Arboricultural Assessment

Precinct Structure Plan- 40E. Ballan Road, Wyndham Vale

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Contents.

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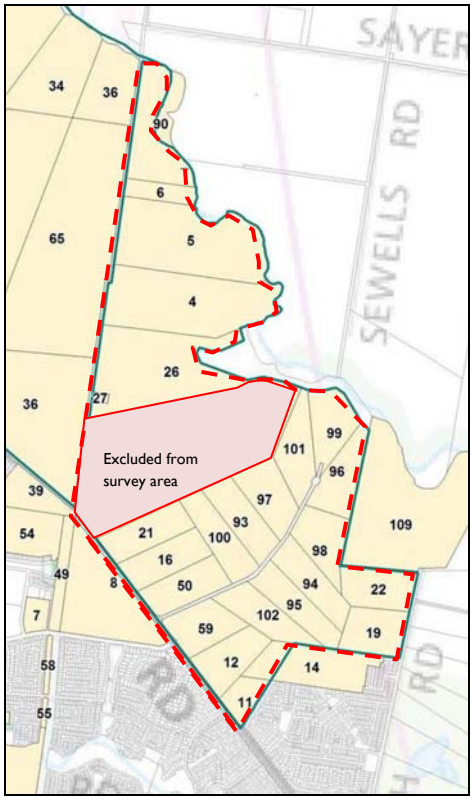
1 Executive summary

Client Brief

The Growth Areas Authority (GAA) commissioned Tree Logic to undertake an arboricultural survey of tree features within the area defined as Precinct 40 E to inform the future precinct design process.

The tree study area, Precinct Structure Plan 40E (PSP40E), comprised approximately 355 hectares and is defined to the west by Ballan Road and Hobbs road, to the north and east by the Werribee River and to the south by McGraths Road and the residential estate on the corner of Ballan Road and McGraths Road. Refer to image below.



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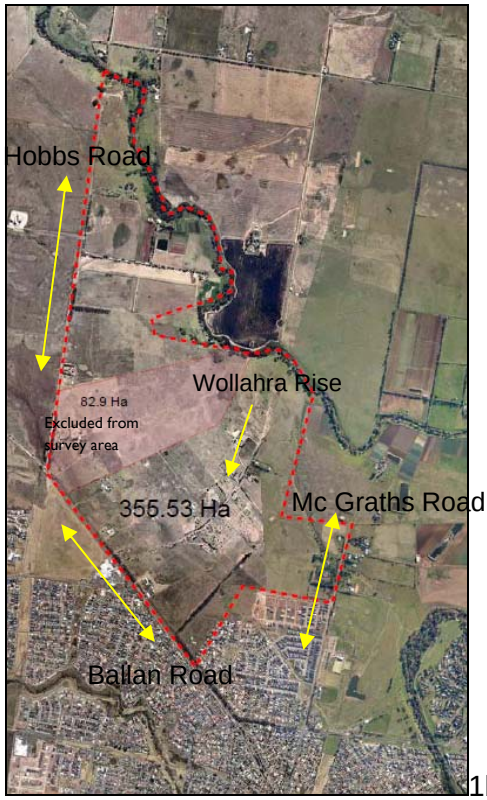

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Figure 1a & b: Ballan Road, Wyndham Vale PSP 40E Area, property boundaries (a) and aerial image of tree study area (b). The shaded pink area in the middle was excluded from the tree study area. Trees within 100m of the centre of the Werribee River were excluded from the tree study area.

The land is currently used for a variety of rural purposes and is zoned Urban Growth Zone and Rural Conservation Zone with a number of overlays affecting parcels within the site. It is divided into allotments of varying size from 6 to 40 hectares.

Key Objectives

The arboricultural assessment was required to include:

- Identification of all trees considered to have High or Very High retention value by the consultant arborist. Trees that are considered to have less than High retention value are not required to be surveyed.
- Survey trees with High or Very High retention value that are over 150mm calliper measured at breast height (1.4m above surrounding ground level)
- Survey data collected was to include:
    - Tree number, Number of trees (if assessed as a group)
    - Location (XY co-ordinates)
    - Species (botanical and common name)

- Tree origin (exotic, native, indigenous)
- Dimensions (DBH, Height, Width)
- Age class
- Health rating
- Structural rating
- Useful life expectancy
- Arboricultural retention value (High or Very High)
- Tree Protection Zone
- Any relevant comments

- Provide an arboricultural report which tables the collected data, illustrating the retention value of all surveyed trees on a plan of the PSP area, and includes discussion and clear recommendations regarding suitability for retention in an urban environment, required protection zones (AS4970-2009) and strategies to maximise longer term viability, where relevant.
- Locate the trees in conjunction with cadastral layers provided by the GAA as site plans attached as Appendix 2.

Summary of Opinion

1.1 The tree population was sparse and unremarkable overall both across the site and within individual properties. Eight trees attracted a Very High arboricultural rating and eighty two tree features attracted a High arboricultural rating. 19 trees were attributed a Moderate/High arboricultural rating.

1.1.1 A further 285 features, comprising approximately 2241 trees, were inspected of which 181 attracted a Moderate arboricultural rating, 83 tree features attracted a Low rating and 21 tree features attracted a rating of None.

1.2 Indigenous trees that appeared to be naturally occurring were identified associated with natural drainage lines that intersect the eastern end of McGrath Rd and the northern end of Hobbs Road. The remaining tree specimens were planted as ornamentals or functional installations.

1.3 Not all 'Moderate or Low' rated tree features should be dismissed as candidates poorly suited for retention, though overall, the retention of such trees should not compromise design intent. In general Moderate rated trees were of semi-mature age and size and could be readily replaced during development of the site. In certain landscape settings, smaller specimens in otherwise reasonable condition have the potential to offer an established tree resource, even if only as an interim measure. Low rated trees with health or structural deficiencies are generally not desirable candidates for retention. Windrows with health and structural defects should generally be removed.

1.4 Trees attributed an arboricultural value of None were the least suited to retention on arboricultural grounds, having significant health and / or structural defects.

2 Method

2.1. Site inspection method.

2.1.1 The site was inspected by Tree Logic staff during the weeks ending August 26 and September 2, 2011. The trees were inspected from the ground and observations made of the growing environment and surrounding area. The trees were not climbed, no samples of the trees or site soil were taken and no investigation of the root plate below ground was undertaken.

2.1.2 Trees less than 10m in height were included in the assessment where such tree(s) were felt to be noteworthy because of their potential for being a long-term landscape component or constituted a prominent landscape feature.

2.1.3 Trees on public land such as road reserves were recorded as “Road reserve” trees in the comments.

2.1.4 Individually assessed trees and tree group features were attributed with unique identifying numbers. Trees numbers used in this report and appearing in column 1 of the tree assessment table in Appendix 1 correspond with unique identifying labels provided in the GIS data sets and plans compiled for the site.

2.1.5 Observations were made of the trees to determine age and condition, with measurements taken to establish tree height (measured with a height meter), crown width (paced) and trunk diameter (measured at 1.4m above grade unless otherwise stated). Definitions of arboricultural descriptors can be seen in Appendix 3.

2.1.6 Photographs of trees and site conditions were taken for further reference and inclusion in the report.

2.1.7 Spatial data relating to tree locations was recorded on measuring tool equipped ruggedised tablet computers using a combination of GIS surveying software (ArcPad), orthorectified site aerial imagery and property boundary cadastre data supplied by the GAA.

2.1.8 Where sufficient identifying characteristics were present trees were identified to species level. Trees were assessed to determine their age class, structure and condition. Tree height was measured using a height meter. Where groups of close spaced trees were assessed, sample heights within the stand were taken and the height of remaining trees estimated against the sample heights. Crown spread was estimated by pacing the crown widths on the widest axis.

2.1.9 Trunk diameter was measured using linear tape measures and diametric tape measures in 1cm increments. The default height for measurement was 1.4m above grade. Where short trunked trees forked at or below 1.4m, trunk diameter was measured at the narrowest point of the single stem below the fork.

2.2. Field Survey Limitations.

2.2.1. Assessment exclusion zones applied to the following:

- Werribee River – 100m from the centre of the river.

2.2.2. Not all properties were accessible for the purpose of this survey. Where access restrictions occurred, limited assessments of trees in such properties were made from external vantage points.

2.2.2.1. Where this is the case accurate assessment of dimensions, health and structure of these trees must be verified by closer arboricultural inspection prior to enacting any recommendations arising from this report.

2.3. Arboricultural assessment method.

2.3.1. The health and structural characteristics of each tree was assessed and each tree was attributed an ‘Arboricultural Rating’. The arboricultural rating correlates the combination of tree condition factors (health, structure & form) with tree amenity value. Amenity relates to the trees biological, functional and aesthetic characteristics within a built environment. The arboricultural rating in combination with other factors can assist the project team and planners in nominating trees suitable for retention. The four arboricultural ratings used by Tree Logic include:

- **Very High:** Tree of very high quality in good condition. Generally a prominent arboricultural feature. Tree is capable of tolerating changes in its environment if managed appropriately.
- **High:** Tree of high quality with generally sound structural condition and good health. Generally is or has the potential to become a prominent landscape feature.

Trees that were considered to have less than High retention value were not required to be surveyed.

Trees that are generally desirable for retention typically display the following attributes:

- Are of a healthy condition that would allow it to tolerate development-associated modifications to its growing environment and,
- Have a structure that was not predisposed to potential failure that could cause damage or injury and,
- Are of an age and/ or size that provide an immediate and ongoing obvious contribution to the landscape.

Conversely trees in poor health, with suspect or deficient structure, or subject to pest or disease infestation that was having a discernable negative impact on tree condition are generally not considered suitable for retention in an urban environment. Trees recognised as environmental weeds and known to be potentially invasive in the locale of the subject site are generally not considered suitable for retention. Small specimens that provide negligible contribution to the landscape, irrespective of condition should not impede reasonable land use.

Full tree descriptors are attached as Appendix 3.

2.3 Establishing Tree Protection Zones (TPZ).

2.3.1 To successfully retain suitable trees within or around a development site, consideration must be given to protecting the trunk, crown and roots of each specimen. Tree protection zones (TPZ's) are used to provide adequate space for the preservation of sufficient roots to maintain tree health (particularly important for mature trees) whilst providing a buffer zone between construction activity and the tree trunk and crown.

2.3.2 The method for determining tree protection zones adopted in this report is the Australian Standard for protection of trees on development sites (AS4970-2009). It provides a method for establishing a TPZ area that is based on the trunk diameter measurement measured at 1.4m and multiplied by 12. The trunk of the tree is used as the centre point for the measurement.

2.3.3 TPZ measurements are included in the tree assessment data in Appendix 1.

2.3.4 The method employed in this document for assigning tree protection zones is a guide for planning purposes. Additional guidelines are outlined in Appendix 4 for establishment and maintenance of the tree protection

2.4 Documents reviewed include.

- Planning property reports and Wyndham City council planning overlays relevant to the sites including:
- Development Plan Overlays
- Heritage Overlay (HO) Schedules. No HO applies to any properties within the study area
- Environmental Significance Overlay (ESO). ESOs are primarily confined to properties that directly adjoin the Werribee River and reflected the 100m exclusion zone associated with the river alignment.
- Urban Growth Zone, Rural Conservation Zone.
- Clause 52.17 applies to sites greater than 4,000 m^2 in area.

Under the clause it is a requirement to '*demonstrate the steps taken to;*

- *Avoid the removal of vegetation native to Victoria.*
- *Minimise the removal of native vegetation.*
- *Appropriately offset the loss of native vegetation if required*.'

3 Observations

3.1 Site description.

The site is generally flat land on the volcanic plains west of Melbourne which is highly disturbed having a long history of previous land uses including farming for grazing and crop raising.

The Werribee River runs in a generally north south direction along the eastern perimeter of the site. Three natural drainage lines forming unnamed creeks existed in the northern and southern sections of the study area. Two of the creeklines contained indigenous trees.

Away from the creek lines the land was predominantly flat and featureless. Once away from the creek lines and on the flat plains there was no remnant indigenous vegetation identified and there was no recruitment of naturally occurring indigenous species.

The existing tree cover was very sparse with the entire tree cover, comprising approximately 2,500 trees and estimated to occupy less than 5% of the PSP area. Apart from the indigenous trees confined to the creek lines, all assessed trees were planted specimens, predominantly installed for functional purposes as screens, windrows and shelterbelts occurring generally around house lots or along internal and boundary fence lines. No planted tree installations occurred along natural contour lines. Relatively few trees were installed as ornamental specimens, and occurrences of such trees were typically restricted to areas surrounding property dwellings and entrance driveways.

The tree stock predominantly comprised maturing to over-mature Sugar Gums (*Eucalyptus cladocalyx*) planted generally as windrow groups along paddock boundaries or as close spaced woodlots with very few singular specimens recorded. It is estimated that 56% of the trees within the study area were Sugar Gum.

Planting of mixed native species had been planted in predominantly native ornamental gardens in the house lots of several properties on McGraths Road, Hobbs Road and Woolahra Rise. It is estimated that these were approximately 10-20 years of age. Despite their overall small stature, by virtue of the lack of trees across the study area, even small trees provided a positive visual impact to the landscape.

Suffice to say the overall impression of the site was that vegetation comprised planted trees dominated by windrow plantings with a lesser proportion of assorted native and exotic species of mixed age and quality and few trees that were of high arboricultural value or that were dominant landscape features.

3.2 Tree population.

Approximately 2,438 trees were observed across the site comprising 394 individual trees and 81 groups comprising approximately 2,125 trees.

90 tree features were attributed a High or Very High arboricultural rating which included 4 groups of trees comprising approximately 92 trees.

3.3 The species and origin of each tree was identified to determine whether any trees were locally indigenous or native to Victoria and is recorded in the tree data as tree origin.

3.3.1 The naturally occurring trees were River Red Gum (*Eucalyptus camaldulensis*) trees in the creek-beds and Red Box (*Eucalyptus polyanthemos subsp. vestita*) associated with the creek in the northern section of Hobbs Road close to the Werribee River.

3.4 Tree health:
The health rating was assessed based on foliage colour, size and density as well as shoot initiation and elongation or presence of crown dieback.

Approximately 50% of the trees displayed Fair or better health considered to be typical for the species growing in this environment under current conditions at the end of more than a decade of drought.

Health deficiencies were typically associated with conditions including;

- Drought stress exhibited as crown dieback and desiccation of limbs/branches exposed to prevailing winds.
- Reduction of conductive stem tissue damaged by decay or trunk/root injury.
- Soil compaction.
- Age related decline.
- Overcrowding and suppressed conditions.

3.5 Tree structure:
The structure of the trees was assessed for structural defects and deficiencies, likelihood of failures and presence of targets.

In general the trees displayed Fair to poor or worse structural condition. Only 30% of the tree features displayed fair structural quality (724 trees), 33 % were of Fair-poor structural condition with minor deficiencies that were considered to be within acceptable tolerances that could be retained with minor works. 37% were of Poor to Very poor structural quality that were generally beyond arboricultural intervention.

Defects and deficiencies were generally observed as trees that;

- Had been lopped or coppiced or were stump re-sprouts.
- Had been subject to major limb/stem failure.
- Had included bark forks and /or over-extended limbs.
- Had excessive dieback and deadwood.
- Had borer damage (especially Acacias and Sugar Gums).
- Had asymmetric crowns and suppressed form.

3.6 Arboricultural rating.

Each of the assessed tree features was attributed an 'Arboricultural Rating'. The arboricultural rating correlates the combination of tree condition factors (health, structure & form) with tree amenity value. Amenity relates to the trees biological, functional and aesthetic characteristics within an urban landscape context and its ability to continue provide these qualities into the medium to long term future. The arboricultural rating in combination with other factors can assist the project team and planners in nominating trees suitable for retention. Definitions of arboricultural ratings can be reviewed in Appendix 3.

3.6.1 Table 1 indicates the arboricultural ratings attributed to the trees inspected.

Table 1 : Arboricultural rating	No of Features		No of trees	
Very high	8	2.0%	8	0.33%
High	82	20.8%	170	6.97%
Moderate/High	21	5.3%	21	0.86%
Moderate	181	45.9%	621	25.47%
Low	83	21.1%	1245	51.07%
None	21	5.3%	375	15.38%
Grand Total	394	100.0%	2438	100.00%

3.6.2 Table 2 indicates Trees attributed Very High and High arboricultural ratings and additional trees worthy of note or within the transition class between Moderate and High.

Table 2: Arboricultural rating	Total features	Tree numbers
Very high	8	64, 65, 68, 69, 70, 109, 110, 112
High	82	32, 33, 39, 40, 41, 42, 43, 47, 63, 66, 67, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 107, 108, 111, 113, 114, 115, 116, 121, 122, 145, 194, 199, 200, 203, 250, 251, 252, 253, 266, 277, 279, 280, 281, 282, 283, 287, 289, 290, 298, 299, 303, 305, 307, G30 (8 trees), G66 (5 trees), G67(9 trees), G68(70 trees).
Moderate/High	19	45, 52, 53, 126, 127, 129, 143, 206, 209, 213, 214, 217, 222, 224, 225, 254, 258, 262, 310
Trees of note	8	247, 254, 255, 256, 258, 262, 276, 312
Total	117	113 individual trees and 4 groups comprising ≈92 trees.

Refer to Appendix 2 for tree location and numbering.

3.7 The most important consideration for the successful retention of trees is to allow appropriate above and below ground space for the trees to continue to grow. This requires the allocation of tree protection zones (TPZs) for retained trees. Refer to appendix 4 for guidelines on establishing and managing tree protection zones in accordance with Australian Standard 4970-2009_Protection of trees on development sites.

4 Discussion

4.1 By far the most significant trees within the study area included the remnant indigenous River Red Gum trees located in the natural creek lines. The best of these trees were semi-mature to maturing specimens that displayed good health and fair structure and a rugged natural amenity and landscape character that linked the trees to the surrounding landscape and the natural intermittent water course. Both individually and as a group these trees were of very high landscape and ecological value and would require a very high offset requirement were they to be removed. They included Trees 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 107, 108, 109, 110, 111, 112, 113, 114, 115 and 116.

4.1.1 Over-mature specimens of River Red Gum associated with the natural creek lines displayed some health and structural deficiencies that were within acceptable tolerances and could be managed with appropriate arboricultural maintenance. Such trees, whilst having lower arboricultural value, have high ecological and landscape value and are included in the list of High rated trees. They include Trees 32, 33, 250, 251, 252 and 253.

4.2 *Eucalyptus camaldulensis* species (River Red Gum) is indigenous to the area adjacent to the Werribee River and it is generally desirable to retain trees of this kind where possible. State legislation (Victoria's Native Vegetation Management – A Framework for Action) also outlines the importance of indigenous/remnant vegetation and specific guidelines are provided for preservation and management of such vegetation.

4.2.1 The importance of preserving River Red Gums associated with the waterways and rivers in the City of Wyndham is referred to in the Environmental Significant Overlay-Schedule One applicable to the east of the site.

4.2.2 The retention and management of River Red Gums can create significant issues in urban settings, which are best addressed by assigning generous tree protection distances. It is well known and well documented that maturing River Red Gums can shed large limbs without warning, and without signs of defect. All tree species have the potential to shed branches or limbs, but maturing River Red Gums have a much greater propensity for this than most common urban trees. This characteristic is probably more evident with River Red Gums because of their prominence in Melbourne's developing outer suburbs, their large size and their ultimate age.

4.2.3 It could be argued that the likelihood of further branch failure is a matter of when rather than if for many mature River Red Gums. In contrast to this antisocial tendency, the positive characteristics of the species would include its variable form

and its ability to decline and recover from drought and flood. These abilities highlight the resilience of the species and reflect the essence of its rugged and desirable landscape character.

4.2.4 A further challenge with this species is that the most ecologically significant trees; those trees containing many hollows for habitat (most hollows forming from major limb failures), are potentially more hazardous, when we consider the trees might be retained in an urban setting.

4.2.5 The establishment of tree protection zones for River Red Gums must therefore meet the needs of tree protection and also the obligation of protecting people and property from any individual tree. On this basis, the tree protection zones should be more extensive than the normal requirements for other tree species. Whilst the nominated TPZ area is likely to be sufficient to sustain tree health, it is recommended that a TPZ area equivalent to the edge of the canopy dripline plus one metre is specified to provide greater protection to the mature River Red Gum as well as to exclude placement of high value targets beneath the tree crown to accommodate the greater propensity to unexpectedly shed limbs. Landscape treatments that effectively excludes targets reduces the level of exposure to risk as well as the perception of risk to persons and property which could lead to trees being removed prematurely.

4.3 Principles of water sensitive urban design must be adopted when designing any redevelopment of the site to ensure that water infiltration and flow rates are not altered in regards to these natural drainage lines which could have a negative impact on the trees associated with the creeks. Such impacts include excessive inundation or drying of the creeks contributing to health decline, increased flow rates that might undermine roots or cause excessive disruption of the root zone by placing infrastructure excessively close to retained trees.

4.4 Red Box trees (*Eucalyptus polyanthemos* subsp. *vestita*) and Bull Oak (*Allocasuarina luehmannii*) were of similar significance to the site being maturing to over-mature naturally occurring indigenous specimens. They included Trees 247, 254, 255, 256, 258, 262, 276 and 312. These trees were attributed arboricultural ratings of Moderate/High to Low because of structural deficiencies. However these trees should be considered for retention in conjunction with the protection of the River Red Gum and natural watercourses. Similar TPZ guidelines as for River Red Gums should be applied to the retention of maturing Red Box trees.

4.5 The remainder of High rated trees, other than River Red Gum, were generally individual planted specimens scattered throughout the site.

4.5.1 They included 14 semi-mature to maturing Yellow Gum (*Eucalyptus leucoxylon*) trees that were located within groups of mixed native trees that lined driveways of properties at the northern end of Hobbs Road. The natural range of this species is thought to possibly extend into the subject region and have been observed to be performing well in other parts of the Wyndham and Werribee area.

4.5.2 The grouped plantings of mixed native trees associated with the Yellow Gums were also worthy of retention as they formed established avenues adjacent to larger driveway access roads.

4.5.3 The other High rated specimens comprised individual specimens generally of the Eucalyptus genus (Gum trees) and related Corymbia genus (Spotted Gums and Lemon-scented Gums) that were of semi-mature to maturing size (i.e. 6 to 18m in height). As individual specimens they may be more difficult to accommodate in the broader planning context but should be considered in conjunction with the retention of other trees nearby that may be of either smaller size or lower arboricultural value. It included 2 groups of relatively small trees in linear plantings that could be retained and enhanced with additional planting (Groups 30 and 66).

4.6 Trees of Moderate/High arboricultural value were generally of semi-mature size but displayed fair health and structure that had the potential to be long term components of the landscape if they were to be retained.

4.7 Trees of note included the indigenous Red Box trees that should be considered for retention within the planning process because of their indigenous status and location within the natural creek line.

4.8 As previously indicated the dominant tree species within the site comprised Sugar Gum. Many of the Sugar Gum trees displayed reduced foliage density or crown dieback as well as structural defects in the trunks, borer damage and evidence of limb failures. The characteristic habit of long ascending limbs with foliage held terminally limits effective arboricultural management of these trees especially in the urban context.

4.8.1 In general, maturing Sugar Gums are not considered to be well suited to retention in urban or residential situations. Retention of Sugar Gums should only be considered where they can be kept in large public open space with low target potential.

4.8.2 A very high proportion of the Sugar Gums had been previously coppiced or lopped for the harvesting of timber for fencing and fuel. The regrowth that is produced in response to the coppicing is vigorous but comparatively poorly attached and the tree base is subject to decay and degradation as well major disruption to the water and nutrient conductive pathways that results in dieback and tree decline. Where trees have been coppiced the trees are considered to have no arboricultural value. This effectively removed a high proportion of trees from the scope of the tree study, being approximately 56% of the trees.

4.8.3 Due to the close grown nature of the Sugar Gum windrows the trees have developed in the shelter of the group and may become susceptible to tree or limb failure if the group is fragmented by failure of defective trees or removal of parts of the group during development. Fragmentation of such groups can expose trees with structural deficiencies to altered environmental conditions and wind loading resulting in increased failure rates among retained trees. Therefore, fragmentation should only occur where retained trees provide sufficient ongoing mutual protection to maintain stand integrity. If the group is overly fragmented it is unlikely the trees will acclimatise to the increased wind loading of previously protected limbs and limb failure and premature decline will result.

4.9 Not all 'Moderate or Low' rated tree features should be dismissed as candidates poorly suited for retention, though overall, the retention of such trees should not compromise design intent. In certain landscape settings, smaller specimens in otherwise reasonable condition have the potential to offer an established tree resource, even if only as an interim measure. Low rated trees with health or structural deficiencies are generally not desirable candidates for retention. Windrows with health and structural defects should generally be removed.

4.10 Trees attributed an arboricultural value of None were the least suited to retention on arboricultural grounds, having significant health and / or structural defects. Such trees are unlikely to provide a useful tree resource insofar as providing established canopy in future development even where risk levels associated with their retention can be managed to an acceptable level.

4.11 The assessment included a useful life expectancy component. The useful life expectancy estimation provides an indicative range of potential functional longevity before anticipated health, structural or age related attrition renders such trees inappropriate in the context of an urban setting. Given the scale of the development and potential settings for trees, the useful life expectancy rating has obvious limitations. In a natural or semi-natural situation and in the absence of people or property, the useful life expectancy of a tree ends when it collapses and completely decomposes. In an urban setting the useful life expectancy of an individual tree or group of trees is measured by its ability to provide ongoing amenity and is therefore highly dependent on context. Another obvious challenge with assigning useful life expectancies is that it presumes some consistency of environmental conditions. Development can irrevocably alters site conditions that have a deleterious effect on tree condition and natural lifespan. Therefore attributing a meaningful useful life expectancy in the absence of design plans that contextualizes the trees setting and environmental changes relies on many assumptions and may be misleading. The useful life expectancy attributed in this assessment, should not therefore be interpreted in isolation from other assessment criteria.

4.12 All trees nominated for retention will require periodic inspection and appropriate arboricultural maintenance and pruning. All pruning must be undertaken by suitably trained and experienced arborists and comply with Australian Standard 4373-2007 - Pruning of Amenity trees.

4.13 No form of excavation for footings or trenching for installation of underground services is permitted within the nominated Tree Protection Zone (TPZ) areas due the risk of severing roots vital to the stability and continued health of the trees. Smothering of tree roots by raising soil levels by more than 150mm within the TPZ area can also cause trees to decline.

4.14 In the absence of site design plans, it is not appropriate to speculate on which trees are most appropriate for retention, beyond the general guide provided by the arboricultural ratings attributed to each tree feature. Retention suitability correlates with the future landscape setting of retained trees, which will vary given the scale of the intended development. The following recommendations are provided for consideration in the design process.

4.14.1 On the basis of tree quality and potential amenity, preference should be given to retaining trees of High or Moderate arboricultural rating in built areas, or areas of increased target potential.

4.14.2 Trees of Low arboricultural value should not compromise reasonable design intent.

4.14.3 Small trees of Low arboricultural value that are otherwise in reasonable condition may offer a potential established tree resource, even if only as an interim measure.

4.14.4 Low rated trees with health or structural deficiencies could generally be considered for removal.

4.14.5 Principles of risk management should be adopted to appropriately locate large maturing River Red Gum and Sugar Gum trees that are to be retained in any future development.

4.14.6 Avoid fragmenting retained windrows. Fragmentation should only be considered when the fragments retain sufficient trees to largely negate the change in the trees' environment that may otherwise result in deterioration of retained specimens.

4.14.7 Position retained windrows in large areas of open space, where the target potential is low and the trees can continue to grow in relatively undisturbed conditions.

4.14.8 Windrows of Low arboricultural value with health and structural defects should be removed.

4.15 Under the Native Vegetation Framework act section 52.17 appropriate steps must be demonstrated to avoid, minimise or offset the removal of naturally occurring vegetation that is native to Victoria.

5 Photographic catalogue

1

2

1 Shows the relative size, condition and location of High rated River Red Gum associated with the creek line that intersects McGraths Road in the south of the study area (525-559 Mc Grath Road Wyndham Vale).

2 Shows the relative size, condition and location of High rated River Red Gum trees at the northern end of the creek line showing the dry creek bed. The trees have adapted to the ephemeral nature of the creek.

3

4

5

3 Shows the relative location and condition of the Red Box tree no. 262 adjacent to the creekline that intersects Hobbs road in the northern end of the study area.

4 Shows an example of trunk wounding and decay typical in the Sugar Gum windrows along Ballan Road.

5 Shows an example of Australian native species, Swamp Mallet, that was a common ornamental planting around house-lots. Other frequently observed species included Round-leaved Moort, Bald Island Marlock and Brown Mallet, all being relatively small growing flowering species from WA. They all have a tendancy to develop acute forks prone to splitting and are unable to produce new growth from dormant buds.

6

7

8

6 Shows the relative size and condition of a Yellow Gum trees in the driveway entrance to 162 Hobbs Rd.

7 Shows the relative size and condition of planted mixed native specimens in the house lot of a property in Wollahra Rise. The trees are semi-mature Victorian natives that were of Moderate arboricultural value.

8 Shows the relative size and condition of a planted River Red Gum in the house lot of 180 Hobbs Road.

7 Conclusion and Recommendations

7.1 Tree Logic was commissioned by the Growth Areas Authority to survey and assess trees within the Wyndham Vale precinct identified as PSP40E. The survey was commissioned primarily for the purpose of providing information on the arboricultural merit of larger trees onsite to inform the design process.

7.2 The tree population, consisting of 394 tree features comprising approximately 2,438, was ostensibly unremarkable overall both across the site and within individual properties. The greatest concentration of Very high and High rated trees were found in natural drainage lines that existed in the northern and southern sections of the site.

7.3 Eight trees attracted a Very High arboricultural rating of which all were naturally occurring indigenous River Red Gum.

7.4 Eighty two tree features attracted a High arboricultural rating of which 52 were indigenous River Red Gum generally occurring as groups associated with natural creek lines.

7.4.1 The remaining 30 high rated trees were generally planted specimens in scattered locations across the study area away from natural contours.

7.4.2 A further 22 trees are mentioned that were of either Moderate/High arboricultural value or are of note because of the natural indigenous status of Red Box trees on site.

7.5 Refer to Tables 2, Arboricultural ratings on Page 7.

7.5.1 A further 285 features were inspected comprising 2,241 additional trees (92% of total trees) were inspected which were attributed arboricultural rating of Moderate, Low or None. The breakdown of arboricultural ratings is indicated in Table 1 on Page 6

7.6 In the absence of site design plans, it is not appropriate to speculate on which trees are most appropriate for retention, beyond the general guide provided by the arboricultural ratings attributed to each feature. Retention suitability correlates with the future landscape setting around retained trees, which will vary given the scale of the intended development.

7.7 Given that the majority of the high rated trees are naturally occurring trees that exist within natural drainage lines it is important that principles of water sensitive urban design are adopted throughout the site to ensure water flow and infiltration rates are not greatly altered to these creeks to ensure the safe retention and longevity of the important River Red Gum and Red Box trees.

7.8 On the basis of tree quality and potential amenity, preference should be given to retaining trees of Very High or High arboricultural rating in built areas, or areas of increased target potential. Design modification should be altered to ensure the retention of high rated trees that have relatively long useful lifespan.

7.9 Conversely, areas of public open space are not only suited to the retention of quality stock, but may also provide opportunity to retain low quality trees either as interim canopy until such time as new landscapes establish or as longer term landscape elements in areas where risk associated with the retention of such trees is acceptable. Arboricultural ratings and useful life spans have been provided for all assessed trees/groups in the tree assessment table in Appendix 1 of this document.

I am available to answer any questions arising from this report.

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Appendix 1: Tree and group details: Wyndham Vale PSP40E

High, Very High , Moderate/High rated trees and groups and trees of note.

Refer to following 6 pages.

DBH = Diameter at Breast Height (measured in centimetres at 1.3m above ground unless otherwise stated).

H x W = Height x Width of crown (measured in metres).

TPZ = Tree Protection Zone (metre radius). Radius distances measured in metres from the centre of the trunk.

For tree location and numbering refer to plans at Appendix 2. See Appendix 3 for tree descriptors.

Feature No.	No of trees	Common Name (Botanic name)	DBH (cm)	Height (m)	Width (m)	Health	Structure	Origin	Age class	ULE (years)	Arboricultural rating	Comments	TPZ (m radius)	x	y
32	1	River Red Gum (Eucalyptus camaldulensis)	78	7	15	Fair to poor	Fair to poor	Indigenous	Over-mature	25-50	High	Epicormic growth. Deadwood/Stubs removal,	9.4	291940.716542713	5805370.044807790
33	1	River Red Gum (Eucalyptus camaldulensis)	140	10	21	Fair to poor	Fair to poor	Indigenous	Over-mature	25-50	High	Epicormic growth. Deadwood/Stubs removal,	16.8	291938.176822670	5805384.591846780
39	1	Lemon-scented Gum (Corymbia citriodora)	35	14	10	Fair	Fair	Australian native	Semi-mature	25-50	High	Branch failures	4.2	291882.319473408	5805310.706885850
40	1	Spotted Gum (Corymbia maculata)	32	11	12	Good	Fair	Victorian native	Semi-mature	50+	High		3.84	291875.689814594	5805331.092736370
41	1	Tasmanian Blue Gum (Eucalyptus globulus)	39	18	9	Good	Fair	Victorian native	Semi-mature	25-50	High		4.68	291897.599022889	5805307.137612370
42	1	Red Ironbark (Eucalyptus sideroxylon)	33	12	8	Good	Fair	Victorian native	Semi-mature	25-50	High		3.96	291908.640208401	5805329.053151520
43	1	Lemon-scented Gum (Corymbia citriodora)	33	12	11	Good	Fair	Australian native	Semi-mature	50+	High		3.96	291914.923541755	5805329.053151520
45	1	Round-leaved Moort (Eucalyptus platypus)	30	6	12	Good	Fair	Australian native	Semi-mature	15-25	Moderate/ High		3.6	291927.152128846	5805318.015398230
47	1	Spotted Gum (Corymbia maculata)	30	11	11	Good	Fair	Victorian native	Semi-mature	50+	High		3.6	291890.301450687	5805343.320247500
52	1	Swamp Mallet (Eucalyptus spathulata)	35	7	10	Good	Fair	Australian native	Semi-mature	15-25	Moderate/ High		4.2	291933.484937265	5805593.249375150
53	1	Swamp Mallet (Eucalyptus spathulata)	35	7	9	Good	Fair	Australian native	Semi-mature	15-25	Moderate/ High		4.2	291944.806481484	5805590.669900190
63	1	River Red Gum (Eucalyptus camaldulensis)	28	9	6	Fair	Fair	Indigenous	Semi-mature	50+	High	Indigenous	3.4	291898.605015893	5805423.863853080
64	1	River Red Gum (Eucalyptus camaldulensis)	59	9	15	Good	Fair	Indigenous	Semi-mature	50+	Very high	Indigenous remnant.	7.08	291880.703287926	5805446.929158210
65	1	River Red Gum (Eucalyptus camaldulensis)	49	11	12	Fair	Fair	Indigenous	Semi-mature	50+	Very high	Indigenous remnant.	5.88	291852.766367451	5805472.563940320
66	1	River Red Gum (Eucalyptus camaldulensis)	28	9	6	Fair	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant.	3.4	291850.045238834	5805478.722686720
67	1	River Red Gum (Eucalyptus camaldulensis)	14	6	4	Fair	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant.	1.7	291845.897579153	5805482.022015150
68	1	River Red Gum (Eucalyptus camaldulensis)	187	11	18	Fair	Fair	Indigenous	Over-mature	25-50	Very high	Indigenous remnant. Deadwood/Stubs removal,	22.44	291840.595501270	5805487.180965070
69	1	River Red Gum (Eucalyptus camaldulensis)	51	11	12	Good	Fair	Indigenous	Semi-mature	50+	Very high	Indigenous remnant.	6.12	291834.295676228	5805497.778807900
70	1	River Red Gum (Eucalyptus camaldulensis)	37	11	10	Good	Fair	Indigenous	Semi-mature	50+	Very high	Indigenous remnant.	4.44	291826.272469728	5805511.246066680
71	1	River Red Gum (Eucalyptus camaldulensis)	20	4	6	Good	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant. Partly suppressed, Crown bias ÔÇôE	2.4	291816.385702417	5805526.712918450

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Feature No.	No of trees	Common Name (Botanic name)	DBH (cm)	Height (m)	Width (m)	Health	Structure	Origin	Age class	ULE (years)	Arboricultural rating	Comments	TPZ (m radius)	x	y
72	1	River Red Gum (Eucalyptus camaldulensis)	30	6	7	Good	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant. Partly suppressed, Crown bias ÔÇôE	3.6	291814.670566804	5805526.143034450
73	1	River Red Gum (Eucalyptus camaldulensis)	25	7	6	Good	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant.	3.0	291814.950925510	5805528.002655930
74	1	River Red Gum (Eucalyptus camaldulensis)	18	5	5	Good	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant. Partly suppressed, Crown bias ÔÇôSth	2.2	291813.235789896	5805527.712714950
75	1	River Red Gum (Eucalyptus camaldulensis)	20	7	6	Good	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant.	2.4	291813.804753152	5805530.292189900
76	1	River Red Gum (Eucalyptus camaldulensis)	31	8	8	Good	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant.	3.7	291812.229796892	5805533.451546820
77	1	River Red Gum (Eucalyptus camaldulensis)	31	10	9	Good	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant.	3.7	291806.787539657	5805537.460730760
78	1	River Red Gum (Eucalyptus camaldulensis)	33	7	8	Good	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant.	4.0	291795.762845833	5805558.656416440
79	1	River Red Gum (Eucalyptus camaldulensis)	37	7	9	Good	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant.	4.4	291794.328068925	5805561.375862910
80	1	River Red Gum (Eucalyptus camaldulensis)	36	7	10	Good	Fair to poor	Indigenous	Semi-mature	50+	High	Indigenous remnant. Asymmetric- E	4.3	291783.154949904	5805580.292012580
81	1	River Red Gum (Eucalyptus camaldulensis)	35	7	9	Good	Fair to poor	Indigenous	Semi-mature	50+	High	Indigenous remnant.	4.2	291762.672272673	5805598.478310810
83	1	River Red Gum (Eucalyptus camaldulensis)	42	6	10	Good	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant.	5.0	291743.327521954	5805630.851721300
84	1	River Red Gum (Eucalyptus camaldulensis)	13	4	3	Good	Fair	Indigenous	Semi-mature	50+	High	Indigenous	1.6	291732.154402933	5805658.216151350
85	1	River Red Gum (Eucalyptus camaldulensis)	35	7	10	Good	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant.	4.2	291723.850837727	5805675.692594070
86	1	River Red Gum (Eucalyptus camaldulensis)	29	7	8	Good	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant.	3.5	291717.691192038	5805674.542828100
87	1	River Red Gum (Eucalyptus camaldulensis)	34	7	9	Good	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant.	4.1	291759.233755601	5805591.889651920
88	1	River Red Gum (Eucalyptus camaldulensis)	42	9	9	Fair	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant. Reduced foliage density	5.0	291768.114529908	5805579.282218120
89	1	River Red Gum (Eucalyptus camaldulensis)	48	10	12	Good	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant.	5.8	291770.975837879	5805574.563178670
90	1	River Red Gum (Eucalyptus camaldulensis)	14	3	4	Good	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant.	1.7	291774.554534303	5805561.375862910
91	1	River Red Gum (Eucalyptus camaldulensis)	43	9	11	Good	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant. Reduced foliage density	5.2	291782.577740803	5805559.226300450
92	1	River Red Gum (Eucalyptus camaldulensis)	43	7	10	Good	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant. Asymmetric- E	5.2	291783.872338358	5805555.936969980

Feature No.	No of trees	Common Name (Botanic name)	DBH (cm)	Height (m)	Width (m)	Health	Structure	Origin	Age class	ULE (years)	Arboricultural rating	Comments	TPZ (m radius)	x	y
93	1	River Red Gum (Eucalyptus camaldulensis)	25	7	10	Good	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant.	3.0	291785.727653324	5805552.787611020
94	1	River Red Gum (Eucalyptus camaldulensis)	40	8	10	Good	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant.	4.8	291788.019998039	5805544.909214650
95	1	River Red Gum (Eucalyptus camaldulensis)	14	4	5	Fair	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant.	1.7	291790.889551854	5805554.077348500
96	1	River Red Gum (Eucalyptus camaldulensis)	19	4	5	Fair	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant.	2.3	291789.603200144	5805537.460730760
97	1	River Red Gum (Eucalyptus camaldulensis)	33	9	8	Fair	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant.	4.0	291791.458515110	5805534.731286340
98	1	River Red Gum (Eucalyptus camaldulensis)	15	4	4	Fair	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant. Asymmetric- E	1.8	291792.753112665	5805532.731693350
99	1	River Red Gum (Eucalyptus camaldulensis)	18	5	4	Fair	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant. Asymmetric- E	2.2	291793.899285022	5805530.722102390
100	1	River Red Gum (Eucalyptus camaldulensis)	40	9	9	Good	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant.	4.8	291799.630146808	5805519.264434570
101	1	River Red Gum (Eucalyptus camaldulensis)	22	6	6	Good	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant.	2.6	291806.070151203	5805509.666388220
102	1	River Red Gum (Eucalyptus camaldulensis)	41	10	9	Good	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant.	4.9	291806.218576400	5805506.517029270
103	1	River Red Gum (Eucalyptus camaldulensis)	20	6	6	Fair	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant. Partly suppressed	2.4	291808.651100467	5805505.227291790
104	1	River Red Gum (Eucalyptus camaldulensis)	13	4	4	Fair	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant. Partly suppressed	1.6	291809.079884371	5805507.946738250
105	1	River Red Gum (Eucalyptus camaldulensis)	13	4	4	Fair	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant. Partly suppressed	1.6	291810.085877375	5805507.086913270
107	1	River Red Gum (Eucalyptus camaldulensis)	21	5	6	Fair	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant. Asymmetric- E	2.5	291812.807005993	5805499.208516890
108	1	River Red Gum (Eucalyptus camaldulensis)	24	9	6	Fair	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant.	2.9	291814.381962253	5805495.769216950
109	1	River Red Gum (Eucalyptus camaldulensis)	41	8	13	Good	Fair	Indigenous	Semi-mature	50+	Very high	Indigenous remnant.	4.92	291814.522141606	5805492.769827470
110	1	River Red Gum (Eucalyptus camaldulensis)	89	15	21	Good	Fair	Indigenous	Maturing	50+	Very high	Indigenous remnant.	10.68	291824.120304367	5805484.031606110
111	1	River Red Gum (Eucalyptus camaldulensis)	64	9	10	Fair	Fair	Indigenous	Maturing	50+	High	Indigenous remnant.	7.7	291842.459062081	5805460.676360000
112	1	River Red Gum (Eucalyptus camaldulensis)	70	10	14	Good	Fair	Indigenous	Maturing	50+	Very high	Indigenous remnant.	8.4	291848.758887123	5805453.227876120
113	1	River Red Gum (Eucalyptus camaldulensis)	15	5	5	Fair	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant. Partly suppressed	1.8	291852.057224842	5805443.919770760
114	1	River Red Gum (Eucalyptus camaldulensis)	18	4	5	Fair	Fair	Indigenous	Semi-mature	50+	High	Indigenous remnant. Asymmetric- Sth	2.2	291852.914792649	5805441.480267310
115	1	River Red Gum (Eucalyptus camaldulensis)	18	2	5	Fair	Fair to poor	Indigenous	Semi-mature	50+	High	Indigenous remnant. Asymmetric- Sth	2.2	291855.347316716	5805441.200324290

Feature No.	No of trees	Common Name (Botanic name)	DBH (cm)	Height (m)	Width (m)	Health	Structure	Origin	Age class	ULE (years)	Arboricultural rating	Comments	TPZ (m radius)	x	y
116	1	River Red Gum (Eucalyptus camaldulensis)	76	7	14	Fair	Fair	Indigenous	Maturing	50+	High	Indigenous remnant. Deadwood/Stubs removal	9.1	291857.499482077	5805442.340092300
121	1	Yellow Gum (Eucalyptus leucoxylon)	23	6	6	Good	Fair	Indigenous	Semi-mature	25-50	High		2.76	290600.989482401	5805120.555590600
122	1	Yellow Gum (Eucalyptus leucoxylon)	39	12	12	Good	Fair	Indigenous	Semi-mature	25-50	High	Acute fork	4.68	290676.257549135	5805163.126925330
126	1	Swamp Mallet (Eucalyptus spathulata)	40	9	10	Good	Fair	Australian native	Semi-mature	15-25	Moderate/ High	Acute forks	4.8	290626.419666210	5805214.286511940
127	1	Swamp Mallet (Eucalyptus spathulata)	40	11	10	Good	Fair	Australian native	Semi-mature	15-25	Moderate/ High	Acute forks	4.8	290631.969119421	5805187.571949610
129	1	Swamp Mallet (Eucalyptus spathulata)	45	11	11	Good	Fair	Australian native	Semi-mature	15-25	Moderate/ High		5.4	290601.434757993	5805195.210394830
143	1	Swamp Mallet (Eucalyptus spathulata)	47	10	12	Good	Fair	Australian native	Maturing	15-25	Moderate/ High	Acute forks.	5.64	291295.099917709	5806247.066292610
145	1	Sugar Gum (Eucalyptus cladocalyx)	50	18	15	Good	Fair	Australian native	Maturing	25-50	High		6	291140.927366906	5806274.790649390
194	1	Lemon-scented Gum (Corymbia citriodora)	26	8	9	Good	Fair	Australian native	Semi-mature	50+	High		3.12	291274.782157364	5805977.531155700
199	1	Spotted Gum (Corymbia maculata)	23	7	6	Good	Fair	Victorian native	Semi-mature	50+	High		2.76	291258.331697993	5806015.803365510
200	1	Lemon-scented Gum (Corymbia citriodora)	27	11	8	Good	Fair	Australian native	Semi-mature	50+	High		3.24	291243.670586835	5806007.755003730
203	1	Lemon-scented Gum (Corymbia citriodora)	24	9	8	Fair	Fair	Australian native	Semi-mature	25-50	High		2.88	291249.929182656	5806035.119433780
206	1	Grey Box (Eucalyptus microcarpa)	28	9	7	Fair	Fair	Indigenous	Semi-mature	50+	Moderate/ High		3.36	291260.838434659	5806023.141871770
209	1	Grey Box (Eucalyptus microcarpa)	20	9	6	Fair	Fair	Indigenous	Semi-mature	50+	Moderate/ High		2.4	291263.872905360	5806030.470380080
213	1	Grey Box (Eucalyptus microcarpa)	15	7	4	Fair	Fair	Indigenous	Semi-mature	50+	Moderate/ High		1.8	291282.830101397	5806033.689724790
214	1	Grey Box (Eucalyptus microcarpa)	18	8	5	Fair	Fair	Indigenous	Semi-mature	50+	Moderate/ High		2.16	291284.619449609	5806032.260015800
217	1	Grey Box (Eucalyptus microcarpa)	20	8	6	Fair	Fair	Indigenous	Semi-mature	50+	Moderate/ High		2.4	291247.241037415	5806048.356739360
222	1	Grey Box (Eucalyptus microcarpa)	20	9	5	Fair	Fair	Indigenous	Semi-mature	50+	Moderate/ High		2.4	291236.867765291	5806027.790925470
224	1	Grey Box (Eucalyptus microcarpa)	19	9	5	Fair	Fair	Indigenous	Semi-mature	50+	Moderate/ High		2.28	291225.785350557	5806028.860707720
225	1	Grey Box (Eucalyptus microcarpa)	6	9	5	Fair	Fair	Indigenous	Semi-mature	50+	Moderate/ High		0.72	291229.182638407	5806017.772964600
247	1	Bull Oak (Allocasuarina luehmannii)	30	6	8	Fair	Fair to poor	Indigenous	Maturing	15-25	Moderate/ High	Boundary observations only.	3.6	290159.919271005	5807339.193993170

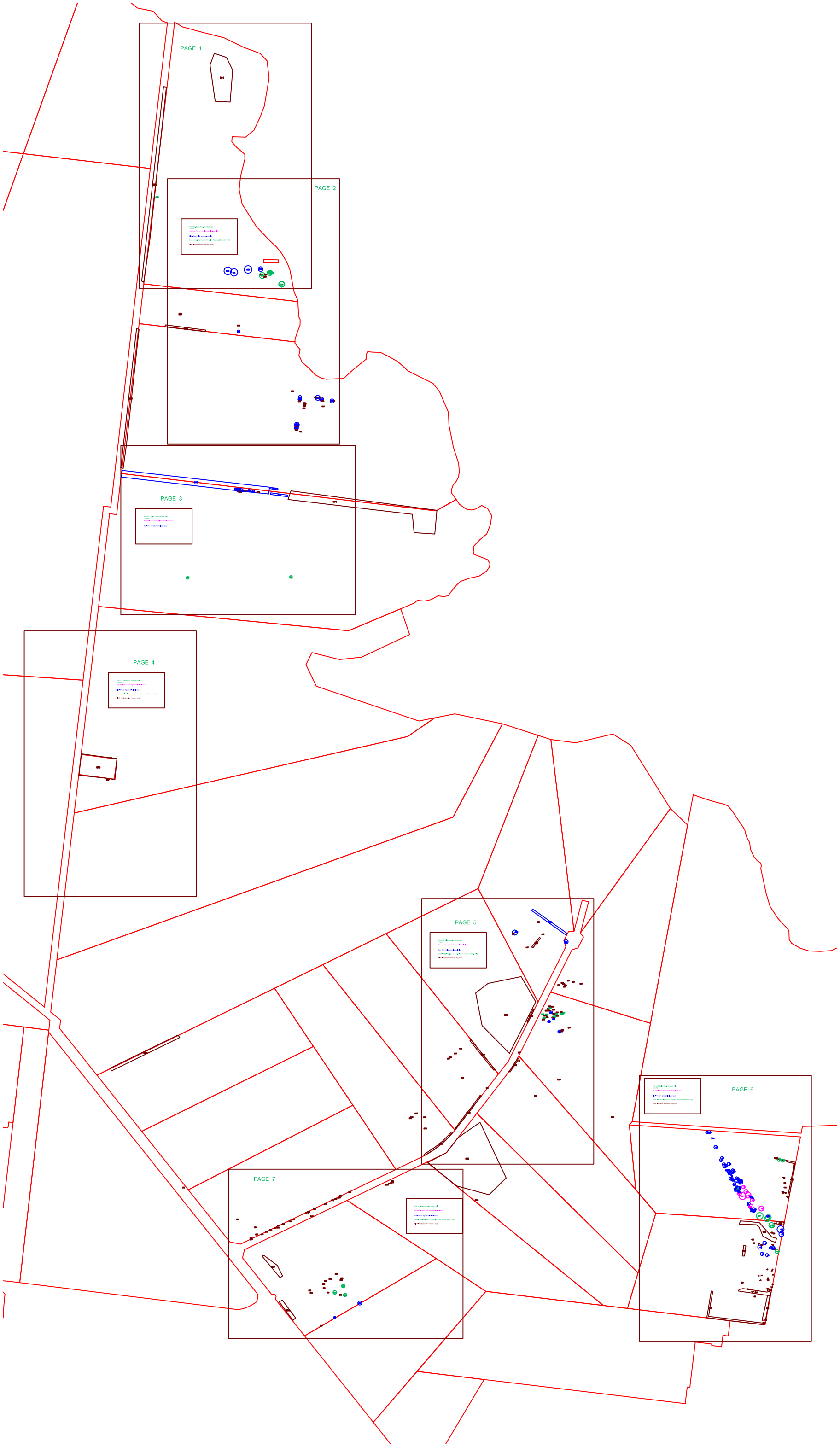
Feature No.	No of trees	Common Name (Botanic name)	DBH (cm)	Height (m)	Width (m)	Health	Structure	Origin	Age class	ULE (years)	Arboricultural rating	Comments	TPZ (m radius)	x	y
250	1	River Red Gum (Eucalyptus camaldulensis)	162	21	23	Fair	Fair to poor	Indigenous	Over-mature	25-50	High	Deadwood/Stub removal, Weight reduce.	19.4	290280.308597727	5808259.606645840
251	1	River Red Gum (Eucalyptus camaldulensis)	181	21	22	Fair	Fair to poor	Indigenous	Over-mature	25-50	High	Weight reduce. Deadwood/Stub removal	21.7	290299.067893501	5808255.067569760
252	1	River Red Gum (Eucalyptus camaldulensis)	155	19	23	Fair	Fair to poor	Indigenous	Over-mature	25-50	High	Weight reduce. Deadwood/Stub removal. Clear weed species from creek line	18.6	290341.121699411	5808263.845782980
253	1	River Red Gum (Eucalyptus camaldulensis)	67	9	14	Fair	Fair	Indigenous	Maturing	50+	High	Clear weed species from creek line	8.0	290378.632045114	5808265.055536740
254	1	Red Box (Eucalyptus polyanthemos subsp. vestita)	76	9	16	Fair	Fair to poor	Indigenous	Over-mature	25-50	Moderate/ High	Hollows. Deadwood/Stub removal. Clear weed species from creek line	9.12	290406.164919218	5808253.557877050
255	1	Red Box (Eucalyptus polyanthemos subsp. vestita)	40	6	8	Fair	Poor	Indigenous	Over-mature	5-15	Low	Stump resprout	4.8	290407.071962091	5808255.677445620
256	1	Red Box (Eucalyptus polyanthemos subsp. vestita)	68	6	11	Fair	Fair to poor	Indigenous	Maturing	25-50	Moderate	Suppressed,. Asymmetric-E	8.16	290409.191144075	5808253.557877050
258	1	Red Box (Eucalyptus polyanthemos subsp. vestita)	125	15	18	Fair	Fair to poor	Indigenous	Over-mature	25-50	Moderate/ High	Undermined roots. Clear weed species from creek line	15	290383.777451954	5808245.989417590
262	1	Red Box (Eucalyptus polyanthemos subsp. vestita)	115	10	17	Fair	Fair to poor	Indigenous	Over-mature	25-50	Moderate/ High	Deadwood/Stub removal.	13.8	290441.861179176	5808219.364836950
266	1	River Red Gum (Eucalyptus camaldulensis)	40	13	8	Good	Fair	Indigenous	Semi-mature	50+	High		4.8	290312.830207631	5808078.233563810
276	1	Red Box (Eucalyptus polyanthemos subsp. vestita)	34	6	6	Fair to poor	Fair to poor	Indigenous	Over-mature	5-15	Low	Trunk/Limb decay	4.08	290068.077057236	5808481.241532700
277	1	Yellow Gum (Eucalyptus leucoxylon)	33	15	9	Good	Fair	Indigenous	Semi-mature	25-50	High		3.96	290321.669752716	5807601.710558690
279	1	Yellow Gum (Eucalyptus leucoxylon)	33	16	10	Good	Fair	Indigenous	Semi-mature	25-50	High		3.96	290313.951642455	5807603.210253430
280	1	Yellow Gum (Eucalyptus leucoxylon)	26	12	7	Fair	Fair	Indigenous	Semi-mature	25-50	High		3.12	290307.577604814	5807603.460202550
281	1	Bushy Sugar Gum (Eucalyptus cladocalyx 'Nana')	26	10	11	Good	Fair	Australian native	Semi-mature	25-50	High		3.12	290310.760500713	5807603.210253430

Feature No.	No of trees	Common Name (Botanic name)	DBH (cm)	Height (m)	Width (m)	Health	Structure	Origin	Age class	ULE (years)	Arboricultural rating	Comments	TPZ (m radius)	x	y
282	1	Yellow Gum (Eucalyptus leucoxylon)	23	9	8	Fair	Fair	Indigenous	Semi-mature	25-50	High		2.76	290344.345824531	5807600.270851740
283	1	Yellow Gum (Eucalyptus leucoxylon)	22	9	8	Fair	Fair	Indigenous	Semi-mature	25-50	High		2.64	290356.846524483	5807598.061301480
287	1	Yellow Gum (Eucalyptus leucoxylon)	44	16	12	Fair	Fair	Indigenous	Semi-mature	25-50	High		5.28	290486.141363045	5807788.152608950
289	1	Yellow Gum (Eucalyptus leucoxylon)	50	17	13	Good	Fair	Indigenous	Maturing	25-50	High		6	290487.369993846	5807795.261162020
290	1	Yellow Gum (Eucalyptus leucoxylon)	50	15	14	Good	Fair	Indigenous	Maturing	25-50	High		6	290487.617369174	5807798.450512840
298	1	Yellow Gum (Eucalyptus leucoxylon)	30	12	10	Good	Fair	Indigenous	Semi-mature	25-50	High		3.6	290496.193047242	5807873.945146130
299	1	Yellow Gum (Eucalyptus leucoxylon)	33	13	10	Fair	Fair	Indigenous	Semi-mature	25-50	High		3.96	290496.926927385	5807881.053699200
303	1	Yellow Gum (Eucalyptus leucoxylon)	45	18	15	Good	Fair	Indigenous	Maturing	25-50	High	Co-dominant stems.	5.4	290550.112623094	5807878.734171330
305	1	Spotted Gum (Corymbia maculata)	53	18	12	Good	Fair	Victorian native	Maturing	50+	High		6.36	290561.261004582	5807874.754981290
307	1	Yellow Gum (Eucalyptus leucoxylon)	47	18	12	Fair	Fair	Indigenous	Maturing	25-50	High		5.64	290593.304355517	5807869.576035440
310	1	Grey Box (Eucalyptus microcarpa)	35	9	11	Fair	Fair to poor	Indigenous	Semi-mature	50+	Moderate/ High		4.2	290500.043856529	5807781.893882890
312	1	Bull Oak (Allocasuarina luehmannii)	30	8	8	Good	Fair to poor	Indigenous	Maturing	15-25	Moderate/ High	Boundary observations only.	3.6	290469.880558094	5807341.493525110
G30	8	Lemon-scented Gum (Corymbia citriodora)	17	6	5	Good	Fair	Australian native	Semi-mature	50+	High		2.04	0.0000	0.0000
G66	5	Spotted Gum (Corymbia maculata)	25	9	8	Good	Fair	Victorian native	Semi-mature	50+	High		3	0.0000	0.0000
G67	9	River Red Gum (Eucalyptus camaldulensis)	35	11	9	Good	Fair	Indigenous	Semi-mature	50+	High		4.2	0.0000	0.0000
G68	70	Mixed natives	35	11	9	Good	Fair	Australian native	Semi-mature	25-50	High	Inc. 35 E cladocalyx 'Nana'. 6 E microcarpa, 14 E viridis, 5 Corymbia maculata, Mel linarifolia & stypheloides	4.2	0.0000	0.0000

Appendix 2: Tree and group numbers & locations: Wyndham Vale PSP40E

High and Very High rated trees and groups.

Refer to following 8 pages.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PSP 40 E. Ballan Road. Wyndham Vale
Legend

Magenta= Tree of Very High arboricultural value

Blue= Tree of High arboricultural value

Green = Additional trees of of note (inc. Trees rated Moderate / High)

Black = Moderate rated trees and groups

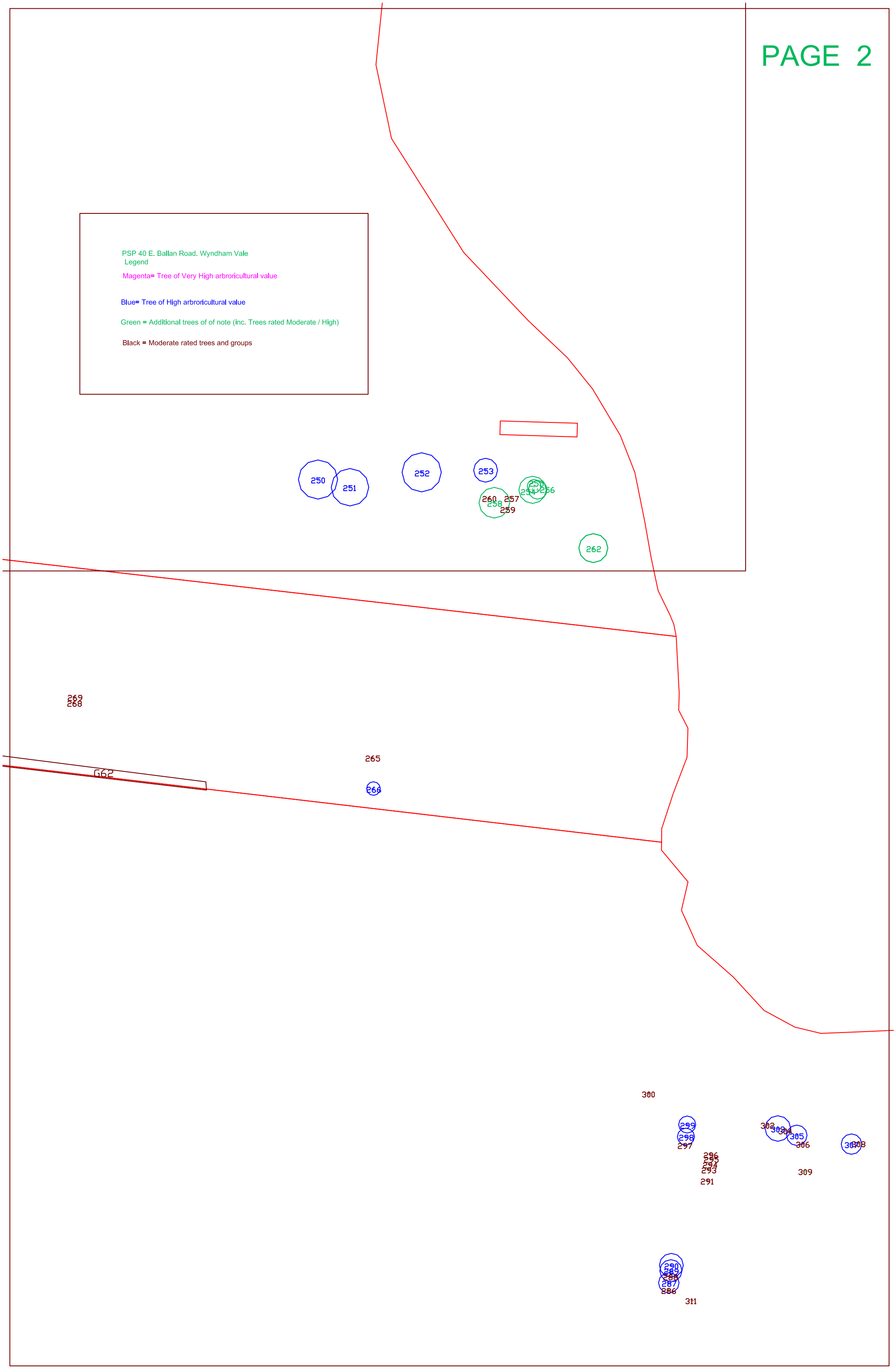
PSP 40 E. Ballan Road. Wyndham Vale
Legend

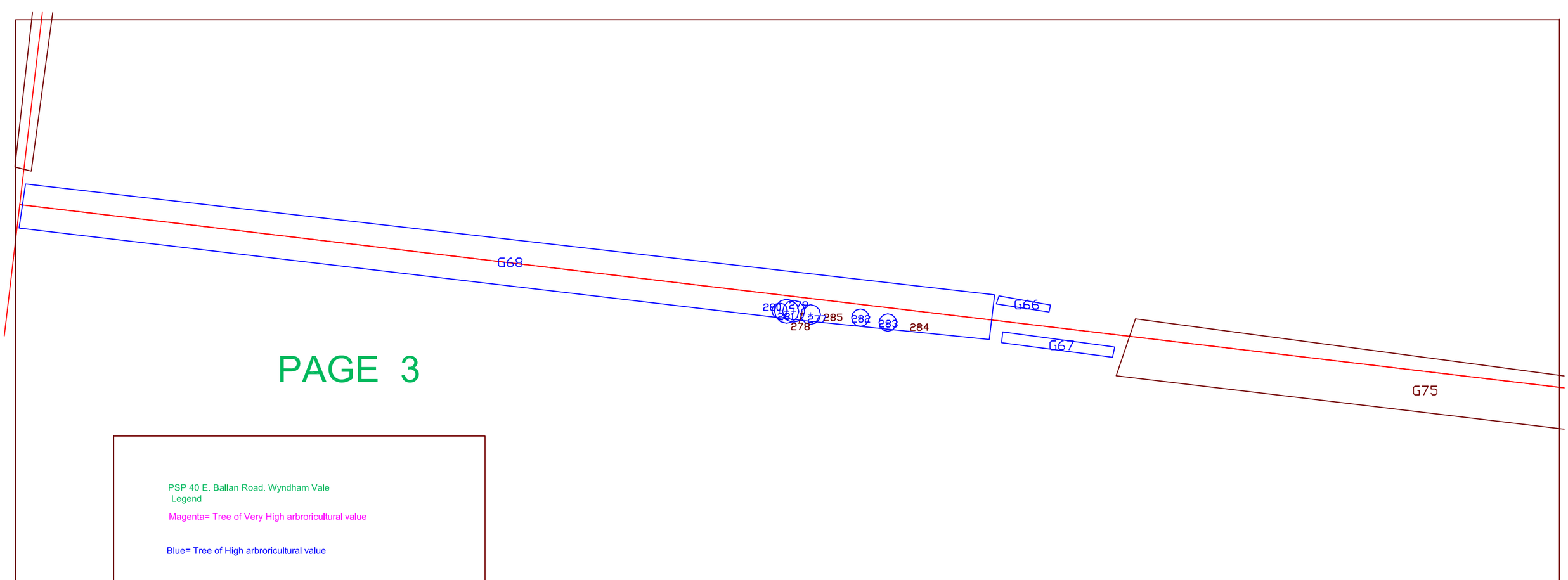
Magenta= Tree of Very High arbroricultural value

Blue= Tree of High arbroricultural value

Green = Additional trees of of note (inc. Trees rated Moderate / High)

Black = Moderate rated trees and groups





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PSP 40 E. Ballan Road. Wyndham Vale
Legend

Magenta= Tree of Very High arbroricultural value

Blue= Tree of High arbroricultural value

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PSP 40 E. Ballan Road. Wyndham Vale
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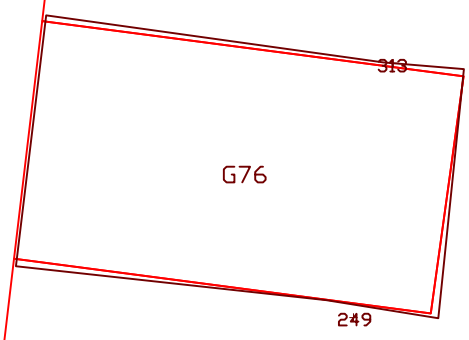
Magenta= Tree of Very High arbroricultural value

Blue= Tree of High arbroricultural value

Green = Additional trees of of note (inc. Trees rated Moderate / High)

Black = Moderate rated trees and groups



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PSP 40 E. Ballan Road. Wyndham Vale
Legend

Magenta= Tree of Very High arboricultural value

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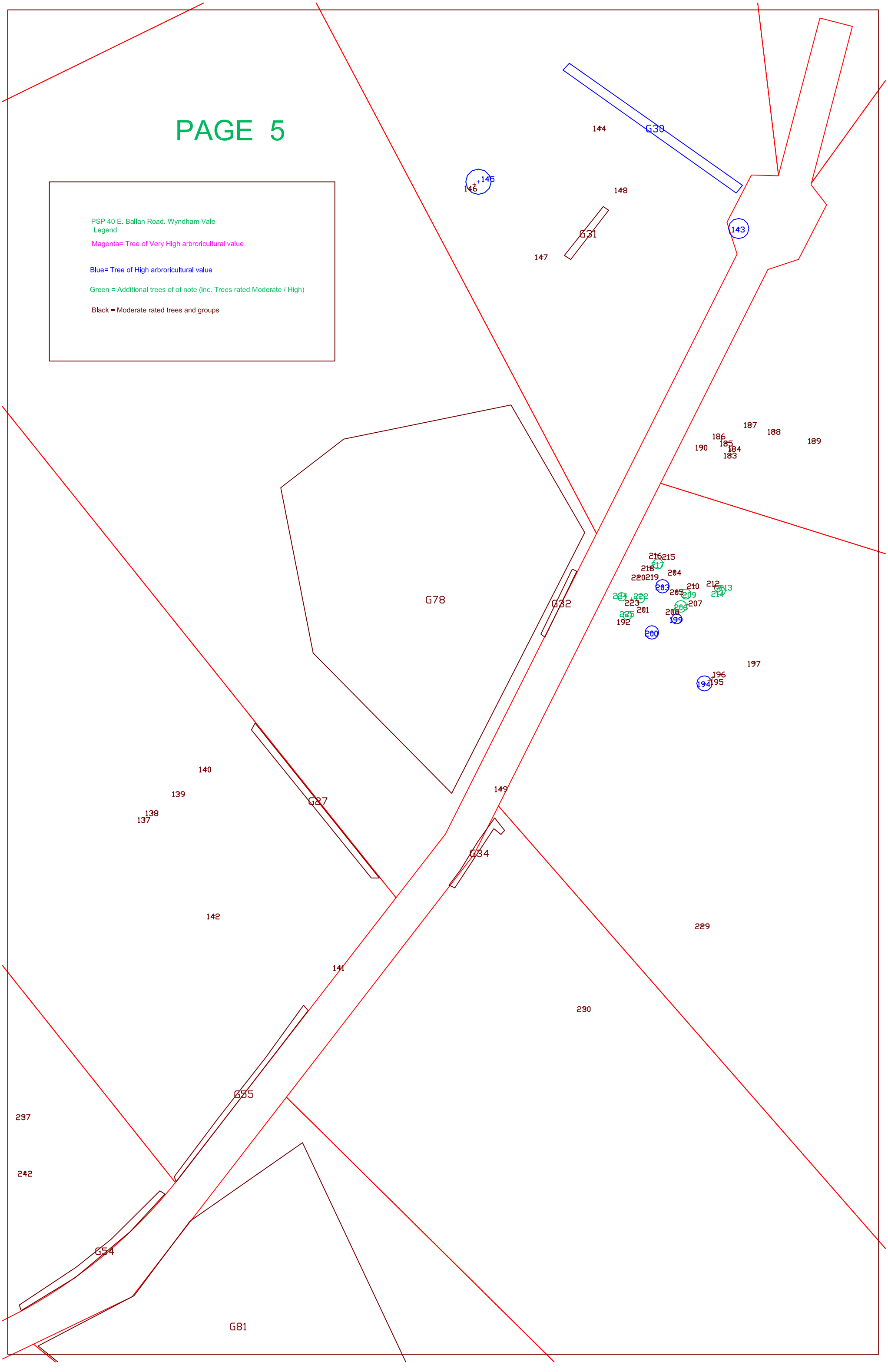

PSP 40 E. Ballan Road. Wyndham Vale
Legend

Magenta= Tree of Very High arbroricultural value

Blue= Tree of High arbroricultural value

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Black = Moderate rated trees and groups

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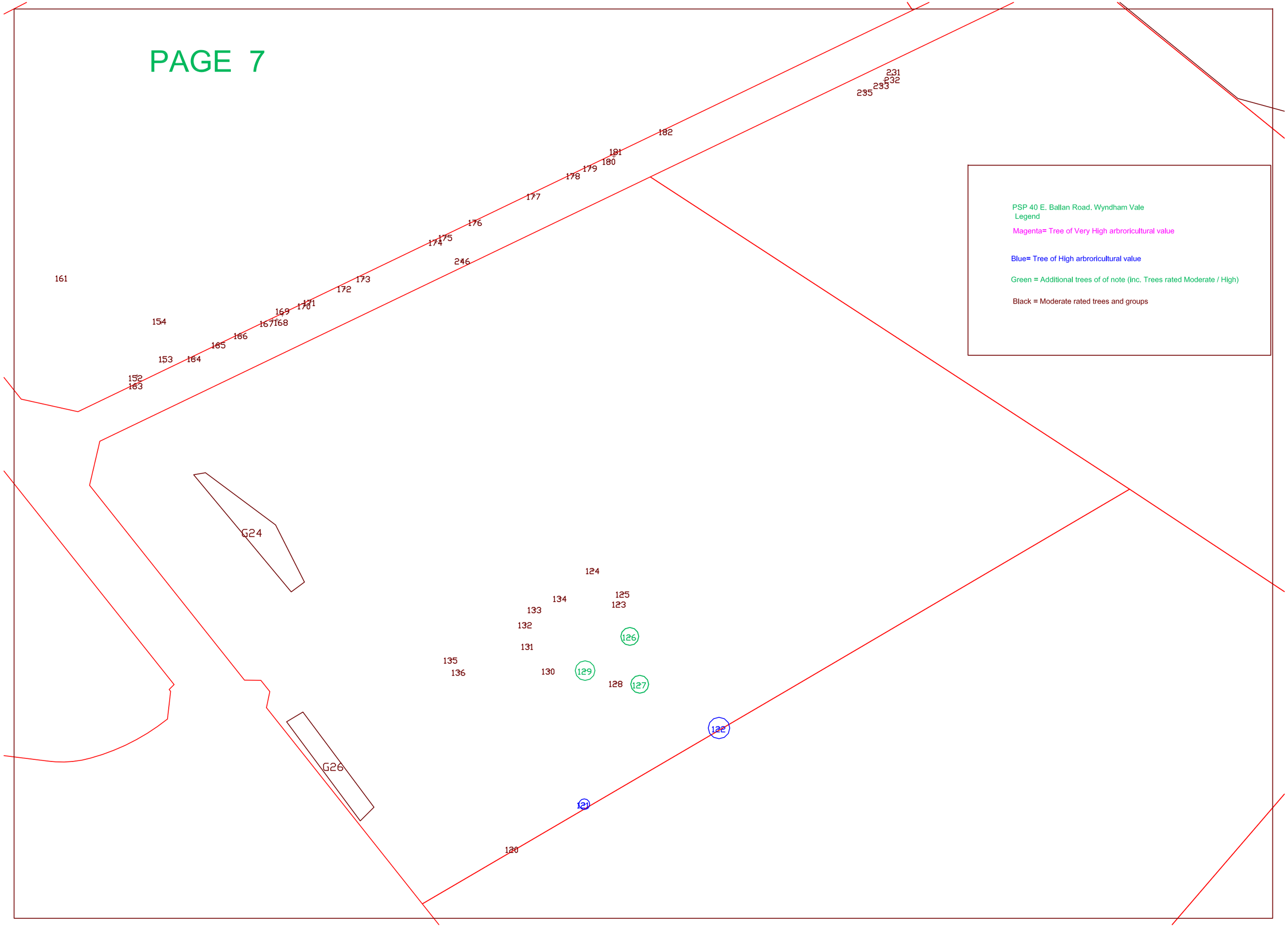
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PSP 40 E. Ballan Road. Wyndham Vale
Legend
Magenta= Tree of Very High arbroricultural value
Blue= Tree of High arbroricultural value
Green = Additional trees of of note (inc. Trees rated Moderate / High)
Black = Moderate rated trees and groups

Appendix 3: Tree Descriptors, Version 3 (June 2006) Tree Logic Pty. Ltd.

Tree Condition: The assessment of tree condition evaluates factors of health, structure and form. The descriptors of health and structure attributed to a tree evaluate the individual specimen to what could be considered typical for that species growing in its location. For example, some species can display inherently poor branching architecture, such as multiple acute branch attachments with included bark. Whilst these structural defects may technically be considered arboriculturally poor, they are typical for the species and may not constitute an increased risk of failure. These trees may be assigned a structural rating of fair-poor (rather than poor) at the discretion of the author.

The normal distribution curve is a statistical model which shows that for a large number of observations of a particular population, the frequency of the observations creates a bell-shaped curve. This pattern is commonly found in the natural and behavioural sciences. Diagram 4, provides an indicative distribution curve for tree condition to illustrate that within a normal tree population the majority of specimens are centrally located within the condition range. Furthermore, that those individual trees with an assessed condition approaching the outer ends of the spectrum occur less often.

Tree name: Provides botanical name, (genus, species, variety and cultivar) according to accepted international code of taxonomic classification, and common name.

DBH: Indicates the trunk diameter (expressed in centimetres) of an individual tree measured at 1.3m above the existing ground level (Diagram 1) or where otherwise indicated (Diagram 2), multiple leaders are measured individually (Diagram 3). Plants with multiple leader habit, e.g. *Cotoneaster* sp., may be measured at the base. Measurements undertaken with foresters∅ tape or builders tape.

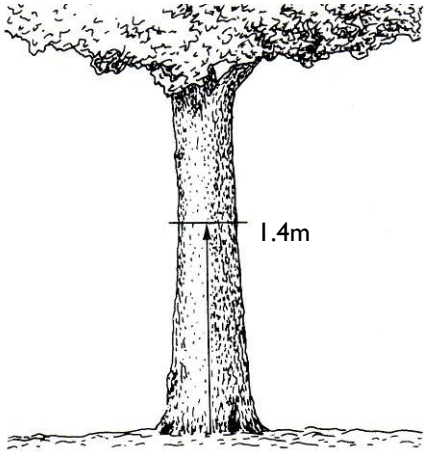


Diagram 1: Measurement of DBH on tree with single trunk

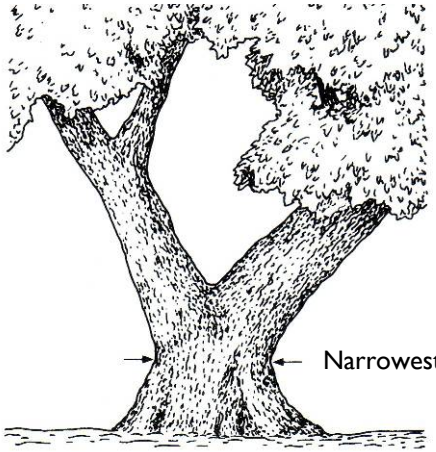


Diagram 2: Measurement of basal diameter at narrowest point above the basal flare

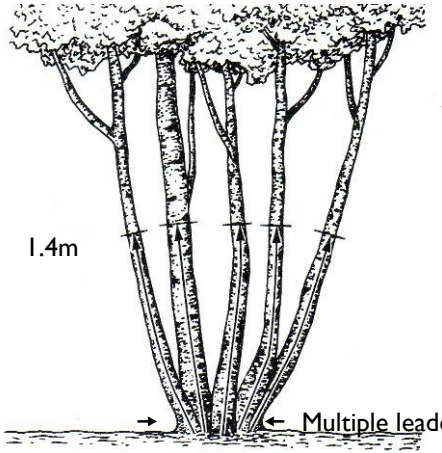


Diagram 3: Measurement of DBH on tree with multiple trunks, measured individually or at the base

Diagrams 1-3 adapted from Gooding *et al.* (2000)

H x W: Indicates height and width of the individual tree; dimensions are expressed in metres. Crown heights are measured with a clinometer where possible. Due to the topography of some sites and/or the density of vegetation it may not be possible to do this for every tree. Tree heights may be estimated in line with previous clinometer readings in conjunction with author's experience. Crown widths are generally paced (estimated) at the widest axis or can be measured on two axes and averaged.

Tree type: Describes the general geographic origin of the species and its type e.g. deciduous or evergreen.

Category	Description
Indigenous	Occurs naturally in the area or region of the subject site
Victorian native	Occurs naturally within some part of the State of Victoria (not exclusively) but is not indigenous
Australian native	Occurs naturally within Australia but is not a Victorian native or indigenous
Exotic deciduous	Occurs outside of Australia and typically sheds its leaves during winter
Exotic evergreen	Occurs outside of Australia and typically holds its leaves all year round
Exotic conifer	Occurs outside of Australia and is classified as a gymnosperm
Native conifer	Occurs naturally within Australia and is classified as a gymnosperm
Palm	Woody monocotyledon
Other	Other descriptions as indicated

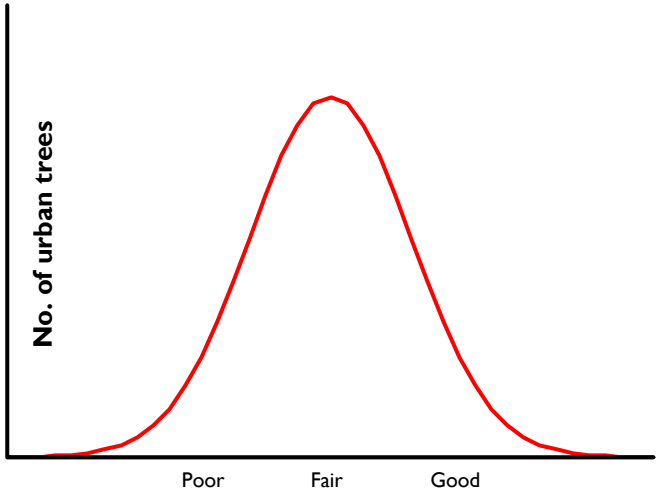


Diagram 4: Indicative normal distribution curve for tree condition

Age: Relates to the physiological stage of the tree's life cycle.

Category	Description
Young	Sapling tree and/or recently planted
Semi-mature	Tree rapidly increasing in size and yet to achieve expected size in situation
Maturing	Specimen approaching expected size in situation, with reduced incremental growth
Over-mature	Tree is senescent and in decline

Form: Describes the general shape of the tree.

Category	Description
Symmetric	Generally evenly balanced and full crown
Asymmetric	Crown generally biased in one direction; can be minor or major
Stump re-sprout	Adventitious shoots originating from stump or trunk (after severe dieback or lopping)
Suppressed	Tree form inhibited
Manipulated	Hedge, pollard, topiary, windrow; managed for specific landscape use or aesthetic

Health: Assesses various attributes to describe the overall health and vigour of the tree.

Category	Vigour/Extension growth	Decline symptoms/Deadwood	Foliage density, colour, size, intactness	Pests and or disease
Good	Above typical	None or minimal	Better than typical	None or minimal
Fair	Typical	Typical or expected	Typical	Typical, within damage thresholds
Fair to Poor	Below typical	More than typical	Exhibiting deficiencies	Exceeds damage thresholds
Poor	Minimal	Excessive and large amount/size	Exhibiting severe deficiencies	Extreme and contributing to decline
Dead	N/A	N/A	N/A	N/A

Structure: Assesses principal components of tree structure (Diagram 5).

	Zone 1	Zone 2	Zone 3	Zone 4		
Descriptor	**Root plate & lower stem**	**Trunk**	**Primary branch support**	**Outer crown and roots**	**Lean from vertical**	**Risk potential if targets present**
Good	No damage, disease or decay; obvious basal flare / stable in ground	No damage, disease or decay; well tapered	Well formed, attached, spaced and tapered	No damage, disease, decay or structural defect	Low or none	Low or none
Fair	Minor damage or decay	Minor damage or decay	Typically formed, attached, spaced and tapered	Minor damage, disease or decay; minor branch end-weight or over-extension	Minor / natural	Minor
Fair to Poor	Moderate damage or decay; minimal basal flare	Moderate damage or decay; approaching recognised thresholds	Weak, decayed or with acute branch attachments; previous branch failure evidence	Moderate damage, disease or decay; moderate branch end-weight or over-extension	Moderate	Moderate
Poor	Major damage, disease or decay; fungal fruiting bodies present	Major damage, disease or decay; exceeds recognised thresholds; fungal fruiting bodies present	Decayed, cavities or has acute branch attachments with included bark; excessive compression flaring; failure likely	Major damage, disease or decay; fungal fruiting bodies present; major branch end-weight or over-extension	Acute	High
Very Poor	Excessive damage, disease or decay; unstable / loose in ground; failure probable	Excessive damage, disease or decay; cavities	Decayed, cavities or branch attachments with active split; failure imminent	Excessive damage, disease or decay; excessive branch end-weight or over-extension	Excessive – root plate failure or stem failure probable	Severe/imminent

The lowest or worst descriptor assigned to the tree in any column could generally be the overall rating assigned to the tree.

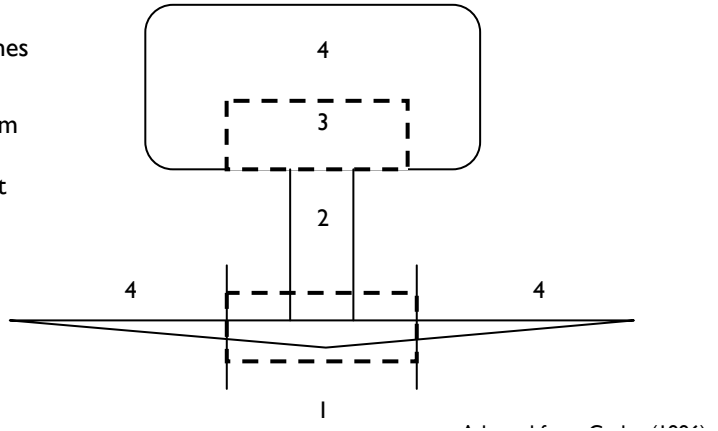
The assessment for structure is limited to observations of external and above ground tree parts. It does not include any exploratory assessment of underground or internal tree parts unless this is requested as part of the investigation.

Trees are assessed and the given a rating for a point in time. Generally, trees with a poor or very poor structure are beyond the benefit of practical arboricultural treatments.

The management of trees in the urban environment requires appropriate arboricultural input and consideration of risk.

Diagram 5: Tree structure zones

1. Root plate & lower stem
2. Trunk
3. Primary branch support
4. Outer crown & roots



Arboricultural Rating: Relates to the combination of previous tree condition factors, including health, structure and form (arboricultural merit), and also conveys an amenity value. Amenity relates to the trees biological, functional and aesthetic characteristics (Hitchmough 1994) within an urban landscape context.

Category	Description
Very High	Tree of very high quality in good condition. Generally a prominent arboricultural feature. Tree is capable of tolerating changes in its environment if managed appropriately. These trees have the potential to be a long-term component of the landscape if managed appropriately. Retention of these trees is highly desirable.
High	Tree of high quality with generally sound structural condition and good health. Generally is or has the potential to become a prominent landscape feature. Tree is capable of tolerating changes in its environment and has the potential to be a long-term component of the landscape if managed appropriately.
Moderate	Tree of moderate quality, in fair or better condition. Tree may have a condition, and or structural problem that will respond to arboricultural treatment. Tree is capable of tolerating changes in its environment if managed appropriately. These trees have the potential to be a medium- to long-term component of the landscape if managed appropriately. Retention of these trees is generally desirable.
Low	Tree of low quality and/or little amenity value. Tree in poor health and/or with poor structure. Tree unlikely to respond positively to changes in its environment and does not warrant design modification to preserve it. Tree is not significant for its size and/or young. These trees are easily replaceable. Tree (species) is functionally inappropriate to specific location and would be expected to be problematic if retained. Retention of such trees may be considered if not requiring a disproportionate expenditure of resources for a tree in its condition and location.
None	Tree has a severe structural defect and/or health problem that cannot be sustained with practical arboricultural techniques and the loss of tree would be expected in the short term. Tree whose retention would be unviable after the removal of adjacent trees (includes trees that have developed in close spaced groups and would not be expected to acclimatise to severe alterations to surrounding environment – removal of adjacent shelter trees) Tree has a detrimental effect on the environment, for example, the tree is a woody weed. These trees should be removed on the basis of sound arboricultural management.

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Appendix 4: Tree protection zones. Tree logic Pty. Ltd. © 2009

1.0 Introduction

In order to sustain trees on a development site consideration must be given to the establishment of tree protection zones.

The physical dimensions of tree protection zones can sometimes be difficult to define. The projection of a tree's crown can provide a guide but is by no means the definitive measure. The unpredictable nature of roots and their growth, differences between species and their tolerances, and observable and hidden changes to the trees growing environment, as a result of development, are variables that must be considered.

Most vigorous, broad canopied trees survive well if the area within the drip-line of the canopy is protected. Fine root density is usually greater beneath the canopy than beyond (Gilman, 1997). If few to no roots over 3cm in diameter are encountered and severed during excavation the tree will probably tolerate the impact and root loss. A healthy tree can sustain a loss of between 30% and 50% of absorbing roots (Harris, Clark, Matheny, 1999), however encroachment into the structural root system of a tree may be problematic.

The structural root system of a tree is responsible for ensuring the stability of the entire tree structure in the ground. A tree could not sustain loss of structural root system and be expected to survive let alone stand up to average annual wind loads upon the crown.

2.0 Allocation of tree protection zone (TPZ)

The method of allocating a TPZ to a particular tree will be influenced by site factors, the tree species, its age and developed form.

Once it has been established, through an arboricultural assessment, which trees and tree groups are to be retained, the next step will require careful management through the development process to minimise any impacts on the designated trees. The successful retention of trees on any particular site will require the commitment and understanding of all parties involved in the development process. The most important activity, after determining the trees that will be retained is the implementation of a TPZ.

The intention of tree protection zones is to:

- mitigate tree hazards;
- provide adequate root space to sustain the health and aesthetics of the tree into the future;
- minimise changes to the trees growing environment, which is particularly important for mature specimens;
- minimise physical damage to the root system, canopy and trunk; and
- define the physical alignment of the tree protection fencing

Tree protection

The most important consideration for the successful retention of trees is to allow appropriate above and below ground space for the trees to continue to grow. This requires the allocation of tree protection zones for retained trees.

The Australian Standard AS 4970-2009 Protection of trees on development sites has been used as a guide in the allocation of TPZs for the assessed trees. The TPZ for individual trees is calculated based on trunk (stem) diameter (DBH), measured at 1.4 metres up from ground level. The radius of the TPZ is calculated by multiplying the trees DBH by 12. The method provides a TPZ that addresses both the stability and growing requirements of a tree. TPZ distances are measured as a radius from the centre of the trunk at (or near) ground level. The minimum TPZ should be no less than 2m and the maximum no more than 15m radius. The TPZ of palms should be not less than 1.0m outside the crown projection.

Encroachment into the TPZ is permissible under certain circumstances though is dependent on both site conditions and tree characteristics. Minor encroachment, up to 10% of the TPZ, is generally permissible provided encroachment is compensated for by recruitment of an equal area contiguous with the TPZ. Examples are provided in Diagram 1. Encroachment greater than 10% is considered major encroachment under AS4970-2009 and is only permissible if it can be demonstrated that after such encroachment the tree would remain viable.

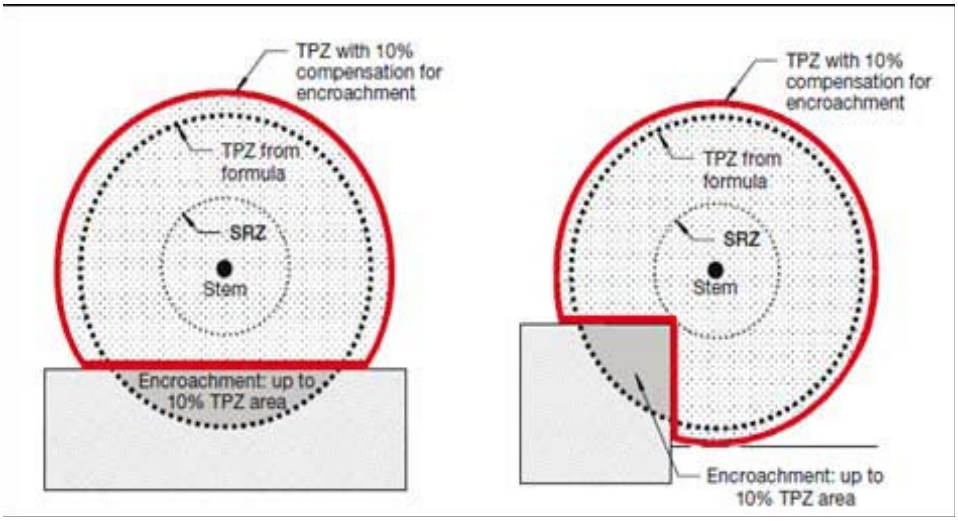

Diagram 1: Examples of minor encroachment into a TPZ. Extract from: AS4970-2009, Appendix D, p30 of 32

The 10% encroachment on one side equates to approximately ⅓ radial distance. Tree root growth is opportunistic and occurs where the essentials to life (primarily air and water) are present. Heterogeneous soil conditions, existing barriers, hard surfaces and buildings may have inhibited the development of a symmetrically radiating root system.

Existing infrastructure around some trees may be within the TPZ or root plate radius. The roots of some trees may have grown in response to the site conditions and therefore if existing hard surfaces and building alignments are utilised in new designs the impacts on the trees should be minimal. The most reliable way to estimate root disturbance is to find out where the roots are in relation to the demolition, excavation or construction works that will take place (Matheny & Clark, 1998). Exploratory excavation prior to commencement of construction can help establish the extent of the root system and where it may be appropriate to excavate or build.

The TPZ should also give consideration to the canopy and overall form of the tree. If the canopy requires severe pruning in order to accommodate a building and in the process the form of the tree is diminished it may be worthwhile considering altering the design or removing the tree.

General tree protection guidelines

The most important factors are:

- Prior to construction works the trees nominated for tree works should be pruned to remove larger dead wood. Pruning works may also identify other tree hazards that require remedial works.
- Installation of tree protection fencing. Once the tree protection zones have been determined the next step is to mulch the zone with woodchip and erect tree protection fencing. This must be completed prior to any materials being brought on-site, erection of temporary site facilities or demolition/earth works. The protection fencing must be sturdy and withstand winds and construction impacts. The protection fence should only be moved with approval of the site supervisor. Other root zone protection methods can be incorporated if the TPZ area needs to be traversed.
- Appropriate signage is to be fixed to the fencing to alert people as to importance of the tree protection zone.
- The importance of tree preservation must be communicated to all relevant parties involved with the site.
- Inspection of trees during excavation works.

Exploratory excavation

The most reliable way to estimate root disturbance is to find out where the roots are in relation to the demolition, excavation or construction works that will take place (Matheny & Clark, 1998).

Exploratory excavation prior to commencement of construction can help establish the extent of the root system and where it may be appropriate to excavate or build. This also allows management decisions to be made and allows time for redesign works if required.

Any exploratory excavation within the allocated TPZ is to be undertaken with due care of the roots. Minor exploration is possible with hand tools. More extensive exploration may require the use of high pressure water or air excavation techniques. Either hydraulic or pneumatic excavation techniques will safely expose tree roots; both have specific benefits dependent on the situation and soil type. An arborist is to be consulted on which system is best suited for the site conditions.

Substantial roots are to be exposed and left intact.

Once roots are exposed decisions can be made regarding the management of the tree. Decisions will be dependent on the tree species, its condition, its age, its relative tolerance to root loss, and the amount of root system exposed and requiring pruning.

Other alternative measures to encroaching the TPZ may include boring or tunnelling.

How to determine the diameter of a substantial root

The size of a substantial root will vary according to the distance of the exposed root to the trunk of the tree. The further away from the trunk of a tree that a root is, the less significant the root is likely to be to the tree's health and stability.

The determination of what is a substantial root is often difficult because the form, depth and spread of roots will vary between species and sites. However, because smaller roots are connected to larger roots in a framework, there can be no doubt that if larger roots are severed, the smaller roots attached to them will die. Therefore, the larger the root, the more significant it may be.

Gilman (1997) suggests that trees may contain 4-11 major lateral roots and that the five largest lateral roots account (act as a conduit) for 75% of the total root system. These large lateral roots quickly taper within a distance to the tree, this distance could be referred to as the Root Plate Radius (Mattheck & Breloer, 1994). Within the Root Plate Radius (RPR) distance, all roots and the soil surrounding the roots are deemed significant.

No root or soil disturbance is permitted within the RPR. In the area outside the RPR, the tree may tolerate the loss of one or a number of roots. The table below indicates the size of tree roots, outside the RPR that would be deemed substantial for various tree heights. The assessment of combined root loss within the TPZ would need to be undertaken by an arborist on an individual basis because the location of the tree, its condition and environment would need to be assessed.

Table 1: Estimated significant root sizes outside RPR

Height of tree	**Diameter of root**
Less than 5m	≥ 30mm
Between 5m - 15m	≥ 50mm
More than 15m	≥ 70mm

Construction Guidelines

The following are guidelines that must be implemented to minimise the impact of the proposed construction works on the retained trees.

- The Tree Protection Zone (TPZ) is fenced and clearly marked at all times. The actual fence specifications should be a minimum of 1.2 - 1.5 metres of chain mesh or like fence with 1.8 meter posts (e.g. treated pine or star pickets) or like support every 3-4 metres and a top line of high visibility plastic hazard tape. The posts should be strong enough to sustain knocks from on site excavation equipment. This fence will deter the placement of building materials, entry of heavy equipment and vehicles and also the entry of workers and/or the public into the TPZ. Note: There are many different variations on the construction type and material used for TPZ fences, suffice to say that the fence should satisfy the responsible authority.
- Contractors and site workers should receive written and verbal instruction as to the importance of tree protection and preservation within the site. Successful tree preservation occurs when there is a commitment from all relevant parties involved in designing, constructing and managing a development project. Members of the project team need to interact with each other to minimise the impacts to the trees, either through design decisions or construction practices. The importance of tree preservation must be communicated to all relevant parties involved with the site.
- The consultant arborist is on-site to supervise excavation works around the existing trees where the TPZ will be encroached.
- A layer of organic mulch (woodchips) to a depth of no more than 100mm should be placed over the root systems within the TPZ of trees, which are to be retained so as to assist with moisture retention and to reduce the impact of compaction.
- No persons, vehicles or machinery to enter the TPZ without the consent of the consulting arborist or site manager.
- Where machinery is required to operate inside the TPZ it must be a small skid drive machine (i.e Dingo or similar) operating only forwards and backwards in a radial direction facing the tree trunk and not altering direction whilst inside the TPZ to avoid damaging, compacting or scuffing the roots.
- Any underground service installations within the allocated TPZ should be bored and utility authorities should common trench where possible.
- No fuel, oil dumps or chemicals shall be allowed in or stored on the TPZ and the servicing and re-fuelling of equipment and vehicles should be carried out away from the root zones.
- No storage of material, equipment or temporary building should take place over the root zone of any tree.
- Nothing whatsoever should be attached to any tree including temporary services wires, nails, screws or any other fixing device.
- Supplementary watering should be provided to all trees through any dry periods during and after the construction process. Proper watering is the most important maintenance task in terms of successfully retaining the designated trees. The areas under the canopy drip lines should be mulched with woodchip to a depth of no more than 100mm. The mulch will help maintain soil moisture levels. Testing with a soil probe in a number of locations around the tree will help ascertain soil moisture levels and requirements to irrigate. Water needs to be applied slowly to avoid runoff. A daily watering with 5 litres of water for every 30 mm of trunk calliper may provide the most even soil moisture level for roots (Watson & Himelick, 1997), however light frequent irrigations should be avoided. Irrigation should wet the entire root zone and be allowed to dry out prior to another application. Watering should continue from October until April.

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