-012**). This would entail the removal of five MLTV trees, out of 12 in total. It is likely that one tree to the east of the shaft could not be reinstated at the end of construction to maintain emergency access from Linlithgow Avenue to the shaft entry. An additional two trees to the west of the construction work site may be adversely impacted, depending on the activities within this portion of the construction work site and later detailed design. Two Canary Island palms (DC011, DC024) within the sub-precinct should be temporarily relocated and reinstated at the conclusion of works, further mitigating against longer-term tree removals.

The following alternative design options would have the ability to avoid or minimise adverse effects on landscape, visual amenity and recreational values as:

- The CityLink Tunnel crossing below the CityLink Tunnels would not require the removal of trees within Domain Parklands for ground settlement mitigation
- Locating the emergency access shaft at the Fawkner Park TBM launch site would limit the requirement for tree removals within Fawkner Park to a single zone where trees already require removal for the TBM launch site and construction work site.

ALTERNATIVE DESIGN OPTIONS – IMPACTED TREES

The following trees have been identified that would require removal as shown on the following plans *Precinct 1 Tunnels AA01.01 – AA01.0804.* Palms indicated with (†) can be relocated and reinstated at the end of works.

Emergency Access Shaft – Tom's Block

TABLE 7-11 TREES TO BE REMOVED - EMERGENCY ACCESS SHAFT, TOM'S BLOCK

No	Species	Common name	ULE	Age
Trees highlighted grey are semi-mature to over mature trees in the public realm with a ULE > 10years (MLTV Trees)				
DN132	*Ulmus* sp.	Elm	11-20	Mature
DC005	*Ulmus procera*	English elm	60+	Juvenile
DC006	*Tilia cordata*	Small-leaved linden	60+	Juvenile
DC007	*Ulmus* sp.	Elm	1-5	Semi-mature
DC008	*Corymbia ficifolia*	Red-flowering gum	6-10	Semi-mature
DC009	*Corymbia ficifolia*	Red-flowering gum	21-30	Semi-mature
DC010	*Ulmus* sp.	Elm	60+	Juvenile

No	Species	Common name	ULE	Age
Trees highlighted grey are semi-mature to over mature trees in the public realm with a ULE > 10years (MLTV Trees)				
DC011†	*Phoenix canariensis*	Canary Island date palm	31-60	Mature
DC012	*Corymbia ficifolia*	Red-flowering gum	6-10	Semi-mature
DC013	*Corymbia ficifolia*	Red-flowering gum	5-10	Mature
DC017	*Pinus canariensis*	Canary Island pine	31-60	Mature
DC018	*Corymbia ficifolia*	Red-flowering gum	6-10	Semi-mature
DC023	*Ulmus* sp.	Elm	60+	Semi-mature
DC024†	*Phoenix canariensis*	Canary Island date palm	31-60	Mature
Total number of trees				**14**
Number of MLTV trees				**6**

† = Palm that can be temporarily relocated and reinstated.

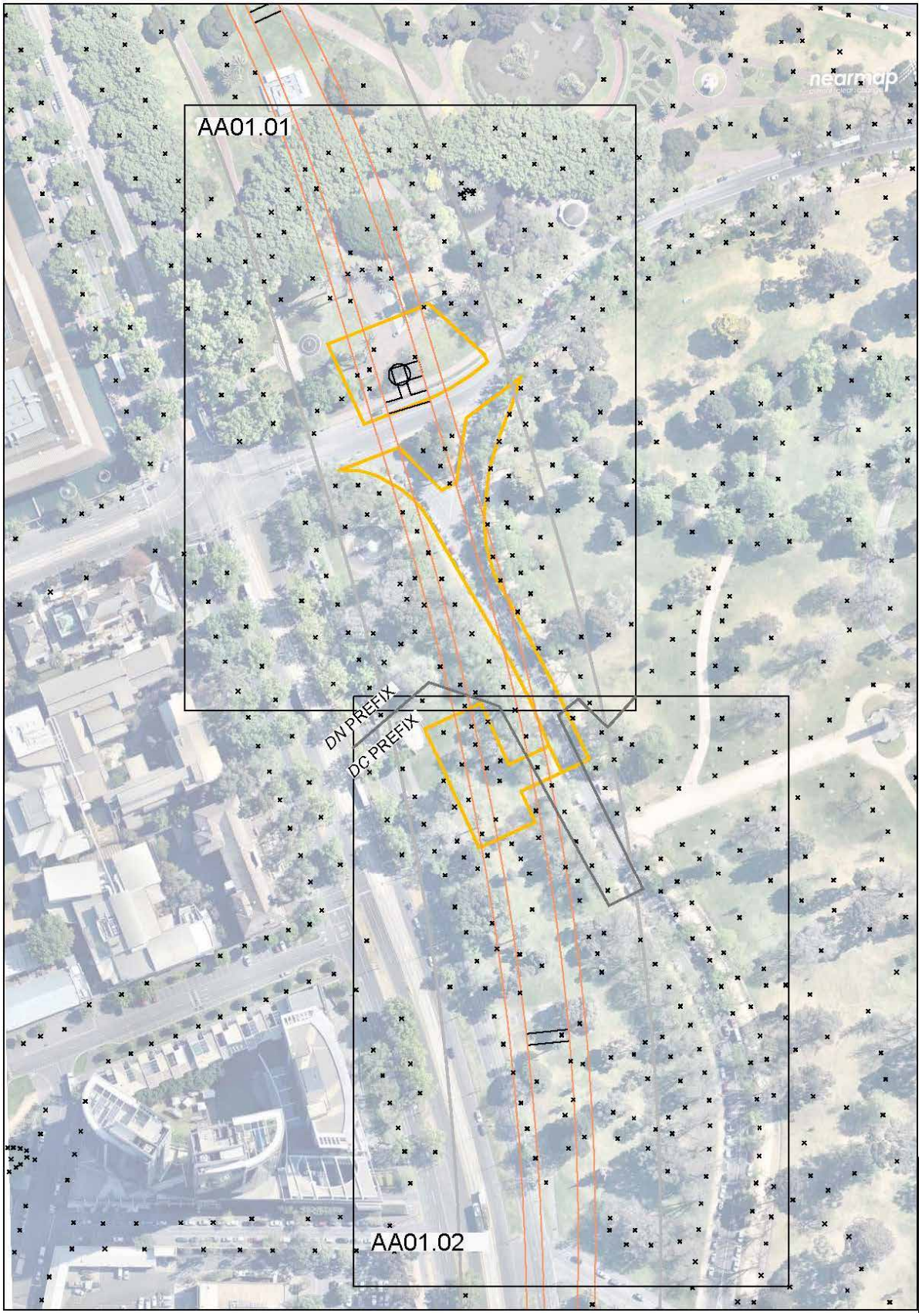

FIGURE 7-9 KEY PLAN – POTENTIALLY IMPACTED TREES, QUEEN VICTORIA GARDENS AND TOM'S BLOCK

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CBD South to Domain Tunnel

SCALE	1:1000 @A4
DATE	APRIL 2016
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CHECKED	SH
JOB NO	15-280
DWG NO	AA01.01
CAD FILE	15-280 L-TS01

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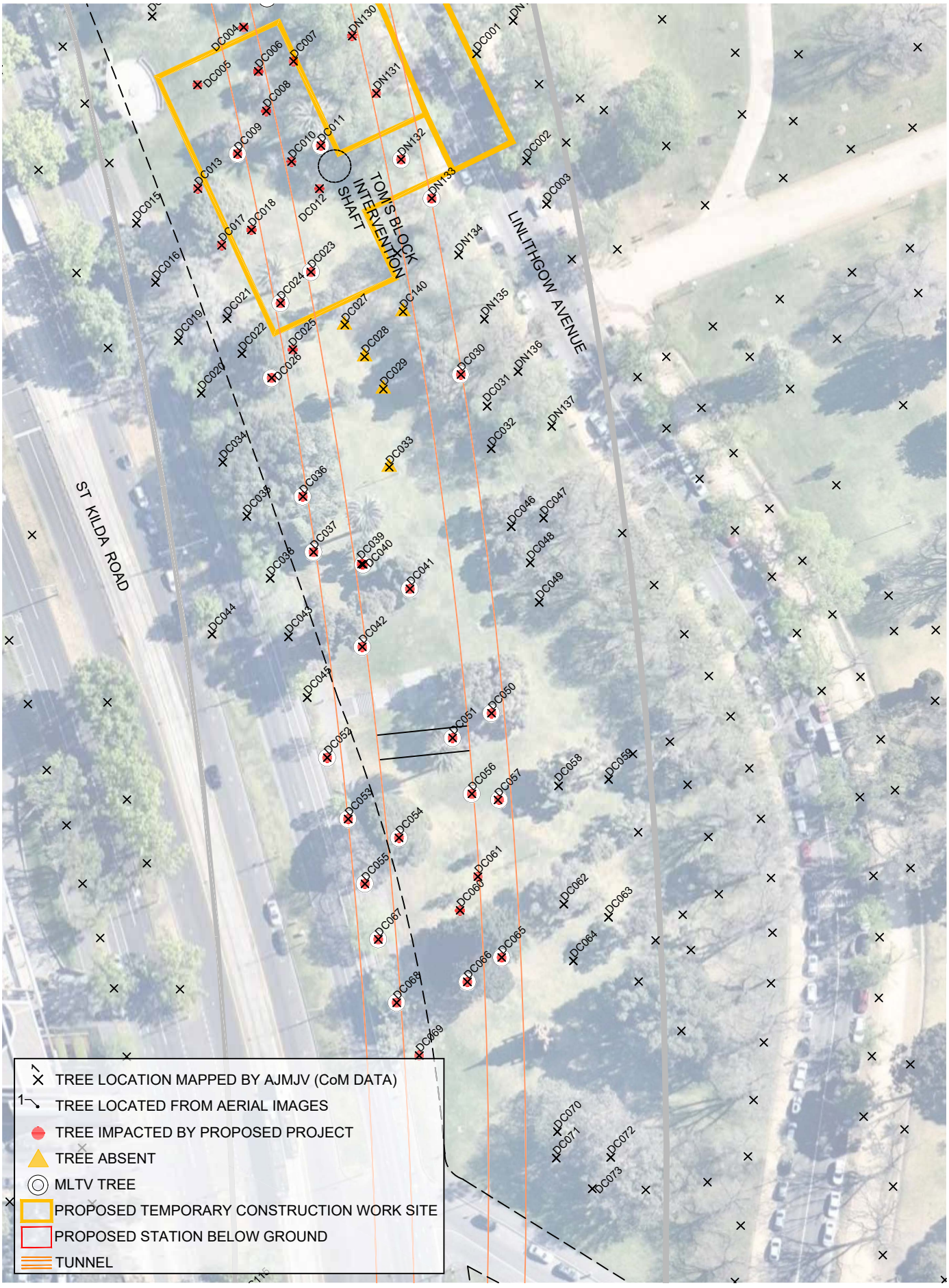

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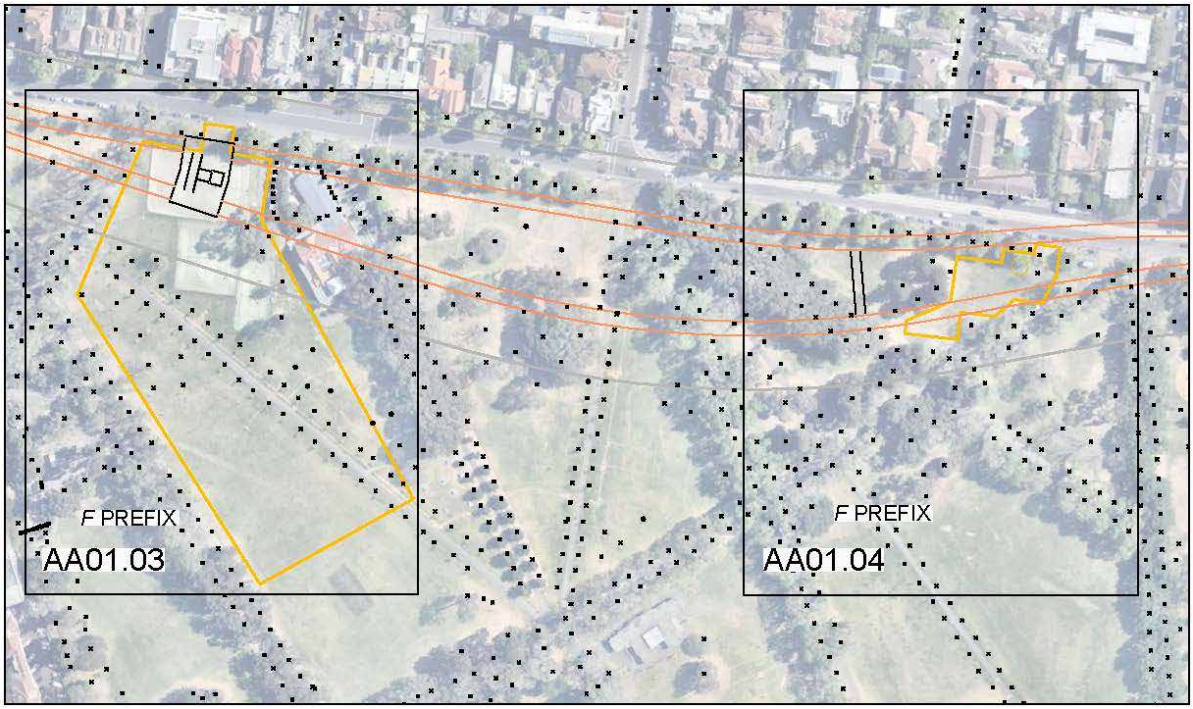
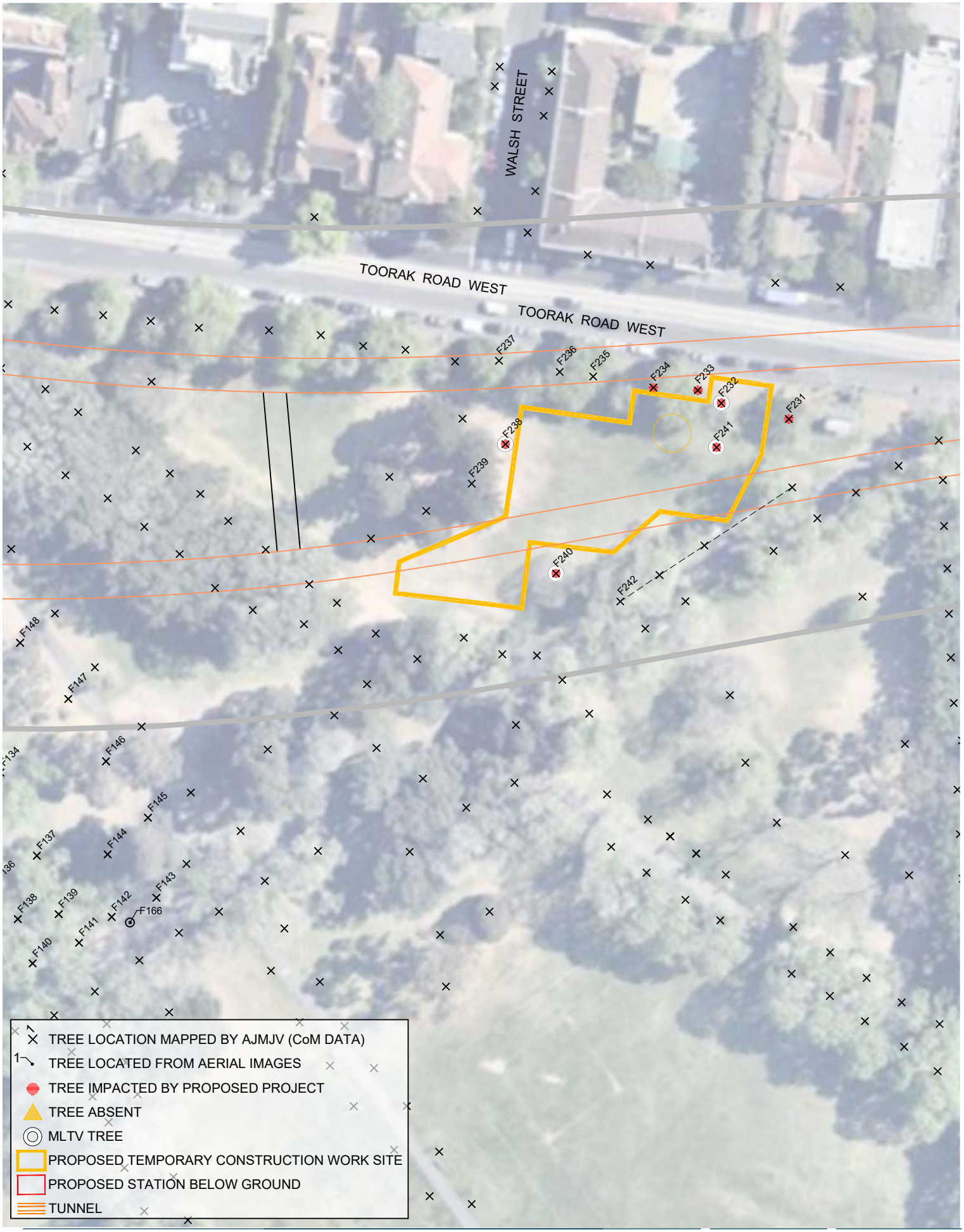


FIGURE 7-10 KEY PLAN – POTENTIALLY IMPACTED TREES, FAWKNER PARK



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Fawkner Park Emergency Access Shaft

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DWG NO	AA01.04
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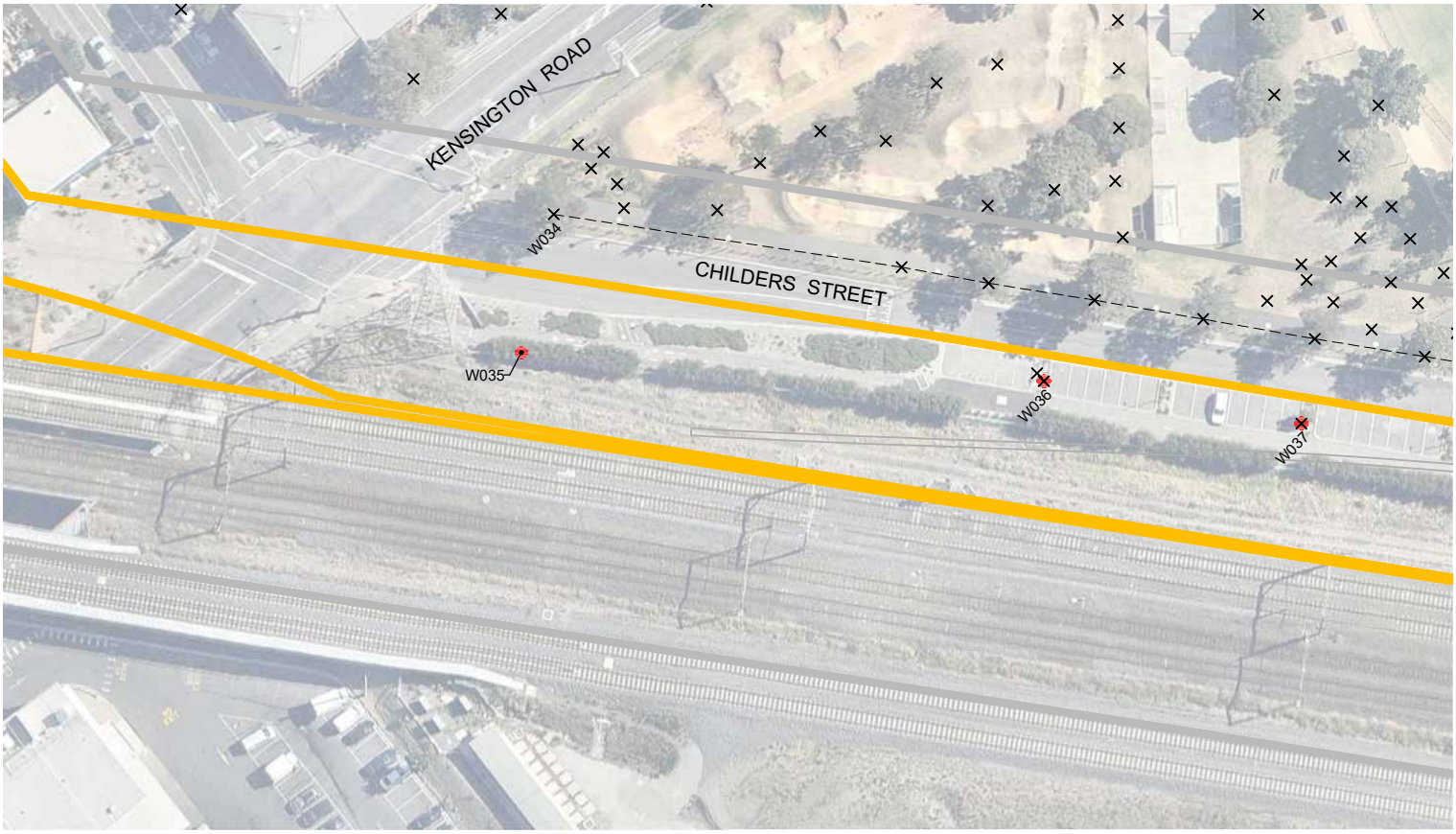

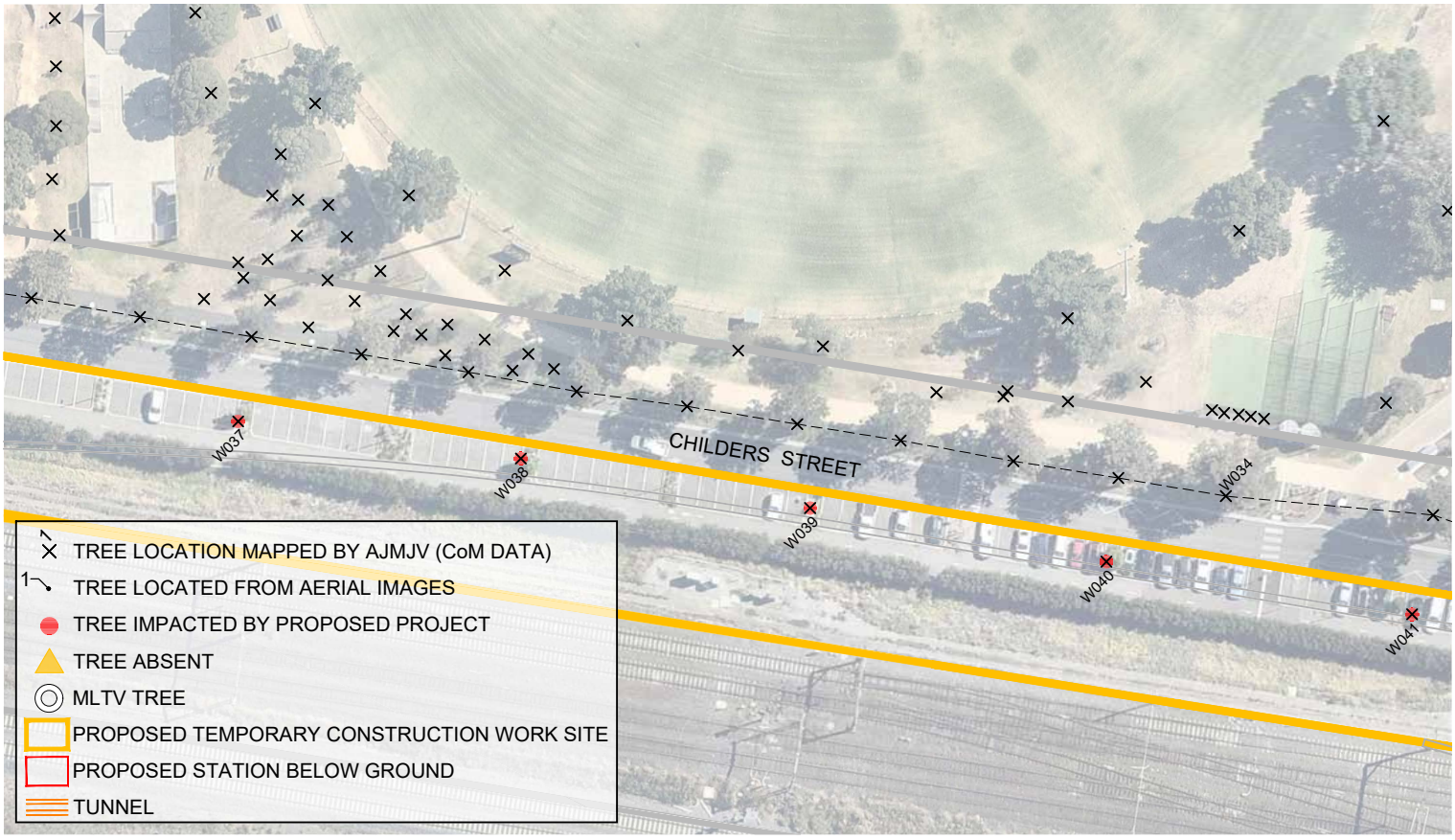

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Precinct 2 Western Portal
South Kensington

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JOB NO	15-280
DWG NO	AA02.01
CAD FILE	15-280 L-TS01

PLEASE NOTE
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Do not scale off drawings.

7.6 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

Table 7-12 provides the recommended Environmental Performance Requirements and proposed mitigation measures for the precinct.

TABLE 7-12 ENVIRONMENTAL PERFORMANCE REQUIREMENTS FOR TUNNELS

Asset / value	Impact	Environmental Performance Requirements	Proposed mitigation measures	Risk no.
Trees within the public realm, including Domain Parklands and Fawkner Park	Removal within each sub-precinct as a result of construction activities and to accommodate built form.	AR1. During detailed design, review potential tree impacts and provide for maximum tree retention where possible. Prior to construction of main works or shafts, develop and implement a plan in consultation with the relevant local council that identifies all trees in the project area which covers: • Trees to be removed or retained • Condition of the trees to be removed • Options for temporary re-location of palms and reinstatement at their former location or another suitable location.	If possible, retain and protect Bunya-bunya pine (Tree F238) and lemon scented gum (Tree F169), which both located on the periphery of Fawkner Park construction work sites. For construction of shallow tunnel within Tom's Block, utilise strict monitoring of volume loss, TBM operations and ground monitoring during tunnelling eliminating or, as far as possible, reducing the extent of soil stabilisation works.	AR001 AR002 AR003
		AR2. Reinstate quality soils to sufficient volumes to support long-term viable growth of replacement trees.		
		AR3. Re-establish trees to replace loss of canopy cover and achieve canopy size equal to (or greater than) healthy, mature examples of the species in Melbourne. Consult with the City of Melbourne, the City of Port Phillip, the Shrine of Remembrance and Shrine Trustees and Heritage Victoria as applicable. Policy documents that must be followed to re-establish trees and valued landscape character include: • The City of Melbourne's Tree Retention and Removal Policy and Urban Forest Strategy • The City of Port Phillip's Community Amenity Local Law No. 1 and Greening Port Phillip - An Urban Forest Approach • Specific policies of the Domain Parklands Conservation Management Plan (CMP), for trees within Domain Parklands		

Asset / value	Impact	Environmental Performance Requirements	Proposed mitigation measures	Risk no.
		• Shrine of Remembrance: Shrine of Remembrance CMP (Lovell Chen, 2010) or any future review and the Shrine of Remembrance Landscape Improvement Plan (rush Wright Associates, 2010) • Albert Road Reserve: Any relevant CMP for the South African Soldiers Memorial • Fawkner Park Conservation Analysis (Hassell, 2002) and the Fawkner Park Masterplan (City of Melbourne, 2005) • The preferred future character of the University of Melbourne, for trees in the grounds of the University of Melbourne.		
Trees within the public realm, including Domain Parklands and Fawkner Park	Damage to trees in the vicinity of construction areas.	AR4. Prior to construction commencing of main works or shafts in affected areas, prepare and implement Tree Protection Plans for each Precinct in accordance with AS4970-2009 Protection of Trees on Development Sites, addressing the detailed design and construction methodology of the project. Within precincts 1, 4 and 7, a Tree Protection Plan must be developed for each heritage place as relevant to the satisfaction of Heritage Victoria or the responsible authority.	None	AR004 AR005 AR007 AR008 AR009 AR010 AR011 AR012
		AR5. For City of Melbourne, trees that are to be retained and protected, a bank guarantee or bond of the trees value will be held against the approved Tree Protection Plan for the duration of the works in accordance with the City of Melbourne Tree Retention and Removal Policy.		
Canary Island and Cotton Palms requiring removal within sub-precincts	Removal within the Queen Victoria Gardens, Tom's Block and Fawkner Park sub-precincts as a result of construction activities.	AR1. (See above)	The palms should be moved with large root balls by an experienced transplanting contractor to the peripheral zone of construction and managed during works to remain in a viable condition.	AR002 AR003

8 PRECINCT 2: WESTERN PORTAL (KENSINGTON)

8.1 PROJECT COMPONENTS

The relevant project components for this assessment include:

50 Lloyd Street Business Estate TBM Retrieval Box

Decline structure and portal to the north of existing railway infrastructure.

ALTERNATIVE DESIGN OPTIONS

TBM Retrieval Box opposite Pavilion on Childers Street

Decline structure and portal further to the west, north of existing railway infrastructure.

CONSTRUCTION

Occupation of the southern side of Childers Street and the south-eastern portion of the Ormond Street road reserves for the precinct construction work site.

ALTRNATIVE CONCEPT DESIGN

TBM Retrieval Box Opposite Pavilion on Childers Street

Occupation of the southern side of Childers Street and the south-eastern portion of the Ormond Street road reserves for the precinct construction work site.

OPERATION

There would be no impact anticipated as a result of ongoing operations.

8.2 EXISTING CONDITIONS

Trees within Precinct 2 – Western Portal are located as:

- Street trees within the roadside cut-outs (north) and a narrow planting in a reserve (south) of Childers Street
- Street trees, including within car park cut outs, on the south side of Childers Street, west of South Kensington station
- Trees to the south side of JJ Holland Park along Childers Street, and in the south east corner of the park
- A row of developing callistemon between the road and railway reserves, extending along much of Childers Street to South Kensington station
- Street trees within the southern section of the Ormond Street road reserve.

All assessed trees are managed by the City of Melbourne.

FIGURE 8-1 ROW OF CALLISTEMON (*CALLISTEMON VIMINALIS*) ALONG RAILWAY BOUNDARY

FIGURE 8-2 SOUTH WESTERN CORNER OF JJ HOLLAND PARK

ASSET VALUES

The asset values for the western portal precinct are summarised in Table 8-1.

TABLE 8-2 ASSET/VALUES FOR PRECINCT 2: WESTERN PORTAL

Asset / value	Details
Trees in the Childers Street road reserve	The majority of trees within the Childers Street road reserve are modestly scaled juvenile specimens of recent planting origins. Larger specimens, such as a narrow-leaved peppermint (*Eucalyptus nicholii*) and spotted gum (*Corymbia maculata*) are located close to the entry to South Kensington station.
Trees in the Ormond Street road reserve	The Ormond Street road reserve is visually dominated by an avenue of maturing brush box (*Lophostemon confertus*), which are a significant component of the streetscape. Two juvenile Illawarra flame trees (*Brachychiton acerifolia*) have been recently planted at the southern end of Ormond Street.
Trees in JJ Holland Park	Whilst dominated by Australian native trees such as spotted gum and river she-oak (*Casuarina cunninghamiana*) forming a continuous plantation along the southern boundary, the reserve also contains a number of substantial exotic trees such as golden elm (*Ulmus glabra* 'Lutescens') and poplar (*Populus* sp.*).*

No naturally occurring indigenous trees were assessed within Precinct 2. The ecological values and impacts to trees within this precinct are contained in Technical Appendix T *Terrestrial Flora and Fauna*.

The root growth of trees assessed within this precinct is well above, and therefore not reliant on, existing groundwater levels, based on a review of the existing conditions described in Technical Appendix O *Groundwater*.

8.3 KEY ISSUES

As identified in the risk assessment (Table 6-1), the key issue associated with the Concept Design would be the removal of trees from the public realm **(Risk #AR003),** including the Childers Street and Ormond Street road reserves.

8.4 BENEFITS AND OPPORTUNITIES

The opportunity associated with this precinct would be the re-establishment of trees in the public realm in accordance with the City of Melbourne's *Urban Forest Strategy.*

8.5 IMPACT ASSESSMENT

The following draft EES evaluation objectives and assessment criteria (and indicators where relevant) are relevant to this assessment.

Draft EES evaluation objectives	Assessment criteria
Landscape, visual and recreational values - To avoid or minimise adverse effects on landscape, visual amenity and recreational values as far as practicable.	Assess likely extent and duration of residual adverse effects on landscape values and available measures to manage or offset those effects.
	Minimise impacts on valued places, including public open space and recreation reserves.

The primary impact within this precinct would be the loss of trees on the south side of Childers Street within an existing car park area for the precinct construction work site and decline structure, as well as the removal of trees from the south eastern end of Ormond Street within the proposed construction work site (**Risk #AR003**). The Concept Design would require the removal of 47 trees from within this precinct. Of these, nine are MLTV trees with the remainder generally

small scale, juvenile specimens. There is the potential for damage to trees adjacent to construction areas (**Risks #AR004-005** and **#AR007-012**) which can be mitigated against with the preparation of a Tree Protection Plan.

Duration of Impact

A detailed discussion of the potential impacts of tree removals during the period of construction, and anticipated timeframes for reestablishment is included in Section 7.5. The six to seven year period during construction would have the greatest impact on the urban landscape. As they mature, replanted trees would progressively mitigate impacts and contribute to the landscape and, as an estimate, it is considered that within 20-30 years following planting, a high quality semi-mature canopy can be established.

The project is consistent with the draft EES evaluation objective to avoid or minimise adverse effects on landscape, visual amenity and recreational values as far as practicable as:

- Works and nominated construction areas would be contained within road reserves and acquired properties, outside the curtilage of JJ Holland Park, a valued local park and active recreational reserve
- Trees that would be removed from the public realm are mostly juvenile, and can be replaced after Melbourne Metro has been constructed.

The proportion of MLTV trees and ULEs of other trees proposed to be removed within this precinct are summarised in Figure 8-3.

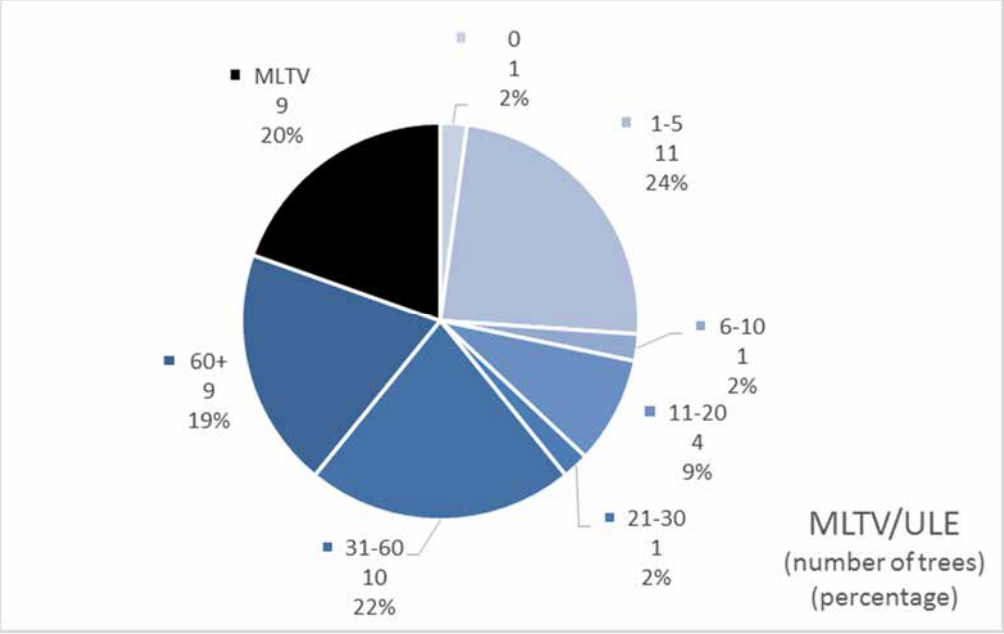


FIGURE 8-3 ULES OF TREES PROPOSED TO BE REMOVED FROM THE PUBLIC REALM, WESTERN PORTAL

IMPACTED TREES

The following trees have been identified that would require removal, as shown on the following plans *Precinct 2 Western Portal AA02.01 – AA02.02.*

TABLE 8-3 TREES TO BE REMOVED – WESTERN PORTAL

No	Species	Common name	ULE	Age
Trees highlighted grey **are semi-mature to over mature trees in the public realm with a ULE > 10years (MLTV Trees)**				
W001	*Eucalyptus cinerea*	Argyle apple	60+	Juvenile
W005	*Eucalyptus cinerea*	Argyle apple	60+	Juvenile
W007	*Eucalyptus nicholii*	Narrow-leaved peppermint	21-30	Mature
W009	*Allocasurina verticillata*	Drooping she-oak	60+	Juvenile
W010	*Tristaniopsis laurina*	Water gum	1-5	Juvenile
W011	*Allocasurina verticillata*	Drooping she-oak	1-5	Juvenile
W012	*Tristaniopsis laurina*	Water gum	60+	Juvenile
W013	*Allocasurina verticillata*	Drooping she-oak	1-5	Juvenile
W014	*Tristaniopsis laurina*	Water gum	60+	Juvenile
W015	*Allocasurina verticillata*	Drooping she-oak	31-60	Semi-mature
W016	*Tristaniopsis laurina*	Water gum	1-5	Juvenile
W017	*Allocasurina verticillata*	Drooping she-oak	1-5	Juvenile
W018	*Allocasurina verticillata*	Drooping she-oak	60+	Juvenile
W019	*Tristaniopsis laurina*	Water gum	1-5	Juvenile
W020	*Jacaranda mimosifolia*	Jacaranda	11-20	Juvenile
W021	*Allocasurina verticillata*	Drooping she-oak	60+	Juvenile
W022	*Allocasurina verticillata*	Drooping she-oak	60+	Juvenile
W023	*Tristaniopsis laurina*	Water gum	1-5	Juvenile
W024	*Tristaniopsis laurina*	Water gum	1-5	Juvenile
W025	*Lophostemon confertus*	Brush box	31-60	Semi-mature
W026	*Allocasurina verticillata*	Drooping she-oak	11-20	Juvenile
W027	*Jacaranda mimosifolia*	Jacaranda	21-30	Juvenile
W028	*Allocasurina verticillata*	Drooping she-oak	1-5	Juvenile
W029	*Allocasurina verticillata*	Drooping she-oak	60+	Juvenile
W030	*Lophostemon confertus*	Brush box	11-20	Semi-mature
W031	*Allocasurina verticillata*	Drooping she-oak	1-5	Juvenile
W032	*Tristaniopsis laurina*	Water gum	11-20	Juvenile
W033	*Allocasurina verticillata*	Drooping she-oak	1-5	Juvenile
W035	*Callistemon viminalis* (row)	Weeping bottlebrush	31-60	Juvenile
W036	*Tristaniopsis laurina*	Water gum	31-60	Juvenile
W037	*Tristaniopsis laurina*	Water gum	31-60	Juvenile
W038	*Tristaniopsis laurina*	Water gum	31-60	Juvenile
W039	*Tristaniopsis laurina*	Water gum	31-60	Juvenile
W040	*Tristaniopsis laurina*	Water gum	31-60	Juvenile
W041	*Tristaniopsis laurina*	Water gum	31-60	Juvenile
W042	*Tristaniopsis laurina*	Water gum	11-20	Juvenile
W043	*Tristaniopsis laurina*	Water gum	31-60	Juvenile

No	Species	Common name	ULE	Age
Trees highlighted grey **are semi-mature to over mature trees in the public realm with a ULE > 10years (MLTV Trees)**				
W044	*Corymbia maculata*	Spotted gum	31-60	Mature
W045	*Tristaniopsis laurina*	Water gum	31-60	Juvenile
W046	*Tristaniopsis laurina*	Water gum	31-60	Juvenile
W047	*Tristaniopsis laurina*	Water gum	0	Juvenile
W048	*Casuarina cunninghamiana*	River she-oak	11-20	Mature
W049	*Casuarina glauca*	Swamp she-oak	11-20	Semi-mature
W050	*Casuarina cunninghamiana*	River she-oak	21-30	Mature
W051	*Casuarina cunninghamiana*	River she-oak	6-10	Semi-mature
W058	*Lophostemon confertus*	Brush box	31-60	Mature
W060	*Brachychiton acerifolius*	Illawarra flame tree	60+	Juvenile
Total number of trees				**47**
Number of MLTV trees				**9**

ALTERNATIVE DESIGN OPTION

An alternative design option for the decline structure, with the TBM retrieval box opposite the pavilion on Childers Street, is not anticipated to require the removal of any additional trees from the public realm.

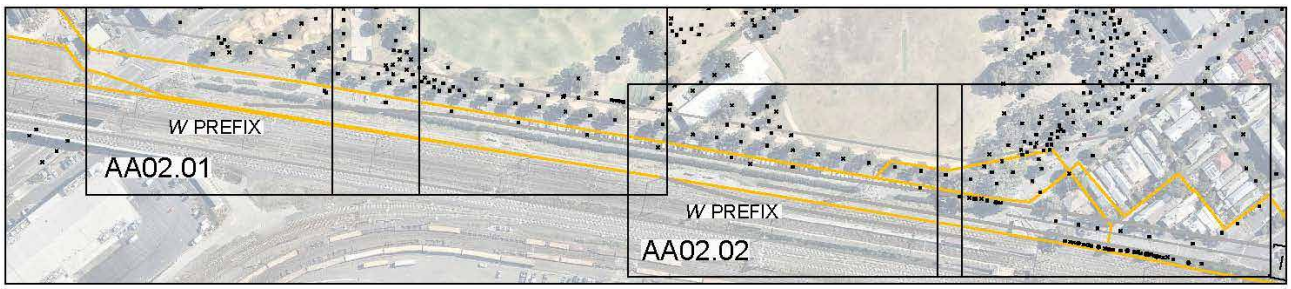
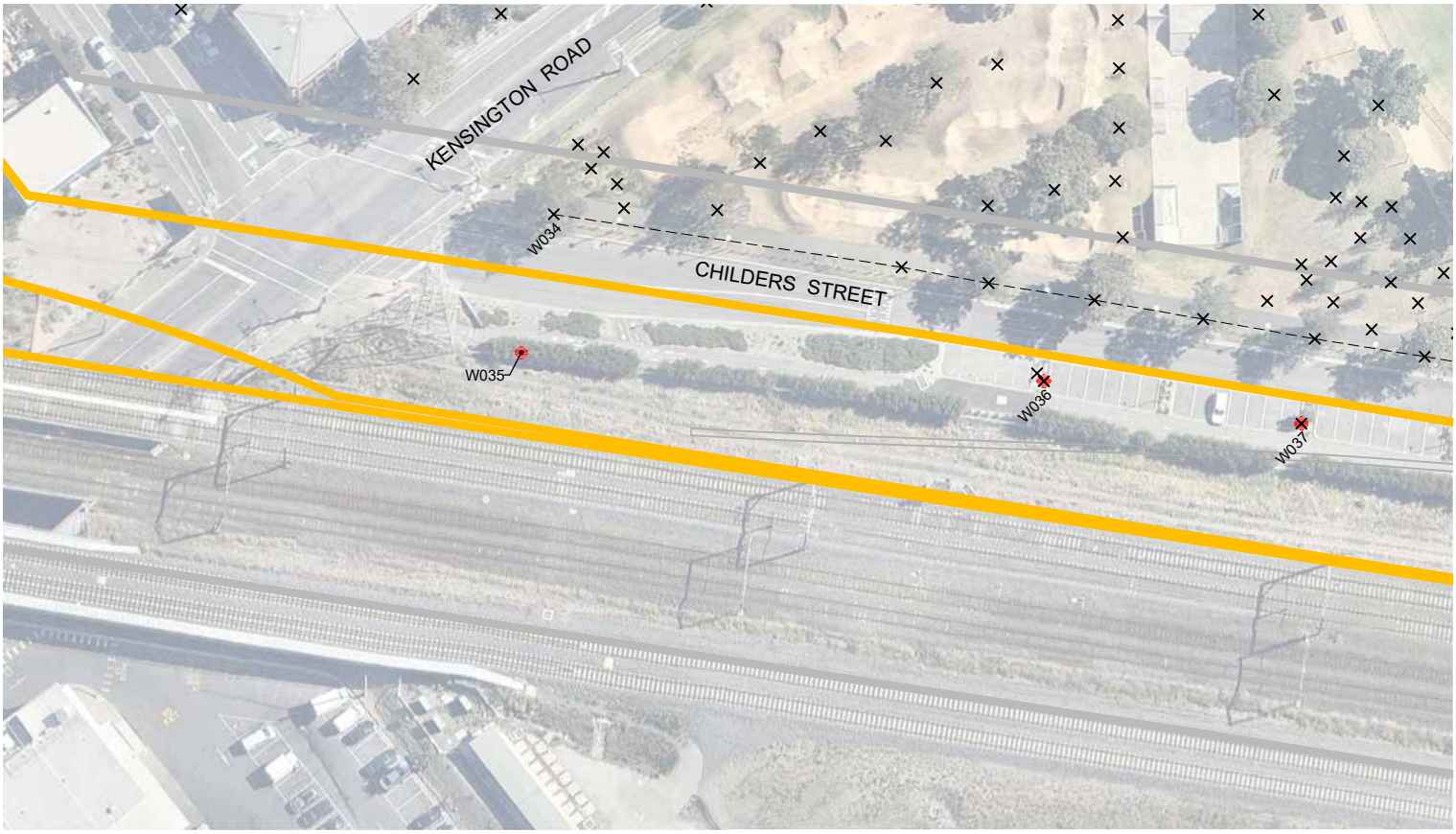
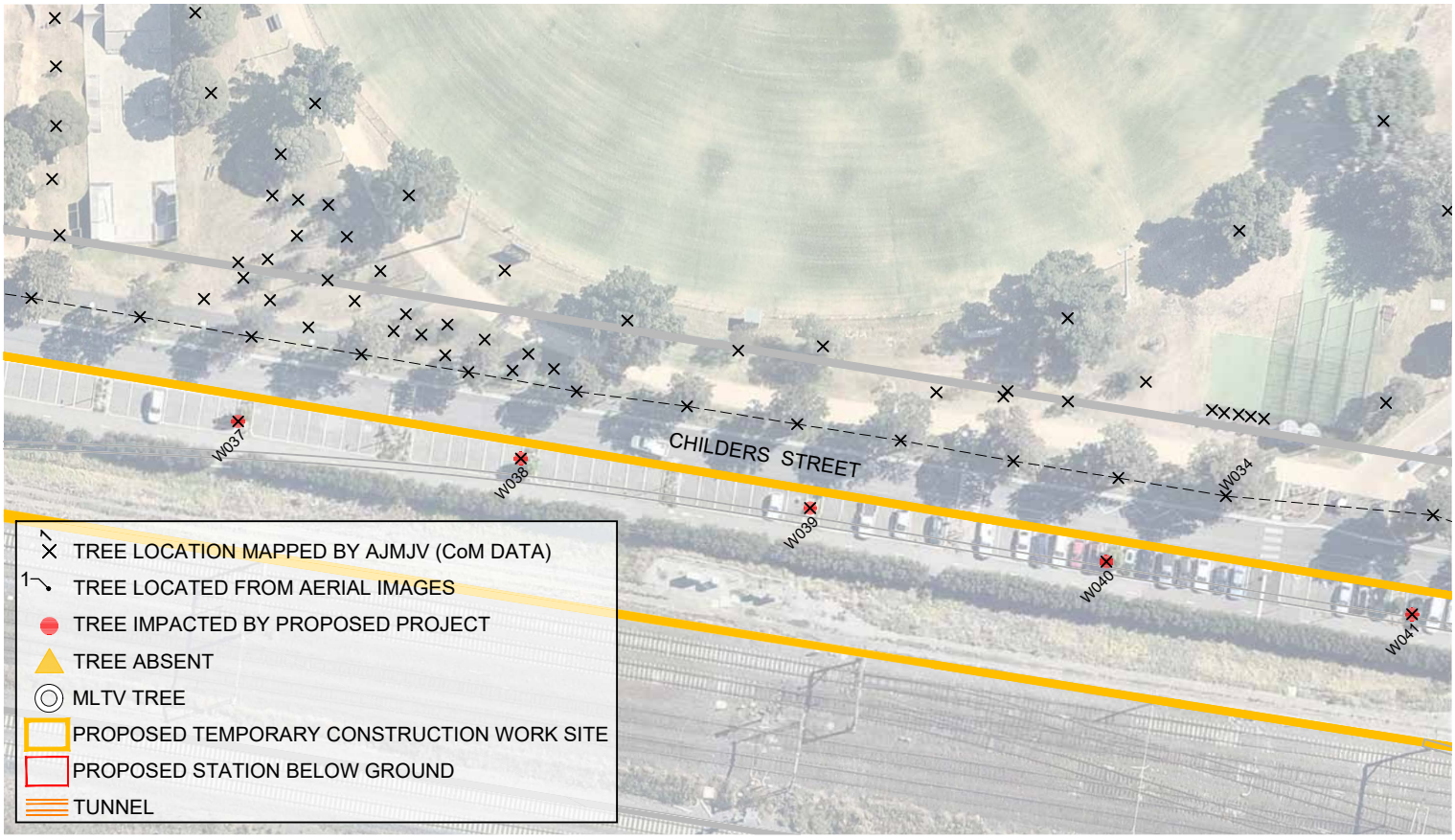


FIGURE 8-4 KEY PLAN – POTENTIALLY IMPACTED TREES, WESTERN PORTAL





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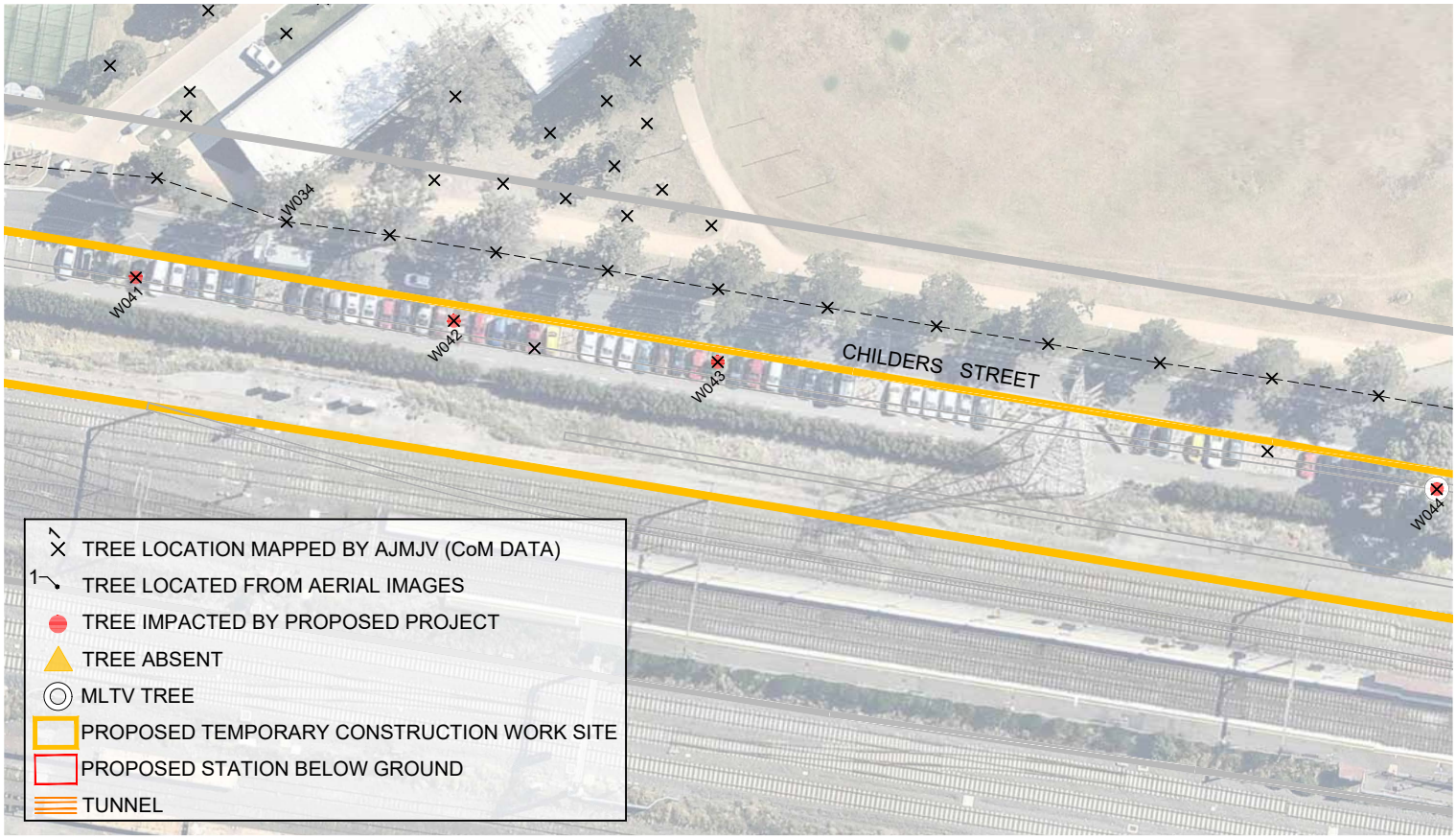

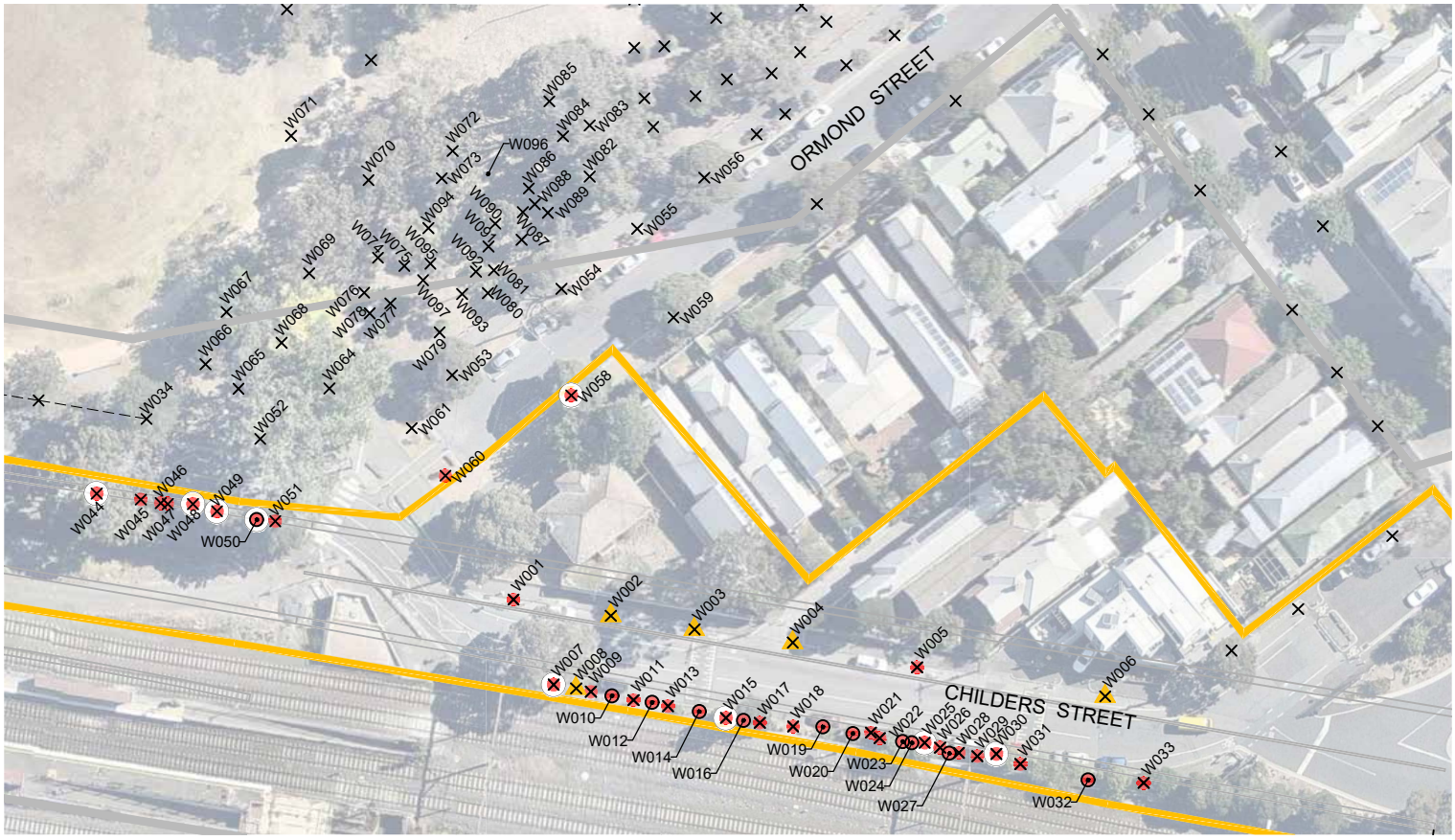

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8.6 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

Table 8-4 below provides the recommended Environmental Performance Requirements and proposed mitigation measures for the precinct.

TABLE 8-4 ENVIRONMENTAL PERFORMANCE REQUIREMENTS FOR PRECINCT

Asset / value	Impact	Environmental Performance Requirements	Proposed mitigation measures	Risk no.
Trees within the public realm	Removal as a result of construction activities and to accommodate built form.	Refer to AR1, AR2 and AR3 as contained in Table 7-12.	None	AR003
Trees within the public realm, including JJ Holland Park	Damage to trees in the vicinity of construction areas.	Refer to AR4 and AR5 as contained in Table 7-12.	None	AR004 AR005 AR007 AR008 AR009 AR010 AR011 AR012

9 PRECINCT 3: ARDEN STATION

9.1 PROJECT COMPONENTS

The relevant project components of the concept design include for this assessment are as follows:

INFRASTRUCTURE

The station box for the Arden station would be located within publicly owned (VicTrack) land. The preferred intake substation site would be on land to the north of Arden Street, on the west side of Langford Street.

CONSTRUCTION

The balance of the publicly owned (VicTrack) land would be used as a construction work site for the duration of the project. There would be the potential for new vehicular access crossings into the preferred Langford Street substation site.

OPERATION

There would be no impact as a result of ongoing operations.

ALTERNATIVE DESIGN OPTIONS

Co-location of the substation at MTM Traction Substation – Option 2

Construction on land located to the west of the VicTrack landholding.

Southern Section of the Arden Precinct – Option 3

Construction of the intake substation on land adjacent to the southern portion of the VicTrack landholding.

Located to the North of the Western Portal, Bakehouse Road – Option 4

Construction of the intake substation on private land north of the western portal.

9.2 EXISTING CONDITIONS

Trees within this precinct were assessed:

- Arden public, street trees to the east of the Concept Design
- Arden private, trees located within the industrial landscape of the publicly owned (VicTrack) land.

Trees within the proposed intake substation site are predominantly environmental weeds of no discernible landscape value. An additional four street trees were assessed within Langford Street, to the immediate east of the substation site.

No public realm trees were identified at the alternative design option intake substation location at MTM traction substation, or the 50 Lloyd Street Business Estate.

Details of the trees are contained in Table 8-2.

FIGURE 9-1 SOUTHERN SECTION OF GOVERNMENT OWNED (VICTRACK) LAND

FIGURE 9-2 TREES WITHIN THE LANGFORD STREET ROAD RESERVE, ADJACENT TO THE PREFERRED ISS LOCATION

ASSET VALUES

The asset values for the Arden station precinct are summarised in Table 9-1.

TABLE 9-1 ASSET/VALUES FOR PRECINCT 3: ARDEN STATION

Asset / value	Details
Trees in the Laurens Street road reserve	Laurens Street contains scattered, mature plane trees, possibly the remnant of an older avenue plantation. The individual trees are of some scale, but are well separated from each other and no longer read as a cohesive avenue.
Trees within the Langford Street intake substion tsite and road reserve	Vegetation within the ISS site appears to be predominantly weedy, with a large number of desert ash (*Fraxinus angustifolia*) and scattered naturalised peppercorn trees (*Schinus areira*), of no discernible landscape value. Trees on the west side of Langford Street consist of three paperbarks (*Melaleuca styphelioides*), and a recently planted juvenile small-leaved linden (*Tilia cordata*) near the corner of Arden Street.
Trees in publicly owned (VicTrack) land	Tree plantings within the publicly owned (VicTrack) land reflect the industrial landscape, with older trees such as scattered peppercorns typical of railway land. Many of these are naturalised (likely self-sown), including weedy Monterey pines (*Pinus radiata*) and Lombardy poplars (*Populus nigra* var *italica*) at various locations. Smaller scale native vegetation has been planted within some sites, of limited overall landscape value. A large river red gum (*Eucalyptus camaldulensis*) Tree AP072 is located near the Laurens Street frontage.

The river red gum, Tree AP072, has been assessed in conjunction with the broader ecological values within this precinct in Technical Appendix T *Terrestrial Flora and Fauna*.

The root growth of trees assessed within this precinct is well above, and therefore not reliant on, existing groundwater levels, based on a review of the existing conditions described in Technical Appendix O *Groundwater*.

9.3 KEY ISSUES

There are no statutory controls that would limit the removal of trees from the publicly owned (VicTrack) land, or the preferred intake substation Langford Street location. As identified in the risk assessment (Table 6-1), a single street tree managed by the City of Melbourne within Laurens Street would require removal (**Risk #AR003**). The single river red gum within the publicly owned (VicTrack) land is assessed in Technical Appendix T *Terrestrial Flora and Fauna*.

There are four street trees within the Langford Street road reserve that may require removal to facilitate construction of the intake substation (**Risk #AR003**).

ALTERNATIVE DESIGN OPTION

There are no key issues associated with the alternative design option: there are no trees within the public realm at the MTM traction substation location or 50 Lloyd Street Business Estate, and the trees in the southern section of the Arden precinct would be removed as part of the Arden construction work site in any event.

9.4 BENEFITS AND OPPORTUNITIES

The benefits associated with the Concept Design is that tree removal within the public realm would be limited to a single street tree within Laurens Street, and potentially four street trees within Langford Street.

There is an opportunity to reinstate street trees to the west side of Laurens Street road reserve (existing gaps in the plantation) as part of project delivery to achieve a high quality urban streetscape and improve on existing conditions.

No benefits and opportunities associated with the alterative design options have been identified in relation to trees.

9.5 IMPACT ASSESSMENT

The following draft EES evaluation objectives and assessment criteria are relevant to this assessment.

Draft EES evaluation objectives	Assessment criteria
Landscape, visual and recreational values - To avoid or minimise adverse effects on landscape, visual amenity and recreational values as far as practicable.	Assess likely extent and duration of residual adverse effects on landscape values and available measures to manage or offset those effects.
	Minimise impacts on valued places, including public open space and recreation reserves.

Trees would require removal from the north of the precinct to facilitate construction of the station, as well as from the Langford Street intake substation site (**Risk #AR003**). The balance of the publicly owned (VicTrack) land would be used as a construction work site for the duration of the project. It is anticipated it would entail the removal of all trees from the land, a total of 111 trees and tree groups.

A single street tree (Tree A002), a MLTV tree, is located very close to the proposed station box footprint and would likely require removal. Four trees may also require removal at Langford Street to facilitate construction access to the ISS site. The total potential impact on trees within the public realm is considered medium, with only limited removals of semi-mature to over-mature trees within the public realm with a ULE >= 10 years, three MLTV trees of five in total.

The balance of trees in the public realm are well separated from the proposed works and should not be impacted. There remains the potential to re-establish a full avenue plantation to the west side of Laurens Street as part of the rehabilitation of the project area or the establishment of urban development in this precinct.

Duration of Impact

A detailed discussion of the impacts of tree removals during the period of project construction, and anticipated timeframes for tree reestablishment are included in Section 7.5. It is noted that a very limited number of trees would be removed from the public realm within this precinct, and potential tree removals from this precinct would not significantly impact on the streetscape. As they mature, replanted trees would progressively mitigate impacts and contribute to the landscape and, as an estimate, it is considered that within 20-30 years following planting, a high quality semi-mature canopy can be established that could also include infilling of the existing Laurens Street road reserve to achieve a higher quality urban landscape than what currently exists.

CONCEPT DESIGN

The project is consistent with the draft EES evaluation objective to avoid or minimise adverse effects on landscape, visual amenity and recreational values as far as practicable as the great majority of trees to be removed are on publicly owned (VicTrack) land and outside the public realm. A limited number of trees would require removal from the public realm with only three MLTV trees removed from Laurens and Langford Streets. The proportion of MLTV trees and ULEs of other trees proposed to be removed within this precinct are summarised in Figure 9-3.

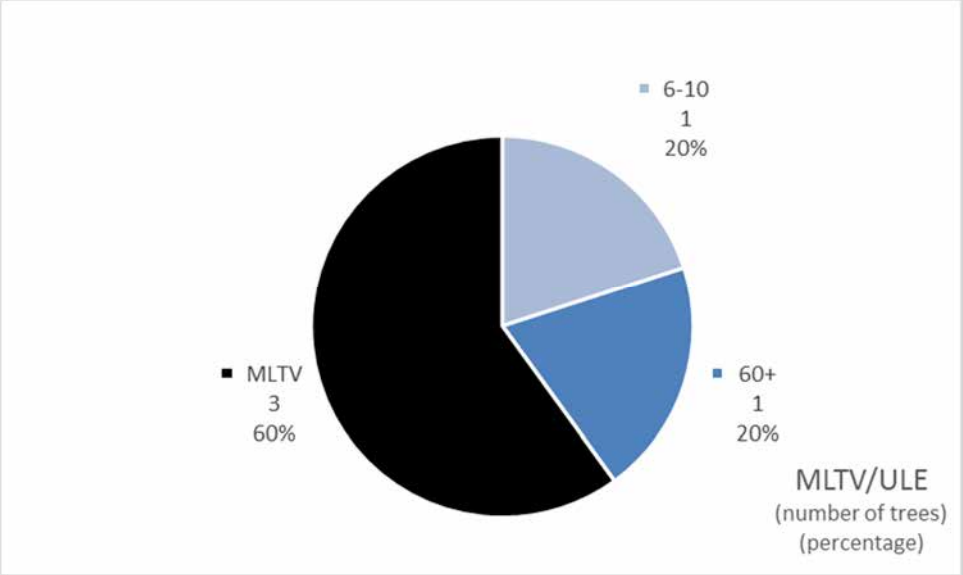


FIGURE 9-3 ULES OF TREES PROPOSED TO BE REMOVED FROM THE PUBLIC REALM, ARDEN PRECINCT

CONCEPT DESIGN - IMPACTED TREES

The following trees have been identified that would require removal, as shown on the following plans *Precinct 3 Arden Station AA03.01 – AA03.04*, located in the publicly owned (VicTrack) land.

TABLE 9-2 TREES TO BE REMOVED – GOVERNMENT OWNED (VICTRACK) LAND

No	Species	Common name	ULE	Age
AP001	*Platanus ×acerifolia*	London plane	21-30	Semi-mature
AP002	*Eucalyptus viminalis*	Rough barked manna gum	21-30	Mature
AP003	*Schinus areira*	Peppercorn tree	0	Semi-mature
AP004	*Schinus areira*	Peppercorn tree	0	Semi-mature
AP005	*Schinus areira*	Peppercorn tree	6-10	Semi-mature
AP006	*Schinus areira*	Peppercorn tree	11-20	Semi-mature
AP007	*Schinus areira*	Peppercorn tree	0	Semi-mature
AP008	*Schinus areira*	Peppercorn tree	11-20	Semi-mature
AP009	*Schinus areira*	Peppercorn tree	21-30	Semi-mature
AP010	*Schinus areira*	Peppercorn tree	11-20	Mature
AP011	*Platanus ×acerifolia*	London plane	21-30	Semi-mature
AP012	*Schinus areira*	Peppercorn tree	11-20	Mature
AP013	*Schinus areira*	Peppercorn tree	11-20	Mature
AP014	*Schinus areira*	Peppercorn tree	11-20	Mature
AP015	*Populus nigra*	Lombardy poplar	6-10	Semi-mature
AP016	*Populus nigra*	Lombardy poplar	0	Semi-mature
AP017	*Unknown* sp.	Unknown		Semi-mature
AP018	*Schinus areira*	Peppercorn tree	0	Semi-mature
AP019	*Schinus areira*	Peppercorn tree	0	Semi-mature
AP020	*Schinus areira*	Peppercorn tree	11-20	Semi-mature
AP021	*Acacia melanoxylon*	Blackwood	0	Semi-mature

No	Species	Common name	ULE	Age
AP022	*Acacia melanoxylon*	Blackwood	0	Semi-mature
AP023	*Schinus areira*	Peppercorn tree	0	Semi-mature
AP024	*Schinus areira*	Peppercorn tree	0	Semi-mature
AP025	*Fraxinus angustifolia*	Desert ash	0	Semi-mature
AP026	*Fraxinus angustifolia*	Desert ash	0	Mature
AP027	*Syzygium paniculatum*	Magenta cherry	21-30	Semi-mature
AP028	*Pittosporum undulatum*	Sweet pittosporum	0	Semi-mature
AP029	*Fraxinus angustifolia*	Desert ash	0	Semi-mature
AP030	*Melaleuca linariifolia*	Snow-in-summer	21-30	Semi-mature
AP031	*Melaleuca linariifolia*	Snow-in-summer	21-30	Semi-mature
AP032	*Cupressus torulosa*	Bhutan cypress	31-60	Semi-mature
AP033	*Agonis flexuosa*	Willow myrtle	0	Semi-mature
AP034	*Cupressus sempervirens*	Pencil pine	21-30	Semi-mature
AP035	*Cupressus macrocarpa*	Monterey cypress	0	Semi-mature
AP036	*Prunus armeniaca*	Apricot	1-5	Mature
AP037	*Fraxinus angustifolia*	Desert ash	0	Semi-mature
AP038	*Syzygium smithii*	Lilly pilly	1-5	Semi-mature
AP039	*Schinus areira*	Peppercorn tree	21-30	Semi-mature
AP040	*Syzygium smithii*	Lilly pilly	11-20	Semi-mature
AP041	*Melaleuca armillaris*	Bracelet honey-myrtle	1-5	Mature
AP042	*Schinus areira*	Peppercorn tree	11-20	Semi-mature
AP043	*Acer negundo*	Box elder	1-5	Semi-mature
AP044	*Schinus areira*	Peppercorn tree	31-60	Semi-mature
AP045	*Schinus areira*	Peppercorn tree	21-30	Semi-mature
AP046	*Unknown* sp.	Unknown	6-10	Semi-mature
AP047	*Schinus areira*	Peppercorn tree	31-60	Semi-mature
AP048	*Schinus areira*	Peppercorn tree	31-60	Semi-mature
AP054	*Corymbia maculata*	Spotted gum	11-20	Semi-mature
AP055	*Eucalyptus polyanthemos*	Red box	11-20	Semi-mature
AP056	*Corymbia maculata*	Spotted gum	21-30	Semi-mature
AP057	*Corymbia maculata*	Spotted gum	21-30	Semi-mature
AP058	*Corymbia maculata*	Spotted gum	21-30	Semi-mature
AP059	*Eucalyptus* sp.	Eucalypt	11-20	Semi-mature
AP060	*Eucalyptus leucoxylon*	Yellow gum	11-20	Semi-mature
AP061	*Eucalyptus polyanthemos*	Red box	11-20	Semi-mature
AP062	*Eucalyptus camaldulensis*	River red gum	21-30	Semi-mature
AP063	*Callistemon* sp.	Bottlebrush	11-20	Semi-mature
AP064	*Eucalyptus camaldulensis*	River red gum	11-20	Semi-mature
AP065	*Eucalyptus camaldulensis*	River red gum	21-30	Semi-mature
AP066	*Corymbia maculata*	Spotted gum	11-20	Semi-mature
AP067	*Corymbia maculata*	Spotted gum	11-20	Semi-mature
AP068	*Corymbia maculata*	Spotted gum	21-30	Semi-mature
AP069	*Corymbia maculata*	Spotted gum	11-20	Semi-mature

No	Species	Common name	ULE	Age
AP070	*Schinus areira*	Peppercorn tree	21-30	Mature
AP071	*Eucalyptus leucoxylon*	Yellow gum	11-20	Semi-mature
AP072	*Eucalyptus camaldulensis*	River red gum	31-60	Mature
AP073	*Eucalyptus conferruminata*	Bald Island marlock	11-20	Semi-mature
AP074	*Callistemon* sp.	Bottlebrush	6-10	Semi-mature
AP075	*Callistemon* sp.	Bottlebrush	11-20	Semi-mature
AP076	*Eucalyptus leucoxylon*	Yellow gum	0	Semi-mature
AP077	*Eucalyptus leucoxylon*	Yellow gum	11-20	Semi-mature
AP078	*Eucalyptus leucoxylon*	Yellow gum	21-30	Semi-mature
AP079	*Melaleuca armillaris*	Bracelet honey-myrtle	11-20	Semi-mature
AP080	*Schinus areira*	Peppercorn tree	21-30	Semi-mature
AP081	*Schinus areira*	Peppercorn tree	11-20	Semi-mature
AP082	*Schinus areira*	Peppercorn tree	11-20	Semi-mature
AP083	*Schinus areira*	Peppercorn tree	6-10	Semi-mature
AP084	*Allocasurina verticillata*	Drooping she-oak	11-20	Semi-mature
AP085	*Eucalyptus leucoxylon*	Yellow gum	11-20	Semi-mature
AP086	*Eucalyptus leucoxylon*	Yellow gum	11-20	Semi-mature
AP087	*Angophora costata*	Sydney red gum	21-30	Semi-mature
AP088	*Angophora costata*	Sydney red gum	21-30	Semi-mature
AP089	*Schinus areira*	Peppercorn tree	21-30	Semi-mature
AP090	*Angophora costata*	Sydney red gum	11-20	Semi-mature
AP091	*Corymbia citriodora*	Lemon-scented gum	21-30	Semi-mature
AP092	*Angophora costata*	Sydney red gum	11-20	Semi-mature
AP093	*Eucalyptus camaldulensis*	River red gum	6-10	Semi-mature
AP094	*Mixed plantation*	Mixed plantation	11-20	Semi-mature
AP095	*Mixed plantation*	Mixed plantation	11-20	Semi-mature
AP096	*Corymbia citriodora*	Lemon-scented gum	11-20	Semi-mature
AP097	*Banksia integrifolia*	Coast banksia	11-20	Semi-mature
AP098	*Corymbia citriodora*	Lemon-scented gum	21-30	Semi-mature
AP099	*Acacia implexa*	Hickory wattle	11-20	Mature
AP100	*Eucalyptus* sp.	Eucalypt	11-20	Semi-mature
AP101	*Eucalyptus leucoxylon*	Yellow gum	11-20	Semi-mature
AP102	*Acacia implexa*	Hickory wattle	11-20	Semi-mature
AP103	*Mixed plantation*	Mixed plantation	11-20	Semi-mature
AP104	*Mixed plantation*	Mixed plantation	11-20	Semi-mature
AP105	*Eucalyptus botryoides*	Southern Mahogany	11-20	Mature
AP106	*Pyrus pashia*	Pashia Pear	6-10	Semi-mature
AP107	*Mixed plantation*	Mixed plantation	11-20	Semi-mature
AP108	*Schinus areira*	Peppercorn tree	11-20	Mature
AP109	*Corymbia ficifolia*	Red-flowering gum	31-60	Mature
AP110	*Corymbia ficifolia*	Red-flowering gum	11-20	Mature
AP111	*Corymbia ficifolia*	Red-flowering gum	21-30	Mature
AP112	*Araucaria heterophylla*	Norfolk Island pine	11-20	Semi-mature

No	Species	Common name	ULE	Age
AP113	*Araucaria cunninghamii*	Hoop pine	21-30	Semi-mature
AP114	*Corymbia ficifolia*	Red-flowering gum	6-10	Mature
AP115	*Prunus armeniaca*	Apricot	6-10	Over mature
AP116	*Schinus areira*	Peppercorn tree	60+	Mature
Total number of trees and tree groups				**111**

Langford Street intake substation site

The following trees have been identified that would require removal from the Langford Street intake substation site, as shown as shown on the following plan *Precinct 3 Arden Station ISS Option 1 AA03.05*.

TABLE 9-3 TREES TO BE REMOVED – LANGFORD STREET ISS SITE

No	Species	Common name	ULE	Age
L005	*Syzygium paniculatum*	Magenta cherry	6-10	Semi-mature
L006	*Fraxinus angustifolia*	Desert ash	0	Semi-mature
L007	*Schinus areira*	Peppercorn tree	21-30	Mature
L008	*Schinus areira*	Peppercorn tree	11-20	Semi-mature
L009	*Schinus areira*	Peppercorn Ttee	0	Semi-mature
Total number of trees				**5**

City of Melbourne

The following tree has been identified that would require removal, as shown on the following plan *Precinct 3 Arden Station AA03.02*, located in the Laurens Street road reserve.

TABLE 9-4 TREES TO BE REMOVED – LAURENS STREET

No	Species	Common name	ULE	Age
Trees highlighted **grey are semi-mature to over mature trees in the public realm with a ULE > 10years (MLTV Trees)**				
A002	*Platanus ×acerifolia*	London plane	21-30	Mature

The following trees have been identified within the Langford Street road reserve that are proposed for removal for construction access or service installation to the facility, and are managed by the City of Melbourne as shown on *Precinct 3 Arden Station ISS Option 1 AA03.05*.

TABLE 9-5 TREES PROPOSED FOR REMOVAL – LANGFORD STREET

No	Species	Common name	ULE	Age
Trees highlighted grey are semi-mature to over mature trees in the public realm with a ULE > 10years (MLTV Trees)				
L001	*Melaleuca styphelioides*	Prickly-leaved paperbark	21-30	Semi-mature
L002	*Melaleuca styphelioides*	Prickly-leaved paperbark	11-20	Mature
L003	*Melaleuca styphelioides*	Prickly-leaved paperbark	6-10	Mature
L004	*Tilia cordata*	Small-leaved linden	60+	Juvenile
Total number of trees				**4**
Number of MLTV trees				**2**

ALTERNATIVE OPTION DESIGN

The proposed alternative locations for the intake substation site are devoid of tree plantings. All options would limit removal of trees from the public realm by removing the potential impact on street trees within the Langford Street road reserve.

The alternative design options are consistent with the draft EES evaluation objective to avoid or minimise adverse effects on landscape, visual amenity and recreational values as far as practicable as:

- There are no trees within the public realm at the alterntatice design options locations for the intake substation.

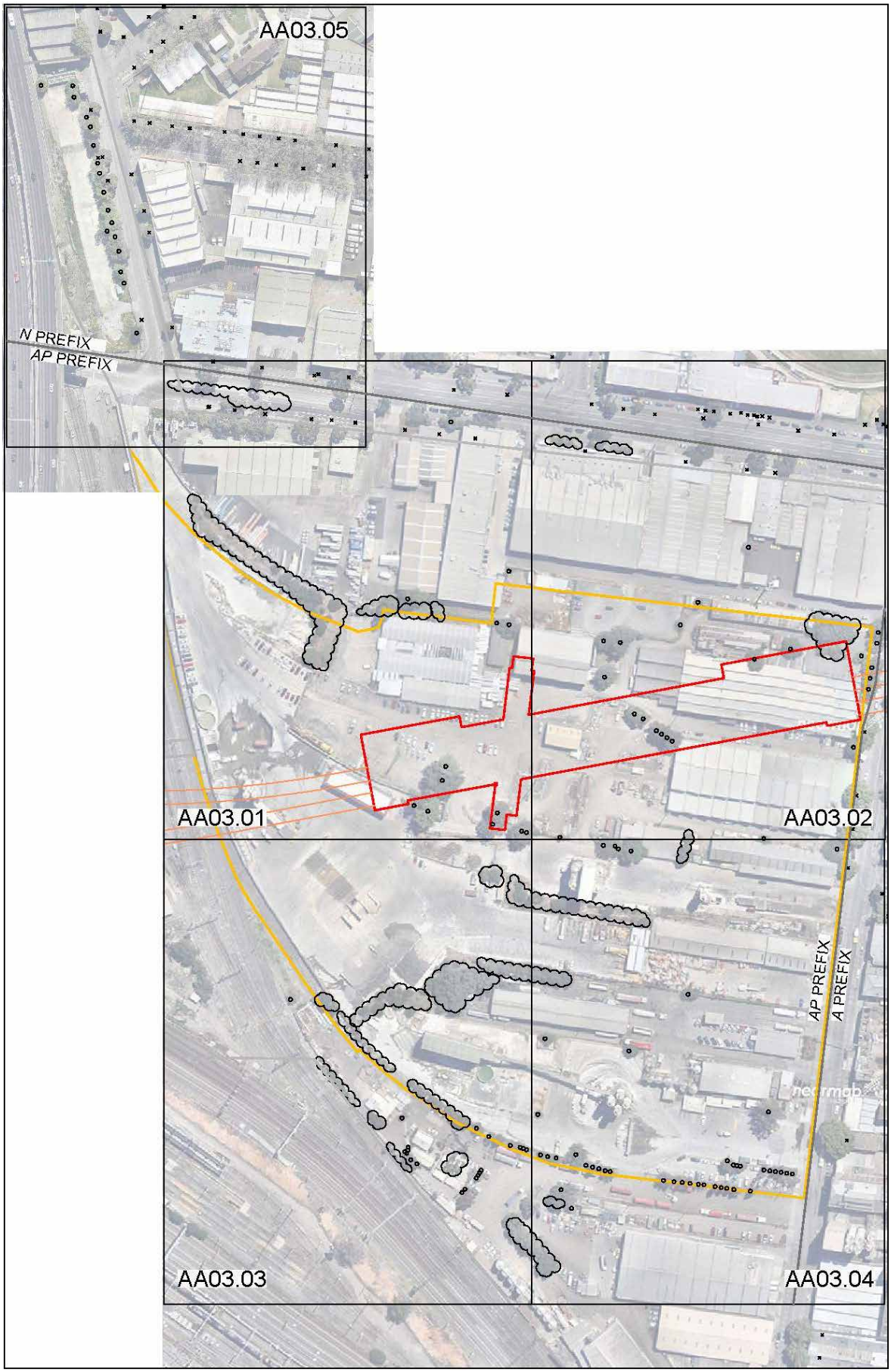
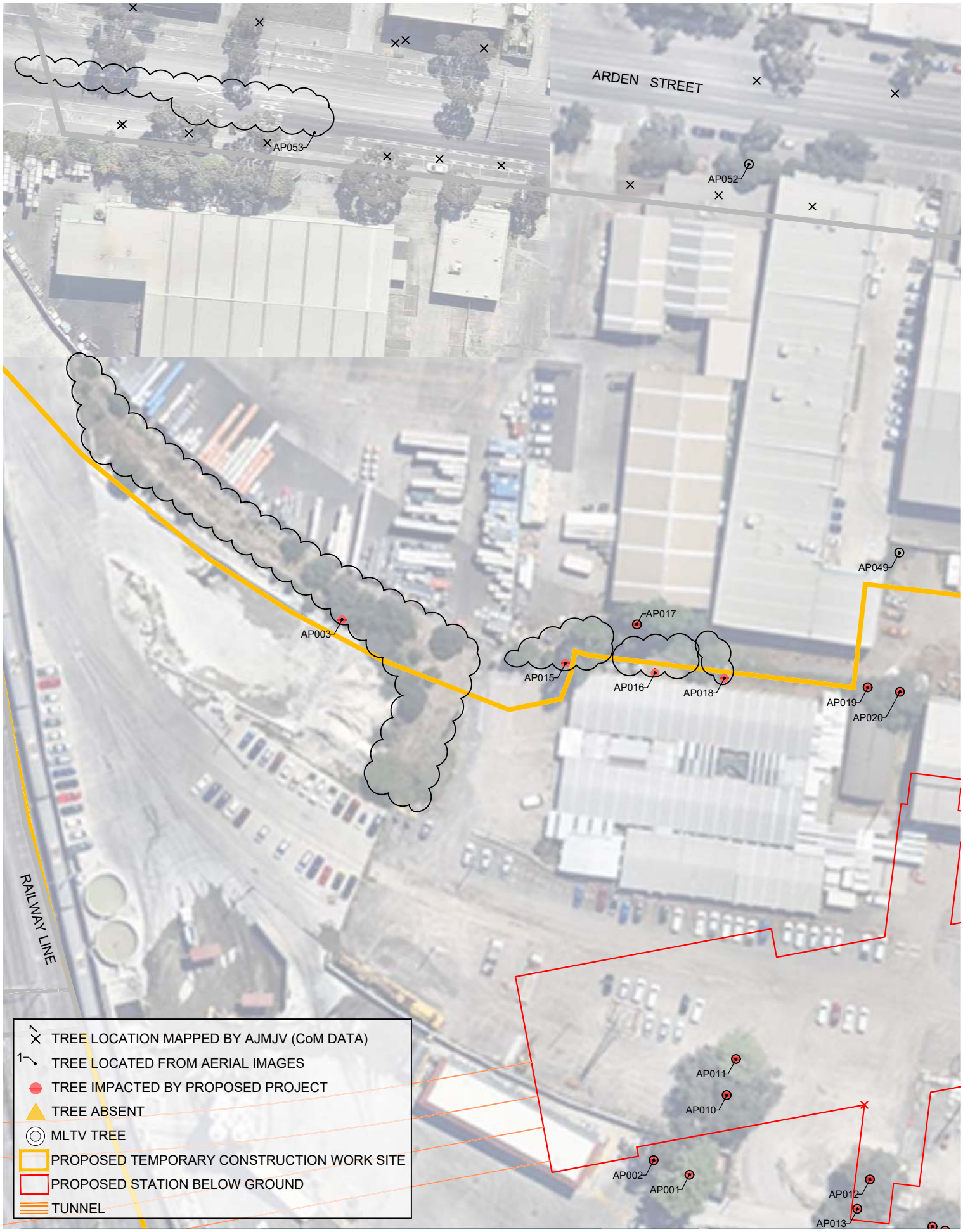


FIGURE 9-4 KEY PLAN – POTENTIALLY IMPACTED TREES, ARDEN



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Arboricultural Assessment

DRAWING
Precinct 3 Arden Station
Arden (Private)

SCALE	1:1000 @A4
DATE	MARCH 2016
DRAWN	MF
CHECKED	SH
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DWG NO	AA03.01
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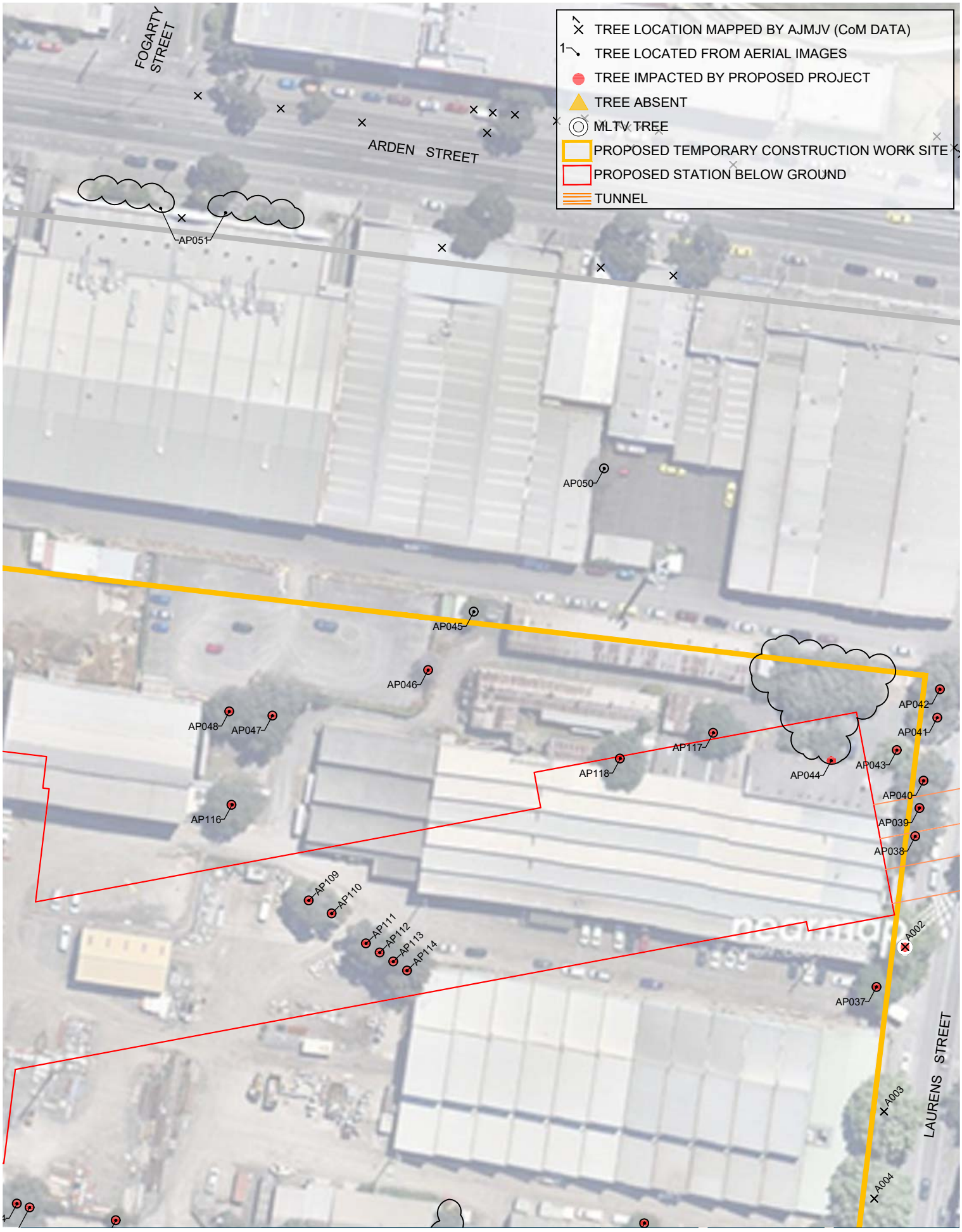

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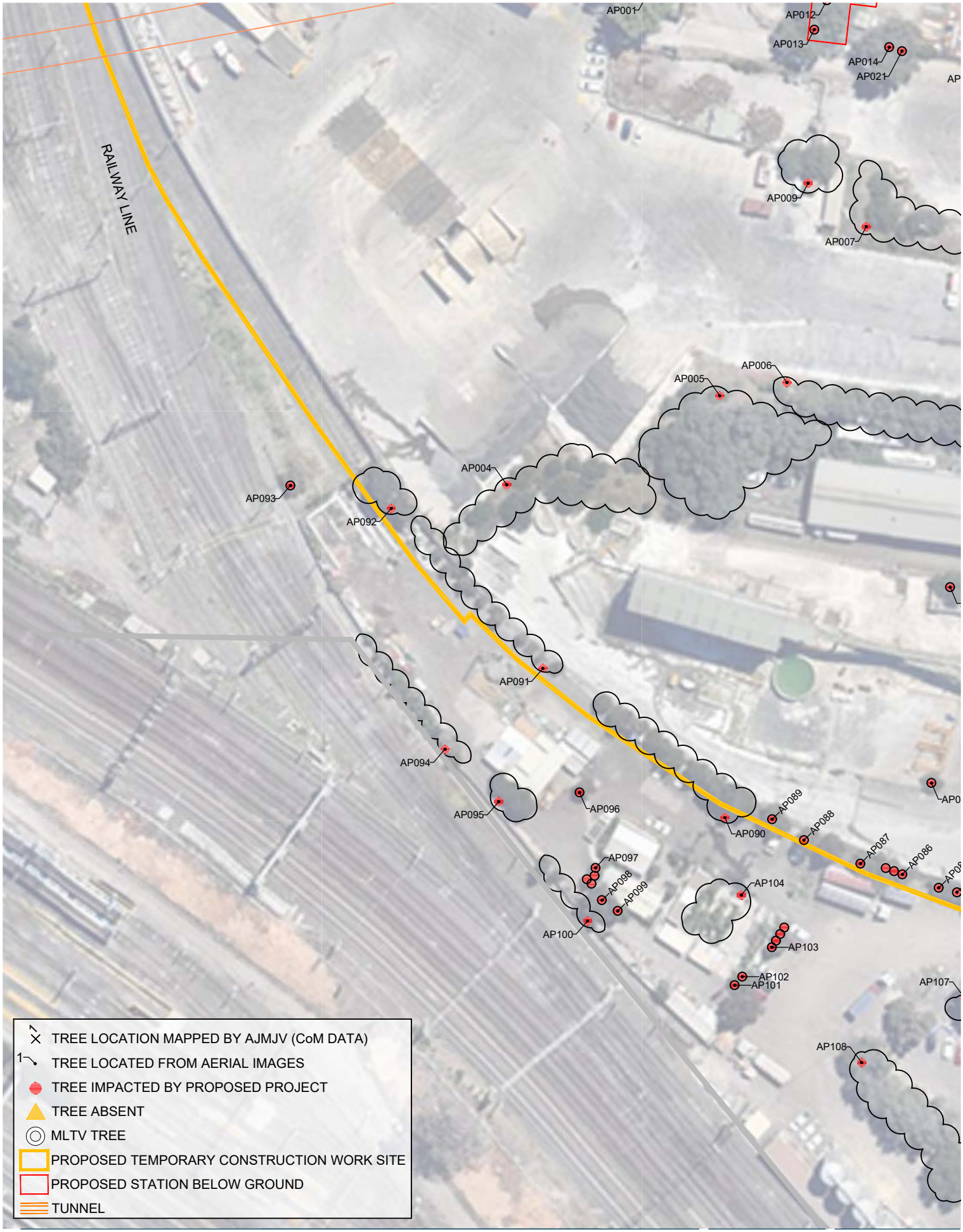

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JOB NO	15-280
DWG NO	AA03.03
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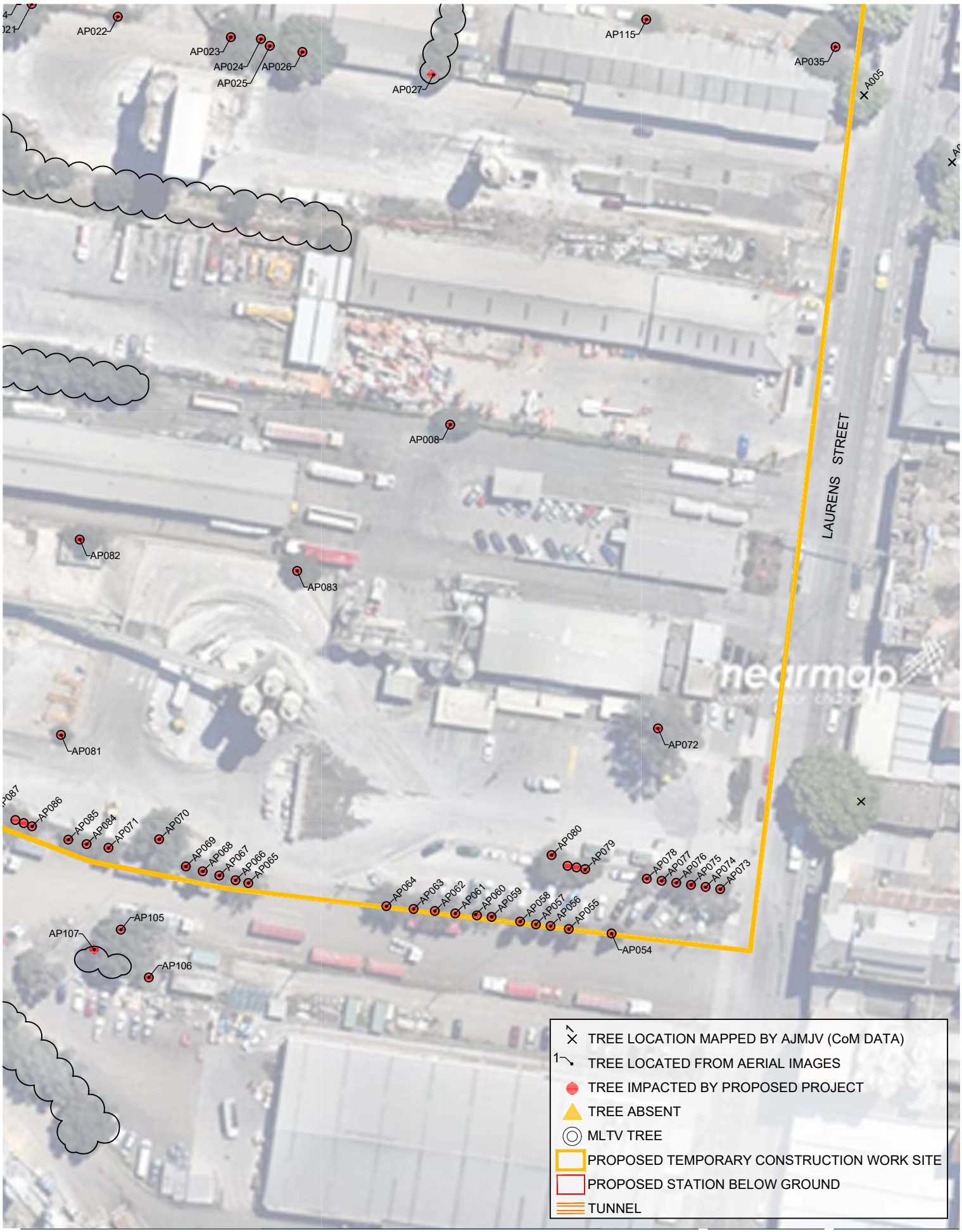

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Arden (Private)

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DWG NO	AA03.04
CAD FILE	15-280 L-TS01

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Precinct 3 Arden Station
ISS Option 1

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DATE	MARCH 2016
DRAWN	MF
CHECKED	SH
JOB NO	15-280
DWG NO	AA03.05
CAD FILE	15-280 L-TS01

9.6 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

Table 9-6 below provides the recommended Environmental Performance Requirements and proposed mitigation measures for the precinct.

TABLE 9-6 ENVIRONMENTAL PERFORMANCE REQUIREMENTS FOR PRECINCT

Asset / value	Impact	Environmental Performance Requirements	Proposed mitigation measures	Risk no.
Trees within the public realm (Laurens Street and Langford Street road reserves)	Removal as a result of construction activities.	Refer to AR1, AR2 and AR3 as contained in Table 7-12.	Introduce full plantation of street trees in addition to single tree to be removed to west side of Laurens Street as part of project delivery.	AR003
Trees within the public realm, Langford Street	Damage to trees in the vicinity of construction areas.	Refer to AR4 and AR5 as contained in Table 7-12.	None	AR003 AR004 AR005 AR007 AR008 AR009 AR010 AR011 AR012

10 PRECINCT 4: PARKVILLE STATION

10.1 PROJECT COMPONENTS

The relevant project components of the concept design for this assessment are as follows:

INFRASTRUCTURE

Located Under Grattan Street, to the East of Royal Parade

The station box would occupy the entire width of Grattan Street to the east of Royal Parade, extending to the east side of University Square. Station entries are proposed to the health facilities to the west of the station, to the north and south sides of Grattan Street, as well as to the University of Melbourne.

New road functional layouts are proposed for Grattan Street and the southern end of Royal Parade to the Haymarket roundabout, including slip lanes and widened medians within the Royal Parade/Elizabeth Street road reserves.

CONSTRUCTION

The construction work site for Parkville station would occupy the entire width of Grattan Street and extend into the grounds of the University of Melbourne. The construction work site would also occupy the northern end of University Square and the Barry Street road reserve to its west.

OPERATION

There would no impact as a result of ongoing operations.

10.2 EXISTING CONDITIONS

This precinct has been divided into two sub-precincts based on the respective manager of the land:

- Sub-precinct – Parkville public. Street trees managed by the City of Melbourne
- Sub-precinct – The University of Melbourne. Trees located within, and managed by University of Melbourne.

SUB-PRECINCT – PARKVILLE PUBLIC

This sub-precinct contains two distinct populations of trees:

- Large elms of late 19th and early 20th century origin, forming avenues within the Royal Parade and Grattan Street road reserves
- Modestly scaled and recently planted groups of crabapples (*Malus* sp.) and cedars (*Cedrus atlantica*) planted within the contemporary landscape of the northern portion of University Square, and developing horse chestnuts (*Aesculus hippocastanum*) in the central medians of Barry Street

The elms located within the entire width of the Royal Parade road reserve are included with the VHR listed H2198 and are specifically mentioned in the statement of significance for the place.

The mature elms within the Royal Parade and Grattan Street road reserves are the most visually dominant landscape features within the public realm. Trees within the northern portion of University Square and the Barry Street road reserve are modestly scaled and of relatively recent planting origin. The University Square contemporary tree plantation is performing poorly, with trees presenting low vigour and offering limited long-term value.

FIGURE 10-1 ELMS WITHIN THE GRATTAN STREET, LOOKING WESTWARDS TOWARDS ROYAL PARADE

FIGURE 10-2 ELMS WITHIN ROYAL PARADE, NORTH OF GRATTAN STREET

SUB-PRECINCT – UNIVERSITY OF MELBOURNE

A total of 62 trees were assessed within this sub-precinct, being the southern boundary of the main university (Parkville) campus, fronting Grattan Street.

The precinct includes trees located on land within the registered place Gatekeeper's Cottage, the University of Melbourne, VHR H0919. Trees are not referred to in the statement of significance for the place.

Plantings through this precinct are diverse in character, reflecting various layers of development within this part of the university grounds. An unusual component of the plantings is the prominent use of coniferous taxa including coast redwood (*Sequoia sempervirens*) and various pines (*Pinus* spp.). These are unusual specimens within an otherwise highly built-up, urbanised environment.

FIGURE 10-3 TREES WITHIN THE SOUTHERN GROUNDS OF THE UNIVERSITY OF MELBOURNE

ASSET VALUES

The asset values for the Parkville station precinct are summarised in Table 10-1.

TABLE 10-1 ASSET/VALUES FOR PRECINCT 4: PARKVILLE STATION

Asset / value	Details
Trees in the Grattan Street road reserve	Grattan Street features an avenue of mature elms extending through the precinct. The form of the trees on the southern side of Grattan Street has been impacted by recent building works, and some replacement trees have been recently planted.
Trees in the Royal Parade road reserve	The elms within Royal Parade are a fundamental component of the registered VHR H2198, planted as a double avenue. The inner rows are located in a median flanking the inner traffic lanes and tramlines, with an outer row located in the nature strip.
University Square and Barry Street	The northern end of University Square (above the underground car park) is planted with a contemporary landscape forming a treed urban plaza. The plantings have not been successful and are in poor condition. Barry Street to the west is planted with a row of horse chestnuts located within the central parking area. These are generally modestly scaled, juvenile and semi-mature trees.
The University of Melbourne	The southern portion of the University of Melbourne grounds fronting Grattan Street is planted with a diverse array of trees. Most notable is a pinetum[3] of various coniferous species that extends along much of the southern boundary within the study area. A number of large elms are located further to the east, including a notable specimen in the immediate surroundings of the Gatekeepers Lodge, VHR H0919.

No naturally occurring indigenous trees were assessed within Precinct 4. The ecological values and impacts to trees within this precinct are contained in Technical Appendix T *Terrestrial Flora and Fauna*.

The cultural heritage values of trees and landscape within Precinct 4 and potential impacts are contained in Technical Appendix J *Historical Cultural Heritage*.

The root growth of trees assessed within this precinct is well above, and therefore not reliant on, existing groundwater levels, based on a review of the existing conditions described in Technical Appendix O *Groundwater*.

10.3 KEY ISSUES

As identified in the risk assessment (Table 6-1), the key issue associated with this precinct would be the removal of trees from the public realm (**Risk #AR001**), including trees within the VHR listed place Royal Parade and the grounds of the University of Melbourne.

10.4 BENEFITS AND OPPORTUNITIES

The benefit associated with the concept design would be that it limits the removal of trees from the VHR registered Royal Parade as the main form of the station box would be located east of Royal Parade.

There would be an opportunity to re-establish trees in the public realm, in accordance with the City of Melbourne's *Urban Forest Strategy.*

It is noted that as a general observation, the trees within the Royal Parade avenue are approaching the end of their useful life expectancy ULE, which for many specimens is estimated to coincide with the construction and delivery timeframe of the project. There would be an opportunity to undertake a block replacement program for the southern section of Royal Parade, which would secure the regeneration and long-term future of an important urban tree plantation.

[3] A plantation of coniferous trees

This would also reduce the competition to new trees from established specimens and achieve a consistent growth form for a section of avenue likely to be due for replacement.

10.5 IMPACT ASSESSMENT

The following draft EES evaluation objectives and assessment criteria (and indicators where relevant) are relevant to this assessment.

Draft EES evaluation objectives	Assessment criteria
Landscape, visual and recreation values - To avoid or minimise adverse effects on landscape, visual amenity and recreational values as far as practicable.	Assess likely extent and duration of residual adverse effects on landscape values and available measures to manage or offset those effects.
	Minimise impacts on valued places, including public open space and recreation reserves.

The major impact to trees within this precinct would be the removal of 22 elms from the Grattan Street road reserve, and 10 elms located within the VHR listed *Royal Parade* (**Risk #AR001**). Of the trees to be removed from Royal Parade, six are to accommodate revisions to the road functional layout. While only 12 of the trees within Royal Parade and Grattan Street have been identified as MLTV trees, the cumulative impact of removal of a complete block of trees from Grattan Street, in the order of 250 m, and additional trees from Royal Parade would significantly impact on the streetscape within this precinct.

To ensure the loss of trees would be temporary, mitigation should seek to re-establish canopy cover in accordance with the City of Melbourne's *Urban Forest Strategy* as part of project delivery. The widened central medians at the Elizabeth Street north interface with the Haymarket Roundabout would allow for previously removed trees from the VHR listed Royal Parade tree avenue to be re-established

Thirty nine trees within the southern portion of the University of Melbourne's grounds would also require removal, and these also contribute to the public realm. Replanting should be undertaken in conjunction with the University's preferred future character for this sub-precinct.

A substantial number of trees (73) would also require removal from the northern portion of University Square (above the underground car park), and from the Barry Street road reserve for a portion of the construction area. Of these, 59 have been identified as MLTV trees by virtue of their estimated useful life expectancy and relative maturity, however the plantings within University Square are modestly scaled and many have generally performed poorly. There would be the opportunity to deliver an enhanced landscape outcome for this site as part of project delivery.

As well as tree removals, there would be the potential for damage to adjacent trees located on the west side of University Square, trees in the Royal Parade road reserve and trees within the university grounds by craning of building materials or high load access as well as by installation of services including above and below ground temporary services (**Risks #AR004-005** and **#AR007-012**). The potential impact of these activities could be substantially mitigated by implementing a Tree Protection Plan prepared in accordance with AS4970-2009 *Protection of Trees on Development Sites*. The Tree Protection Plan should address final design plans and construction management plans formulated for the precinct.

The proportion of MLTV trees and ULEs of other trees proposed to be removed within this precinct are summarised in Figure 10-4. These are trees located in the Royal Parade, Grattan Street and Barry Street road reserves, and University Square.

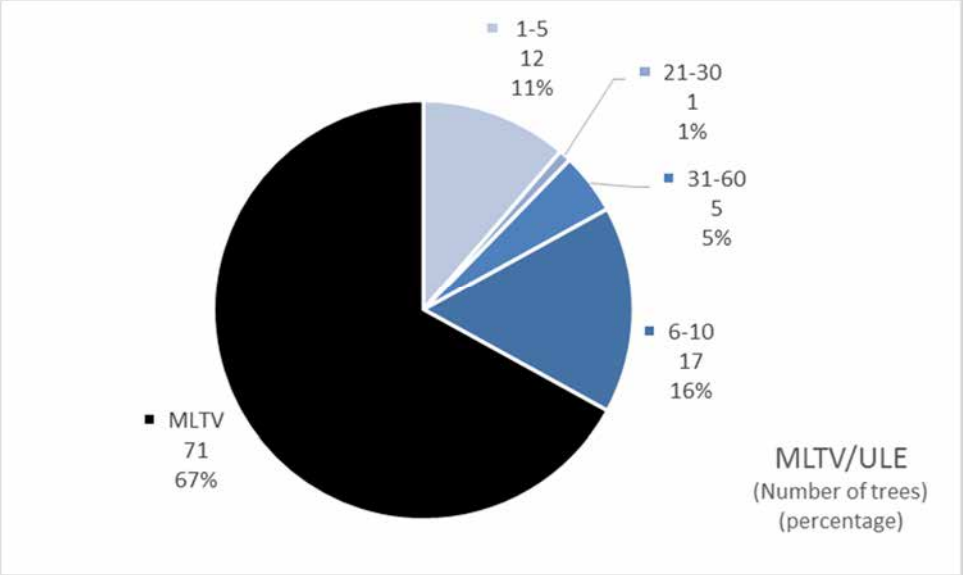


FIGURE 10-4 ULES OF TREES PROPOSED TO BE REMOVED FROM THE PUBLIC REALM, PARKVILLE PRECINCT

Duration of Impact

A detailed discussion of the potential impacts of tree removals during construction, and anticipated timeframes for tree re-establishment are included in Section 7.5. The six to seven year period during construction would have the greatest impact on the urban landscape. As they mature, replanted trees would progressively mitigate impacts and contribute to the landscape and, as an estimate, it is considered that within 20-30 years following planting, a high quality semi-mature canopy can be established, especially within the Grattan Street road reserve, subject to sufficient soil volume being provided over the station box at a minimum depth of one metre to sustain long-term tree growth.

The project is consistent with the draft EES evaluation objective to avoid or minimise adverse effects on landscape, visual amenity and recreational values as far as practicable as:

- Trees to be removed from the public realm can be replaced to achieve 40 per cent canopy cover within the precinct, consistent with the City of Melbourne's *Urban Forest Strategy*
- Trees on the periphery of construction areas can be managed and protected by a Tree Protection Plan prepared in accordance with AS4970-2009 *Protection of Trees on Development Sites*.

IMPACTED TREES

The following trees have been identified that would require removal from within the precinct to accommodate built form, revised road functional layouts or that would require removal for the construction zone in the south of the precinct, and are shown on the following plans *Precinct 4 Parkville Station AA04.01-AA04.02*.

City of Melbourne

TABLE 10-2 TREES TO BE REMOVED – CITY OF MELBOURNE

No	Species	Common name	ULE	Age
Trees highlighted grey are semi-mature to over mature trees in the public realm with **a ULE > 10years (MLTV Trees)**				
P018	*Ulmus* sp.	Elm	6-10	Mature
P019	*Ulmus* sp.	Elm	1-5	Mature
P023	*Ulmus* sp.	Elm	6-10	Mature
P027	*Ulmus* sp.	Elm	1-5	Mature
P028	*Ulmus* sp.	Elm	1-5	Mature
P036	*Ulmus* sp.	Elm	6-10	Mature
P037	*Ulmus* sp.	Elm	11-20	Mature
P045	*Ulmus* sp.	Elm	6-10	Mature
P046	*Ulmus* sp.	Elm	6-10	Mature
P047	*Ulmus* sp.	Elm	11-20	Mature
P052	*Ulmus* sp.	Elm	31-60	Semi-mature
P053	*Ulmus* sp.	Elm	6-10	Mature
P054	*Ulmus* sp.	Elm	6-10	Mature
P055	*Ulmus* sp.	Elm	6-10	Mature
P056	*Ulmus* sp.	Elm	11-20	Mature
P057	*Ulmus* sp.	Elm	11-20	Mature
P058	*Ulmus* sp.	Elm	11-20	Mature
P059	*Ulmus* sp.	Elm	11-20	Mature
P060	*Ulmus* sp.	Elm	1-5	Mature
P061	*Ulmus* sp.	Elm	1-5	Mature
P062	*Ulmus* sp.	Elm	31-60	Semi-mature
P063	*Ulmus* sp.	Elm	1-5	Mature
P064	*Ulmus* sp.	Elm	1-5	Mature
P065	*Ulmus* sp.	Elm	11-20	Mature
P066	*Ulmus* sp.	Elm	11-20	Mature
P067	*Ulmus* sp.	Elm	31-60	Juvenile
P068	*Ulmus* sp.	Elm	11-20	Mature
P069	*Ulmus* sp.	Elm	11-20	Mature
P070	*Ulmus* sp.	Elm	6-10	Mature
P071	*Ulmus* sp.	Elm	1-5	Mature
P072	*Ulmus* sp.	Elm	1-5	Mature
P073	*Ulmus* sp.	Elm	31-60	Juvenile
P074	*Ulmus* sp.	Elm	1-5	Mature
P079	*Cedrus atlantica* Glauca Group	Blue atlas cedar	6-10	Semi-mature
P080	*Cedrus atlantica* Glauca Group	Blue atlas cedar	6-10	Semi-mature
P081	*Cedrus atlantica* Glauca Group	Blue atlas cedar	6-10	Semi-mature
P082	*Cedrus atlantica* Glauca Group	Blue atlas cedar	6-10	Semi-mature
P083	*Cedrus atlantica* Glauca Group	Blue atlas cedar	6-10	Semi-mature
P084	*Cedrus atlantica* Glauca Group	Blue atlas cedar	6-10	Semi-mature

No	Species	Common name	ULE	Age
Trees highlighted grey are semi-mature to over mature trees in the public realm with **a ULE > 10years (MLTV Trees)**				
P087	*Malus* sp.	Crabapple	11-20	Semi-mature
P088	*Malus* sp.	Crabapple	11-20	Semi-mature
P089	*Malus* sp.	Crabapple	11-20	Semi-mature
P090	*Malus* sp.	Crabapple	11-20	Semi-mature
P091	*Malus* sp.	Crabapple	11-20	Semi-mature
P092	*Malus* sp.	Crabapple	11-20	Semi-mature
P094	*Malus* sp.	Crabapple	11-20	Semi-mature
P095	*Malus* sp.	Crabapple	11-20	Semi-mature
P096	*Malus* sp.	Crabapple	11-20	Semi-mature
P097	*Malus* sp.	Crabapple	11-20	Semi-mature
P098	*Malus* sp.	Crabapple	11-20	Semi-mature
P099	*Malus* sp.	Crabapple	11-20	Semi-mature
P100	*Malus* sp.	Crabapple	11-20	Semi-mature
P101	*Malus* sp.	Crabapple	11-20	Semi-mature
P102	*Malus* sp.	Crabapple	11-20	Semi-mature
P103	*Malus* sp.	Crabapple	11-20	Semi-mature
P104	*Malus* sp.	Crabapple	11-20	Semi-mature
P105	*Malus* sp.	Crabapple	11-20	Semi-mature
P108	*Malus* sp.	Crabapple	11-20	Semi-mature
P109	*Malus* sp.	Crabapple	11-20	Semi-mature
P110	*Malus* sp.	Crabapple	11-20	Semi-mature
P111	*Malus* sp.	Crabapple	11-20	Semi-mature
P117	*Cedrus atlantica* Glauca Group	Blue atlas cedar	31-60	Juvenile
P118	*Cedrus atlantica* Glauca Group	Blue atlas cedar	31-60	Juvenile
P119	*Cedrus atlantica* Glauca Group	Blue atlas cedar	6-10	Juvenile
P120	*Cedrus deodara*	Deodar	31-60	Juvenile
P121	*Aesculus hippocastanum*	Horse chestnut	6-10	Semi-mature
P122	*Aesculus carnea*	Red horse chestnut	21-30	Semi-mature
P123	*Aesculus hippocastanum*	Horse chestnut	11-20	Semi-mature
P124	*Aesculus hippocastanum*	Horse chestnut	21-30	Semi-mature
P125	*Aesculus hippocastanum*	Horse chestnut	21-30	Juvenile
P128	*Malus* sp.	Crabapple	11-20	Semi-mature
P129	*Malus* sp.	Crabapple	11-20	Semi-mature
P130	*Malus* sp.	Crabapple	11-20	Semi-mature
P131	*Malus* sp.	Crabapple	11-20	Semi-mature
P132	*Malus* sp.	Crabapple	11-20	Semi-mature
P133	*Malus* sp.	Crabapple	11-20	Semi-mature
P134	*Malus* sp.	Crabapple	11-20	Semi-mature
P135	*Malus* sp.	Crabapple	11-20	Semi-mature
P136	*Malus* sp.	Crabapple	11-20	Semi-mature
P137	*Malus* sp.	Crabapple	11-20	Semi-mature
P138	*Malus* sp.	Crabapple	11-20	Semi-mature

No	Species	Common name	ULE	Age
Trees highlighted grey are semi-mature to over mature trees in the public realm with **a ULE > 10years (MLTV Trees)**				
P139	*Malus* sp.	Crabapple	11-20	Semi-mature
P140	*Malus* sp.	Crabapple	11-20	Semi-mature
P141	*Malus* sp.	Crabapple	11-20	Semi-mature
P142	*Malus* sp.	Crabapple	11-20	Semi-mature
P143	*Malus* sp.	Crabapple	11-20	Semi-mature
P144	*Malus* sp.	Crabapple	11-20	Semi-mature
P145	*Malus* sp.	Crabapple	11-20	Semi-mature
P146	*Malus* sp.	Crabapple	11-20	Semi-mature
P147	*Malus* sp.	Crabapple	11-20	Semi-mature
P148	*Malus* sp.	Crabapple	11-20	Semi-mature
P149	*Malus* sp.	Crabapple	11-20	Semi-mature
P150	*Malus* sp.	Crabapple	11-20	Semi-mature
P151	*Malus* sp.	Crabapple	11-20	Semi-mature
P152	*Malus* sp.	Crabapple	11-20	Semi-mature
P153	*Malus* sp.	Crabapple	11-20	Semi-mature
P154	*Malus* sp.	Crabapple	11-20	Semi-mature
P155	*Malus* sp.	Crabapple	11-20	Semi-mature
P156	*Malus* sp.	Crabapple	11-20	Semi-mature
P157	*Malus* sp.	Crabapple	11-20	Semi-mature
P158	*Malus* sp.	Crabapple	11-20	Semi-mature
P159	*Malus* sp.	Crabapple	11-20	Semi-mature
P160	*Malus* sp.	Crabapple	11-20	Semi-mature
P161	*Malus* sp.	Crabapple	11-20	Semi-mature
P162	*Cedrus atlantica* Glauca Group	Blue atlas cedar	1-5	Semi-mature
P163	*Cedrus atlantica* Glauca Group	Blue atlas cedar	1-5	Semi-mature
Total number of trees				**106**
Number of MLTV trees				**71**

The University of Melbourne

TABLE 10-3 TREES TO BE REMOVED – THE UNIVERSITY OF MELBOURNE

No	Species	Common name	ULE	Age
Trees highlighted grey are semi-mature to over mature trees in the public realm with a **ULE > 10years (MLTV Trees)**				
PP04	*Ulmus glabra* 'Lutescens'	Golden elm	11-20	Semi-mature
PP05	*Eucalyptus blakelyi*	Blakely's red gum	31-60	Semi-mature
PP06	*Lophostemon confertus*	Brush box	11-20	Semi-mature
PP07	*Lophostemon confertus*	Brush box	31-60	Semi-mature
PP08	*Populus nigra*	Lombardy poplar	21-30	Semi-mature
PP09	*Populus ×canadensis*	Grey poplar	21-30	Semi-mature
PP10	*Fagus sylvatica*	Beech	21-30	Semi-mature
PP11	*Ulmus procera*	English elm	60+	Semi-mature

No	Species	Common name	ULE	Age
Trees highlighted grey are semi-mature to over mature trees in the public realm with a **ULE > 10years (MLTV Trees)**				
PP12	*Ulmus procera*	English elm	60+	Semi-mature
PP13	*Ulmus procera*	English elm	31-60	Semi-mature
PP14	*Ulmus procera*	English elm	60+	Semi-mature
PP15	*Pinus canariensis*	Canary Island pine	60+	Semi-mature
PP16	*Ulmus procera*	English elm	31-60	Semi-mature
PP17	*Agathis robusta*	Queensland kauri	60+	Semi-mature
PP18	*Crataegus phaenopyrum*	Washington thorn	11-20	Semi-mature
PP19	*Morus alba*	White mulberry	11-20	Semi-mature
PP20	*Morus alba*	White mulberry	21-30	Semi-mature
PP21	*Crataegus phaenopyrum*	Washington thorn	11-20	Semi-mature
PP22	*Acer palmatum*	Japanese maple	11-20	Semi-mature
PP23	*Sequoia sempervirens*	Coast redwood	60+	Semi-mature
PP24	*Sequoia sempervirens*	Coast redwood	60+	Semi-mature
PP25	*Sequoia sempervirens*	Coast redwood	60+	Semi-mature
PP26	*Cedrus atlantica*	Blue atlas cedar	11-20	Semi-mature
PP27	*Sequoia sempervirens*	Coast redwood	60+	Semi-mature
PP28	*Sequoia sempervirens*	Coast redwood	60+	Semi-mature
PP29	*Pinus* sp.	Pine	60+	Semi-mature
PP30	*Cupressus glabra*	Smooth Arizona cypress	60+	Semi-mature
PP31	*Sequoia sempervirens*	Coast redwood	60+	Semi-mature
PP32	*Sequoia sempervirens*	Coast redwood	60+	Semi-mature
PP33	*Sequoia sempervirens*	Coast redwood	60+	Semi-mature
PP35	*Pinus canariensis*	Canary Island pine	31-60	Semi-mature
PP35	*Pinus canariensis*	Canary Island pine	21-30	Mature
PP36	*Eucalyptus botryoides*	Southern mahogany	6-10	Mature
PP37	*Eucalyptus botryoides*	Southern mahogany	11-20	Mature
PP38	*Pinus* sp.	Pine	1-5	Semi-mature
PP39	*Pinus canariensis*	Canary Island pine	21-30	Semi-mature
PP40	*Cupressus sempervirens*	Italian cypress	60+	Semi-mature
PP41	*Melaleuca styphelioides*	Prickly-leaved paperbark	11-20	Semi-mature
PP42	*Syzygium smithii*	Lilly pilly	21-30	Semi-mature
Total number of trees				**39**
Number of MLTV trees				**38**

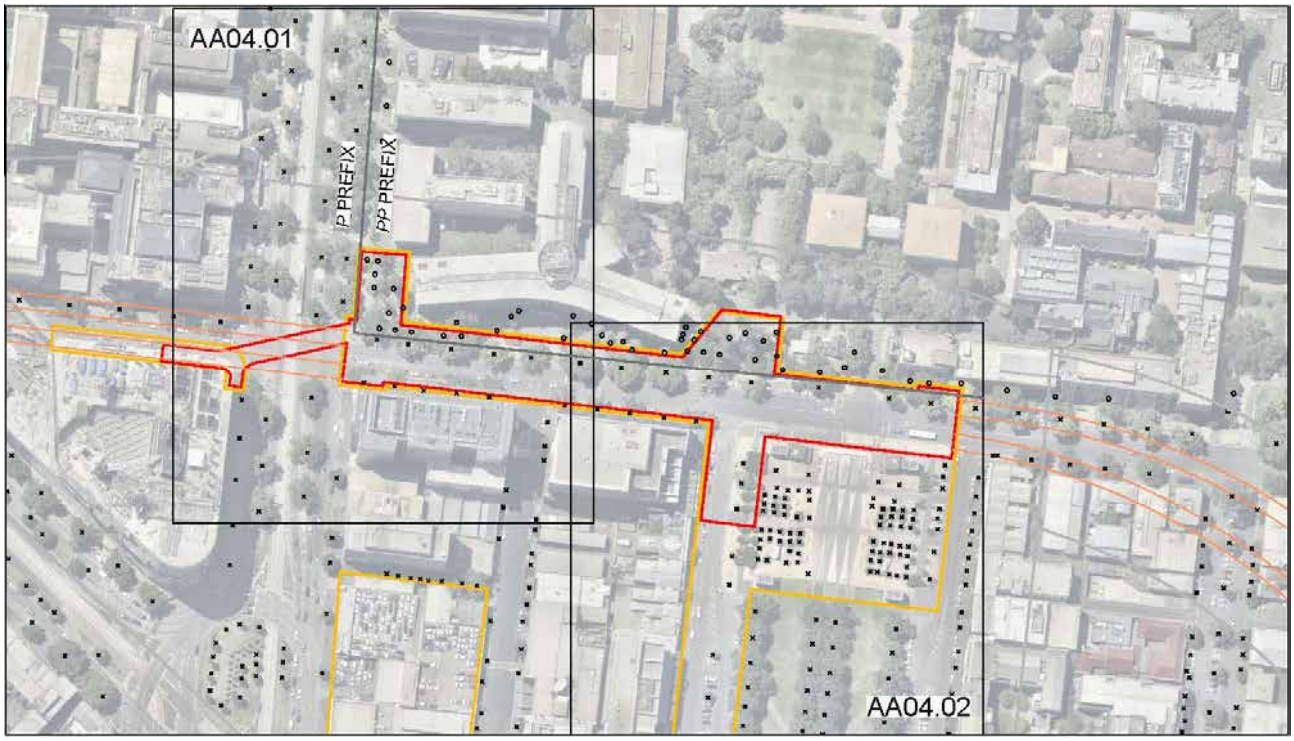
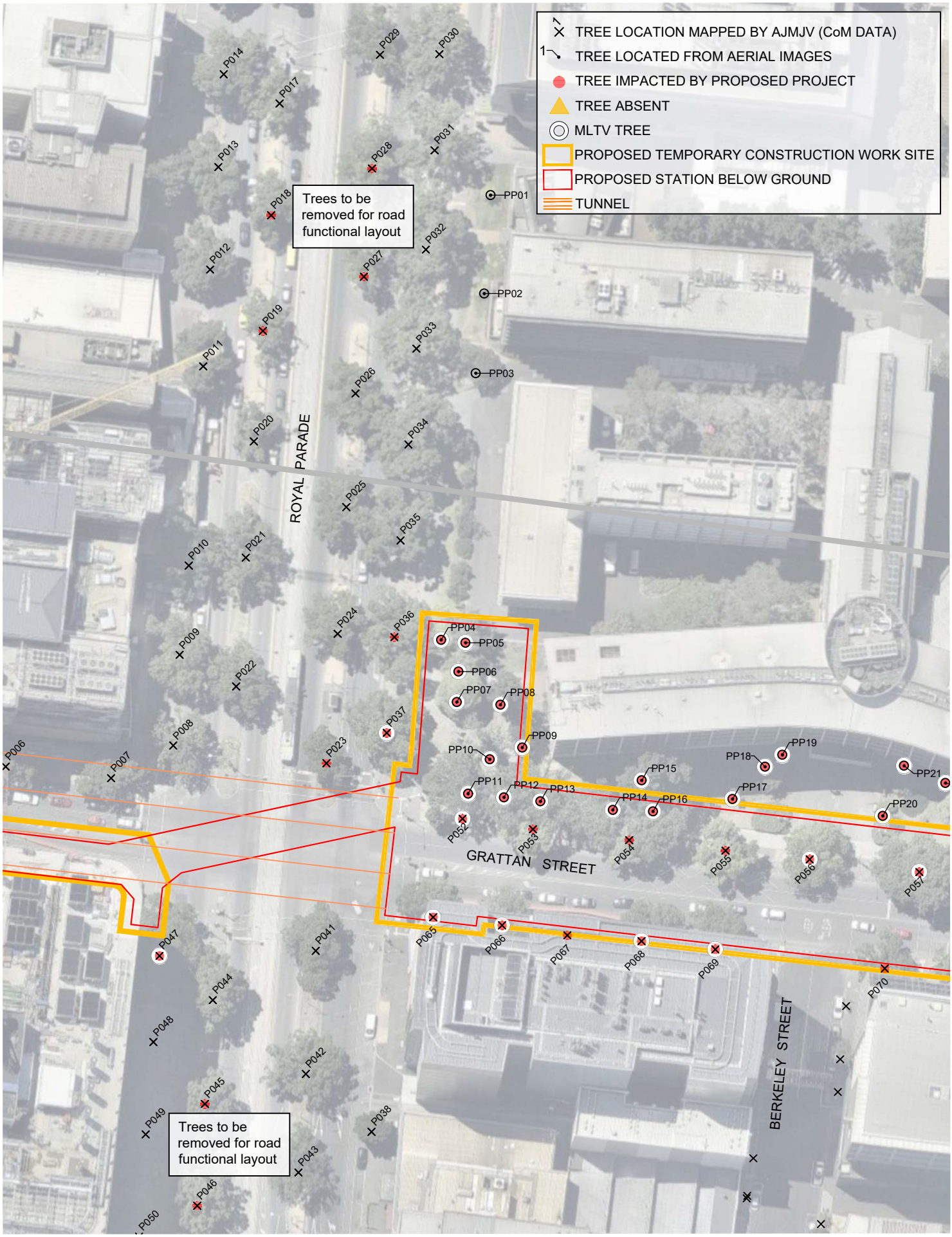


FIGURE 10-5 KEY PLAN – POTENTIALLY IMPACTED TREES, PARKVILLE



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CLIENT
MELBOURNE METRO

PROJECT
MELBOURNE METRO RAIL PROJECT

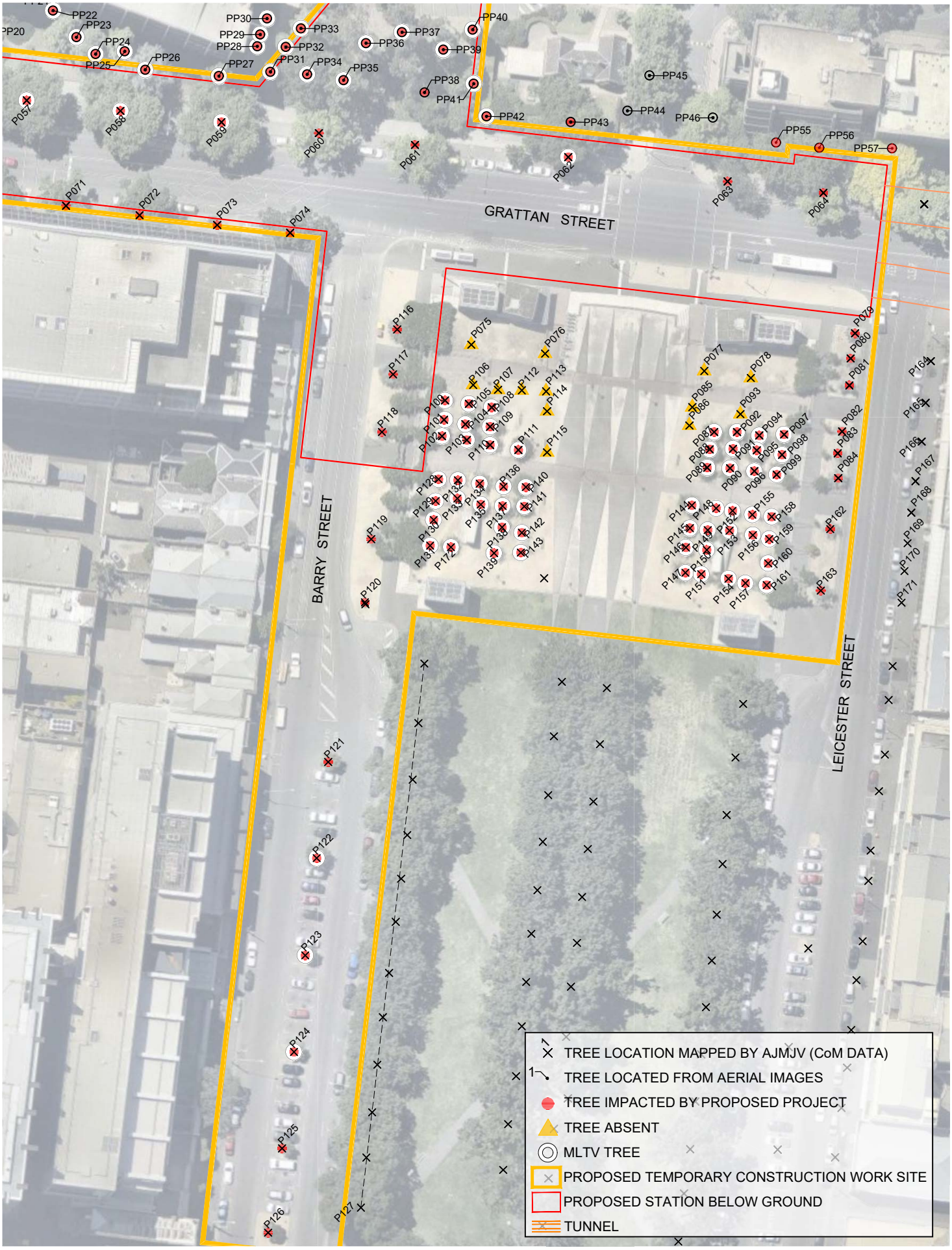
Arboricultural Assessment

DRAWING
Precinct 4 Parkville Station Parkville (Public & Private)

SCALE	1:1000 @A4
DATE	MARCH 2016
DRAWN	MF
CHECKED	SH
JOB NO	15-280
DWG NO	AA04.01
CAD FILE	15-280 L-TS01

PLEASE NOTE
The contractor must verify all dimensions on site before commencing any work or preparing any shop drawings.

Do not scale off drawings.



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Arboricultural Assessment

DRAWING
Precinct 4 Parkville Station Parkville (Public & Private)

SCALE	1:1000 @A4
DATE	MARCH 2016
DRAWN	MF
CHECKED	SH
JOB NO	15-280
DWG NO	AA04.02
CAD FILE	15-280 L-TS01

10.6 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

Table 10-4 below provides the recommended Environmental Performance Requirements and proposed mitigation measures for the precinct.

TABLE 10-4 ENVIRONMENTAL PERFORMANCE REQUIREMENTS FOR PRECINCT

Asset / value	Impact	Environmental Performance Requirements	Proposed mitigation measures	Risk no.
Trees within the public realm, including the Grattan Street and Royal Parade road reserves and the grounds of the University of Melbourne	Removal within each sub-precinct as a result of construction activities and to accommodate built form.	Refer to AR1, AR2 and AR3 as contained in Table 7-12.	Replant previously removed Elms in central portion of Elizabeth Street North, within widened central median. Investigate the opportunity to undertake a block replacement program for all trees in the southern section of Royal Parade which would secure the ongoing viability of an important urban tree plantation.	AR001
Trees within the public realm, including the southern portion of University Square	Damage to trees in the vicinity of construction areas.	Refer to AR4 and AR5 as contained in Table 7-12.	None	AR004 AR005 AR007 AR008 AR009 AR010 AR011 AR012