Inquiry and Advisory Committee in relation to
the North East Link Environment Effects Statement

STATEMENT OF EVIDENCE
ON ARBORICULTURAL ISSUES

COMMISSIONED BY

City of Manningham

in relation to the

North East Link Project

GALBRAITH & ASSOCIATES

14/July/19

The Members of the
Inquiry and Advisory Committee
in relation to the North East Link
Environment Effects Statement

Introduction
The North East Link Project (NELP) is a Victorian Government project planned to commence in 2020 and to be completed in 2027. The project will involve major road construction works from Ringwood to Watsonia, including connection of the Eastern Freeway to the M80 Ring Road, underground tunnels and freeway widening. In Manningham the NELP will be located principally adjacent to the Eastern Freeway between Springvale Rd and Bulleen Rd, and in the vicinity of Bulleen Rd from the Eastern Freeway north to the Yarra River beyond Bridge St.

Galbraith and Associates has been retained by the City of Manningham primarily to consider the condition, age and significance of the River Red Gum (Eucalyptus camaldulensis) in the road reserve adjacent to the south-west corner of the Caltex Service Station at 39 Bridge Street, Bulleen. According to the proposal, this iconic signature tree will be removed. I note its removal is contrary to the wishes of the City of Manningham, The National Trust of Victoria, the Wurundjeri Corporation and the Birrarung Council, as stated in their submissions to the IAC. In addition I have been asked to comment on other arboricultural impacts of the proposal, where within my sphere of expertise.

The 39 Bridge Street River Red Gum
The tree is a large old example of the pre-European dominant tree species of the area, namely River Red Gum. Such trees would have been far more widespread in the local vicinity prior to European settlement. This particular individual measures approximately 20m in height with a crown spread of 11m to the north, 8m to the south, 8m to the east and 15m to the west. The trunk has a circumference of 597cm at 1.4m above ground, equivalent to a diameter of 190cm at that level.

Health
Despite the tree being surrounded by concrete in the service station to the north, the concrete drive from Manningham Road into the site to the west of the trunk and the footpath and asphalt of Manningham Road to the south, the tree is in good health. It has a dense cover of lush green foliage, despite it having weathered the driest January – May period since meteorological records began and it receiving no irrigation.

The tree has had a chequered career in terms of health. Page 42 of the April 2006 Manningham Heritage and Significant Tree and Garden Study has a photo of the tree. It is thinly foliated, due, according to the Study, from heavy browsing by possums. It is also stated in that report that possum guards were installed on the day of the recording of the tree, namely 2/10/02. According to a report by Tree Survey dated December 2017, the existing steel possum guard was installed in 2011 around the trunk base, following which there was significant re-foliation**.**

Structure

Structurally the tree has many pockets of decay of varying size, as would be expected for a very old tree. I consider that overall its structural integrity is still good and can be maintained that way for many years. Decay pockets are common on old River Red Gums and are used as habitat by arboreal dwelling animals such as parrots, owls, kookaburras, bats, gliders and possums. Decay associated with very old branch failure wounds is common in old River Red Gums. The trees respond by compartmentalising the decay pockets to limited volumes, unless the tree is weak and overwhelmed with many large wounds, the evidence for which is lacking here. The vascular cambium between the sapwood and bark in healthy trees such as this responds to localised weakening from internal decay by manufacturing extra wood to optimise and more evenly spread the loading stresses throughout the tree.

In this case it is apparent that the main trunk, at approximately 4m height, collapsed many years ago. It was already extensively decayed at the time of collapse. The rest of the tree has long since grown around and into the space once occupied by the collapsed section of trunk, forming a new crown. I arranged a climbing inspection to be undertaken by Mr Alex Pinniger, an experienced Arborist who has worked for Galbraith and Associates for many years. A series of photos were taken, some of which are in this report.

I would strongly suggest that a reason this tree was not cut down in early European settlement and later years, is because of the massive defect present as a result of the trunk collapse and decay, rendering the tree relatively useless for timber.

There has been some recent branch shed history however in relation to the great majority of other tree species of similar size and age, it is remarkably stable. If the tree was to be retained, I would suggest that it could be conserved safely with minor hazard reduction pruning conducted every seven years. Typically such pruning would entail the removal of dead wood and weight reduction of any major branches which are deemed too long and heavy relative to thickness, taper, load distribution and accumulated defects.

It is interesting that two recent branch failures have occurred since 2017 when unauthorised trenching works were undertaken near the tree (see reports by Tree Survey dated 13/Dec/17 and by Treespace dated 24/Nov/17). River Red Gums are known to shed branches when drought stressed as a moisture conservation measure. The root loss caused by the trenching may have been a factor for the shedding.

With respect to the below ground root anchorage and structural stability, it is obviously difficult to tell, the roots being submerged, potentially many of them under hard structure. Much of the root zone has been built over in the past (see the attached 1945 aerial image where it is apparent there was no structure near it). It is my experience however that it is exceptionally unusual for relatively upright River Red Gums such as this to uproot. It tends only to happen to those on heavy leans. It is much more common for trees to lose sections of the crown in severe storm events than uproot.

Overall I would suggest this tree, if subjected to minor maintenance and protected from site disturbance, has a long safe useful life expectancy of well over a hundred years.

Age

Age estimation is difficult in River Red Gums. As with most trees, basing a tree`s age on its size is fraught. Tree size depends not only on age but the rate of growth. This in turn is highly dependent on growth conditions such as competition in early stages from grass and other trees, soil and moisture conditions, and pest outbreaks. Visible annual increment analysis of cross sections of Red Gum is not easy, because the timber is diffuse porous (the vessels are distributed randomly throughout a year`s growth). Further, there is often difficulty in discerning lighter coloured wider bands of early wood (wood typically produced in spring) from late wood (wood typically lain down in autumn winter). The trees are opportunistic in their growth, hence they will produce woody tissue when the conditions are right, such as during medium to warm conditions when soil moisture is plentiful. Furthermore increments can be indistinct due to heavy tanning. Despite these problems however, Galbraith and Associates has removed River Red Gums of known age on a number of occasions and found visible annual increment estimation to correlate moderately well with known age.

The EES refers to this tree as a 300 year old tree, however no evidence is presented to back up the estimation. In fact there is very little description of the tree in the entire EES. Under the National Trust`s citation of it being a tree of regional significance, it is stated that it is possibly in excess of 300 years and is probably the oldest tree remaining of the original red gum forest. Again, no evidence is provided as to how this age estimation is derived. Similarly the April 2006 Manningham Heritage and Significant Tree and Garden Study suggests 300 + years with no evidence for the estimation, yet it suggests a 400 year age for a considerably smaller tree much closer to the river at the Greenery.

A survey dated December 2008 for the Shire of Moorabool of River Red Gums in the Bacchus Marsh Valley by Mr Bob Reid of the Friends of Werribee Gorge, mentioned an age determination method undertaken for River Red Gums in Bundoora Park. According to Bob Reid, it was a Dr. Noel Schleiger of the Field Naturalists Club of Victoria who had conducted the Bundoora Park study. Dr Schleiger had told him that radial increment core samples were taken from the lower trunks of a number of trees, and sent to Lucas Heights in Sydney for carbon 14 dating. As a result it was suggested that the age of a River Red Gum could be approximated by the trunk circumference (girth) in centimetres representing years, +/- 110 years. Thus a tree with a 597cm trunk circumference at breast height, as is the case with the subject tree, would be 597 years of age +/- 110 years.

Unfortunately we have not been able to find a report of this Bundoora study. However we would suggest the formula is simplistic in that it does not take account the usually (unless hindered by completion or browsing) relatively large radial increment growth of the trees when they are young compared to when they are old. Thus there would be a bias to the over estimation of age of young trees. Young vigorous trees of perhaps 40 years of age may be predicted to be well over a hundred.

It has been re-enforced to me time and time again over the years as a contractor and also as a visitor to many housing estate projects where River Red Gums have been removed and stumps or trunks are still present to examine, that trunk radial increment growth tapers off significantly with age. In the first twenty years in good growing environments, the radial expansion is often of the order of approx. 8mm per year. After approx. 70 years it is more like 2-3mm a year. When over 100cm – 120cm Diameter at Breast Hight (DBH) the increments are usually more like 2mm a year, tapering off to 1mm with size increase. Thus, assuming a 5mm radial annual increment average over the first 70 years, which is feasible in quite good conditions, this brings the DBH to 70cm. Up to 120cm DBH at 2mm average radial increment per year (4mm diameter increment), this would take another 125 years. Then at an average of 1.5mm radial increment per year (3mm annual diameter increment) to take it to a DBH of 190cm, this would take another 200 years. Thus assuming good conditions with this approach, an age estimate of approximately 400 years for this tree is forthcoming. I do not believe it can be much younger, however it could be much older, particularly when one considers issues such as repeated kangaroo/wallaby browsing when very young, dense grass competition or competition with dense tree regrowth in its earlier life, and the loss of its main trunk at approximately 4m height. Later root loss since infrastructure was built near it and consequent possum browsing would likely have slowed down growth.

Yingabeal

The mature River Red Gum named Yingabeal is a large canoe tree in the grounds of the Heide Museum of Modern Art. The tree is located approx. 600m north-west of the subject tree and at a significantly higher elevation. It has a girth of 560cm at breast height, i.e. a diameter of 178cm. It measures approximately 20m in height with a radial canopy spread of 8m north of the trunk centre, 9m south, 8m east, 7m west and 12m south-west. The latest the canoe would have been cut out from its trunk is probably 1850, as European settlement in the area and displacement of indigenous people and lifestyle was likely widely established by then. As assessed from the beginning of woundwood establishment, i.e. the new wood formed after the scar was inflicted, the tree was approximately 105cm diameter when the bark was cut off. Thus its age before the canoe was cut out could be conservatively interpreted as being 70 years by the time it was 70cm DBH, then, at 2.5mm per year for an extra 175mm radial growth = 70 years, for a total age of 140 years before the canoe was cut out.

Assuming the bark for the canoe was cut off in 1850 at the latest, the tree has increased in diameter by 73cm (36.5cm radially) over 169 years. This equates to an approx. 2.16mm radial increment a year on average, which based on my observations is too large for a large old tree like this, given its environment. Assuming however that an average radial increment growth of only 1.3mm per year was being achieved, then it could be assumed the bark was cut off the trunk 365mm/1.3mm = 280 years ago, i.e. in 1739, which is quite plausible, making it 420 years of age.

The growth rate of Yingabeal was probably a little lower than that of the subject tree (before the subject 39 Bridge St tree had its environment severely modified with the road and service station), due to its higher elevation and probable less soil moisture availability. It is quite possible therefore that Yingabeal was older when the canoe was cut out of it. The two trees could have germinated after a wild fire even.

Reliable River Red Gum DBH Growth Rate Data

Obviously if reliable data was widespread whereby trunk diameters of many trees of local provenance in the Melbourne area in similar growing conditions were measured accurately over many years, then a good deal of the speculation could be removed from determining the ages of these two trees. The only long term study that I am aware of in the diameter growth of mature River Red Gums was that which took place between 1955 and 1995 in River Red Gum stands in the Murray River Basin of NSW. In the extract on page 7 of this statement, taken from page 71 of the CSIRO publication *"Flooded Forest and Desert Creek – Ecology and History of the River Red Gum"* by Matthew J Colloff, graphs are provided of trunk diameters over bark (DBHs) for various size classes at five yearly intervals over time. It is apparent from the largest trunked trees in the study, measured to average 60cm – 65cm DBH in 1955, that there was only an average 12cm diameter growth (6cm radial growth) over 40 years, or 1.5mm radial increment per year.

If we were to assume there was an average 1.5mm radial annual increment from the time when both the Bridge St tree and Yingabeal were 630mm DBH to the present, then it would take 423 years for the Bridge St tree to grow radially an extra 635mm to reach its current DBH of 1900mm (190cm) and 383 years for Yingabeal to grow radially an extra 575mm to reach its current DBH of 1780mm (178cm). Assuming they were each 65 years of age when their DBHs were 63cm, then the Bridge St tree would be 488 years of age and Yingabeal 448 years of age if one extrapolated from the data. Again I would suggest this would be conservative, as by the time the Murray Basin trees were 120cm in diameter, I would expect the annual radial increment of the Murray Basin trees to be substantially less than 1.5mm.

I note in the April 2006 Manningham Heritage and Significant Tree and Garden Study that the DBHs for each of the Bridge St tree and Yingabeal were measured to be 1873mm and 1750mm respectively.

The 39 Bridge St tree (Tree 3 as per the 2006 study) was stated in the study to have been recorded in October 2002. Over the intervening 17 year period it has grown to be 1900mm. Thus the Bridge St tree has grown in diameter by 27mm or 13.5mm radially. The average annual radial increment over the last 17 years is therefore 0.8mm. Assuming an average 1mm annual radial increment growth since the tree was 1200mm diameter, the tree has put on 350 years of growth on top of the previously calculated 195 years of a 1200mm DBH tree, providing a calculated age of 545 years. We are "in the ball park" of the approximate age which would be obtained by using Dr Schleiger`s formula (page 4).

With respect to Yingabeal (Tree 15 as per the 2006 study), it was recorded to have a DBH of 1750mm on 1/9/05. Thus it has grown 30mm over the 14 year period, or 15mm radially. This equates to an average radial increment of 1.07mm for Yingabeal. If the tree averaged say 1.2mm annual increment from when it was 1050mm DBH, when it was deduced to be 140 years of age, its age now could be calculated as 350mm/1.2mm + 140 = 432 years.

The bottom line is that the 39 Bridge St tree is very old, perhaps 500+ years, and has a long safe useful life expectancy.

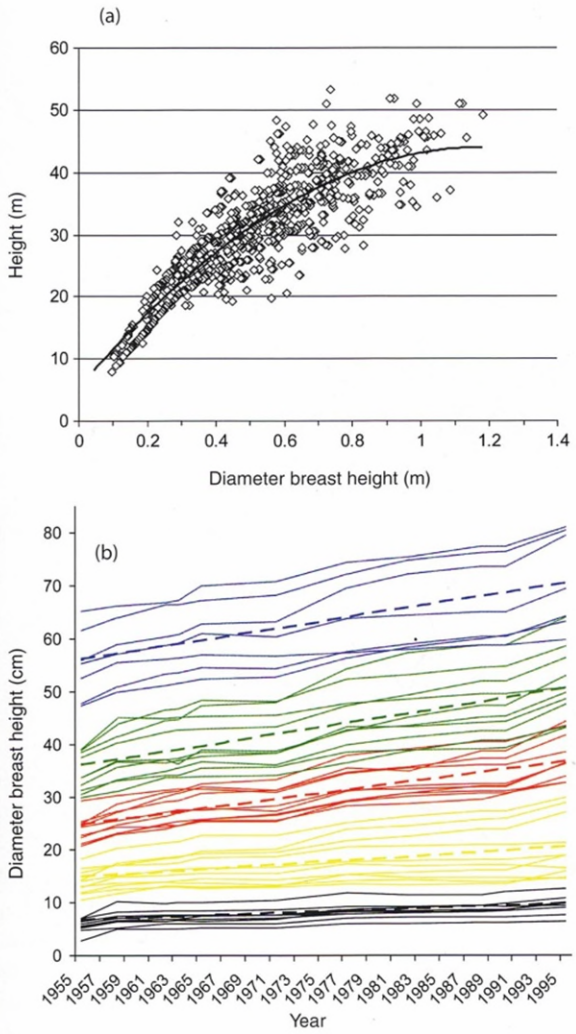


Fig. 3.15: Growth of river red gums. (a) Height versus diameter at breast height of trees in plots at Moira, Millewa, Gulpa Island, Koondrook and Campbells Island state forests, measured between 1955 and 2001. Average diameter is 0.51 m (range 0.1–1.18 m), average height is 30.1 m (range 7.9–53.3 m). (b) Increase in diameter for five different diameter classes of trees at Gulpa Island, 1955–95. Dashed lines are averages. Data from growth trials kindly supplied by Paul Childs, New South Wales Office of Environment and Heritage.

forest. The stand was established from natural regeneration and not subject to thinning (young trees in thinned stands tend to grow faster because the competition from close neighbours is reduced). There is a steady increase in diameter increments with increasing diameter

Photo 1 – Looking east-south-east along Manningham Road at the subject tree.

Photo 2 – Looking south to the tree from the service station. The arrow points to where a major failure occurred many years ago, with several sprouts emanating from the same location.

Photo 3 – Looking west-north-west.

Photo 4 – looking northwards to the tree.

Photo 5 – looking east at the trunk.

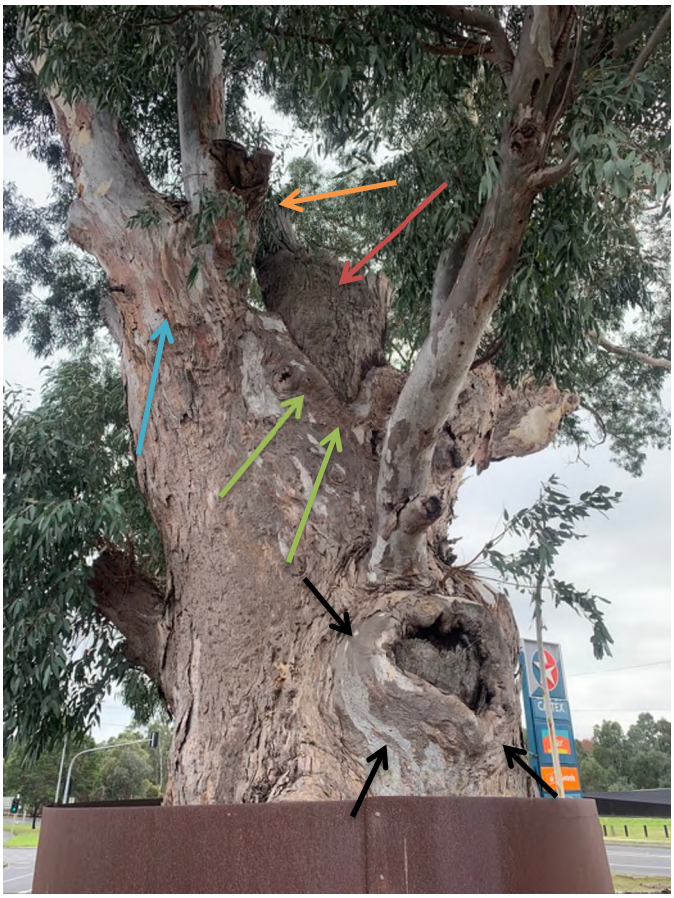


Photo 6 – The black arrows show the woundwood thickening around an old branch loss wound. The thickening and fibre orientation optimises the forces on the trunk. The green arrows show where wood growth is occurring to counter any increased propensity of the wood to split below the old trunk failure wound above. The blue arrow shows where active thickening of supporting wood is forming. The red arrow points to the remnants of the primary trunk, which was obviously already hollow and ancient at the time of collapse. The orange arrow points to an old branch which may have died after the trunk fracture. Two scarfe wounds diametrically opposite one another have been made by a saw at the base of this old branch stub.

Photo 7 – The orange arrowed branch remained alive after the main trunk from which it emanates had collapsed. A fire has burnt inside the trunk at some stage, but after the collapse of the trunk and death of arrowed branch.

Photo 8 – Somebody has tried to cut the branch off well after it had died, as is apparent from the orange arrowed scarfe wound.

Photo 9 – Contextual view of the scarfe wound in photo 8. The dead branch however did not fracture and collapse at the old scarfe wounds, but rather a metre above.

Photo 10 – Active wildlife habitat hollow in the tree. It is located at the green arrow in photo 11. Two Sulphur Crested Cockatoos, including the bird in photo 13, were hovering and squawking at Alex Pinniger when he took this photo. Breeding season begins shortly.

Photo 11 – The red arrow points to a recent failure which occurred soon after the 2017 trenching occurred. The orange arrow points to Cockatoo damage whereby chunks of bark have been removed from a patch. This appears to be long term preparation for Cockatoo descendants to have hollows to nest in.

Photo 12 – The black arrows indicate where the slab of the driveway is rising and lipping relative to the metal grid of the drain and the concrete inside the service station. It is probable major root development is occurring beneath the drain, arrowed blue, causing lifting of the drive.

Photo 13 – A local keeping a wary eye on the intruder.

Photo 14 – Yingabeal – the canoe tree River Red Gum some 600m north-east of the old tree at 39 Bridge Street, Bulleen. It is located in the grounds of the Heide Museum of Modern Art.

Photo 15 shows the trunk where a bark slab was removed from the trunk for a canoe. The woundwood, as arrowed, covering the scar is a maximum 300mm thick and extends 420mm – 460mm from each side across the scar.

Photo 16 Shows the upper part of the scar.

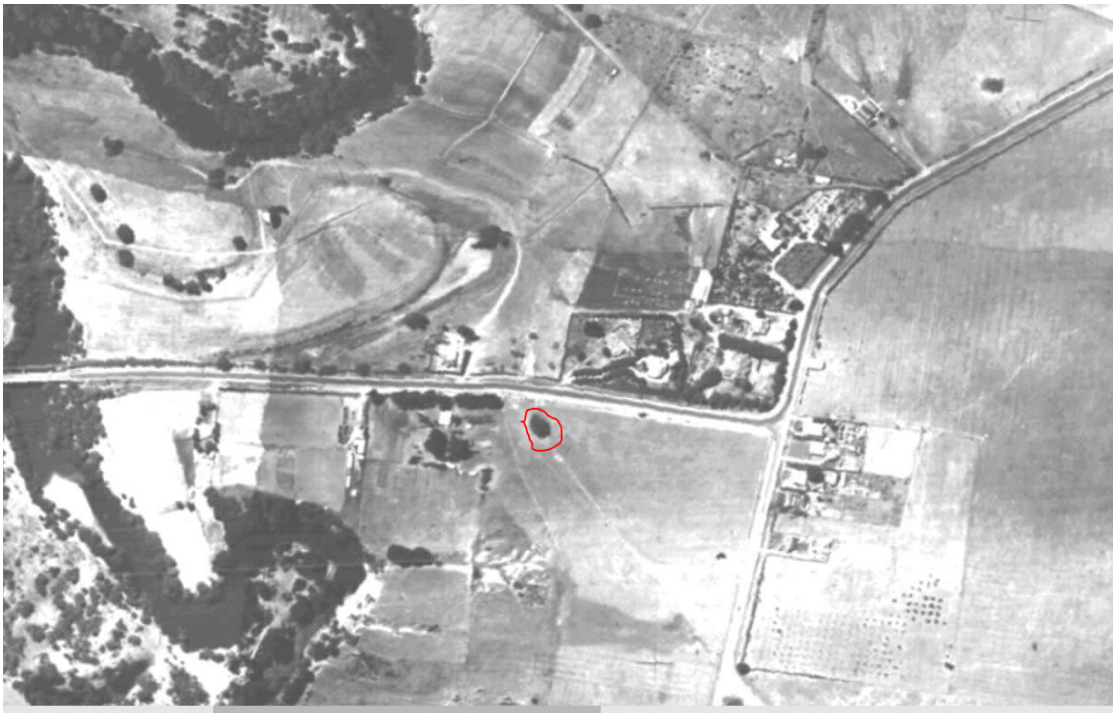


Photo 17 – 1945 Aerial image in the Melbourne University Archives. The River Red Gum is circled in red.

Photo 18 – 2019 Google aerial image. The tree is circled in red. Its canopy spread is certainly no larger – if anything smaller, than it was in 1945.

Significance

As stated in the Environmental Effects Statement (EES) in several places, a Heritage Overlay HO24 (Manningham City Council) applies to the tree. The overlay derives from inclusion of the tree in the 2006 report by John Patrick Pty Ltd titled 'Manningham City Council Heritage Garden & Significant Tree Study, Stage 2 Report- Garden and Tree Assessment' (pages 42-43). When the tree was assessed for the report (October 2002), it was noted that it exhibited "Severe possum damage, leaving very limited foliage cover". The author rated the tree as having Regional Significance, the meaning of which is clarified in the following excerpts from the report :

> "Trees were assessed using the National Trust criteria as a basis for significance and were compared against other trees in the municipality. …….Once trees were identified as being significant their level of significance was determined. This was divided into three categories:
>
> • Trees of Local Significance
> This included trees that were of significance to the suburb they were within or to the local streetscape. In particular, trees of large size and aesthetic value, and those associated with properties of historic or cultural interest to the suburb or township were included.
> • Trees of Regional Significance
> This included trees that were of significance to the wider Manningham and Melbourne region. This included trees associated with the history of the region, as well as trees identified as being the largest and best examples of individual species in the area.
> • Trees of State Significance
> This included trees that were of significance to the state of Victoria. This included trees that were among the largest, oldest or best examples of the species in the state, as well as trees of extreme rarity or horticultural value and trees associated with the wider history of the state of Victoria."

Some 18 other River Red Gums are listed in the 2006 report. According to the measurements in that report, the 39 Bridge St tree has the largest stem diameter among them. Two of the trees are situated in the grounds of Heide II, one being an aboriginal canoe scar tree.

Design and Methods – Factors affecting Retention

The approximate location of the tree is shown or included on various plans of the EES documentation. None of the plans include detailed information concerning, for example, the exact location of the stem of the tree, proposed changes in levels, or the extent and specifications of proposed works in the vicinity of the tree. The greatest detail relevant to the retention of the tree appears to be shown in "Reference Design", Sheet 17 of 47 of Map book - Vertical Alignment Plans and Indicative Cross Sections, which has therefore been used as the main source of information in the following discussion. A second plan has also been used, namely Figure 8-14 "Manningham Rd interchange (reference project)", at page 8-28 of Chapter 8 (Project Description).

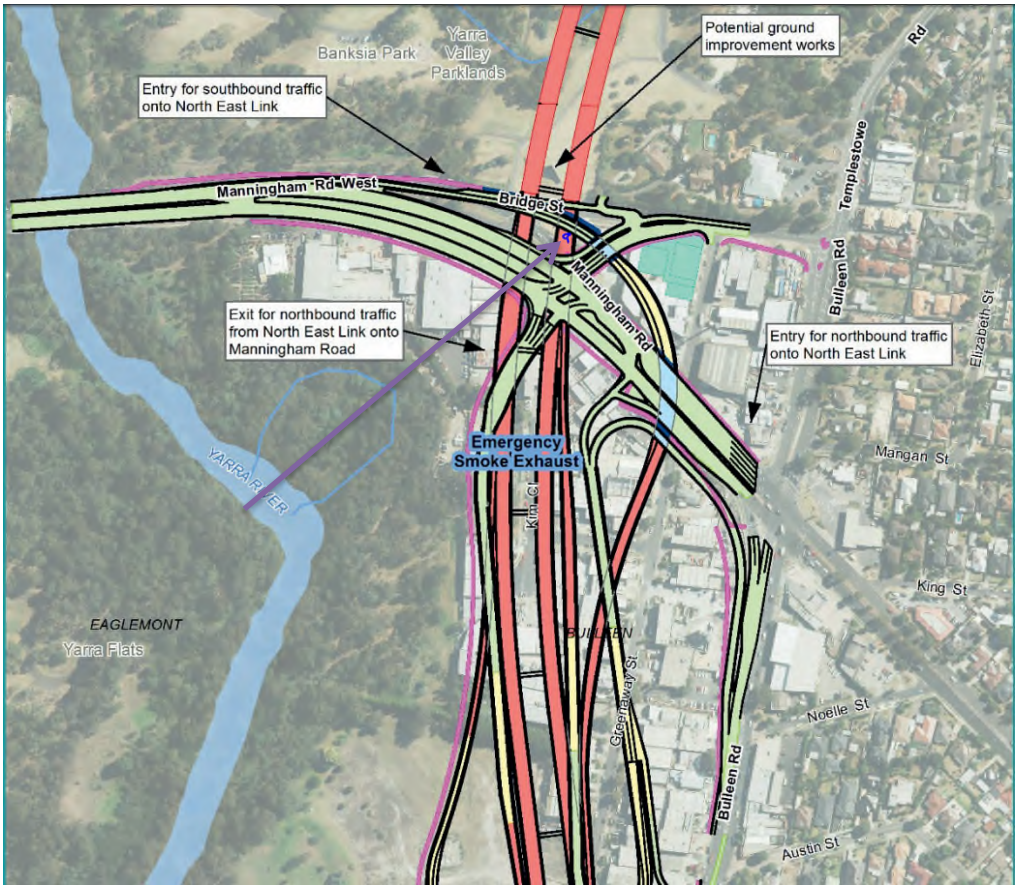
Root Distribution

As currently depicted, the project design does not enable the retention of the tree. Any serious consideration given to retaining the tree must take into account both the root and crown radial spread and distribution. Root location and density of the water absorbing fraction of those roots is likely to be highly asymmetric, given the artificial structures that have been placed near it. An example is Manningham Road where substantial excavation some 6m south of the trunk would have taken place during its construction, potentially eliminating all the root growth in that zone. Despite this it is

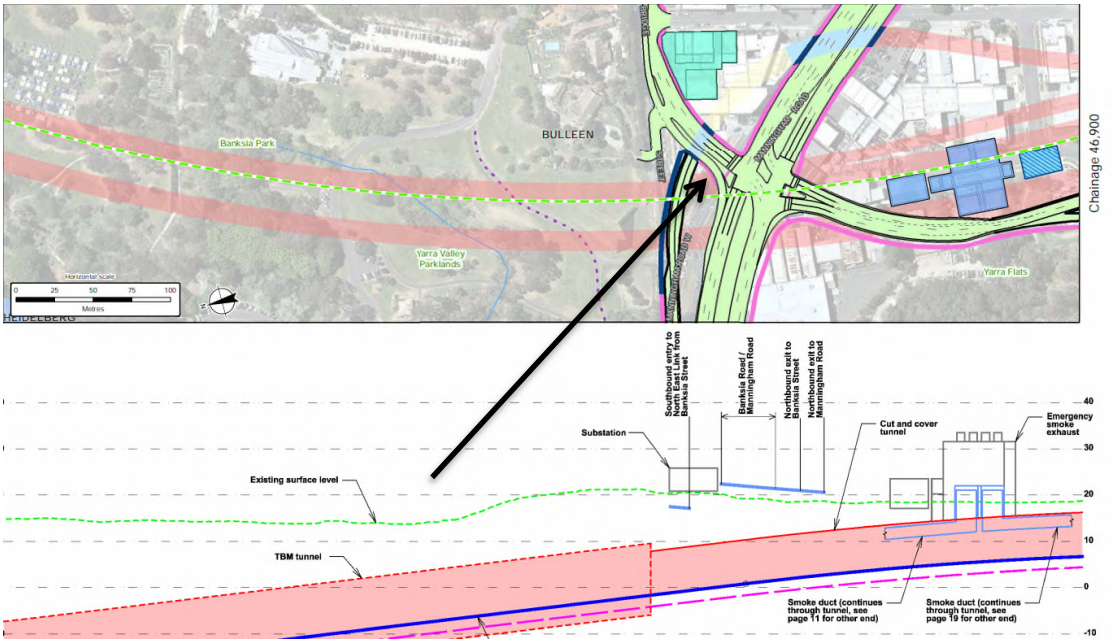
probable that some root regrowth has occurred beneath the road, given the tolerance of this species to low oxygenated environments. The excavation for underground tanks, underground services and drains, and the removal of topsoil for the concrete pavement of the service station would also have caused substantial changes to root distribution.

The relevant Australian Standard 4970:2009 ‘Protection of trees on development sites’ for determining appropriate clearances from the trunk can only be assumed to be a rough guideline. The tree protection zone according to the Australian Standard is 15m radius from the trunk centre. I would suspect however that a 15m radial clearance to the south under Manningham Road is not necessary to be retained for the ongoing health of the tree. However at least this distance is highly likely to be necessary to the east and west of the tree where open ground and drains are located (see photo 12). Due to the perceived asymmetric nature of the root distribution and large size of the tree, I would suggest that a 20m radial root zone distance from the trunk centre will need to be catered for (apart from some 4m out into Manningham Road) intact and free of site disturbance, unless root distribution studies reveal otherwise.

Any investigations for retaining this tree should start by ensuring that a ground penetrating radar (GPR) study is undertaken to help determine root distribution. The tree is the only one anywhere near the site, so roots picked up in the scanning can be reliably identified as those from this tree. The GPR has its limitations, one of which is that it cannot reliably assess root thickness, however if the machine is in good operational order and appropriately programmed, it has been found to reliably determine location and depth of roots (see “Ground Penetrating Radar Accurately Locates Roots in Two Soil Media Under Pavement” by Bassuk et al in Arboriculture and Urban Forestry 2011 37(4)).



The approximate location of the 39 Bridge St tree is arrowed purple. Extract from Figure 8-14 "Manningham Rd interchange (reference project)", at page 8-28 of Chapter 8 (Project Description).



The arrow points to the approx. location of the trunk of the 39 Bridge St, tree – it has no hope of being retained under the current proposal. The above drawing is an extract from sheet 17 of 47 Map book – Vertical Alignment Plans and Indicative Cross Sections

The Proposal and Recommendations in Relation to the Bridge Street River Red Gum

Considering the reference project design of the proposed Manningham Road interchange can be modified to some extent, a number of aspects which would need to be addressed for the successful retention of the tree (that is, the retention of the tree without negatively affecting its ongoing health or safe useful life expectancy) are:

1. That the proposed tunnel extending north from near the Eastern Freeway is currently proposed to be situated directly below the tree and excavated using the cut and cover method in the proximity of the tree. Retention of the tree would not be possible if the cut and cover method is used because it will remove the tree. However, two other methods of tunnel excavation are proposed in other locations of the NELP, namely the use of a tunnel boring machine (TBM) and the use of tunnel mining. TBM excavation in fact is proposed to be used as close as 30 m south of the tree. If the tunnel could be kept at the minimum depth necessary to enable TBM excavation to continue beneath the tree and say 15m beyond it, then it may be feasible to keep the tree from the point of view of the tunnel.
2. Details of the alignment of Manningham Road, the south bound entry ramp onto the North East Link and the north bound exit ramp onto Manningham Road and across to Bridge Street, along with the exact location of the trunk need to be shown, together with the exact level changes required, finished levels and how they are going to be achieved. The outlook for the tree looks poor having regard to the reference design for the proposed interchange in the EES, irrespective of the tunnelling mentioned earlier. The roots of the tree spread out laterally close to the surface and can be expected to be 20m away in some directions. Assuming that the tree requires a tree protection zone of at least 15m radially, including up to 20m radially from the trunk, successful retention of the tree will require some change to the location of each road and thus to that of the interchange as a whole.
3. The alternative design of the Manningham Rd interchange, which is described briefly on page 8-26 of the EES and depicted, for example, on page 8-28 appears to involve slightly greater encroachment of the tree than the reference design and is therefore not considered further.

The tree is too large and old to be considered for transplantation, yet still be expected to remain viable.

In The Link, issue no.6 (newsletter issued by NELP in April 2019) it is stated that "Earlier this month, specialists started collecting seeds from the historically important River Red Gum in Bulleen. Such seeds will be useful for producing tubestock of local provenance."

In the event that a decision is made to remove the 39 Bridge St River Red Gum, consideration should be given to the much lesser consolation of establishing a "memorial tree" in an appropriate location. Such a tree should be cutting-grown rather than grown from seed for two reasons:

1. so that the individual identity (the genotype) of the Bridge St tree is preserved and perpetuated.

2. so that one can be confident that the vigour of the seedling is not compromised, as is often the case in progeny produced from seed of self-pollinated flowers of the same tree, as can be expected to occur in this case.

We therefore suggest that a cutting propagation process be initiated promptly.

Impact Generally on the Trees within the City of Manningham

Methods
In conducting this review, I viewed and read the following relevant plans and sections of the EES:

Plans (Construction/Operation)
Map Book Horizontal Alignment Part 1 (HA1)
Map Book Horizontal Alignment Part 2 (HA2)

Arboriculture
Main Report- Chapter 15 Arboriculture (AMR)
Technical Report G Arboriculture (ATR)
Technical Report G Arboriculture Appendices A-B (AAAB)
Technical Report G Arboriculture Appendices C Part 1 (AAC1)
Technical Report G Arboriculture Appendices C Part 2
Technical Report G Arboriculture Appendices D

Ecology
Main Report- Chapter 21 Ecology (EMR)
Technical Report Q Ecology (ETR)
Technical Report Q Ecology Figures Part 1 (E1)
Technical Report Q Ecology Figures Part 2 (E2)
Technical Report Q Ecology Appendices (EA)

Environmental Management
Main Report- Chapter 27 Environmental Management Framework

The tree data is assumed to be correct and comprehensive unless otherwise stated. Mr Knud Hansen of this office also carried out field work to check data accuracy and to provide an overview of what trees are present within Manningham in different parts of the project area where construction will occur.

Mr Hansen carried out field checks of seven random groups of trees in different areas to appraise the accuracy of the data – may be 1% of the trees surveyed for the EES in Manningham. His impressions are as detailed in Appendix 1.

Main Definitions
In this statement **tree canopy**, or simply **canopy**, generally refers to the crown (branches, branchlets and leaves) of one or more trees at least three metres high (trees less than 3 m. high were not considered in the EES Arboriculture assessments).

Canopy area of a tree refers to the area enclosed by the crown outline as viewed from above; the canopy area of a very close group of trees will refer to the area enclosed by

the crown outline of the group. In this report therefore, canopy area is regarded as independent of foliage and branch density.

Tree canopy loss in this report, also referred to as **canopy loss**, uses the above definition of 'canopy', and essentially refers to loss caused by NELP. A tree with a radially symmetrical crown would be regarded as experiencing 50% canopy loss if branches and foliage of one half of the crown were removed. A row of 5 trees, each having the same canopy area, and whose canopies do not overlap, would be regarded as experiencing 20% canopy loss if one of the trees were removed.

Note that the term 'canopy tree' as defined by the Department of Land, Water and Planning (DELWP) includes the condition that the tree 'is normally found in the upper layer of the relevant vegetation type' (DELWP 2017, p.6). This condition is not part of the meaning of 'canopy' (whether of planted trees or native vegetation) in this report.

The terms MLTV and non-MLTV are used in parts of the EES. A **MLTV** tree is one which has been assessed to be 'medium or long term viable'. Medium term viable trees are those whose useful life expectancy (ULE) has been assessed to be 11-20 years, while long term viable trees are those whose useful life expectancy has been assessed to be 20+ years. **Non-MLTV** trees are those that have a useful life expectancy of up to 10 years, or those that are weed species or those whose age has been assessed as juvenile. **Useful life expectancy (ULE)** can be regarded as an estimate of how long a tree can be retained in the landscape, assuming it receives (to a reasonable degree) the maintenance it requires and that it is unaffected by major change (such as NELP).

Identification of Trees

Species identifications were generally correct in the random samples, but some instances of mis-identification were noted. Suffice to say, inadvertent species mis-identification in the EES mostly related to planted trees, hence should be considered to be of little consequence when discussing impact, however inaccurate species identification can lead to inaccurate forecasting relating to safe useful life expectancies (SULEs).

Tree Measurements (DBH, height, width)

DBH and height estimations were generally good. Canopy width estimations (which in large part form the basis of planted tree canopy loss calculations in this report), were reasonably good, generally being accurate to within one or two metres.

Tree Age and Condition (age, ULE, health, structure)

Generally, these assessments were good. Some substantial trees assessed as being juvenile, and therefore classed as non-MLTV trees (e.g. tree group E-119 (AAAB-Appendix B), would arguably be better classified as MLTV trees.

Omitted trees

It was noted at several locations that some planted trees are not shown numbered on the relevant plan and therefore, have presumably not been assessed. In some cases, the trees were situated on the margin of an area designated as a patch of native vegetation. In other cases, they (presumably) occur on private residential or commercial

properties. Trees in private areas have generally not been assessed as part of the EES (ATR, page 15). However, in such situations where they will be removed by construction works (particularly, much of the area west of Greenaway St, Bulleen), the reason for a lack of assessment and quantification of loss is not apparent to me.

Outline of which Planted Trees will definitely be removed in Manningham

The definite loss of planted trees will be greatest in the vicinity of Bulleen Rd from Manningham Rd West to the Eastern Freeway. The main species which will be affected are various eucalypts which are between 15 and 45 years old and which include local species such as River Red Gum and Yellow Box. Some wattles and paperbarks are also in the same areas. Adjacent to the freeway east from Bulleen Rd to just past Tram Rd/Station St, the same trend continues, and includes mass plantings of Yellow Box and occasional she-oaks. Oriental Plane of moderate size are common at Doncaster Park and Ride. From just beyond Tram Rd, the number of planted trees which will definitely be removed is low, except at a few hundred metres west of Springvale Rd, where wattles, eucalypts and over-mature pines occur.

Summary of what Information about Canopy Loss is stated in the EES

Planted Trees

The EES states that project-wide, a total of approximately 15,814 planted trees will need to be removed because they are in or near the construction footprint and that a further 10,133 planted trees (approx.) will possibly be impacted. The latter group consists of all of the trees in the project area except the first group just mentioned and some other exceptions (ATR, page 15). The EES does not provide corresponding figures which are specific to Manningham, but it includes data which allows such numbers to be calculated (AAAB- Appendix B).

The EES does not estimate canopy loss (planted trees) for the project as a whole or for Manningham specifically but states that a project by the Department of Environment, Land, Water and Planning (DELWP) to map and measure 'urban forest cover' of metropolitan Melbourne will enable the impact of NELP on the 'canopy cover' of trees (whether planted or in native vegetation) to be quantified (ATR, page 22). The impacts upon those trees which will possibly be impacted are intended to be minimised by adopting Environmental Performance Requirements.

Self-sown Native Vegetation

The EES estimates a project-wide loss of 52.1 hectares of native vegetation (patches), 92 Large Trees in patches and 170 scattered trees. These figures assume the loss of all such native vegetation (hereafter referred to as **'native vegetation'**) in the project area and additionally treat as lost all trees outside the project area for which at least 10 per cent of the tree protection zone is within the project area (see EMR, page 29 for definitions and further detail). This is in contrast to the approach used for planted trees, where a distinction is made between trees which will be removed and those which might be impacted.

However, estimates are able to be made of how much native vegetation will certainly be lost and in contrast, how much may be impacted, by using the following in combination: construction plans, plans showing native vegetation, and information about the area of individual native vegetation patches.

The extent of canopy within patches is not stated in the EES, nor is the canopy width of scattered trees documented. However, as stated above, the EES states that mapping by DELWP will enable the impact of NELP upon the canopy cover of trees in native vegetation to be quantified. The impacts upon native vegetation are intended to be minimised by adopting Environmental Performance Requirements.

Degree of Tree Loss and Canopy Loss which will occur within Manningham due to the NELP

Trees which will definitely be removed

Planted Trees

Analysis of the planted tree data in the EES (AAAB- Appendix B) indicates that NELP will cause the certain loss of 1902 trees, consisting of 1,380 MLTV trees and 522 non-MLTV trees. Assuming a circular canopy outline for each tree, this is equivalent to canopy losses of approximately 67,793 m² plus 13,592 m² respectively, making a combined loss of approximately 81,385 m². See Appendix 3 of this report for further details.

The total canopy loss rises to 83,125 m² when an additional loss of at least 1,740m² is taken into account. The additional loss will arise from the removal of planted trees (chiefly a large row of cypresses) located where excavation will take place west of Greenaway St, Bulleen. (The trees were not assessed as part of the EES process (AAC1, page 30).

Trees in Patches of Native Vegetation

Using plans and information in the EES, definite canopy loss resulting from the removal of designated native vegetation (within patches) will be approximately 20,361 m². This figure assumes that the canopy area of patches is 70% of the area of the patch. See Appendix 4 of this report for further details.

Scattered Trees

There is a total of approximately 34 trees designated as scattered trees in Manningham within the project area, which account for a very small canopy area compared to that of planted trees and patches of native vegetation. All are treated as ‘to be removed’ in this report. Assuming an average canopy diameter of 10 m and a circular canopy shape, total scattered tree canopy loss will be approximately 2,672 m².

Total

Adding the losses in the three categories above gives a total definite canopy loss of approximately 106,158 m².

Trees which may be impacted (i.e. are at risk of removal or damage)

Planted Trees

A corresponding analysis of data to that above indicates that the NELP may possibly impact a maximum of 1,743 planted trees in Manningham (consisting of 1,343 MLTV trees and 400 non-MLTV trees). (See Appendix 4 of this statement for more detail.) However, because the risk of impact will vary (ATR, page 15) and there will be Environmental Performance Requirements to be met which minimise the impact of

works upon trees (ETR, page 60), it can be assumed that the maximum likely impact will be considerably less than the removal of all of the trees (which would equate to a canopy loss of approximately 49,258 m²).

As an example, if it were assumed that 35% of the relevant trees were removed, and that 35% of the trees incurred 20% canopy loss (but no loss of useful life expectancy), and finally that 30% of the trees were not impacted at all, the consequent total canopy loss would be 20,688 m². (These figures assume that average canopy width of each category is the same as that of all of the trees.)

Trees in Patches of Native Vegetation
In addition to the approximately 20,361 m² of tree canopy area of native vegetation (patches) which will be lost, an approximate additional maximum 58,469 m² of tree canopy area deriving from the same source may be impacted. Details are provided in Appendix 4 of this report. However, as is the case for planted trees which may be impacted, this figure should be seen in perspective. It is reasonable to believe that actual impacts are likely to be considerably less, for the same reasons that have been mentioned for planted trees.

Replacement of Lost Canopy

Planted Trees
The EES proposes that canopy lost due to the project will be replaced within 15 years of the completion of NELP (i.e. 2042) and that a net gain in tree canopy cover will occur by 2045. These objectives are to be achieved by the adoption of a Tree Canopy Replacement Plan (ATR, page 61).

The EES states that replacement plantings will be as close as possible to the North East Link, and that the following priority of planting location will be followed:
1. Where the canopy was lost within the project boundary.
2. Adjacent to the project alignment.
3. Within Victorian Government and local council land within the municipalities of Manningham, Boroondara, Nillumbik, Yarra, Whitehorse and Banyule.
4. Within the wider north-east region.

It is unclear to me whether this approach will ensure that replacement plantings in Manningham will lead to the replacement of canopy lost in Manningham due to NELP.

Native Vegetation
The removal of a significant amount of native vegetation in Manningham which will be caused by NELP apparently does not need to be offset within Manningham (ETR, Appendix L). If so, this would mean that there would not be replacement of the lost canopy as a matter of course.

Area within Manningham to be lost to NELP
There has been no attempt of which I am aware to calculate the total area within Manningham which will be lost to the NELP. An effective way to do so would be to map such parts of the project area by comparing plans of the existing conditions to those showing the project area after construction, and to then calculate the total area

of the affected parts by using a digital scanning process. This to me would seem to be a basic requirement to consider the impact on the treed environment in Manningham as a result of this proposal.

Comments on Relevant Environmental Performance Requirements (EPRs)

EPR AR1 "Tree retention must be maximised to the extent practicable through detailed design and selection of construction methods to minimise canopy loss, and in accordance with EPR FF1, including by retaining trees where practicable and minimising potential impacts to trees."

The word "practicable" is to be considered here. It would appear it is not practicable in the eyes of the NELP designers to retain the 39 Bridge St tree. Do we assume that anywhere there is a potential conflict with trees so far not anticipated, that the trees will not be practicable to retain?

EPR FF2 "Where the removal of native vegetation is unavoidable the project must meet the offset requirements of the Guidelines for the removal, destruction or lopping of native vegetation, DELWP December 2017 except as otherwise agreed to by the Secretary to DELWP"

It would appear that there is potential in the above EPR for the Secretary of the DELWP to agree to less than the guidelines.

Overall there needs to be an agreement between the vegetation and landscape officers, along with any other officers of the City of Manningham who have relevant input into legitimate land uses, along with the landscape designers and ecologists from the NELP as to how and where long term canopy establishment should be provided. This should include a mix of ecologically suitable species, whilst ensuring that competing needs in the public spaces are not jeopardised, to ensure there is an increase of an agreed level in tree canopy, and to integrate treed areas to form and enhance wildlife corridors.

Appendix 1- Data Accuracy

1. Main areas visited (including Melways reference)
Box Hill North- south-east corner of Eastern Fwy and Elgar Rd (MEL 47C3)
Bulleen- west of Bulleen Rd, near the south side of Manningham Rd West (MEL 32D5)
Bulleen- south-west corner of Bulleen Rd and Greenaway St (MEL 32E7)
Bulleen- north side of Bulleen Park access road, starting at Bulleen Rd (MEL 32D9)
Doncaster- parts of Park and Ride Car Park (MEL 46K1)
Doncaster- approximately SE of Colston Close, north of Koonung Ck Trail (MEL 47H3)
Donvale- Koonung Ck Linear Park, south/south-east of Fink Ct (MEL 48E5)

2. Species misidentifications
J-1168 Acacia melanoxylon (identified in EES as Acacia implexa)
J-1337 Eucalyptus globulus (identified as Eucalyptus viminalis subsp.viminalis)
E-549 Melaleuca ericifolia (identified as Melaleuca ericifolia)
E-78 Cupressus lusitanica (identified as Cupressus funebris)
E-558 Eucalyptus rubida (identified as Eucalyptus viminalis subsp.viminalis)
I-156 Eucalyptus polyanthemos (identified as Eucalyptus baueriana)
I-18 Platanus orientalis (x5) (identified as Platycladus orientalis (x5))

3. Omitted trees (examples)
Row of four eucalypts- south side of Manningham Rd West, Bulleen
Late Black Wattle- NW corner of Bulleen Rd & Bulleen Park access road, Bulleen
Assorted trees, including row of Monterey Cypress- west of Greenaway St, Bulleen
Assorted trees- Kim Close, Bulleen
River Red Gum- NW corner of Bulleen Rd & Bulleen Park access road, Bulleen
Pinus radiata- approximately SE of Colston Close, north of Koonung Ck Trail, Doncaster
Several eucalypts- west of row of pines, SSW of Fink Court, Donvale

4. Groups of trees, etc whose designation as patches of Native Vegetation is doubtful/incorrect
Patch M-57 (eastern 'lobe') (see E2, Figure 11-11)
Patch M-125 (see E2, Figure 11-13)
Patch M-126 (see E2, Figure 11-13)
Patch C-2 (see E2, Figure 11-19)
Patch C-20 north of Koonung Ck (see E2, Figure 11-18)
Patch C-103 north of Koonung Ck (see E2, Figure 11-18)
Patch E-100 (see E2, Figure 11-18)
Patch E-62 (see E2, Figure 11-17)

5. ***Trees whose designation as Scattered Trees is incorrect/highly unlikely (examples)***
Scattered Tree 976 (see E2, Figure 11-12)
Scattered Tree 977 (see E2, Figure 11-12)
Scattered Tree 974 (see E2, Figure 11-13)
Scattered Tree 975 (see E2, Figure 11-13)
Scattered Tree 49 (see E2, Figure 11-13)
Scattered Tree 50 (see E2, Figure 11-13)
Scattered Tree 19 (see E2, Figure 11-20)

Appendix 2 - Approximate definite canopy loss- native vegetation in patches

Patch	Approximate area of the patch to be definitely removed (m^2)	Approximate area of definite canopy loss (m^2)
C-2	2095	1467
C-10	35	25
C-20	14400	10080
C-21	600	420
C-96	1350	945
C-98	1470	1029
C-99	340	238
E-100	750	525
M-34	500	350
M-35	2625	1838
M-56	50	35
M-57	800	560
M-125	840	588
M-126	1320	924
M-129	1610	1127
NO ID CODE	300	210
TOTAL	**29085**	**20361**

In the above table, the approximate areas of native vegetation which will be removed in Manningham have been derived by comparing the location of construction works to that of native vegetation, and using the patch areas stated in EA (Appendix J, pages 4 to 22). Canopy loss has been estimated by assuming that canopy area is 70% of the relevant area of patch.

Where only part of the patch will certainly be removed, the remainder of the patch is regarded as 'potentially impacted'.

The final entry in the table refers to a possible patch which is shown on AAC1- page 29 (west of Kim Close).

Appendix 3 - Planted trees which may be impacted (are at risk of removal or damage)

Canopy Diam (m)	Canopy Area per tree (m²)	Number of MLTV trees (all, i.e. ULE≥11yrs)	Canopy Area, MLTV trees (m²)	No. of non-MLTV trees, ULE 6-10 yrs	Canopy Area, non-MLTV trees, ULE 6-10 yrs (m²)	No. of non-MLTV trees, ULE ≤5 yrs	Canopy Area, non-MLTV trees, ULE ≤5 yrs (m²)	Number of non-MLTV trees (all)	Canopy Area, all non-MLTV trees (m²)
1	0.8	2	2	36	36	4	4	40	40
2	3.1	200	620	58	180	46	143	104	322
3	7.1	276	1960	68	483	16	114	84	597
4	12.6	214	2696	51	643	11	139	62	781
5	19.6	116	2274	17	333	8	157	25	490
6	28.3	66	1868	11	311	5	142	16	453
7	38.5	195	7508	4	154	16	616	20	770
8	50.3	109	5483	4	201	3	151	7	352
9	63.6	66	4198	3	191	1	64	4	255
10	78.6	37	2908	12	943	1	79	13	1022
11	95.1	1	95	-	-	-	-	-	-
12	113.1	18	2036	12	1357	3	339	15	1697
13	132.8	1	133	-	-	-	-	-	-
14	154.0	11	1694	1	154	-	-	1	154
15	176.8	5	884	5	884	-	-	-	-
16	201.1	12	2412	2	402	-	-	2	402
17	227.1	3	681	-	-	-	-	-	-
18	254.6	4	1018	1	255	-	-	1	255
19	283.6	0	0	-	-	-	-	-	-
20	314.3	6	1886	1	314	-	-	1	314
TOTAL		**1343**	**40470**	286	6841	114	1948	**400**	**8788**

Data in the above table is derived from that in Technical Report G Arboriculture Appendix B. In that appendix, trees which may be impacted are shown as 'Impacted 2'. Canopy areas have been calculated assuming canopy shape is circular.

The tree number totals (1,343 MLTV trees and 400 non-MLTV trees) and their corresponding canopy areas (40,470 m² and 8,788 m² respectively) are approximate maximums.

Appendix 4 - Native vegetation in patches which may be impacted (is at risk of removal or damage)

Patch	Approximate maximum area of the patch which may be impacted (m^2)	Approximate maximum area of possible canopy loss (m^2)
B-92	640	448
C-2	8385	5870
C-10	315	221
C-11	1820	1274
C-16	5800	4060
C-19	670	469
C-20	1600	1120
C-63	150	105
C-96	12150	8505
C-97	3000	2100
C-98	2200	1540
C-99	230	161
C-101	600	420
C-102	2400	1680
C-103	1640	1148
C-348	400	280
D-64	780	546
E-62	1800	1260
E-100	750	525
K-140	590	413
M-30	1730	1211
M-31	8110	5677
M-34	1900	1330
M-35	6125	4288
M-52	480	336
M-53	420	294
M-54	4500	3150
M-55	440	308
M-57	9880	6916
M-125	2270	1589
M-127	370	259
M-128	1080	756
NO ID CODE	300	210
TOTAL	**83525**	**58469**

In the above table, for each patch the approximate maximum area of native vegetation which may be impacted has been calculated by subtracting the approximate area in Manningham which will definitely be lost (Appendix 3 of this report) from the total area of the patch in Manningham (E2, Figures 11-11 to 11-21; EA- Appendix J, pages 4 to 22). Canopy loss has been estimated by assuming that canopy area is 70% of the relevant area of patch.

The final entry in the table refers to a possible patch which is shown on AAC1- page 29 (west of Kim Close).

Conclusion
The 39 Bridge Street River Red Gum is a survivor, having suffered the vicissitudes of trunk collapse, fire, de-forestation, grade changes, paving and excavation of topsoil and roots. Despite these, it is still healthy with a very long life expectancy, particularly if managed appropriately. Of the many trees and groups of trees in the 2006 Manningham Garden and Tree Study, it is apparent that only 19 River Red Gums are on the list. Of these, none has as large a trunk. Furthermore, all the others are either in company with other trees and/or in garden settings. This tree is isolated in stark surroundings in one of the busiest metro thoroughfares, surrounded by concrete, glass and asphalt. One of the spectacular charms of this tree is that its presence comes as a complete surprise as one is travelling east or west along Manningham Road. It virtually explodes into view where the road bends to the south-east or when one reaches the Bulleen Road intersection. Design solutions ought be forthcoming to ensure the ongoing conservation of its long term viability. The tree is an icon.

With respect to the impact on the trees elsewhere in Manningham, there are substantial uncertainties surrounding this proposal. Not least is the lack of information regarding the net change to the tree canopy in years to come.

Declaration:
I hereby declare that I have made all the enquiries that I believe are desirable and appropriate, and no matters of significance which I regard as relevant have to my knowledge been withheld from the Committee.

GALBRAITH & ASSOCIATES

Rob Galbraith

The following pages set out details of my qualifications and experience

1. Name and Professional Address of Expert

Robert C Galbraith
40 Glyndon Road,
Camberwell

2. Qualifications and Experience

1977 Attained Degree in Forest Science from Melbourne University

1978-81 Forest inventory work and road locating in Gippsland, Tasmania and Northern Territory

1982 Contract re-vegetation at various MMBW parks

1982-83 Attained the National Certificate of Horticulture in Arboriculture at Merrist Wood College, England, with Distinctions

1983-85 Foreman of a Melbourne Treemasters

1986-88 Tree surgery sub-contractor

1988-90 Manager of the Arboricultural Services Division of Rivett Enterprises. Arboricultural Consultant for Rivett Enterprises.

1991- Principal, Galbraith & Associates - Arboricultural Consultants and Contractors.

Consultants to Royal Botanic Gardens Sydney, Major Projects Victoria, St Kilda Botanic Gardens, Melbourne Parks & Waterways, Vic Urban, Office of Housing Department of Human Services, legal firms, insurance companies, developers, town planning consultants, architects, landscape architects, local government (Cities of Albury, Bayside, Boroondara, Manningham, Moreland, Stonnington, Whitehorse). Contracting in arboricultural services for private, government and commercial clients.

Voluntary arboricultural industry works

Arboricultural Association of Australia (President, 1994, 95, 96)
Major contributor to the Australian Standard AS4373-1996 Pruning of Amenity Trees.

3. Area of Expertise

My area of expertise is in amenity tree management.

4. Expertise to Prepare this Report

My expertise is based on substantial experience in forestry and arboriculture, with many years directly working with thousands of different trees in differing situations. The tasks of climbing, dismantling, pruning and excavating near trees, particularly in Melbourne, is or has been, virtually a daily routine over many years. I keep well abreast of important and relevant research in

arboriculture, reading widely and conferring regularly with colleagues in the arboricultural field.

5. Instructions Received in Relation to this Matter

I have received instructions from Harwood Andrews. They have been as follows:

a. consider the River Red Gum in the road reserve adjacent to the Caltex Service Station at 39 Bridge Street, Bulleen, including:
i. its health, structure and age;
ii. its relationship with the River Red Gum known as Yingabeal in the grounds of the Heide Museum of Modern Art; and
iii. having regard to other organisations' comments on its heritage values;

b. provide your opinion on the capacity of the Project to achieve an acceptable arboriculture outcome as relevant to Council's municipal area, particularly with respect to that River Red Gum;

c. provide any recommendations as to feasible modifications to the alignment or design of the Project that would offer improved outcomes relevant to your area of expertise;

d. provide any recommendations or specific measures (including any changes to the proposed Environmental Performance Requirements) that you consider necessary and appropriate to prevent, mitigate or offset adverse environmental effects having regard to your area of expertise;

e. identify any areas where you consider there to be insufficient information to make an assessment of the environmental effects of the Project, having regard to the current stage of the Project as a 'reference design' with any 'detailed design' to follow the EES process; and

f. respond appropriately to Planning Panels Victoria's recently updated guide to expert evidence.

6. Facts/Matters/Assumptions/Reference Documents used to prepare this Report

Main EES Report:
- Chapter 1 Introduction;
- Chapter 2 Project rationale;
- Chapter 3 Legislative framework;
- Chapter 4 EES assessment framework;
- Chapter 6 Project development;
- Chapter 8 Project description;
- Chapter 15 Arboriculture;
- Chapter 19 Historical heritage;
- Chapter 20 Aboriginal cultural heritage;

• Chapter 25 Ecology;
• Chapter 27 Environmental management framework;
• Chapter 28 Conclusion;

Attachment III Risk Report;

Map Book;

Technical Reports:
i. Technical report G Arboriculture;
ii. Technical report K Historical heritage;
iii. Technical report L Aboriginal cultural heritage; and
iv. Technical report Q Ecology.

a. Manningham Heritage Garden & Significant Tree Study – Stage 2 Report Garden and Tree Assessment (April 2006) prepared by John Patrick Pty Ltd Landscape Architects;

b. Tree Management Plan (24 November 2017) prepared by Treespace Solutions Pty Ltd for Caltex Australia Petroleum Pty Ltd in relation to 39 Bridge Street, Bulleen;

c. Arboricultural Assessment (13 December 2017) prepared by Arbor Survey for Manningham City Council in relation to 39 Bridge Street Bulleen;

d. final scoping requirements for the EES (June 2018);

e. IAC terms of reference (11 April 2019);

f. IAC member biographies;

g. public submissions made to the IAC, including:
i. Manningham City Council (submission no. 316);
ii. National Trust of Australia (Victoria) (submission no. 340);
iii. Wurundjeri Woi-wurrung Cultural Heritage Aboriginal Corporation (submission no. 700); and
iv. Birrarung Council (submission no. 742 (a duplicate submission appears at no. 756)).

Australian Standard AS 4970-2009 'Protection of Trees on Building Sites'

"Flooded Forest and Desert Creek – Ecology and History of the River Red Gum" by Matthew J Colloff 2014 CSIRO publications

Survey dated December 2008 for the Shire of Moorabool of River Red Gums in the Bacchus Marsh Valley by Mr Bob Reid of the Friends of Werribee Gorge

"Ground Penetrating Radar Accurately Locates Roots in Two Soil Media Under Pavement" by Bassuk et al in Arboriculture and Urban Forestry 2011 37(4)).

DELWP (2017) Guidelines for the removal, lopping or destruction of native vegetation; The State of Victoria Department of Environment, Land, Water and Planning

7. Other Persons Relied Upon

Mr Knud Hansen of Galbraith and Associates
B.A. (Melb.) Dip. Hort. (Arboriculture),
Assoc.Dip.App.Sci. (Amenity Horticulture)

Mr Hansen has 17 years of experience in tree identification, assessment and reports concerning indigenous, native and exotic trees in domestic, municipal and broad acre contexts.
– relied upon in relation to assessing impact on trees in Manningham other than the Bridge St tree by the NELP

Mr Alex Pinniger of AP Trees for the climbing inspection of the Bridge St tree

8. Relationship with the City of Manningham

I have no relationship with the City of Manningham other than a financial agreement to prepare this evidence statement