



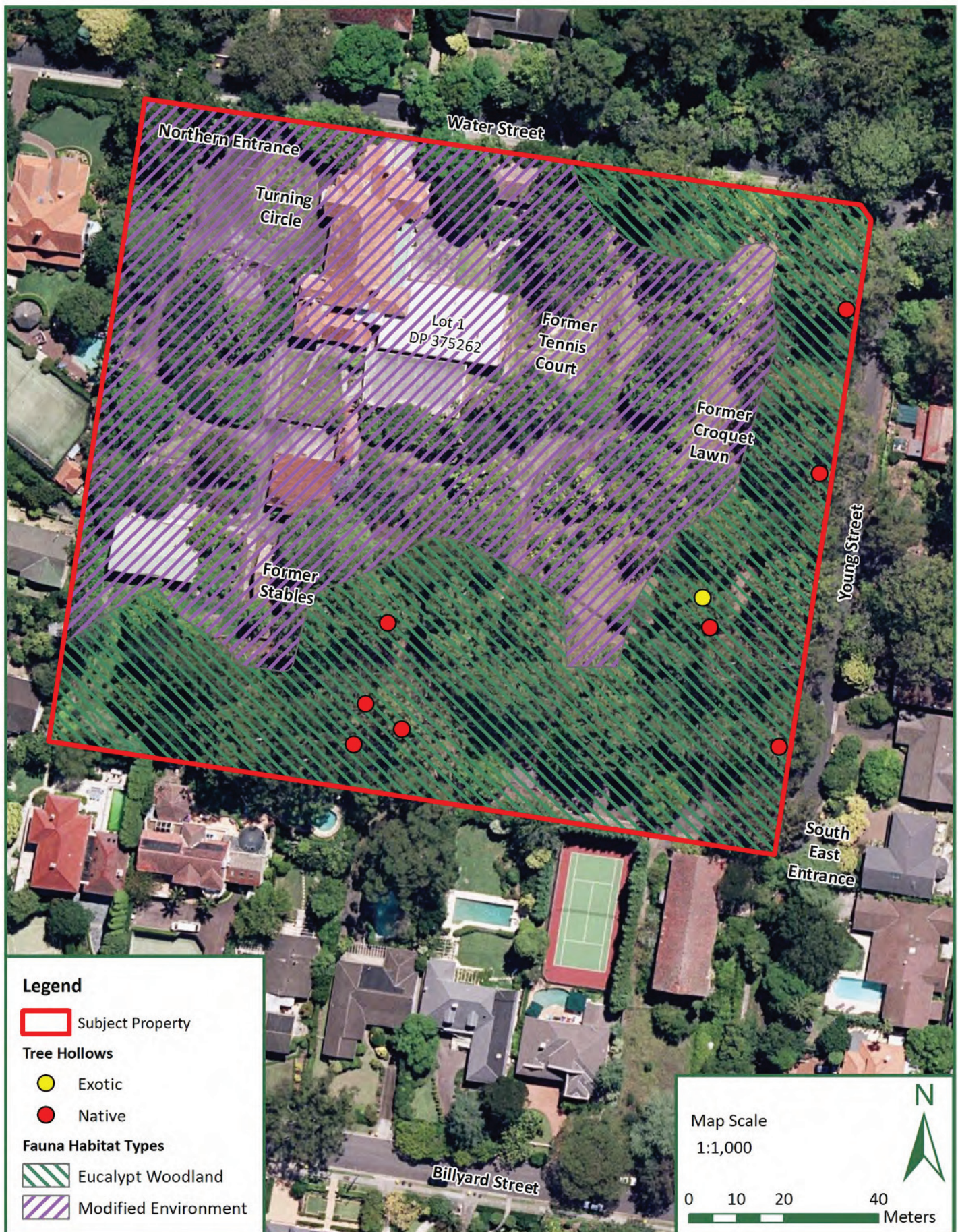
Plate 7: Tall canopy trees provide habitat and serve as a local filter corridor through the locality for arboreal mammals and birds

The understorey within the Eucalypt Woodland is variable, up to four (4) metres in height, and is a mixture of native and exotic shrubs, while the groundcover is a high-density layer of exotic grasses, vines and weeds to 30 cm in height. Some fallen logs and ground debris is present. All of the native species recorded within the Eucalypt Woodland are considered to be urban tolerant animals, i.e. species that would be commonly recorded within the surrounding gardens and parklands.

Because the majority of the Eucalypt Woodland is proposed for retention and enhancement (weed control, indigenous planting), existing resources for those species would be retained. Given the tolerance of those species detected within this habitat type to urban development and infrastructure, it is expected that the further development of the site and its re-occupation would not adversely affect their overall presence.

However, it is noted that the Common Ringtail Possum *Pseudochieris peregrinus* is a species usually associated with a medium to high density understorey stratum (in urban areas this can consist of both native and exotic plants). Within the Subject Property, this species currently has a vegetation structure suitable for the construction of its nesting dreys.

Removal of this stratum (albeit mainly comprised of weed thickets) has the potential to reduce the distribution of available nesting sites, thereby affecting the local population of the Common Ringtail Possum.





4.5.3 Wildlife Corridors & Vegetation Links

A review of aerial photography that covers the Wahroonga area clearly shows the overall 'leafy character' of the suburb, the Subject Property being part of this environment. The former John Williams Respite Centre site is in no way unique within this landscape, and does not stand out in comparison to any of the other woodland stands.

The site is not considered to form a significant component of any regionally important dispersal corridors. Species traversing through and across the site would also be moving through and over the adjacent residential properties and urban areas.

The closest areas of native bushland to the Subject Property are:

- Wahroonga Public School (the Bush School) (~ 100 metres north). This is located on the opposite side of Water Street, near its intersection with Young Street.;
- Clive Evatt Reserve (~425 metres north east) – bushland is in good to moderate condition as bush regeneration work has been undertaken in recent years. Similar in topography and aspect to subject property (note potential for seed indigenous collection);
- Turiban Reserve South (~245 metres east) – lower part of Reserve is contained within a steep sided gully. Remnant trees over a weed understorey (note little potential for indigenous seed collection); and
- Turiban Reserve North (~260 metres north east). Upper part of reserve on slightly sloping land is in good condition as bush regeneration works are underway: very bare understorey (leaf litter) (note potential for some indigenous seed collection).

For ground-traversing species to disperse between the Subject Property and these bushland reserves they would need to negotiate several roads, cross through residential properties, and to gain access to Clive Evatt Reserve, cross a cleared playing ground. The native species expected to be traversing through and across the Study Area are all considered to be urban- tolerant animals, i.e. species that are adapted to negotiating and moving through urban environments.

Recommendations have been provided to ensure that the dispersal patterns of those ground-traversing native species recorded occupying the former Respite Care Centre are not adversely affected by the redevelopment of the site (see Section 7.9).



4.6 CULTURAL & HISTORICAL ENVIRONMENT

Rippon Grange was built by Mr Frederick Sargood as a private residence in the late 1890s, but was later sold to Mr E.R. Williams, Managing Director of Woolworths Australia Ltd.

In 1951, Mr Williams gave his residence and the surrounding six (6) acres to the Royal Alexander Hospital for Children to be used for children suffering from poliomyelitis. He asked that the Hospital be named for his son John, who had died in the 2nd World War.

In 1980, the property was taken over by the Hornsby and Ku-ring-gai District Hospital, which managed the Hospital for intellectually and physically handicapped children and adolescents.

Latterly known as the John Williams Respite Care Centre, the Hospital was until 2005, under the control of the NSW Department of Community Services ('DOCS'), when it was sold to *Waterbrook at Wahroonga Pty Ltd* who are proposing its redevelopment as a Private Hospital.

Photographs sourced from the book *The Railways Come to Ku-ring-gai* (Cook 1991) show the remnant bushland along the eastern boundary, as well as providing early views of Water Street, Billyard Avenue and Burns Road. The leafy character of the new suburb – with many mature native trees remaining, especially along the road verges – is a feature of these photographs.



Plate 8: Water Street, Wahroonga in the early 20th Century



4.7 MANAGEMENT ZONES

The native vegetation in the Subject Property to be rehabilitated and/or reconstructed totals some of 8,333 sq metres (~0.833 hectares), representing a 31.2 % increase on the area of BGHF identified by Smith & Smith (2006).

This area has been divided into five (5) **Management Zones**, according to the characteristic vegetation, its condition/health, location within the Subject Property, and the different management strategies proposed to achieve the Zone's designated future land use (i.e. bushland, indigenous landscaping or restored heritage gardens).

Accordingly, Management Zones have been determined as follows (see Figure 4.6).

- Management Zone 1 - existing BGHF Habitat, Young/Water Streets – East and South-eastern Areas
- Management Zone 2 - BGHF trees with some native understorey, with introduced plantings - Central Area
- Management Zone 3 - canopy trees over lawns and garden beds – South Western Area
- Management Zone 4 - includes the existing buffer zone planting on the south-western property boundary.
- Management Zone 5 - incorporates the five (5) areas designated as 'compensatory offsets' between the BGHF Habitat (as mapped) and adjacent land uses (e.g. private gardens, lawns, or development).

Section 5 of the VMP addresses a number of management issues identified for all, or individual Management Zones, and provides a series of recommendations for amelioration of existing and potential future impacts, including those potential impacts of development identified by Council and others.

Section 6 provides a general Basis for Management (of bushland), while Section 7 provides a discussion on the BGHF rehabilitation and reconstruction processes identified for the Subject Property.



Figure 4.5: Management Zones for BGHF Habitat





5 MANAGEMENT ISSUES & RECOMMENDATIONS

5.1 REQUIREMENTS OF THE THREATENED SPECIES LEGISLATION

The Subject Property at Wahroonga supports an important, although highly simplified remnant of the Blue Gum High Forest ('BGHF') Ecological Community – a community listed as 'critically endangered' under the Schedules of the NSW *TSC Act*. As the only critically endangered ecological community in NSW, BGHF has a very high conservation value at local, regional, State and National levels of significance.

In addition, three (3) threatened species – the Magenta Lilly Pilly (*Syzygium paniculatum*), the Grey-headed Flying Fox (*Pteropus poliocephalus*) and Gang-gang Cockatoo (*Callocephalon fimbriatum*) are known to occur, or to utilise the resources of the Subject Property.

The Magenta Lilly Pilly (although thought to be a horticultural specimen) and the Grey-headed Flying Fox are listed as 'vulnerable' under both the *EPBC* and *TSC Acts*; while the Gang-gang Cockatoo is listed as a 'vulnerable' species throughout NSW and as an 'endangered population' within the Ku-ring-gai and Hornsby Local Government Areas.

Management objectives for the BGHF Habitat at Wahroonga are stated as follows:

- i) To conserve and rehabilitate those areas of BGHF Habitat occurring within the Subject Property and promote local biodiversity values; and
- ii) To manage the bushland rehabilitation and reconstruction process to ensure the retention of suitable habitat for those threatened and/or significant flora and fauna species present within the Subject Property and environs.

Under the terms of the NSW environmental legislation, Local Government must assess the impacts of any proposed activity which might adversely impact on the endangered ecological community or any threatened species or populations, and where these are likely to occur, it must identify strategies to minimise any such impacts.

In addition, development on adjoining land may also have a significant impact on the bushland's natural values, so that such activities must be carefully assessed by the Approval Authority prior to development consent being granted. Such impacts are not restricted to development activities *per se* as unless carefully planned, weed control, revegetation, infrastructure development, and even routine management activities could have a potentially damaging effect on threatened species and their habitats.

In requiring the protection and rehabilitation of the BGHF Habitat within the Subject Property, and the preparation of a special plan of management ('this VMP'), the NSW Department of Planning is acting to fulfil its legal obligations under the terms of the *TSC Act*.



Previously, under the terms of the *TSC Act*, the National Parks & Wildlife¹⁵ Group Division of DECCW was required to prepare **Recovery Plans** for species, populations and endangered ecological communities within five (5) years of the gazettal of the Final Determination. These Plans were designed to assist consent and determining authorities in the assessment of impacts on listed species, population or ecological communities, and members of the public interested in becoming involved in conservation activities.

In 2004, reforms the *TSC Act* were made to better integrate threatened species management with land use planning, and to improve the development assessment process. As part of the reform, the Threatened Species **Priorities Action Statement ('the PAS')** was introduced. The PAS is currently in draft form, and can be viewed at: www.threatenedspecies.environment.nsw.gov.au.

The PAS lists high priority actions for BGHF such as: developing criteria and targets for protection of remnants and threat abatement actions; liaising and supporting landholders to secure protection of remnants, and providing assistance with the preparation of site specific plans of management. The undertaking of priority weed control works and rehabilitation/restoration/bush regeneration works at identified 'priority sites' are also flagged as high priority.

Recommendations:

1. Adopt and implement a comprehensive VMP (this Report) which provides the framework for the rehabilitation of BGHF Habitat areas within the Subject Property, and which also provides for the reconstruction (via removal of competing weeds followed by an indigenous planting program) of BGHF Habitat where currently only the native tree canopy remains *in situ*.
2. As it is essential that the locations of any threatened species, populations or significant areas of habitat are identified prior to weed clearance, a targeted search should be carried out, and where such occurrences are identified, these should be tagged and protective measures set in place.
3. Such locations must be identified (with a GPS), marked on a site map, and the map updated as required. All personnel undertaking on-grounds works must be inducted to the site and provided with relevant information (species descriptions, location maps). It will be the responsibility of the Proponent's Project Manager to ensure that all personnel are kept fully informed.
4. Adopt low impact weed control strategies which take the presence of all significant species, populations and ecological communities into account, and avoid all unnecessary damage to habitat areas. The Bush Regeneration approach to habitat restoration is strongly recommended (see Section 6.2).
5. Where unavoidable damage to Habitat is likely to occur, contractors are to consult with the Project Manager, who will in turn contact the Environmental Consultant appointed to oversee and monitor on-ground works. Any works likely to result in damage to

¹⁵ Previously National Parks & Wildlife Service – now NPW Group of DECCW



threatened species, populations or their habitats must not be undertaken without written permission from the Project Manager and/or Environmental Consultant¹⁶.

6. Bush Regeneration strategies must consider the need to maintain (or create) suitable habitat for those significant/listed flora and fauna species known to occur. Where the (unchecked) growth of shrubs as *Pittosporum undulatum* (for example) threatens the integrity of such habitats, remedial measures must be undertaken to restore suitable site conditions.

5.2 MANAGING THE IMPACTS OF DEVELOPMENT

5.2.1 Protection of BGHF Habitat

The proposed East Wing will be sited adjacent to, and marginally within, Core BGHF Habitat adjacent to Young and Water Streets (see Figure 1.2). The total area of BGHF Habitat to be removed for the construction of the East Wing Building will be about 42 sq. metres. This represents less than 1% of the total BGHF area identified by Smith and Smith (2006).

Council's consultant ecologist Dr Peter Smith has recommended that all non-BGHF trees (as identified in the Final Determination for BGHF) should be removed from the Core and Non-Core BGHF Habitat. The Arboricultural Impact Assessment Report (Tree Wise Men March 2009) and Landscape Design (Taylor Brammer November 2009) have been amended to reflect this position.

Taylor Brammer (November 2009) has provided for the removal of 47 trees within the area designated as Core BGHF Habitat, and a further eight (8) trees from the area to be recreated as BGHF. Another five (5) ornamental trees will be transplanted elsewhere in the gardens. A number of the trees scheduled for removal have previously been identified as significant plantings (see Table 7.1) and are relicts of the historic garden landscape and arboretum established on the property in the late 19th and early 20th Century. However, some tall shrubs and small trees will be retained in the south-western corner to provide screening for neighbouring properties.

In keeping with these requirements, the VMP recommends that prior to the commencement of construction works a secure Construction Zone around the East Wing building must be clearly defined. It is anticipated that a '**Construction Corridor or Buffer Zone**' will be established around any building within the BGHF mapped area of not greater than three (3) metres in width, measured from the outer wall of the proposed buildings. The Construction Corridor will be required for worker access and to install essential drainage, pipeworks, and other associated works. Following completion of construction, it is anticipated that this Buffer Zone will be reduced to a two (2) metre width, gravelled, and used for pedestrian access and general building maintenance.

Areas of mapped BGHF Habitat adjacent to the construction zone must be protected by the erection of exclusion and sediment fencing, which must stay in place for the duration of the works. Among the potential impacts of construction on the BGHF Habitat are: inadvertent incursion and damage to vegetation by machinery or deposition of waste material or fill soil, trenching to install essential

¹⁶It will be necessary for Waterbrook (as the landowner) to obtain a Section 91 license from the NSW Department of Environment & Conservation to carry out works in an endangered ecological community.



services (drains, power lines), and the potential for increased runoff, resulting in soil erosion and increased weed growth. Careful planning prior to commencement of works will serve to reduce or negate these potential impacts.

In-ground pipeworks should be avoided wherever possible within the mapped BGHF areas. Where this is unavoidable, the **Critical Root Zones ('CRZ')** of trees to be retained should be avoided. Where all other alternatives have been considered, and running in-ground pipework through CRZ's is unavoidable, in-ground pipeworks are to be bored within the CRZ offset or hand-dug, with no roots greater than 50mm to be cut.

The Site Arborist is to monitor all trenching within CRZ offsets. If horizontal boring is to be used within the CRZ offsets, the top of the bore is to be greater than 600mm below the PL at the base of the tree.

Trees within the construction zone or immediately adjacent which have been identified for retention must be protected by individual wooden tree shields and ideally, by supplementary fencing (see *Arboricultural Impact Assessment Report Tree Wise Men March 2009*). Guidelines for the installation of scaffolding have been provided in Figure 5.1. Further, ground protection should be provided within the Primary Root Zones ('PRZ') of all retained trees.

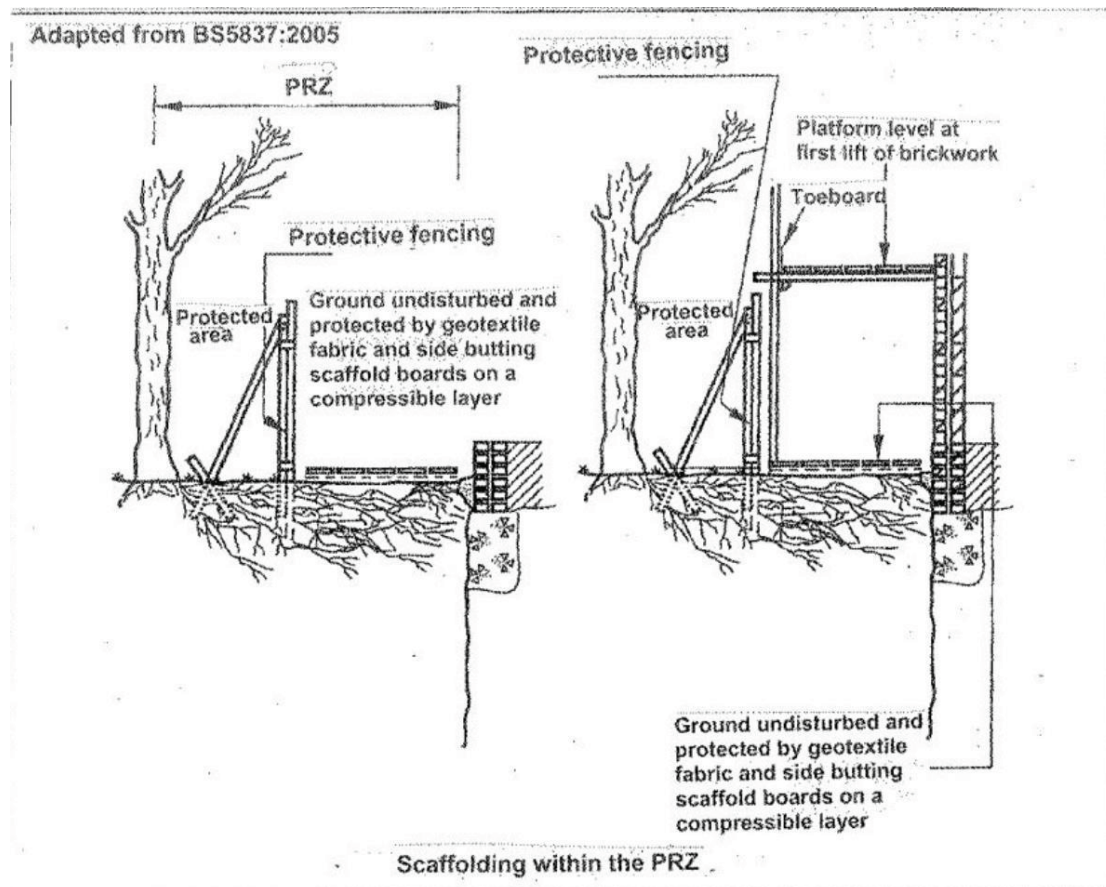
Recommendations:

1. Generic guidelines for the protection of native vegetation during construction have been developed, and are included in the VMP as Appendix 8.
2. Recommendations for the protection of significant trees have been included in the *Arboricultural Impact Assessment Report (Tree Wise Men March 2009)*. These are prescriptive for the Subject Property, and include recommendations for: i) retention of significant trees, ii) canopy pruning iii) protection of trees during construction, particularly pipeworks and other hydraulic works, v) erection of scaffolding; and vi) transplanting of selected trees.
3. Where the East Wing Building encroaches into the BGHF, protection should include the installation of exclusion fencing as well as sediment and runoff control measures prior to the construction of stormwater drainage. These are to be maintained in good order for the duration of the construction period.
4. As both construction activities and limited runoff can potentially impact on the BGHF Habitat unless contained, it is recommended these protective measures be considered as priority works. Protective measures will include the use of sediment fencing and installation of fixed hay bales along these boundaries (as per Appendix 8).
5. Scaffolding, if required should be installed as per Figure 5.1, and wherever possible scaffolding should be avoided or reduced in width to minimise canopy pruning.
6. Ground protection should be provided within the Primary Root Zones ('PRZ') of all retained trees (mulch, woodchips, and duck boards, sacking or similar).



7. During the construction period, no heavy motor vehicles are to be used within the mapped BGHF Habitat areas – this serving to prevent potential root compaction and damage to the CRZ of significant and/or BGHF canopy trees.
8. Similarly, there is to be no storing of heavy pallets or materials for an extended period over areas identified as CRZs, or within those parts of the Construction Zone located within the mapped BGHF areas.
9. The construction manager shall ensure that a suitably qualified arborist carries out regular site inspections during the construction period to ensure that protection requirements to the BGHF and retained trees are being adhered to. Any non-conformances are to be reported to the Principal Certifying Authority.

Figure 5.1: Protective Devices for Trees In or Adjacent to the Construction Zone





5.3 CHANGES TO HYDROLOGICAL PATTERNS / RUNOFF & DRAINAGE

Ku-ring-gai Council has also expressed some concern that an increase in overland flows and changes to sub-surface drainage patterns as the result of construction may impact on the BGHF Habitat (specifically on the remnant canopy trees). Excessive moisture, pollutants and nutrients carried from development in stormwater runoff are widely acknowledged as threats to native vegetation in the urban environment.

In considering the likelihood of such impacts occurring as the result of the Proposal, it must be acknowledged that in light of the long-term development of the Subject Property (>100 years), substantial changes to 'natural' drainage patterns on the site would already have occurred. The remnant BGHF trees on the site have adjusted to these shifts in local hydrology, with most indigenous (and introduced) trees remaining in relatively good condition. It is considered that the proposed construction works would not serve to alter local drainage patterns to such an extent that the BGHF Habitat would be further impacted.

A *Hydraulic Services Report* and a *Stormwater Drainage Concept Plan* (LHO Group, February 2009) have been prepared to assist the Proponent and Architect in the planning of the proposed development.

The *Stormwater Drainage Concept Plan* (LHO Group, February 2009) addresses stormwater quantity and quality issues, and the design of the stormwater drainage plan prepared for the proposed development. This Plan has been prepared in accordance with Ku-ring-gai Council's requirements (DCP-47, April 2005), and provides detailed recommendations for on-site retention (demand post-construction), detention of stormwater, roof, surface drainage and basement drainage, subsoil drainage and stormwater quality control. The drainage system is designed to cover the 100 year ARI storm event.

Critical to ameliorating the impacts of runoff from the development area into the BGHF Habitat are measures such as on-site retention and detention, and the control of surface and sub-surface flows from the development site into the BGHF Habitat areas

The BGHF Habitat will remain essentially intact. Specific protection measures for the BGHF Habitat are provided by the *Concept Drainage Plan* (LHO Group, February 2009), and have been stated as follows:

1. It is proposed to install a drainage pipe in two (2) locations within the Habitat where the spacing between the pipelines and the trees is adequate so as to not cause any damage to the tree roots during construction.
2. Excavation will be by hand where required to minimise impact on tree roots, particularly in or near nominated CRZs, and proper erosion control measures will be used to minimise any disturbance to existing natural ground.
3. Immediately after completion of the drainage, a restoration program will be undertaken, including bush regeneration and revegetation.
4. Drainage installation will be co-ordinated with any hydrogeological relief measures that may be required.



The *Hydraulic Services Report* (LHO February 2009) has been prepared to address stormwater drainage, sanitary plumbing and drainage, water supply for domestic, irrigation and fire fighting uses and provision of gas services.

With relation to the impact of such services on the BGHF Habitat, LHO state that while it is generally not required to provide sewer, water and gas services concept plans for this section of the Subject Property, the *Hydraulic Services Report* has provided commentary on the design development and installation of in-ground services to ensure protection of the threatened BGHF extant on the property.

Protective measures for the BGHF Habitat are set out as follows:

1. The Hydraulic Services Report provides for all in-ground services to be designed and installed so as to avoid interference with the BGHF Habitat, and where it is not possible to locate in-ground pipework outside the Habitat, then this pipework is to be installed to enable adequate spacing between the pipelines and trees so as to not damage tree roots during excavation.
2. In BGHF Habitat areas, all work will be carried out by hand, with boring used as an alternative in areas designated as Critical Root Zones ('CRZs'), (as per the recommendations of the *Tree Impact Statement*, Tree Wise Men March 2009).
3. Similarly, proper erosion control measures will be used to minimise disturbance to natural ground, and restoration works will be carried out post construction (as above).
4. Drainage installation will be co-ordinated with any hydrogeology relief measures that may be required.

During the construction phase, a sediment and erosion control procedure will be implemented to follow the requirements of the NSW Department of Housing publication *Soil & Water Management for Urban Development* (August 1998).

This procedure, together with the recommended sediment fencing and hay baling along individual building footprint boundaries adjacent to BGHF Habitat (see Appendix 8) will serve to control overland and sub-surface flows into the BGHF Habitat.

Given the safeguards provided, it is anticipated that the existing drainage pattern between the landscaped portions of the landscaped grounds and the existing BGHF Habitat would remain essentially unchanged as the result of the Proposal. Nor will there be any significant change in local hydrological patterns into or from, those areas identified for the reconstruction of BGHF Habitat.

Recommendations:

1. Recommendations of the *Drainage Concept Plan* and the Hydraulic Services Report (LHO Group February 2009) are to be fully implemented, with maximum protection afforded to those areas of BGHF Habitat identified in Figures 2.1 and 4.6.
2. Based on data set out in the *Hydraulic Services Report* (LHO Group February 2009), there is to be no increase in overland or sub-surface water flow into or from those areas of existing (or core) BGHF Habitat identified in Figures 2.1 and 4.6.



3. Nor is there to be any significant change in local hydrological patterns into, or from, those areas identified for the reconstruction of BGHF Habitat – i.e. ‘no net increase’ (see Figures 2.1 and 4.6).

5.4 CHANGES TO HYDROLOGICAL PATTERNS DUE TO EXCAVATION

The following information has been sourced from the *Interim Hydrogeology Investigation Report (May 2008)* and from two (2) *Supplementary Hydrogeology and Infiltration Reports* (June 2009 and October 2009) prepared by D.F. Dickson & Associates.

Kur-ging-gai Council has also expressed some concern about the potential impacts of excavation for construction purposes on any BGHF trees located adjacent or downslope of the new East Wing (see Figure 1.2). Council is of the opinion that excavation as forming of basement car parking will significantly change overland and subsurface water flows into the BGHF, and contribute to the decline or death of individual trees.

This and other related issues have been addressed by D.F. Dickson & Associates Consulting and Geotechnical Engineers (2008, 2009a, 2009b). In summary, and with reference to baseline data quoted and available in the public domain, the Dickson Report provides the following information.

In the Subject Property, the substrate comprises shales from the Ashfield Shale Unit of the Wianamatta Group, and residual clays derived from the overlying shales. There has been some misconception that significant lateral groundwater flows could occur within the shale which may be accessed by the Sydney Blue Gums, and altered by the basement car park construction. This is incorrect as the clays in fact act as an aquiclude - forming a permeable layer below a water source, and preventing water movement.

The root system of the Sydney Blue Gum is relatively shallow, with about 66% of the root system contained within the first 600mm or so of the soil. The Blue Gum does not form a deep reaching tap root. Information provided by Tree Wise Men (correspondence June 2008), indicates that this species is susceptible to uprooting, particularly in moist shallow soils. Exposure of soils through removal of vegetation could subject the surface roots to drying, but this need not be an issue if appropriate measures are taken during the construction phase.

The design of the basement car park is to be ‘fully tanked’ (as required by DWE), and does not rely on pumping of ground water for its structural integrity. The proposed design is a ‘closed system’ which will be watertight, thus avoiding any changes to current hydrological patterns. Design will include installation of a hydraulic filter to the basement to match the hydraulic properties of the existing undisturbed site so that there will be minimal disturbance to groundwater flows and levels. This system is described as ‘passive’, and may incorporate control drains to maintain the current water table, with its seasonable fluctuations.

Dickson concludes that “It must be remembered that the primary aim of both the developer and Council is the preservation and sustainable maintenance of the BGHF. To this end, it would be far more advantageous to both parties to understand the pre-existing soil moisture levels in the soils



surrounding the root zones and (to understand) how it varies with rainfall (i.e. infiltration rate vs. evapo-transpiration)".

Dickson goes on to state that "Technically, there is no reason that the proposed (East Wing) basement cannot be designed and constructed so that the effect or potential changes to the water regime within the BGHF would be undetectable".

Outcomes of the hydrogeological investigations, which included the installation of piezometers across the Property to measure subsurface flows, are fully detailed in the Interim and Supplementary Hydrogeological Investigation Reports (Dickson, May 2008, June 2009), with the outcomes of further investigations detailed in a supplementary report prepared in October 2009.

With respect to the potential for building construction close to mature BGHF trees to cause negative impacts through changes in surface and sub-surface hydrology, Dickson (October 2009) states that the proposed three (3) metre construction zone (or buffer) provided in the Construction Management Plan is considered to be adequate for the protection of both individual BGHF trees and the natural environment generally.

The proposed three (3) metre construction zone will only be utilised for pedestrian and incidental traffic and it serves as a 'buffer zone' between the construction and ecological outlines. Dickson goes on to say that the significance of this buffer zone will (in part) be as the location of the proposed primary infiltration zone in those areas identified by the project horticulturalist/arborist (Tree Wise Men), thus reducing any perceived edge effect and maintaining a moisture buffer around the subject trees. It is also worth noting that post construction, this VMP recommends that the three (3) metre wide construction zone be reduced to a two (2) metre buffer and paved or gravelled with a low nutrient substance.

Recommendations:

1. The recommendations provided by Dickson (Hydrogeology Investigation Report, February 2009) are to be adopted in full.
2. The design and construction of the basement car park to the East Wing is to be a water-tight, closed drainage system which does not alter surface or sub-surface flows into the BGHF.
3. Exposed soil within the CRZ of BGHF and other significant trees as the result of construction works is to be mulched with an appropriate material to prevent surface drying and possible impacts to the surface roots of such trees. The use of mulch is a temporary measure, with such material being removed off site at the conclusion of works.
4. Post-construction, the three (3) metre wide buffer should be retained and gravelled with a low nutrient paving material.



5.5 OTHER MANAGEMENT ISSUES

5.5.1 Fragmentation of BGHF / Linkages & Vegetation Corridors

There has been some concern that the Proposal will fragment or further isolate those areas of BGHF Habitat occurring within the Subject Property, and reduce the habitat value of these areas for native fauna. It has also been suggested that the development as proposed will serve to disrupt linkages for native flora and fauna between the Subject Property and other local bushland reserves (KRG Council, December 2006, R. Lembit 2006).

The results of previous (UBMC 2006, Cumberland 2007) fauna surveys undertaken for the former John Williams Respite Care Centre; assessment of current habitat values; and the position of the Subject Property within the Locality have been discussed in Section 4.5 of the VMP. The limited diversity of native fauna recorded in all previous surveys, or considered likely to utilise the resources of the Subject Property on occasion, and the possible reasons for this, have also been discussed.

Within the Subject Property, areas of BGHF Habitat and individual/small stands of native canopy trees are separated by existing buildings, footpaths, parking areas, lawns and garden beds, while other occurrences of BGHF in the Locality exist as individual or disjunct stands of canopy trees over exotic gardens in private property, or occur in small bushland reserves, with a generally disturbed or weedy understorey.

Habitat for all but a small number of highly mobile fauna species (e.g. birds, arboreal mammals) in the Subject Property and Locality is already fragmented, with local connectivity retained only through the tree canopy (see Figure 4.5).

However, it is acknowledged that the dense (weedy) understorey in the Subject Property provides habitat for small ground dwelling fauna (e.g. skinks), for invertebrates, and for the Common Ring-tailed Possum (see Section 4.5.2). Clearing the introduced and weedy understorey to reinstate an entirely native vegetation form will (at least temporarily) reduce available fauna habitat.

Under the Proposal, BGHF Habitat will be rehabilitated and restored in a broad arc stretching from Young & Water Streets (east) through the centre of the property, and, using reconstruction techniques pioneered by the bush regeneration industry, and extend BGHF Habitat into the southern and south-western corners of the Property (see Figure 4.6). As a result, fragmentation within the Subject Property will be substantially reduced over time, and disjunct stands of BGHF Habitat will be reconnected through the native shrub and ground cover strata - a connection which at this time is sparse to non-existent.

These works will serve to enhance connectivity through the shrub and ground cover layers (whereas it currently exists only through the tree canopy). Currently, connectivity through the tree canopy includes utilisation by native and introduced fauna of both native and introduced (horticultural specimen) trees.

In summary, the BGHF Habitat within the Subject Property will NOT be *ecologically* fragmented, and will continue to provide habitat for those urban tolerant fauna known to utilise the resources of the property and the locality generally (see Section 4.5.1). Connectivity to adjoining BGHF trees and



small remnants (e.g. the Bush School) will not be compromised; in fact it should be improved by the rehabilitation and reconstruction works proposed.

While this is the case, in some instances the reinstating of a 'pure' BGHF vegetation community (as recommended by Council and other stakeholders), is expected, due to the lack of a dense understorey in this habitat type in nature, to lead to the local extinction (i.e. within the site) of at least one (1) native species – the Common Ring-tailed Possum (see Section 4.5.1).

Recommendations

Note: the recommendations set out below apply to the protection and enhancement of fauna habitat within the Subject Property and Locality generally (see Section 4.5).

1. Avoid clearing dense weed thickets in spring (nesting time for birds).
2. Clear weed thickets gradually and in a mosaic fashion to minimise disruption to fauna habitat (adopting the precautionary principle in considering that such habitat does exit on-site).
3. Inspect garden beds and weed thickets for presence of dreys and nests, and if these, or any live animals are encountered, cease work and contact the local chapter of WIRES to remove these to a secure site.
4. Avoid using herbicide on plants with ripe or ripening fruit (eaten by birds).
5. Retain tree canopy and linkages within the Subject Property and (wherever possible) consider linkages to trees in adjoining properties (i.e. replant indigenous trees in gaps/clearings to reinstate linkages where these are absent).
6. Rehabilitation strategies for the Subject Property should include the preservation and/or replacement locally occurring eucalypts, combined with the retention of (non-weedy) existing native and exotic trees (the Grey-headed Flying Fox is known to forage on fruits and pollen of exotic plants). This will ensure that foraging opportunities for this species are maintained within the Subject Property
7. In developing the planting plan for those areas proposed to be 'reconstructed' as BGHF Habitat, develop bands of native vegetation through the Subject Property (rather than planting single or lines of trees), with a range of native shrubs and understorey vegetation incorporated into the planting design.
8. Provide some areas of open grassland and some areas with dense plantings of shrubs in order provide refuge, breeding and foraging opportunities for small birds should they be present within the surrounding urban area, and thus available to recolonise the Subject Property post rehabilitation.
9. Through Council, encourage local landowners to preserve and/or reinstate areas of BGHF Habitat within their own properties wherever Blue Gum canopy trees have been retained, and ensure that the Tree Preservation Order is enforced when development applications are submitted.



5.5.2 Controlling Weeds & Garden Escapes

Of a total of 229 flora species recorded within the Subject Property, 190 species (83%) are introduced (horticultural) species or weeds. Of these, 81 species (42.6%) are trees or shrubs (some classified as 'significant' plantings), 19 are vines or scramblers, and the remainder (163) are herbaceous species. Twelve of the herbaceous species (26.4%) present are introduced grasses – several being common lawn (turf) species (see Appendix 2)¹⁷.

Most of the 'weeds' in the BGHF Habitat areas have been introduced as horticultural plantings; while others have spread unchecked from the adjoining gardens and unmanaged land. The majority of these weeds are plants widely used in the latter half of the 20th Century, and now acknowledged as 'Environmental Weeds' in the Sydney Region. Thirteen (13) species are listed as 'Noxious Plants' for the Ku-ring-gai Local Control Area (see Section 4.3.4).

The *Noxious Weeds Act 1993* (as Amended 2005) provides for the control of gazetted noxious weeds. Of the 13 noxious weeds occurring, 11 are Class 4 weeds¹⁸ (see Section 4.3.4). Regional Weed Management Plans have been prepared for the majority of these Class 4 weeds, and these Plans have been endorsed by the Noxious Weeds Advisory Committee to the Minister of Primary Industries. Council is the enforcing body for the Act.

Recommendations for targeted weed control have been made for those areas of Core BGHF Habitat Areas, and for those Non-Core BGHF Habitat Areas proposed to be cleared, replanted and maintained as 'reconstructed' BGHF Habitat.

Recommendations:

Management Zones 1 and 2 (Existing BGHF Core Habitat Areas)

1. Prioritise work in the existing BGHF Core Habitat (MZ 1 and MZ 2) while considering the need to protect and retain habitat for native flora and fauna.
2. The need to protect culturally significant plantings is also stressed (some plantings are to be retained within the BGHF Core Habitat areas – see Table 7.1)
3. Undertake a targeted weed control program in the existing BGHF Habitat (MZ 1 and MZ 2), focusing efforts on control/eradication of species identified in Table 7.2.
4. Weed control shall focus on the control/eradication of species listed as 'Noxious Plants' and as 'Keystone Environmental Weeds': minor garden escapes and secondary weeds are to be treated as time and resources allow.
5. Weeds are to be treated according to a seasonal weeding 'calendar' – with the primary aim of preventing flowering and fruiting (the weed calendar is to be prepared by the bush regeneration contractor undertaking works and will form part of the Site Action Plan).

¹⁷ **Note** that the list in Appendix 2 does not include all the horticultural plantings occurring at Rippon Grange.

¹⁸ Action for Class 4 - the growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed



6. Appendix 5 provides a number of recommended weed control methods, including hand weeding techniques and herbicide application. Herbicide application must be undertaken strictly in accordance with the product's label directions.
7. Plants bearing ripening or ripe fruit should not at any time be treated with herbicide (as identified on the weed calendar) in case they are ingested by bird and other animals.
8. Weed debris is to be removed from the work site, stockpiled for removal and/or mulching or chipping. Debris containing seed heads, bulbs, corms, rhizomes or other propagative parts shall not be retained for mulching/composting, but should be removed from the site to a designated landfill depot.
9. Weed timbers from species such as Indian Coral Tree, Privet and Camphor laurel should not be chipped for re-use as mulch, as all have a marked tendency to regenerate from fragments.
10. It is also recommended that if possible, the bulk of primary weed clearance be carried out at some time during the construction phase as a variety of machinery will be available on site, and trucks will be able to pick up stockpiled debris and polluted soils and transport them to a designated landfill site.

Management Zones 3, 4 and 5 (Reconstructed BGHF Habitat, including Offsets)

1. Remove keystone/target weeds (as per Table 7.2) from those areas identified for reconstruction of BGHF Habitat, being cognisant of the methods and procedures listed as Items 4-9, above.
2. Remove (or relocate to other sites within the heritage gardens) significant small trees or shrubs and other introduced plantings from the garden beds (see Table 7.1). Dismantle garden beds and rockeries.
3. Treat lawn areas to be removed with a grass-selective herbicide (e.g. Fusilade), prior to soil disturbance. When turf is dead, scalp turf and underlying weedy topsoil to a depth of 10 cm. A repeat treatment may be required to treat regrowth from broken rhizomes. Remove weed debris and weedy topsoil off-site.
4. Protect trees and ensure site preparation works (e.g. scalping/ripping) does not impact on CRZ of nearby trees (see recommendation of Tree Management Plan, Tree Wise Men March 2009).
5. Proceed with BGHF Habitat Reconstruction Program (see Section 8.5 Protocols for Revegetation).

Recommendations

Note: the recommendations set out below also apply to the protection and enhancement of fauna habitat within the Subject Property and Locality generally.

1. Avoid clearing dense weed thickets in spring (nesting time for birds).



2. Clear weed thickets gradually and in a mosaic fashion to minimise disruption to fauna habitat (adopting the precautionary principle in considering that such habitat does exit on-site).
3. Inspect garden beds and weed thickets for presence of dreys and nests, and if these, or any live animals are encountered, cease work and contact the local chapter of WIRES to remove these to a secure site.
4. Avoid using herbicide on plants with ripe or ripening fruit as this may be eaten by birds and other animals).
5. Retain tree canopy and linkages within the Subject Property and (wherever possible) consider linkages to trees in adjoining properties (i.e. replant indigenous trees in gaps/clearings to reinstate linkages where these are absent).
6. Rehabilitation or landscaping strategies for the Subject Property should include the preservation and/or replacement locally occurring eucalypts, combined with the retention of (non-weedy) existing native and exotic trees (the Grey-headed Flying Fox is known to forage on fruits and pollen of exotic plants). This will ensure that foraging opportunities for this species are maintained within the Subject Property.
7. In developing the landscape plan for those areas proposed to be 'reconstructed' as BGHF Habitat, develop bands of native vegetation (rather than planting single or lines of trees), with a range of native shrubs and understorey vegetation incorporated into the planting design.
8. Provide/retain some areas of open grassland and some areas with dense plantings of shrubs in order provide refuge, breeding and foraging opportunities for small birds should they be present within the surrounding urban area, and thus available to recolonise the Subject Property post rehabilitation.
9. Through Council, encourage local landowners to preserve and/or reinstate areas of BGHF Habitat within their own properties wherever Blue Gum canopy trees have been retained, and ensure that the Tree Preservation Order is enforced when development applications are submitted.

5.5.3 Managing Edge Effects

Concern has been expressed about the fragmentation of the BGHF within the Subject Property as the result of the proposed development, with a concurrent increase in edge effects.

Edge effects – i.e. impacts at the interface of developed or recreational areas and the bushland – are increased where the ratio between the bushland 'core' and its perimeters is decreased, thereby presenting a large exposed edge which is vulnerable to a range of disturbance events. Such impacts include the incremental loss of vegetation due to routine maintenance activities (often described as 'mower creep'), damage to vegetation by tracking or vandalism, increased weed invasion, changes in hydrology, increased or decreased light levels, and potentially, overshadowing of bushland by nearby buildings. Additionally, long exposed edges provide increased opportunities for predation by feral or domestic animals, while at the same time, opportunistically providing additional feeding



niches (or sites) for native fauna and providing for wider dispersal of native plants (via pollination and ultimately, seed dispersal) .

The configuration of any bushland remnant is critical in reducing the impact of edge effects. Generally, the longer and narrower the shape of the remnant, edge effects will increase proportionally, thereby putting the core bushland at risk. Conversely, a large consolidated remnant has a smaller edge to core ratio, and is less likely to suffer from edge effects.

In the Subject Property, the long-term use of the site, first as a residence and latterly as a hospital set in extensively landscaped grounds, and including recreational areas, garden beds, paved roads and pathways, has served to significant fragment the BGHF community which once likely occurred on the Property. Given the size and shape of the BGHF remnants remaining, all of the BGHF Habitat in the Subject Property can be said to be (unavoidably) ‘edge affected’. In effect, most of the potential negative impacts set out above have already taken place.

The proposed development of the Property as a Private Hospital will not further fragment the remnant BGHF and increase edge effects: in fact, the reconstruction of BGHF Habitat between the existing remnants in the eastern, central and south-western sectors of the Property will serve to rationalise site boundaries and reconnect currently disjunct stands of trees and understorey vegetation and thus to reduce edge effects.

Overshadowing and Shading - The construction of the East Wing, while providing some overshadowing, cannot reasonably be expected to significantly decrease light levels such that the Sydney Blue Gums are affected. In fact, the proposed rehabilitation of the south-eastern remnant will remove the dense stand of woody weeds and vines from the understorey, and (within site constraints) reinstate more appropriate light levels, which will help to promote the recovery of the ecological community.

Arborist Peter Castor (Tree Wise Men March 2009) has stated that “the additional but seasonably variable shadowing from the proposed buildings is not expected to have a significant detrimental impact on the long-term retention of the assessed (BGHF) trees. In the main, the canopies of these trees are above the line of the proposed shadows and on sunny days the photosynthesis will be unchanged. On cloudy days, the proposed shadows become irrelevant to vegetation growth”. Castor goes on to state that “the understorey and ground cover plants are currently shadowed by the canopy trees above¹⁹”, and that ‘the increased shadows will not have a significant impact on plant survival as ambient light levels will be sufficient to maintain growth”.

Recommendations

1. The interface between the BGHF habitat and the East Wing Building are to be managed in order to provide a protective buffer zone to the bushland.
2. An average distance of two (2) metres for the buffer zone is proposed. This buffer zone or interface area may be landscaped with appropriate native species, but is not to be turfed with aggressive species such as Kikuyu Grass which will rapidly invade into the BGHF. If possible, the buffer zone should be gravelled or paved, or otherwise delineated from the

¹⁹ And, it should be noted, by thickets of woody weeds