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Flora related response to Facts and Contentions:
Avon Road Pymble

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1.0 Introduction

The Concept Plan (Figure 1) on the 2.3667 ha of 1, 1A, 5 Avon Road and 4, 8 Beechworth Road Pymble has been revised in response to Facts and Contentions prepared by the Planning Assessment Commission dated 17 October 2013. It should be noted on the Concept Plan Rev E dated 11 December 2013 that the proposed Conservation Area has increased from 0.713 ha to 0.78 ha, namely:

Areas	**Revise PPR lodged December 2012**	**Rev E dated 11 December 2013**
Conservation Area	0.713 ha	Increased to 0.780 ha
Managed Buffer to the Conservation Area (Bushfire Asset Protection Zone - at least 10 m from the Buildings)	0.414 ha	Increased to 0.45 ha
Total area for conservation of local native species of Blue Gum High Forest	**1.127 ha**	**1.23ha**

2.0 Response to Flora related Facts and Contentions

I have responded to flora related Facts and Contentions for the Concept Plan Rev E dated 11 December 2013 as follows:

Inadequate Rehabilitation and Maintenance of Blue Gum High Forest

Contention 7, 7a.

The Project does not ensure effective rehabilitation and maintenance of the critically endangered BGHF at the site over the long term as:
a. The proposed development will impact on protection and enhancement of the BGHF on site by overshadowing, which will inhibit the survival and regeneration of BGHF species and favour other species of darker habitats

The original native vegetation in high-rainfall areas on shale-derived soil in northern Sydney, such as in the gully at Pymble, would have been wet sclerophyll forest with a dense fern understorey. The canopy of the original forest would have been dominated by tall trees including *Eucalyptus saligna* (Sydney Blue Gum). The forest was once a valuable source of timber resource with trees over 40 m in height (Benson and Howell 1990).

The variation of species found in different topographic locations of Blue Gum High Forest is described by Benson and Howell (1990, page 17) as:

> ***On drier sites*** *the understorey had a layer of shrubs up to 2 m high. …*
>
> ***On moister sites****, particularly in depressions, ferns predominated; particularly* Culcita dubia, Adiantum aethiopicum, Doodia aspera *and* Blechnum cartilagineum, *together with the small trees* Pittosporum undulatum, Glochidion ferdinandi, Clerodendrum tomentosum *and* Polyscias sambucifolia. *Trees with rainforest affinities, including Coachwood,*

Ceratopetalum apetalum, *and Lillypilly*, Acmena smithii, *were found along some of the creeks…..*

The presence of Blue Gum High Forest in sheltered locations such as the Pymble Gully is noted in paragraph 6, of the Final Determination for Blue Gum High Forest:

Typically, Blue Gum High Forest occurs more than 100m above sea level, where rainfall exceeds 1050 mm per annum, although it may be present in sheltered locations with lower rainfall (Tozer 2003).

In paragraph 4 of the Final Determination, it compares the differences between gully vegetation and ridgetop vegetation, namely,

Mesophyllous species are generally more common in gullies associated with both shale and volcanic soils than slopes and ridgetops. ….. The ground stratum is often dense and contains a mixture of herb, grass and fern species including Adiantum aethiopicum, Entolasia marginata *(Bordered Panic),* Lomandra longifolia *(Spiny-headed Matrush)*, Calochlaena dubia *(Common Groundfern),* Dianella caerulea *(Blue Flax Lily),* Pseuderanthemum variabile *(Pastel Flower) and* Oplismenus imbecillis. *Vine species are also frequently present, in particular* Tylophora barbata *(Bearded Tylophora),* Eustrephus latifolia, *(Wombat Berry),* Clematis aristata *(Old Man's Beard) and* Pandorea pandorana *(Wonga Wonga Vine).*

And in also in paragraph 4 of the Final Determination, it states:

Blue Gum High Forest belongs to the North Coast Wet Sclerophyll Forests vegetation class of Keith (2004).

Keith (2004, on page 63) provided a photograph of and describes the Blue Gum High Forest remnant in Dalrymple-Hay Nature Reserve, as:

The wet sclerophyll forests are almost gone from Sydney, but at Dalrymple Hay Nature Reserve in St Ives, a fine example survives with Eucalyptus pilularis *(blackbutt) and* Eucalyptus saligna *(Sydney bluegum), smaller mesophyllous trees of* Pittosporum, Syzygium *and* Allocasuarina, *and a dense ground cover of* Calochlaena dubia *(common ground fern).*

7a Particulars

(i)	The Revised PPR only provides shadow diagrams for the winter solstice, when shadowing effects are greatest. These show that extensive areas of the upper gully in the proposed BGHF Conservation Area will be overshadowed by the nine-storey Building 5 at 1 pm, 2 pm and 3 pm at the winter solstice
(ii)	This is likely to favour plant species of dark habitats, such as native rainforest species or exotic species that grow well in low light conditions.
(iii)	Survival and regeneration of plant species adapted to eucalypt open-forest habitats such as BGHF, which require higher levels of direct sunlight, are likely to be adversely impacted
(iv)	Further shadow diagram analysis should be provided examining the impact of the buildings on the Conservation Area at the summer solstice and the spring and autumn equinoxes, as well as the winter solstice.

In terms of natural overshadowing, the topography of the Pymble site is a gully.

From shadow diagrams of the natural topography in the four seasons (Figure 2a);

- At 9 am, the west facing slope and the gully floor in the east are in shadow in all seasons; and
- At 3 pm the east facing slope is in shadow in all seasons.

Consequently, the vegetation is not expected to be that of a high light situation. The topography favours plant species of sheltered shaded habitats.

In the shadow diagram of the natural topography at the winter solstice (21 June) at 1 pm, 2 pm and 3 pm (Figure 2b), the east facing slope in the west is partly in shade at 2 pm and fully in shade at 3 pm due to the topography alone. At 3pm in winter (Figure 2c), 61% of the remnant native trees are in shadow.

In terms of the natural overshadowing plus the proposed buildings (Revision E), building heights and scale have been reduced. The proposed height of Building 5 has been reduced from RL 166.6-163.6 (6 to 8 storeys) to RL 156.4 -147.4 (2 to 5 storeys).

From comparisons of the shadow diagrams for 9 am, noon and 3 pm for all seasons without and with the proposed buildings present (Figure 2d), the shadows cast by the buildings over the Conservation Area are largely within the shadows cast from the natural topography, except in Winter.

Season and time	**Shadows in Conservation Area**
Summer (21 December)	
9 am	Building shadow largely within existing topographic shadow
12 (noon)	No additional shadows
3 pm	Building shadow within existing topographic shadow
Autumn (21 March)	
9 am	Building shadow largely within existing topographic shadow
12 (noon)	No additional shadows
3 pm	Building shadow within existing topographic shadow
Winter (21 June)	
9 am	Shadow from Buildings 3, 4, 5 extend south-west beyond existing topographic shadow
12 (noon)	Shadow from Building 5 extends south-east beyond existing topographic shadow
3 pm	Shadow from Building 5 extends south-east beyond existing topographic shadow
Spring (21 September)	
9 am	Building shadow largely within existing topographic shadow
12 (noon)	No additional shadows
3 pm	Shadow from Building 5 extends south-east beyond existing topographic shadow

In conclusion, the remnant Blue Gum High Forest in the Pymble gully would have supported species found in sheltered habitats with reduced light conditions due to its topographic location, irrespective of the presence of the proposed buildings. These species include the ferns recorded in the flora assessment.

In the Conservation Area, shadows from the buildings for all seasons, except Winter, are largely within those cast from the natural topography.

Contention 7b.

*The proposed Vegetation Management Plan ('**VMP**') does not ensure effective rehabilitation and maintenance of Blue Gum High Forest on the site over the long term.*

The aims of the Vegetation Management Plan are to:

- conserve and enhance the local native vegetation;
- establish a long-term, ecologically viable *Blue Gum High Forest* ecosystem in the gully upslope of the mapped upper tributary of the Lane Cove River; and
- protect water quality flowing through and from the Subject site via the constructed drainage network. (It is noted that the site is not at the ultimate head of its watercourse's catchment, which is to the north-east across the railway and Pacific Highway. There is a culvert discharging from the railway embankment).

The long-term conservation and enhancement of the existing local native vegetation and protection of water quality will be achieved by amelioration of potential threats and the implementation of management objectives with realistic targets.

Currently in the suburban gully in Pymble, the canopy trees are being smothered by common worldwide weeds including the exotic climber *Ipomoea indica* (Blue Morning Glory) with up to 50% projected foliage cover, *Lantana camara* (Lantana) with up to 80% cover and by *Ligustrum* spp. (Privet) with up to 80% cover. The extensive weed occurrence in this gully is symptomatic of the soil physical, chemical and microbial changes due to surrounding suburban development (Hazelton and Clements in press).

As part of the ecologically sustainable development directed to protecting and/or restoring and maintaining the native remnants, measures to mimic pre-development soil landform, soil moisture content and nutrient cycling, as well as the structure and function of the Blue Gum High Forest ecosystem are to be implemented.

Contention 7b, i.

The VMP does not consider management of the Conservation Area beyond the first two to five years after development after which the condition of the vegetation will deteriorate again without a perpetual maintenance program;

The management of the Conservation Area is likely to be minimal after the factors causing the degradation have been mitigated in the first 5 years. The mitigation includes:

- water management to mimic that of the pre-development environment;
- nutrient input from stormwater minimised by application of water-sensitive urban design principles, including upgrading of the existing sewerage line, probably constructed in the 1920s (Spearritt 1978); and
- natural nutrient cycles to be re-established, including re-establishment of soil fungal hyphae and native ground layer, as outlined in the Vegetation Management Plan (Clements *et al.* 2012).

In the Pymble gully surrounded by suburban development, weeds have established in historically modified and disturbed areas and flourished in the nutrient-enriched environment. The nutrient cycles of weedy exotic species, that are dominant in the

gully, differ from that of eucalypts, which have evolved in nutrient-limited environments (Wardle *et al.* 2004). In eucalypts, prior to litter fall a large percentage of nutrients is withdrawn from the senescent leaves to the living tree (Attiwill *et al.* 1996, 1978), as part of their natural nutrient cycle.

Unlike native eucalypts, the exotic species have very high foliage phosphorus concentrations exceeding 1000 ppm dry leaf weight (Lambert and Turner 1987). Their nutrients are not withdrawn prior to litter fall and their nutrient-rich litter drop encourages further weed growth. For example, pH, total nitrogen and phosphorus, and available nitrogen and phosphorus levels under dense Lantana are significantly higher than 2-5 m away from the Lantana individuals (Fan *et al.* 2010). The invasion by exotic species such as *Lantana camara* in disturbed forest, such as in the Pymble gully, further accelerates Lantana spread by promoting its own enriched-nutrient environments (Sharma and Raghubanshi 2010, Gooden et al. 2009a, 2009b, Richard Lamb's unpublished research discussed in Buchanan 1989).

To assist in reversal of the existing native ecosystem degradation, species naturally occurring in moist, shale-derived soils typical of the Blue Gum High Forest are to be actively favoured by progressively providing suitable habitat and reducing weed competition. The native species to be re-introduced include ferns, such as *Adiantum formosum* (Black Maidenhair Fern), *A. hispidulum* (Rough Maidenhair Fern), *Christella dentata*, *Doodia aspera* (Prickly Rasp Fern), *Microsorum pustulatum* (Kangaroo Fern) and *Pteris tremula* (Tender Brake). These species are currently persisting as scattered individuals or small colonies under the dense weedy growth.

The species discussed under Management Objective 3 (enhance the local native vegetation) in the VMP often have deep spreading rhizomes that respond to the existing nutrient contaminations, similar to the rapid fern responses to nutrients following post fires (Gill *et al.* 1999). The extensive fern rhizomes not only assist in re-establishing natural nutrient cycling, they also minimise erosion risks and suppress weed re-establishment.

Currently the natural nutrient cycles of the *Blue Gum High Forest* have been disrupted in the gully at Pymble. The disrupted nutrient cycles favours weeds and places the remnant trees at risk of extinction.

In the first 5 years, it is expected that the factors adversely affecting the conservation area will be progressively addressed. The factors include nutrient-enriched stormwater, sewer overflows, smothering of native species by weeds, weed dominant nutrient cycling, and lack of sufficient native groundlayer for natural nutrient cycling.

At the end of 5 years, the required weeding is expected to be at maintenance level. Weeds are expected to continue to germinate from the soil seed bank and/or from bird drop.

If weed species are thriving in the conservation zone (Conservation Area and Managed Buffer Zone), then the factors causing the environmental degradation have not been sufficiently mitigated and will be further addressed.

In terms of ongoing maintenance, it is stated in section 4.3.3 of the VMP (page 53) that:

> *The implementation of the Vegetation Management Plan is to commence with the phase of initial seed collection, earthworks, primary weed removal, and*

*planting – **after which ongoing maintenance will be required for at least a further 5 years after planting**, as specified by the Environmental Manager.*

In Table 4 under Management Objective 6, the monitoring time-frame is specified as **Month 1, 3, 6, then yearly**.

I agree with Dr Smith that monitoring and corrective actions are required in the long-term. As part of the monitoring program, targets are re-evaluated to achieve the aims of the VMP. The aims are not just a weed removal exercise, but management of water quality, nutrient input, re-establishment of nutrient cycling and development of habitat for the long term survival of the viable Blue Gum High Forest remnants.

Contention 7b, ii.

The VMP does not provide specific performance targets for long-term weed control and restoration of native plant species diversity which are essential to guide bush regeneration activities at the site and to monitor performance;

The VMP provides specific targets for month 1, month 3, month 6 and then yearly in Table 4 (Clements et al. 2012). The targets and actions include:

Targets	**Actions**
Source of contamination identified and corrected.	If nutrient, phosphorus or human faecal bacteria are identified in the stormwater runoff, then the source is to be identified and corrective strategies implemented.
Test results on water entering the site and flowing in the gully at time of rain events.	Test stormwater runoff in accordance with ANZECC 2000 guidelines, as specified by the Environmental Manager.
Water quality testing onsite	Record water quality at sampling points to test stormwater surface runoff in accordance with ANZECC 2000 guidelines and compare against baseline data at entry and exit points.
At commencement of works and gradually to minimise erosion risk, Remove 95% of primary weed cover	- Photograph weed cover prior to removal. - Physically remove the surface layer of weeds. - Remove the seed-bearing weed material. - Carefully cut and paint weeds. - Photograph/ monitor the areas post weed removal.
All vehicles and machinery and equipment cleaned during works to minimise risk of pathogens	- Clean and inspect all machinery and vehicles prior to entry and/or re-entry of the site. -Document the cleanliness (records and photographs) and include in the early monitoring report.
During construction phase and gradually to minimise erosion risk, removal of 95% of secondary weed cover	- Carefully remove secondary weeds.

The VMP is designed to achieve long-term ecosystem's resilience. Diversity of the native species increases the ability of the ecosystem to withstand the challenges of the disturbance events, such as flooding, droughts and fires.

As part of long-term monitoring, the presence of thriving weeds in ecosystems should trigger actions to find the sources of the nutrient and water contaminants such sewer overflows and blocked drains. The monitoring includes:

- details of rainfall and stormwater;
- fauna sightings and associated works;

- works done and further works required;
- a photographic record of works and photographs from the fixed monitoring points;
- data on vegetation structure and species composition recorded from fixed transects.

Updating targets is part of a successfully applied VMP. The long-term targets as stated in the VMP (section 4.1.5) include providing habitat for fauna species, such as:

- Powerful owl (*Ninox strenua*), the top native predators of the St Ives Blue Gum High Forest, preying on ringtail possums;
- Sugar glider (*Petaurus breviceps*) prefers mature forests with many tree hollows to nest in;
- Grey-headed flying-fox (*Pteropus poliocephalus*) in Blue Gum High Forests feed on the pollen and nectar of flowering *Angophora costata, Eucalyptus pilularis* and *Eucalyptus saligna*. Blossoms containing pollen and nectar are their main diet;
- Glossy black cockatoo (*Calyptorhynchus lathami*) feeds on seeds extracted from the woody cones of *Casuarina* and *Allocasuarina* trees in forests including Blue Gum High Forest; and
- Brush-turkey (*Alectura lathami*) feeds on insects, seeds and fallen fruits, which they expose by raking up leaf litter. Their continued presence is essential for raking up leaf litter and exposing bare soil to promote the germination of the soil seed bank.

Contention 7b, iii.

The VMP does not address the important issues of fire management and Phytophthora management as recommended in the Office of Environment and Heritage's Best Practice Guidelines for BGHF.

In Chapter 3 of the document that include the VMP (Chapter 4), fire and the risk of pathogens are addressed, namely:

Key Threatening Process	Comments
High frequency fire resulting in the disruption of life cycle processes in plants and…loss of vegetation structure and composition	There is no evidence of a high fire frequency in or close to the Subject site. To the contrary, the dominance of exotic species in the understorey appears to have prevented all fire for several decades at least.
Infection of native plants by *Phytophthora cinnamomi*	No evidence of *Phytophthora cinnamomi* infection was observed during the surveys. Risk of introduction during any conservation works needs to be controlled during construction/ landscaping phase.
Introduction and Establishment of Exotic Rust Fungi of the order Pucciniales pathogenic of the family Myrtaceae	No evidence of Myrtle Rust was observed during the surveys. Risk of introduction from nursery stock may need to be addressed, though spread of the pathogen by wind-borne spores is likely to render futile local prevention measures.

Fire

The management of the high frequency fire in *Best practice guidelines for Blue Gum High Forest* (DECC 2008) is as follows:

- *Use fire frequency that allows native vegetation to reach maturity before reburning.*

- *Prepare burn area, use weed piles.*
- *Use a mosaic burn approach.*
- *Monitor the site before and after fire.*
- *Maintain the site after fire.*
- *Use a high intensity surface fire to encourage maximum germination of seedlings.*

Burning is a good technique in some situations, but given the distribution of native remnant trees may not be appropriate in the Pymble gully.

The moist gully at Pymble is not likely to have ever had a 'high frequency fire' cycle (Graham Swain, pers. comm., December 2013).

Pathogen
Best Practice Guidelines for BGHF (DECC 2008) discuss *Phytophthora cinnamomi* but not the risk of exotic rust fungi, another key threatening process. It is stated in DECC (2008, page 13) that:

> ***Soil pathogens***
> Phytophthora cinnamomi *is a microscopic soil-borne organism that can survive in very small quantities of soil for long periods of time. It kills a wide variety of native and non-native plant species by rotting the roots of its host. The risk of spreading* P. cinnamomi *can be minimised by appropriate hygiene procedures.*
>
> *Tools, machinery, boots and tyres are to be regularly drenched in a solution of disinfectant with all traces of soil washed off. When planting a number of plants, disinfect tools before and after each individual planting.* P. cinnamomi *can persist in dead organic tissue of the trees it has infected for many years. Infected vegetation is to be disposed of carefully. Never woodchip vegetation suspected of being infected by* P. cinnamomi. *DEH (2006) describes in detail the management of communities infected with* P. cinnamomi.

The VMP addresses the risk of pathogens under Management Objective 1 (Protection of the Conservation Area) and Management Objective 3 (Enhance the local native vegetation through revegetation and planting). The times of likely risk are:

During construction period, with:

> *The Conservation Area is to be protected from deliberate or accidental encroachment by persons or vehicles and from sediment and runoff from the works site, prior to, during, and after construction.*
>
> *Prior to construction*
> - *All machinery is to be cleaned prior to entry into the Conservation area. The machinery and loading equipment is to be inspected and photographed as required by the Environmental Manager.*
>
> *During the earthworks and removal of introduced materials and soil preparation*
> - *Soils in the Conservation Area must be sufficiently dry at the time of earthworks, as specified by the Environmental Manager;*
>
> *Once earthworks within the Conservation Area are complete*
> - *Buffer plantings are to be undertaken on the edge of the Conservation Area and the adjoining properties to assist in protection of the Conservation area*

from weed invasion and nutrient, sediment and water runoff from the adjoining properties;

During the maintenance of the Managed Buffer Zone, brush matting and seed harvested from the Buffer Zone may be transferred to the Conservation Area. In the VMP, it is stated that:

> *... Before any material is distributed in the Conservation Area, it must checked by the Environmental Manager or qualified bush regenerators to ensure it does not introduce any weed material or pathogens to the Conservation Area.*

Another potential risk of pathogen introduction is from nursery stock. Under Management Objective 3 (Enhance the local native vegetation through revegetation and planting), tubestock are to be obtained from nurseries with known local provenance stock. Plants in the nurseries are inspected by the skilled restoration ecologists and bush regenerators prior to delivery. Nurseries have in place and enforce cleanliness procedures.

By having skilled restoration ecologists and bush regenerators onsite, standard procedure for cleanliness to avoid pathogen introduction are adhered to by professional bush regenerators.

The plant material used to re-establish the understorey of the Blue Gum High Forest must be of local provenance. The proposed Conservation Area will in future form part of the locality's conservation assets, containing material available for use in rehabilitation of other local sites.

Hence, pathogen risks, such as from the microscopic soil-borne organism *Phytophthora cinnamomi* are major concerns, and addressed in the VMP. *Phytophthora cinnamomi* introduced from soil is controllable by reducing risks of contaminated soil introductions and soil movement via stormwater.

Contention 7c, i and ii.

Parts of the Conservation Area are required to be managed as an Asset Protection Zone, to the detriment of their management as BGHF.
Particulars
i. The VMP states that the bushfire protection requirements for the development will not impinge on the Conservation Area;

ii. The Rural Fire Service requires that all buildings be provided with a 10 m wide Inner Protection Area around the entire building;

In the VMP

> *The bushfire requirements are outside the proposed Conservation Area. Graham Swain of Australian Bushfire Protection Planner Pty Limited has specified an at least 10 m wide managed buffer zone to the Conservation Area downslope of Buildings 3, 4 and 5. The at least 10 m wide managed buffer zone to the Conservation Area complies with the management prescriptions of an Inner Protection Area.*

Under Management Objective 3 (Enhance the local native vegetation through revegetation and planting), the bushfire requirements for the Managed Buffer Zone to the Conservation Area are discussed, namely:

The bushfire requirements limit the planting in these areas to native canopy trees … and groundlayer species.

The list of suitable local native groundcover species is given on page 58 of Clements *et al.* (2012). The list includes native ferns. The local native suitable species selected for the Managed Buffer Zone naturally occur in moist environments and are likely to occur in *Blue Gum High Forest*.

The management of this Buffer Zone for bushfire asset protection includes native plant material (bark, branches and seed) being collected and dispersed into the Conservation Area as appropriate.

The management of and selection of species for this asset protection zone are not likely to be detrimental to *Blue Gum High Forest*. It is a managed buffer for the protection of the Conservation Area.

Contention 7c, iii.

However, the most recent plans indicate that the buffer zone along the eastern side of Building 5 will be less than 10 m wide for most of its length; and the buffer zone at the northern end of Building 3 will also be less than 10 m wide, and thus establishment of an Inner Protection Area in these locations is likely to impinge into the Conservation Area and conflict with management to rehabilitate the BGHF ;

iv. A plan should be provided demonstrating which parts of the BGHF will be managed as an Asset Protection Zone.

The plans have been revised in response to the Contentions. On REV E, all of the Managed Buffer Zones to the Conservation Area are at least 10 m wide. The Buffer to the Conservation Area is managed as an Asset Protection Zone as specified by Australian Bushfire Protection Planners Pty Limited (2012).

Contention 7d.

An extensive network of pedestrian pathways and creek crossings is proposed for the Conservation Area, which will restrict rehabilitation of the BGHF and pose long-term management problems.
Particulars
i. A network of pedestrian pathways, including three creek crossings, is proposed within the Conservation Area;

ii. It is desirable to provide some access for residents and the public to the BGHF Conservation Area in order to engender continuing support for protection and enhancement of BGHF on the site;

iii. However, what is proposed is excessive and will restrict the area within the Conservation Area where a BGHF understorey and ground layer can be restored;

iv. The network of pathways also poses long-term management problems as it will be a continuing source of weed invasion of the Conservation Area, and a potential source of invasion by the root rot pathogen, Phytophthora cinnamomi.

The paths in the Conservation Area on Rev E (Figure 3) have been reduced in number to a single path and a link to Pymble Station. The paths are located to minimise risk of fragmentation and disturbance to the Conservation Area. The formalised pathway in the Conservation Area provides access for bush regenerators,

for observation of weed presence, and allows the Conservation Area to be appreciated.

The paths on Rev E are consistent with the VMP in section 4.1.8 (Formalised walking paths), namely:

> *In order to maximise the appreciation of and minimise risk of fragmentation and disturbance to the Conservation Area, a formal walking path and/or boardwalk and seating area form part of the consideration in the Vegetation Management Plan. Formalised walking paths and boardwalks are widely utilised in Conservation Areas including through endangered ecological communities such as Eastern Suburbs Banksia Scrub at Jennifer Street, Botany Bay National Park, and Sydney Coastal Estuary Swamp Forest Complex at the Warriewood wetlands (Appendix 8).*
>
> *In addition, a public footpath to connect residents with the Pymble Railway Station forms part of the ecologically sustainable development.*

Contention 7e.

The largest BGHF trees on the subject land will not be adequately protected by the Conservation Area and some will be in close proximity to buildings and roads, compromising their stability and longevity.

Particulars
i. Eight of the 62 BGHF trees on the subject land are large trees 30 m or more in height (up to 45 m), including six Eucalyptus saligna *(Sydney Blue Gum) trees and two* E. pilularis *(Blackbutt) trees;*
ii. Only four of the eight trees are located within the proposed Conservation Area;
iii. One of the large trees outside the Conservation Area is to be removed (Tree 23, E. saligna *30 m tall, 12 m spread, 1.2 m DBH) and the trunk of another will be only some 3 m away from Building 5 (Tree 102,* E. saligna *30 m tall, 20 m spread, 1.3 m DBH);*
iv. Two of the large trees within the Conservation Area will be only some 4 m away from the proposed access road and footpath to Building 3 (Tree 188, E. saligna 45 m tall, 30 m spread, 1.7 m DBH; and Tree 210, E. pilularis 40 m tall, 25 m spread, 1.5 m DBH);
v. There will not be an adequate Tree Protection Zone retained around these three trees and their stability and longevity will be compromised;
vi. The impact on the two trees listed in (iv) above would be exacerbated by the necessary access widening set out in contention 10;
vii. No Arboricultural Impact Statement has been provided for the current proposal.

Of the total of 151 trees recorded on the blocks, there were:

- 52 local native trees including 46 *Eucalyptus saligna*;
- 28 non-local native trees including 12 *Lophostemon confertus* and 8 *Syzygium australe*; and
- 71 exotic trees including 17 *Jacaranda mimosifolia.*

Higgins surveyors plotted the tree locations on plan. All of the remnant local native trees were confined to the gully and the western side of the gully (Figure 1). Most of these local native trees are observable on the 1943 aerial photograph (Figure 4). There are no remnant trees in the upper eastern slopes associated with abandoned

houses at 1A and 5 Avon Road. Higgins surveyors estimated the height and spread of the trees.

Of the 52 local native trees recorded, 8 trees were estimated by Higgins surveyors to be at least 30 m tall. The approximate distance from centre of tree trunk of these trees to the nearest structure on REV E are as follows. Of the eight (8) large trees (≥ 30 m):

- seven (7) trees are in the Conservation Area (Tree #s 210, 44, 188, 49, 184, 50, 102); and
- one (1) tree to be removed (in Building 5) (Tree # 23)

Tree #	*Species*	Dimensions by Higgins surveyors (Diameter, spread, height)	Distance from proposed structure	Structure	Location of tree
23	*Eucalyptus saligna*	1.2Ø,12SP,30H	0	Building 5	Building 5
210	*Eucalytpus pilularis*	1.5Ø,25SP,40H	10	Driveway	Conservation Area
188	*Eucalyptus saligna*	1.7Ø,30SP,45H	10	Driveway	Conservation Area
44	*Eucalyptus saligna*	0.7Ø,15SP,40H	11	Building 5	Conservation Area
184	*Eucalytpus pilularis*	1.0Ø,15SP,30H	19	Driveway	Conservation Area
49	*Eucalyptus saligna*	2.5Ø,30SP,30H	22	Building 5	Conservation Area
50	*Eucalyptus saligna*	0.7Ø,15SP,40H	32	Building 5	Conservation Area
102	*Eucalyptus saligna*	1.3Ø,20SP,30H	56	Building 3	Conservation Area

For 16 local native trees ≥ 25 m and < 30 m, there are:

- three (3) trees (Tree #s 182, 343, 39) at least 6 m from structures and less than 10 m from structures;
- the closest tree(Tree # 182) is 6 m downslope of the suspended driveway; and
- the 13 trees over 15 m away from structures.

Tree number	*Species*	Dimensions by Higgins surveyors (Diameter, spread, height)	Distance from Proposed structure	Structure	Location of tree
182	*Eucalyptus saligna*	1.0Ø,15SP,25H	6	Driveway	Conservation Area
343	*Eucalyptus saligna*	0.7Ø,15SP,25H	7.5	Building 5	Landscape zone
39	*Eucalyptus saligna*	1.0Ø,15SP,25H	9	Building 5	Buffer Zone
222	*Eucalyptus saligna*	0.6Ø,15SP,25H	15.7	Driveway	Conservation Area
185	*Eucalyptus pilularis*	1.0Ø,10SP,25H	17.6	Driveway	Conservation Area

Tree number	*Species*	Dimensions by Higgins surveyors (Diameter, spread, height)	Distance from Proposed structure	Structure	Location of tree
52	*Eucalyptus saligna*	0.7Ø,15SP,25H	38	Building 5	Conservation Area
83	*Eucalyptus saligna*	1.0Ø,20SP,25H	39	Building 3	Conservation Area
69	*Eucalyptus saligna*	0.7Ø,15SP,25H	27	Driveway	Conservation Area
53	*Eucalyptus saligna*	0.7Ø,15SP,25H	38	Building 5	Conservation Area
70	*Eucalytpus pilularis*	0.7Ø,15SP,25H	29	Driveway	Conservation Area
89	*Eucalyptus saligna*	1.0Ø,20SP,25H	33	Building 3	Conservation Area
72	*Eucalyptus saligna*	1.0Ø,20SP,25H	31	Driveway	Conservation Area
61	*Eucalytpus paniculata*	1.0Ø,20SP,25H	39	Driveway	Conservation Area
74	*Eucalyptus saligna*	0.8Ø,10SP,25H	35	Driveway	Conservation Area
96	*Eucalyptus saligna*	1.0Ø,20SP,25H	42	Building 3	Conservation Area
98	*Eucalyptus saligna*	1.0Ø,20SP,25H	46	Building 3	Conservation Area

In Revision E, of the 24 large trees (16 + 8 trees) (≥25 m estimated by Higgins Surveyors), only one is in the platform of Building 5. and three trees are greater than 6 m and less than 10 m from a structure.

Tree #24 is also in the platform of Building 5.

Trees at least 10 m from structures are at low risk from the proposal, provided sediment control is adhered to.

Of the 52 Blue Gum High Forest canopy trees, 45 are in the Conservation Area, except for the following located to the Buffer Zone to the Conservation Area:

Tree #	Located in the Managed Buffer Zone
37, 39, 44, 348	associated with Building 5
175, 180	Between Buildings 1 and 3
136	associated with Building 3

In section 4.3.3.1 Management Objective 1 (Protection of the Conservation Area) in the VMP, the Conservation Area, including 45 remnant trees, is to be protected from deliberate or accidental encroachment by persons or vehicles and from sediment and runoff from the works site, prior to, during, and after construction.

Prior to any construction on site and prior to conservation earthworks in the Conservation Area, all existing remnant trees or tree groups are to be clearly identified and protected, as required by the Environmental Manager. It is expected that the

Environmental Manager would require an arborist to protect remnant trees at risk (located less than 10 m from structures).

Revision E has been modified in response to the Contentions. This Contention has been addressed.

Contention 7f There is a lack of certainty that the Conservation Area will continue to be managed as BGHF in perpetuity and that the Community Association will continue to support and fund an appropriate level of vegetation management.

In perpetuity, management is expected for the site assets by the Community Association. The Conservation Area, Managed Buffer to the Conservation Area and General Landscape Area are part of the site assets.

Insufficient Information

Contention 10

Inadequate information has been provided to properly assess the Project in respect of the following: *(a) Impact on BGHF* *(i) Further shadow diagram analysis required to assess the impact of buildings overshadowing Blue Gum High Forest at the summer solstice and the spring and autumn equinoxes, as well as the winter solstice (see contention 9(a)(iv)).* *(ii) A plan is required to clarify the interaction between the Conservation Area and the Asset Protection Zones. (see contention 9(c)(iii)).* *(iii) An arboricultural impact assessment is required to assess the impact on BGHF trees on site (see contention 9(d) (vi)).*

To address Contention 10, a revised Assessment of Significance, using the 7 part test, assesses the impact of the proposed residential development REV E on the critically endangered ecological community *Blue Gum High Forest in the Sydney Basin Bioregion* in Part 2 of Schedule 1 of the *Threatened Species Conservation Act 1995* (NSW).

Assessment of Significance

In paragraph 11 of the Final Determination for *Blue Gum High Forest in the Sydney Basin Bioregion*, it is stated that:

> *11. .... A number of stands of Blue Gum Forests have highly modified understories, in which the native woody component has been largely replaced by woody exotic species or by increased abundance of native and exotic grasses. ....*

In the *Threatened Species Assessment Guidelines: The Assessment of Significance* (DECC 2007), the terms are defined, namely:

Defined terms (page 3 of DECC 2007)	For the assessment of significance
Subject site *is the area directly affected by the proposal.*	The Subject site is approximately 2.5ha consisting of 1, 1A, and 5 Avon Road, and 4 and 8 Beechworth Road, Pymble

Study area *is the subject site and any additional areas which are likely to be affected by the proposal, either directly or indirectly. The study area should extend as far as is necessary to take potential impacts into account.*	The Study area includes: ▪ Subject site; ▪ adjoining rail corridor; and ▪ adjoining properties
Direct impacts *are those that directly affect the habitat and individuals. They include, but are not limited to, death through predation, trampling, poisoning of the animal/plant itself and the removal of suitable habitat. When applying each factor, consideration must be given to all of the likely direct impacts of the proposed activity or development.*	Removal of 2 of 52 remnant trees on the Subject site. These remnant trees are characteristic of Blue Gum High Forest.
Indirect impacts *occur when project-related activities affect species, populations or ecological communities in a manner other than direct loss. Indirect impacts can include loss of individuals through starvation, exposure, predation by domestic and/or feral animals, loss of breeding opportunities, loss of shade/shelter, deleterious hydrological changes, increased soil salinity, erosion, inhibition of nitrogen fixation, weed invasion, fertiliser drift, or increased human activity within or directly adjacent to sensitive habitat areas. As with direct impacts, consideration must be given, when applying each factor, to all of the likely indirect impacts of the proposed activity or development.*	Include: • effects of stormwater runoff and erosion resulting from the development; • effects of altered hydrology on the Subject site and on adjoining properties; • effects of additional shadowing from the buildings; • effects of increased formalised pedestrian use; and • proximity of buildings and structure may result in branch and root pruning.
Interpretation of key terms (page 7 of DECC 2007)	
Local occurrence*: the ecological community that occurs within the study area. However the local occurrence may include adjacent areas if the ecological community on the study area forms part of a larger contiguous area of that ecological community and the movement of individuals and exchange of genetic material across the boundary of the study area can be clearly demonstrated.*	The ecological community that occurs within the Study area is Blue Gum High Forest, existing as a highly modified relic of the community persisting as canopy trees without native understorey.

Vegetation of the Subject Site

The native vegetation component of the Subject site consists of 52 canopy trees, namely 43 *Eucalyptus saligna*, 6 *Eucalyptus pilularis*, 2 *Eucalyptus paniculata* and 1

Angophora floribunda, as well as 1 *Acmena smithii* (17 m tall) and 1 *Pittosporum undulatum*, with a few scattered individuals of native ferns persisting amongst a dense growth of weeds. The canopy species of the listed community is given in paragraph 5 of the Final Determination, namely:

> *4. … Blue Gum High Forest is dominated by either* Eucalyptus pilularis *(Blackbutt) or* E. saligna *(Sydney Blue Gum).* Angophora costata *(Smooth-barked Apple) is frequently observed in remnants close to the shale/sandstone boundary, but also occurs infrequently on deep shale soils, as does* A. floribunda *(Rough-barked Apple).* Eucalyptus paniculata *(Grey Ironbark) is typically found on upper slopes.*

The dominant weeds recorded are *Ipomoea indica* (Morning Glory), *Lantana camara* (Lantana), *Ligustrum lucidum* (Large-leaf Privet) and *Tradescantia fluminensis* (Wandering Jew).

The native canopy trees are characteristic of the critically endangered ecological community *Blue Gum High Forest in the Sydney Basin Bioregion,* with many exceeding a height of 30 metres. There are no native shrub species growing within the native vegetation component on the Subject site.

The native canopy trees extend beyond the site boundary into the Rail Corridor to the north-east of the Subject site and also into some adjacent properties.

Revised Concept plan REV E

The Revised Concept Plan REV E proposal is to construct four apartment blocks (Buildings 1, 3, 4 and 5) (Figure 1) with a total of 184 apartments and 233 parking spaces.

Overlaying the proposal onto the plotted locations of the native canopy trees indicates that the proposal will result in the loss of 2 of the 52 native canopy trees characteristic of the critically endangered ecological community *Blue Gum High Forest in the Sydney Basin Bioregion*. The two trees affected (Tree #s 23, 24) are *Eucalyptus saligna* (Sydney Blue Gums) in the proposed building footprint of Building 5 (Figure 1 and Figure 3).

The distances of the closest native canopy trees to the proposed Buildings and or Driveways (Figure 1) are:

Tree No.	DIAMETER, SPREAD, HEIGHT (Higgins 2012)	Distance from centre of trunk to nearest structure (m)	Structure type	Species	Common Names
23	1.2Ø,12SP,30H	0	Building 5	*Eucalyptus saligna*	Sydney Blue Gum
24	0.5Ø,6SP,10H	0	Building 5	*Eucalyptus saligna*	Sydney Blue Gum
136	0.4Ø,10SP,15H	5	Building 3	*Acmena smithii*	
182	1.0Ø,15SP,25H	6	Driveway	*Eucalyptus saligna*	Sydney Blue Gum
343	0.7Ø,15SP,25H	7	Building 5	*Eucalyptus saligna*	Sydney Blue Gum
x	not surveyed by Higgins 2012	8	Building 3	*Pittosporum undulatum*	Sweet pittosporum (Sub canopy)
180	0.3Ø,5SP,5H	6	Driveway	*Eucalyptus saligna*	Sydney Blue Gum
229	0.4Ø,10SP,15H	9	Driveway	*Eucalyptus saligna*	Sydney Blue Gum

Tree No.	DIAMETER, SPREAD, HEIGHT (Higgins 2012)	Distance from centre of trunk to nearest structure (m)	Structure type	Species	Common Names
39	1.0Ø,15SP,25H	9	Building 5	*Eucalyptus saligna*	Sydney Blue Gum
188	1.7Ø,30SP,45H	10	Driveway	*Eucalyptus saligna*	Sydney Blue Gum
210	1.5Ø,25SP,40H	10	Driveway	*Eucalytpus pilularis*	Blackbutt
44	0.7Ø,15SP,40H	11	Building 5	*Eucalyptus saligna*	Sydney Blue Gum
209	0.8Ø,10SP,15H	13	Driveway	*Eucalyptus saligna*	Sydney Blue Gum
37	0.8Ø,15SP,15H	13	Building 5	*Eucalyptus saligna*	Sydney Blue Gum
228	0.4Ø,10SP,15H	13	Driveway	*Eucalyptus saligna*	Sydney Blue Gum
214	0.3Ø,5SP,10H	14	Driveway	*Eucalytpus pilularis*	Blackbutt
227	0.4Ø,10SP,15H	14	Driveway	*Eucalyptus saligna*	Sydney Blue Gum
175	0.5Ø,7SP,10H	15	Building 3	*Eucalyptus saligna*	Sydney Blue Gum
222	0.6Ø,15SP,25H	16	Driveway	*Eucalyptus saligna*	Sydney Blue Gum
185	1.0Ø,10SP,25H	18	Driveway	*Eucalyptus pilularis*	Blackbutt
184	1.0Ø,15SP,30H	19	Driveway	*Eucalytpus pilularis*	Blackbutt

Under the Ku-ring-gai Council's Tree Preservation Order, trees greater than 3 m from an approved building are protected. None of the 52 trees characteristic of *Blue Gum High Forest in the Sydney Basin Bioregion* are exempt species under the Tree Preservation Order.

Of the 52 trees, the 50 trees being retained are more than 3 m from proposed buildings and would remain protected under the Ku-ring-gai Council's Tree Preservation Order, with:

- the nearest tree to a building being Tree #136 *Acmena smithii* located approximately 5 m north of Building 3 in the Managed Buffer to the Conservation Area. It has an estimated canopy spread of 10 m (5 m radius) and height of 15 m. It is unlikely the branches of Tree #136 would requiring pruning;
- Tree #343 *Eucalyptus saligna* located 7 m north west of Building 5 in the Managed Buffer to the Conservation Area. It has an estimated canopy spread of 15 m (7.5 m radius) and height of 25 m. It is unlikely the branches of Tree #343 would requiring pruning;
- Tree #39 *Eucalyptus saligna* located more than 9 m south east of Building 5 in the Managed Buffer to the Conservation Area on the edge of the Conservation Area, and Tree #44 *Eucalyptus saligna* located more than 10 m east of Building 5 in the Conservation Area. Neither of these two trees would require pruning.

The proposed loss of 2 of 52 native canopy trees characteristic of *Blue Gum High Forest in the Sydney Basin Bioregion* is a direct loss of 3.8%. The acceptable maximum limit loss of the Blue Gum High Forest community discussed in Court evidence by Dr Smith is considered to be 5%. In paragraph 82 of the Judgement for Murlan Consulting Pty Limited v Ku-ring-gai Council and John Williams Neighbourhood Group Inc [2007] NSWLEC 374, the acceptable level of loss of Blue Gum High Forest resulting from a proposed development was discussed.

> *82 The impact of the proposal on the remnant BGHF on the land was determined to a loss of 17% to a stand of trees ...but in oral evidence Dr Smith stated that the loss of BGHF would actually be .... Dr Smith also took the position in oral evidence that acceptable development impacts should not exceed 5% loss of the BGHF community.*

In terms of indirect impacts during construction, trees within 10 m of driveways have the potential of root damage. These trees are:

Tree No.	Species	Spread, Height in metres (Higgins 2012)	Distance from centre of trunk to driveway
182	*Eucalyptus saligna*	15SP,25H	**6 m**
180	*Eucalyptus saligna*	5SP,5H	**6 m**
229	*Eucalyptus saligna*	10SP,15H	**9 m**
188	*Eucalyptus saligna*	30SP,45H	**10 m**
210	*Eucalytpus pilularis*	25SP,40H	**10 m**

Assessment of Significance background

In the Threatened Species Assessment Guidelines (DECC 2007), it is stated that:

> *Under the Threatened Species Conservation Amendment Act 2002, factors to be considered when determining whether an action, development or activity is likely to significantly affect threatened articles s5A of the Environmental Planning and Assessment Act 1979 (EP&A Act), s94 Threatened Species Conservation Act 1995 and s220zz Fisheries Management Act 1994 (FM Act), have been revised.*

The Assessment of Significance under the TSC Act, known previously as the Eight Part Test, is now known as the Assessment of Significance.

The objective of an Assessment of Significance is to:

> *improve the standard of consideration afforded to threatened species, populations and ecological communities, and their habitats through the planning and assessment process, and to ensure this consideration is transparent* (Threatened Species Assessment Guidelines, dated August 2007).

The revised factors for the Assessment of Significance maintain the same intent as the Eight Part Test but focus on:

> *consideration of likely impacts in the context of the local rather than the regional environment as the long-term loss of biodiversity at all levels arises primarily from the accumulation of losses and depletions of populations at a local level.*

The Threatened Species Assessment Guidelines (DECC 2007) are to facilitate:

> *a consistent and systematic approach when determining whether an action, development or activity is likely to significantly affect threatened species, populations or ecological communities, or their habitats in a direct or indirect manner ... Where there is any doubt regarding the likely impacts, or where detailed information is not available, a Species Impact Statement should be prepared.*

Application of the Assessment of Significance for the critically endangered ecological community Blue Gum High Forest in the Sydney Basin Bioregion

a)	***In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,***

Not applicable. *Blue Gum High Forest in the Sydney Basin Bioregion* is a critically endangered ecological community, not a threatened species.

b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable. *Blue Gum High Forest in the Sydney Basin Bioregion* is a critically endangered ecological community, not an endangered population.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

The vegetation component of *Blue Gum High Forest in the Sydney Basin Bioregion* on the Subject site comprises 52 canopy trees with sparsely scattered native ferns persisting under a dense exotic weed growth.

In terms of maximum acceptable loss of 5% of the characteristic canopy trees (based on Dr Peter Smith provided oral evidence in the Judgement for Murlan Consulting Pty Limited v Ku-ring-gai Council and John Williams Neighbourhood Group Inc [2007] NSWLEC 374), the loss of 2 of the 52 characteristic trees of Blue Gum High Forest is not considered likely to place the community at risk of extinction.

(ii) or is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

The extent of additional shadowing from the proposed buildings has been assessedby comparing shadow diagrams without and with the proposed buildings present (Figure 2d). It is found that shadows from the buildings cause little or no additional shadowing of the Conservation Area than that already caused by the natural topography, except in Winter (21 June).

Given the community on the Subject site is reduced to 52 native canopy trees, with sparsely scattered ferns persisting under dense exotic weed growth, the loss of 2 of these 52 characteristic trees of Blue Gum High Forest is not considered likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

d) In relation to the habitat of threatened species, populations or ecological community:
(i) The extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The loss of habitat likely to be removed or modified as a result of the action proposed is 3.8% of the number of characteristic trees of Blue Gum High Forest. All of the remnant local native trees are confined to the gully and mostly the western side of the gully (Figures 1 and 3). Most of these local native trees are observable on the 1943 aerial photograph (Figure 4).

(ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The existing habitat of the Blue Gum High Forest on the Subject Site is largely restricted to the upper section of the gully in the north and in the west. There are additional characteristic trees of Blue Gum High Forest offsite to the north along the Railway Corridor and offsite to the west in adjoining gardens.

The Concept Plan REV E includes a formalised pedestrian path in the existing weed infested groundlayer.

The proposal is not likely to result in the fragmentation or isolation of the area of Blue Gum High Forest habitat.

(iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

The canopy trees characteristic of Blue Gum High Forest on the Subject site are part of a larger stand of canopy trees characteristic of this community that extends offsite to the north.

The proposal to remove 2 of the 52 canopy trees is not likely to remove, modify, fragment or isolate the existing Blue Gum High Forest habitat on the Subject site or reduce the long-term survival of the community.

The importance of the small part of the Blue Gum High Forest habitat to be removed in this locality to the long term survival of the ecological community, is not likely to be changed by the proposed action.

e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been declared for the Blue Gum High Forest on the Subject site.

From the Register of Critical Habitat in NSW (Office of Environment and Heritage website: http://www.environment.nsw.gov.au/criticalhabitat, accessed 12 December 2013), Critical habitat recommendations (pending finalisation) exist for:

- Bomaderry Zieria within the Bomaderry bushland;
- *Eastern Suburbs Banksia Scrub* Endangered Ecological Community on public exhibition to 18 April 2006;
- *Wollemia nobilis* (the Wollemi Pine) on public exhibition to 9 December 2005.

Critical habitat declarations (final) exist for:

- Gould's Petrel;
- Little penguin population in Sydney's North Harbour;
- Mitchell's Rainforest Snail in Stotts Island Nature Reserve;
- Wollemi Pine.

Therefore, the proposal will not have an adverse effect on critical habitat (either directly or indirectly).

f) *Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,*

There is no recovery plan for *Blue Gum High Forest in the Sydney Basin Bioregion*. It is not specifically targeted in the Cumberland Plain Recovery Plan (DECCW 2010) as only a small proportion of it occurs on the Cumberland Plain.

There are *Best Practise Guidelines for Blue Gum High Forest* (DECC 2008A). No objectives or actions of a recovery plan or threat abatement plan appear to be included.

g) *Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of a key threatening process.*

Key Threatening Process	Comments
Clearing of native vegetation	Almost all of the vegetation to be cleared, apart from 2 trees to be removed is exotic (or non-local natives), including weeds and former garden plantings.
High frequency fire resulting in the disruption of life cycle processes in plants and...loss of vegetation structure and composition	There is no evidence of a high fire frequency in or close to the Subject site. To the contrary, the dominance of exotic species in the understorey appears to have suppressed fire for several decades. It is unlike the vegetation in this protected gully has ever burnt.
Infection of native plants by *Phytophthora cinnamomi*	No evidence of *Phytophthora cinnamomi* infection was observed during the surveys. Risk of introduction during any conservation works needs to be controlled during construction/ landscaping phase.
Introduction and Establishment of Exotic Rust Fungi of the order Pucciniales pathogenic of the family Myrtaceae	No evidence of Myrtle Rust was observed during the surveys. Risk of introduction from nursery stock may need to be addressed, though spread of the pathogen by wind-borne spores is likely to render futile local prevention measures.
Invasion and establishment of exotic vines and scramblers	Exotic vines were recorded during the surveys. The site is currently infested with dense growth of exotic vines, including *Ipomoea indica,* that are proposed for removal.
Invasion, establishment and spread of Lantana (*Lantana camara* L. sens. lat)	*Lantana camara* was recorded during the surveys and is prolific amongst and between native canopy areas. The proposal requires its removal.
Removal of dead wood and dead trees	Standing or fallen local native trees on the Subject site will be retained in situ within the proposed conservation area unless they pose a safety concern.
Loss of hollow-bearing trees	There is the potential for hollows to exist in the two trees proposed for removal.

The key threatening process likely to be of relevance to the proposed development is the possible *Loss of hollow-bearing trees,* arising from the proposed removal of two trees of *Eucalyptus saligna* that contain, or are likely to contain, hollows.

In conclusion, the existing *Blue Gum High Forest* onsite was assessed as consisting of 52 native canopy trees characteristic canopy trees with sparse scattered ferns persisting under dense weeds.

The proposal will result in removal of 2 characteristic canopy trees (Tree numbers 23, 24). The removal of 2 of the 52 characteristic canopy trees is considered to not likely significantly impact the occurrence of the community on the Subject site. Hence, a Species Impact Statement is not required.

Ameliorative and compensatory measures

Ameliorative and compensatory measures proposed for the Subject site are to:

- Conserve and enhance the critically endangered ecological community *Blue Gum High Forest in the Sydney Basin Bioregion* in the long-term as part of the ecological sustainable development (example in Hazelton and Clements 2009, Clements *et al.* 2010);
- Implement the vegetation management plan in consultation with the Council for the onsite Conservation Area and Managed Buffer to the Conservation Area to reduce the existing and long-term direct and indirect risks to the *Blue Gum High Forest.*

The aims of the Vegetation Management Plan are more than reducing the occurrence of weeds. They include to:

- conserve and enhance the local native vegetation;
- protect water quality flowing through and from the Subject site;
- restore the natural nutrient cycling of the native ecosystem; and
- establish a long-term, ecologically viable *Blue Gum High Forest* ecosystem.

The formal pathway through the Conservation Area and Managed Buffer to the Conservation Area should be designed to minimise risk of pathogen and weed introduction. Formalised walking paths and boardwalks are widely utilised in Conservation Areas including through endangered ecological communities such as Eastern Suburbs Banksia Scrub at Jennifer Street, Botany Bay National Park, and Sydney Coastal Estuary Swamp Forest Complex at the Warriewood wetlands (see photographs in Appendix 8 of Clements et al. 2012). The use of formalised paths reduces the risk of trampling and accidental incursions by pedestrians.

Trees within 10 m of proposed structures (buildings and road) are to be protected during construction by a qualified arborist under the supervision of the Environmental Manager.

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Figures

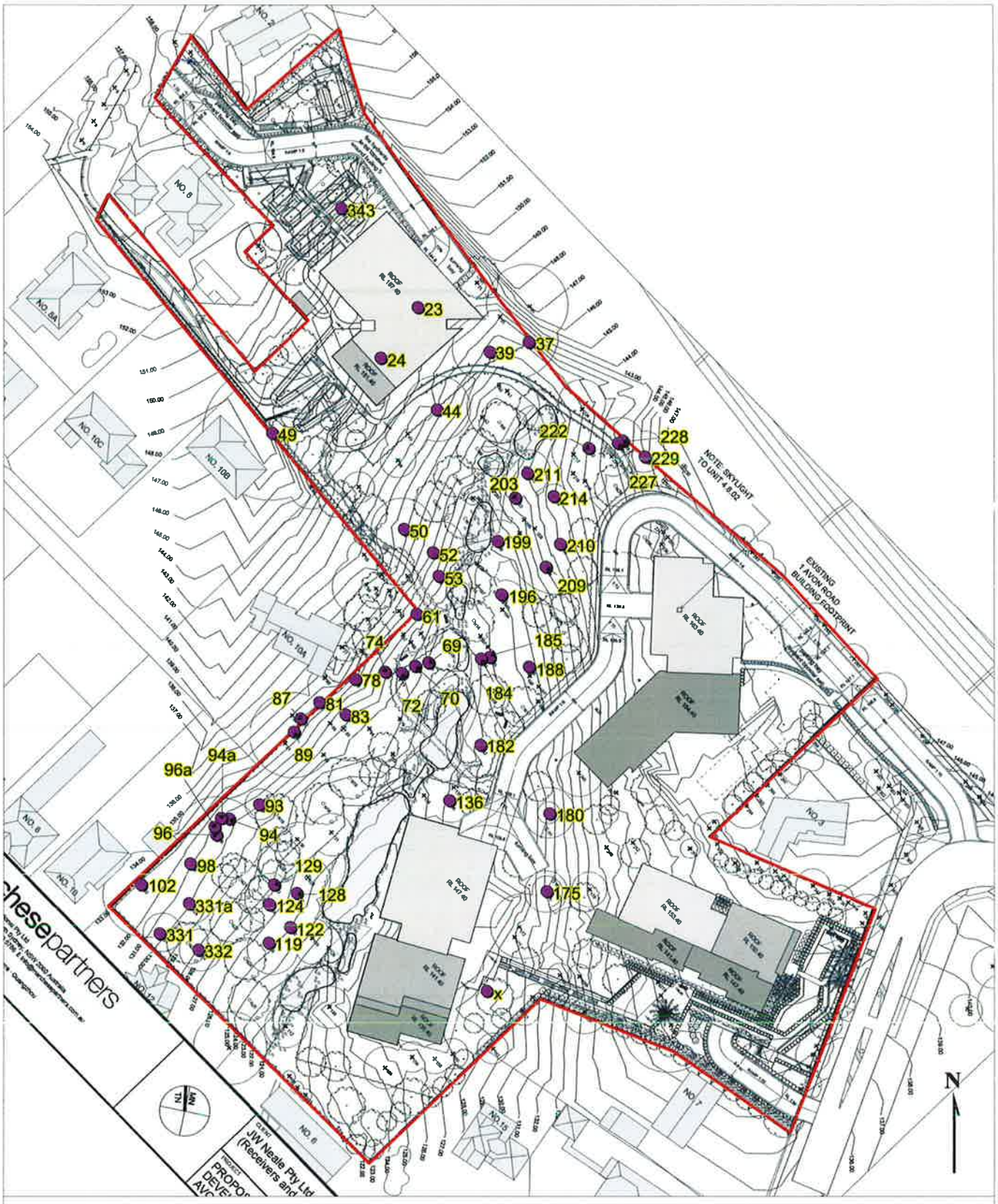


Figure 1.
Native trees overlaid on the Concept Plan (Marchese Partners REV E dated 11 December 2013)

Figure 2a. Seasonal shadow diagrams from natural topography at 9 am, 12 (noon), 3 pm

Season	9am	12 noon	3 pm
Summer 21 December			
Autumn 21 March			

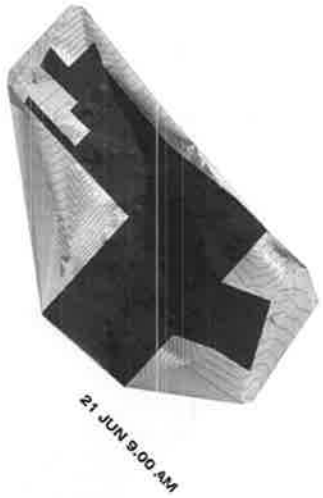
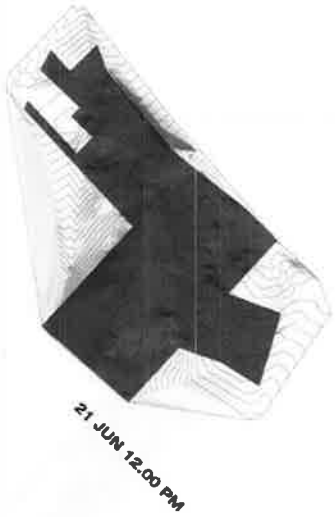
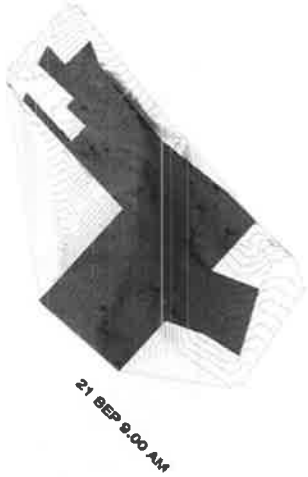
Winter 21 June			
Spring 21 September			

Figure 2b.
Winter solstice shadow from natural topography at 1 pm, 2 pm, 3 pm

Winter solstice (21 June)

1 pm	2 pm	3 pm
		

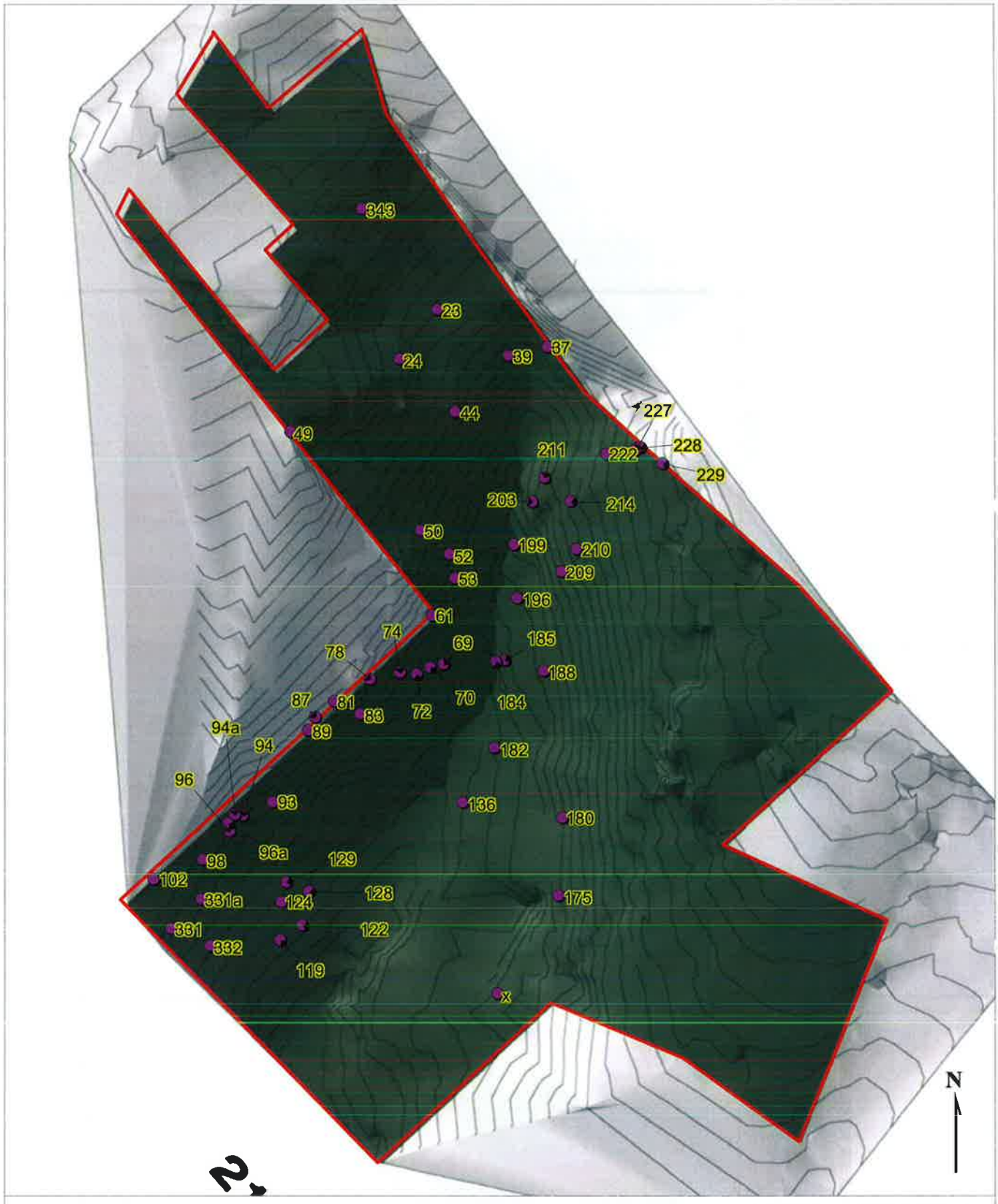


Figure 2c.
Remnant native tree locations overlaid on shadow diagram for winter (21 June) at 3 pm

Figure 2d-1.
Seasonal shadow diagram from natural topography (left) and from natural topography with proposed buildings (right)

Figure 2d-2.
Seasonal shadow diagram from natural topography (left) and from natural topography with proposed buildings (right)

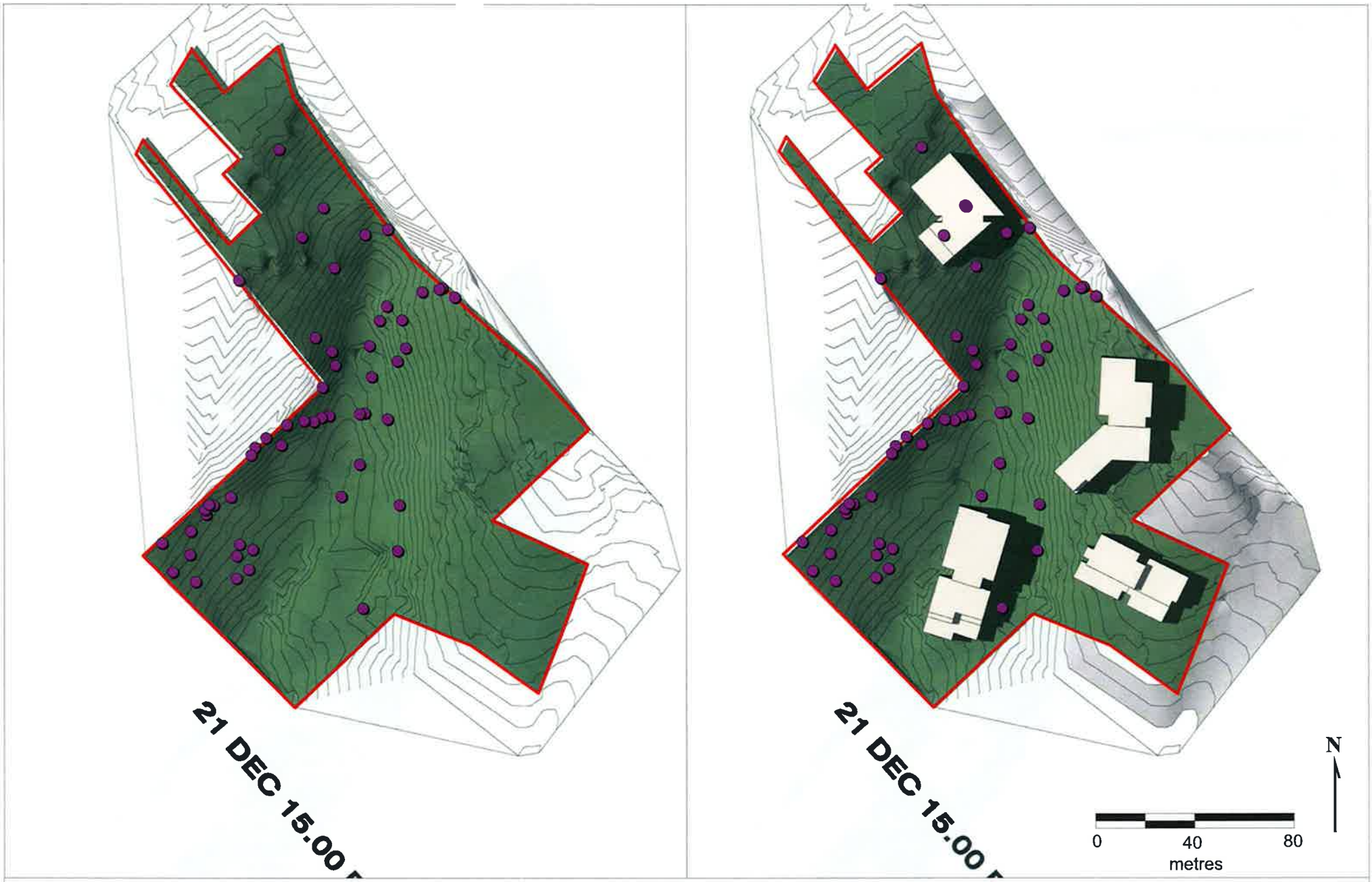


Figure 2d-3.
Seasonal shadow diagram from natural topography (left) and from natural topography with proposed buildings (right)

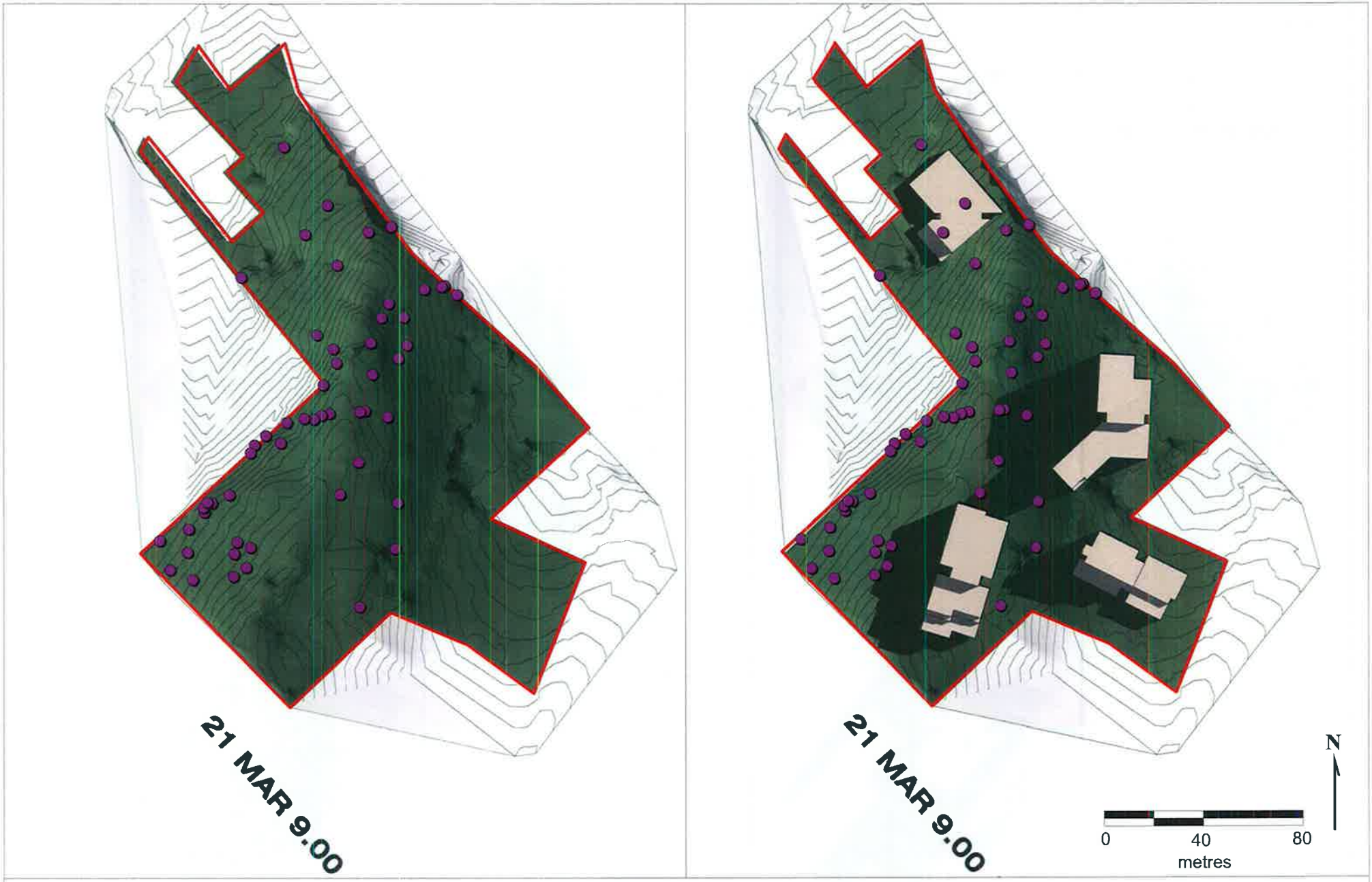


Figure 2d-4.
Seasonal shadow diagram from natural topography (left) and from natural topography with proposed buildings (right)

Figure 2d-5.
Seasonal shadow diagram from natural topography (left) and from natural topography with proposed buildings (right)

Figure 2d-6.
Seasonal shadow diagram from natural topography (left) and from natural topography with proposed buildings (right)

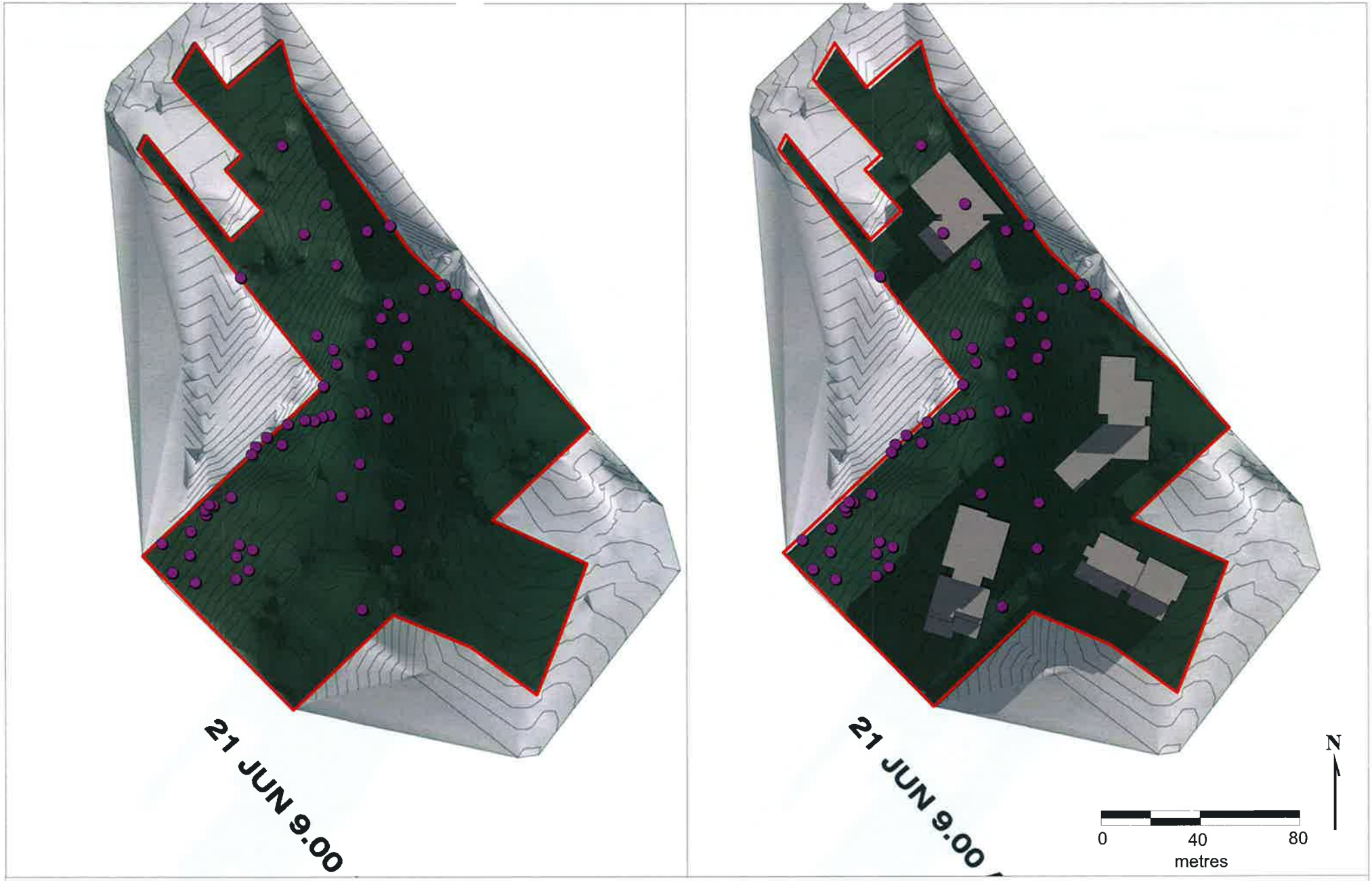


Figure 2d-7.
Seasonal shadow diagram from natural topography (left) and from natural topography with proposed buildings (right)

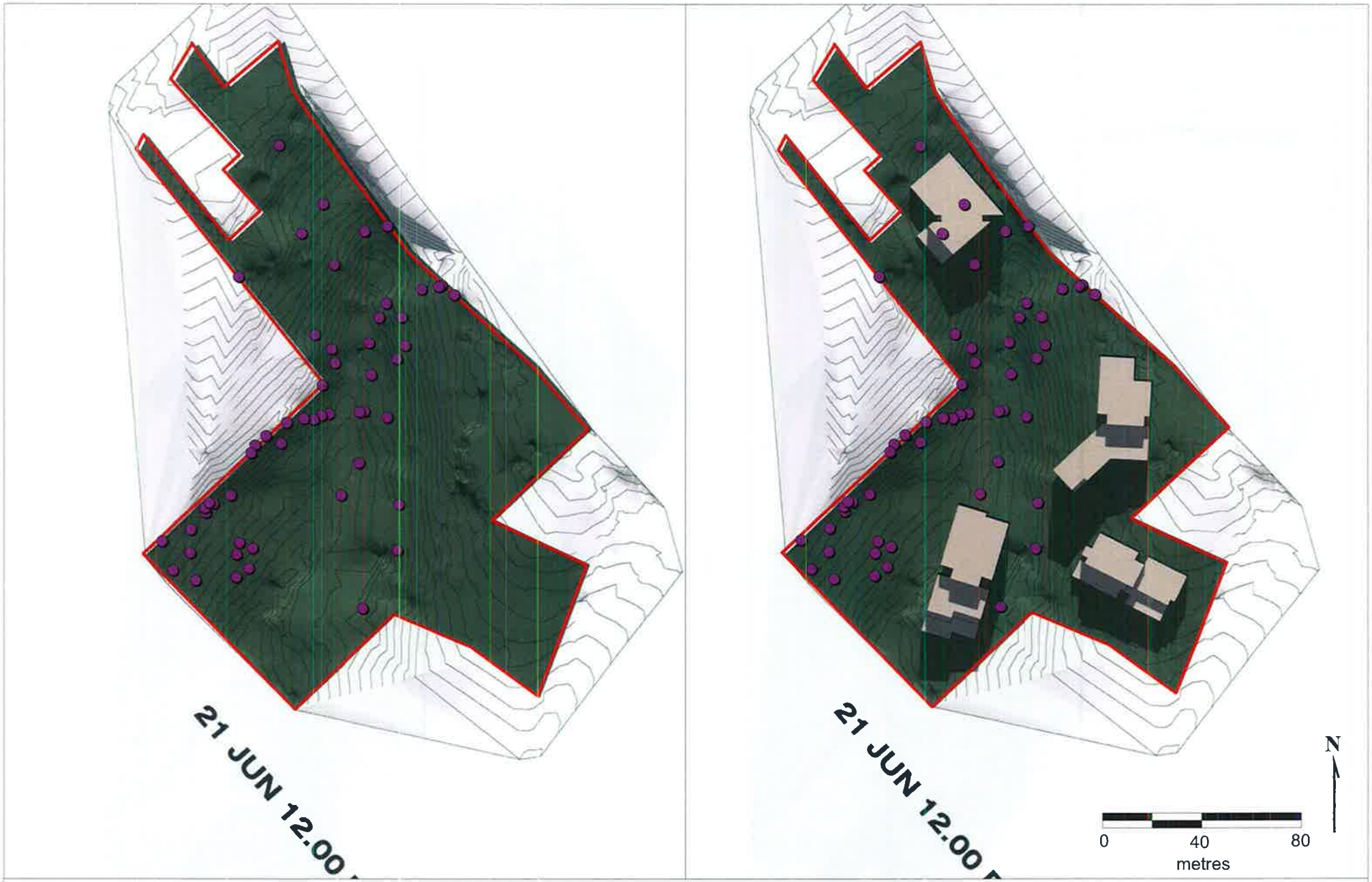


Figure 2d-8.
Seasonal shadow diagram from natural topography (left) and from natural topography with proposed buildings (right)

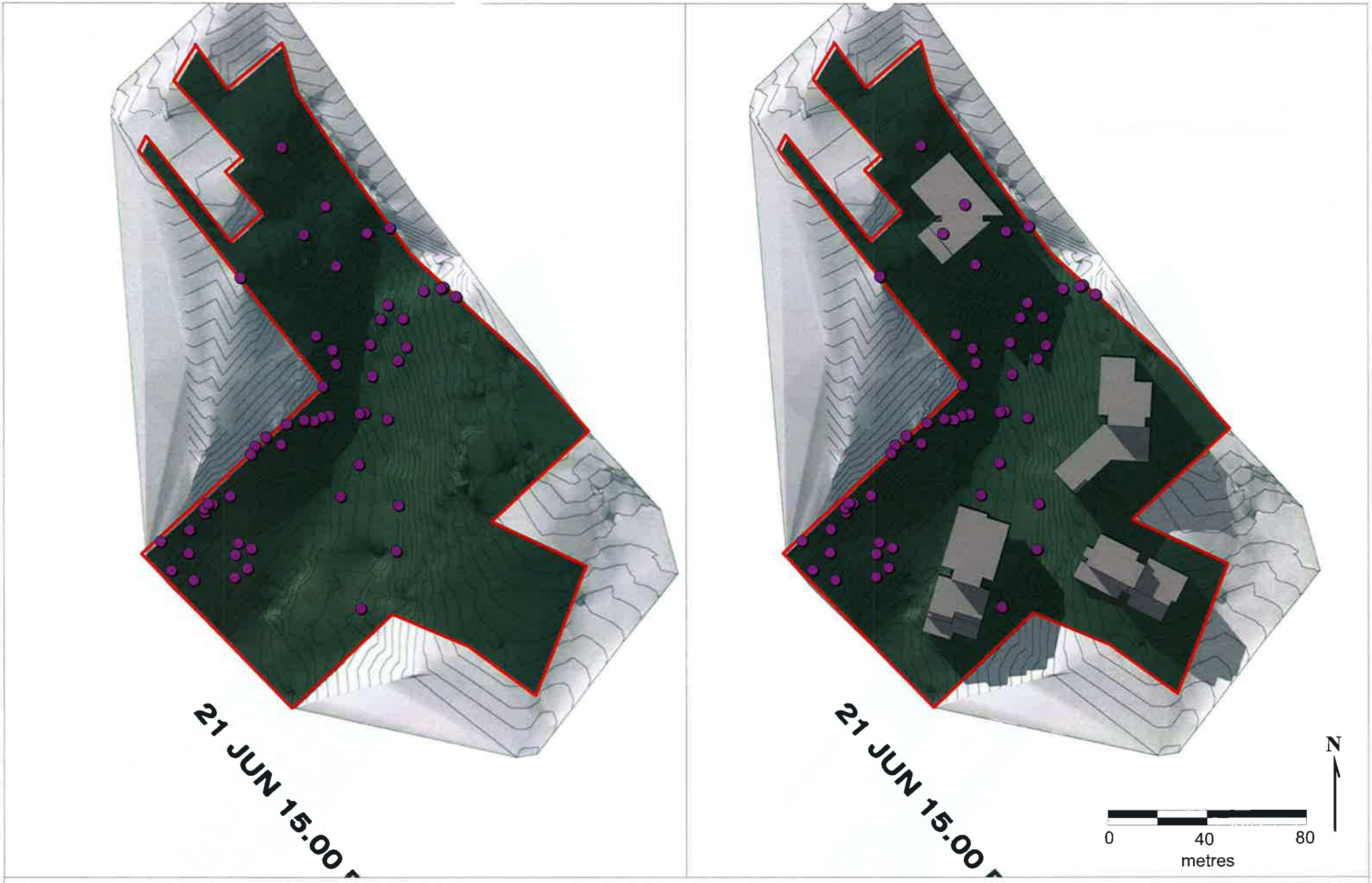


Figure 2d-9.
Seasonal shadow diagram from natural topography (left) and from natural topography with proposed buildings (right)

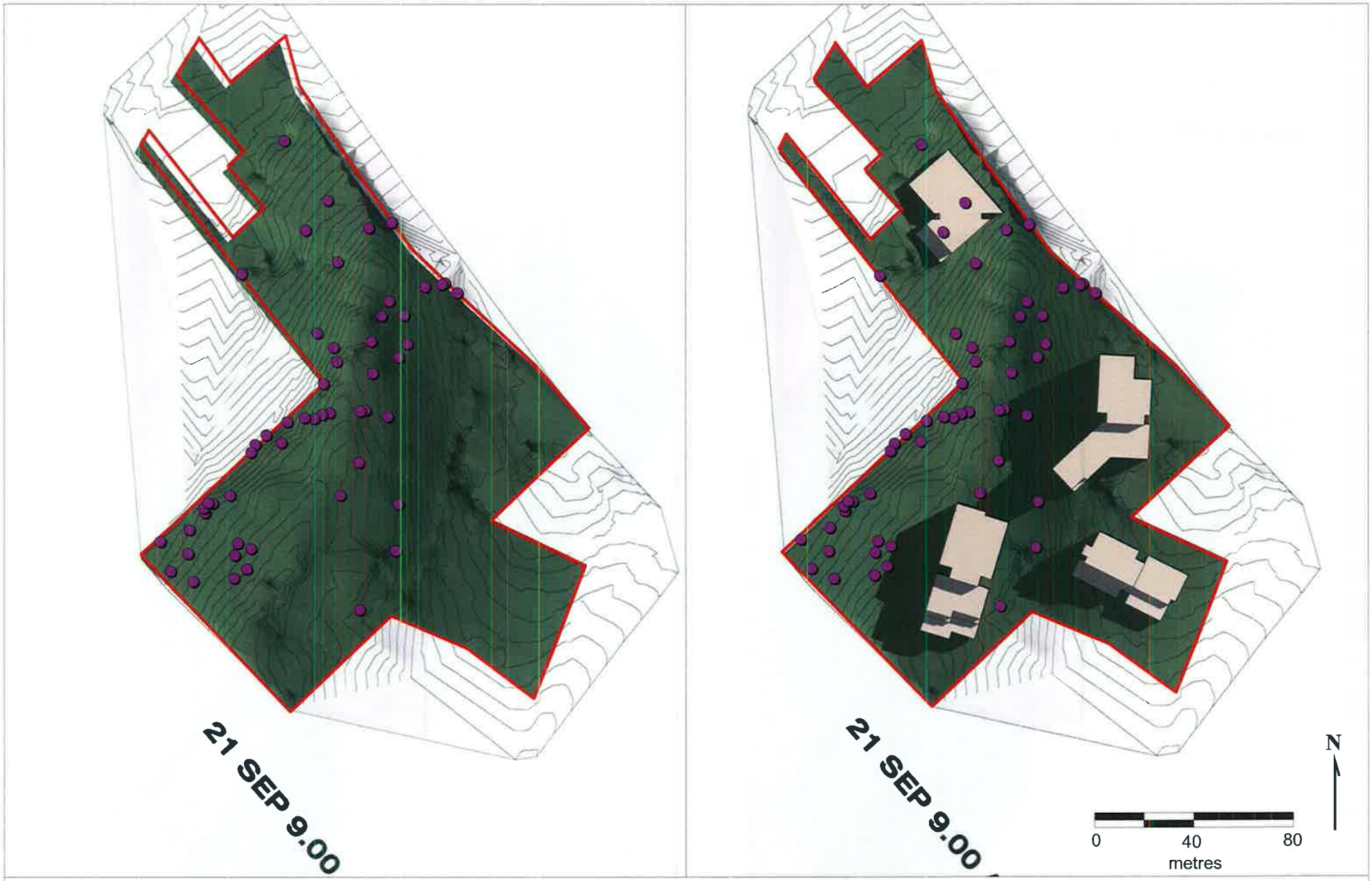


Figure 2d-10.
Seasonal shadow diagram from natural topography (left) and from natural topography with proposed buildings (right)

Figure 2d-11.
Seasonal shadow diagram from natural topography (left) and from natural topography with proposed buildings (right)

Figure 2d-12.
Seasonal shadow diagram from natural topography (left) and from natural topography with proposed buildings (right)

Figure 3.
Vegetation Zones for Avon Road, Pymble
(Drawing MP 01.06 Rev E, Marchese Partners)

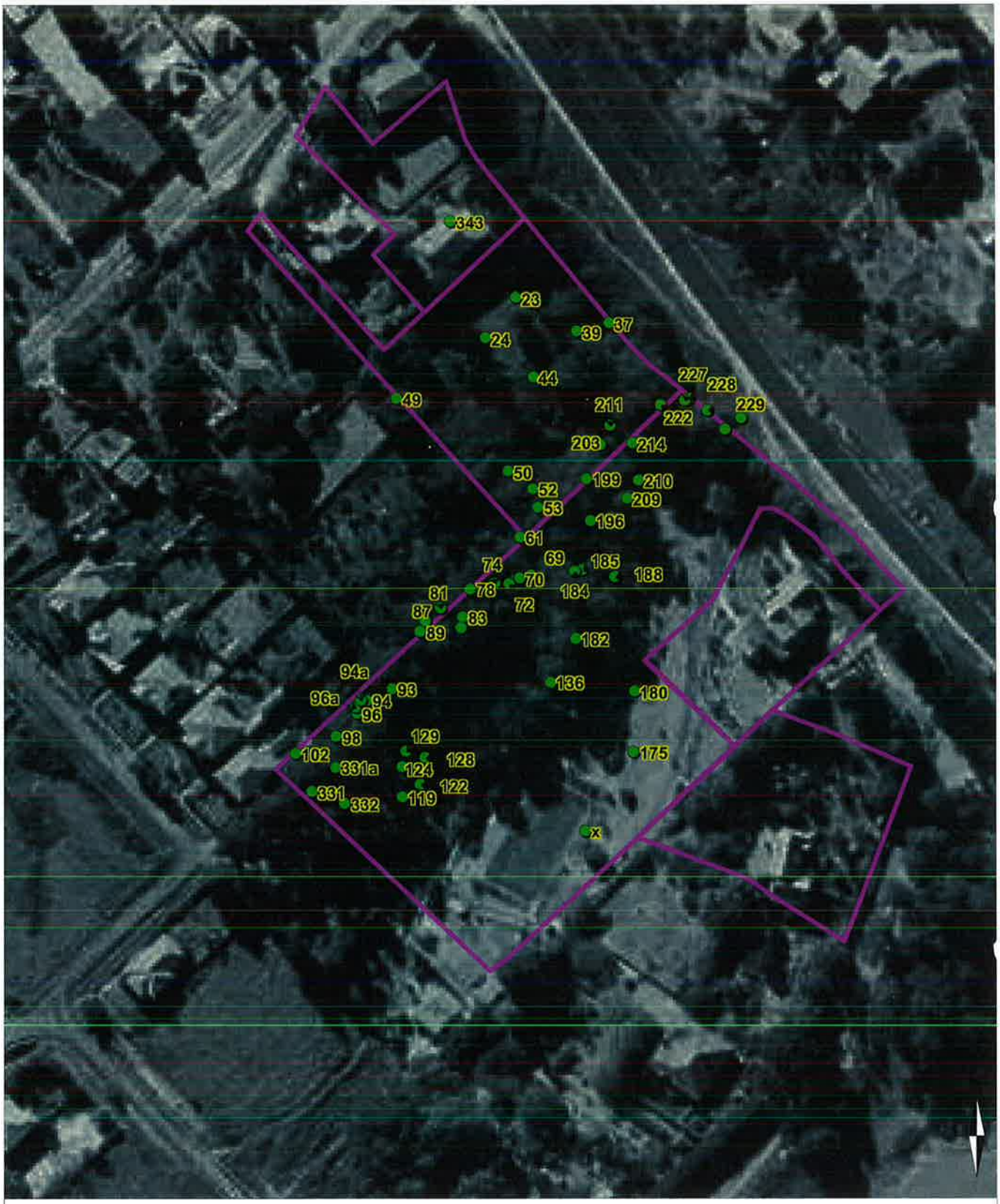


Figure 4.
Native trees recorded overlaid on the 1943 historic aerial photograph from SIX Maps (NSW Land and Property Information)