

Bush Fire Safety Assessment

for

LHJ Pty Limited

at

166A Windsor Road
Northmead

Lots 939/940 DP 1176567

July 2013

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Executive Summary

This report provides advice on bush fire protection measures considered to be appropriate for a proposed residential development following rezoning of the grounds of a disused quarry site. The area is not classed as bush fire prone land, and there is no legislated necessity to comply with any formal guidelines.

There is a reasonably extensive area of native vegetation adjoining the site. The developer believes it would be responsible to take the possibility of fire in this area into account, although not necessarily to the extent which would be required were it formally classed as bush fire prone land.

I based this advice on what I consider to be reasonable standards, taking the guidelines current at the time of initial design into account. As with recommendations based on the current standards where their observance is mandatory, compliance does not guarantee the safety of structures in the event of nearby bushfire.

I recommend construction to Level 2 under AS 3959-1999, more or less equivalent to BAL-19 under AS 3959-2009, and maintenance of an Inner Protection Area about 25m in width plus a less intensively managed Outer protection Area about 15m deep.

Background

My full name is Roger Fenwick, and my date of birth is 27 December 1946. I reside at 26/16-22 Helen St, Lane Cove, NSW. I hold a bachelors degree in Science (Forestry), am a former Chief Fire Control Officer of the ACT Bush Fire Council, and have been self-employed as a consultant in bush fire protection planning, management and investigation since 1987. My brief *curriculum vitae* is attached as Annex 2.

I have read and agree to be bound by the expert witness code of conduct in Schedule K of the Supreme Court Rules 1970, Part 36, Rule 13C.

I have been asked by Mr Len Jones of LHJ Pty Limited to assist in the design of a proposed residential development to support the site rezoning application currently with the Dept of Planning.

Vegetation on the adjoining land is not classified as Bush Fire Prone, and there is no mandated requirement to comply with bush fire protection standards. However, the developer recognised the potential for bush fire nearby, and requested advice on an appropriate voluntary level of design and siting measures. When the design for this development was prepared, a modified degree of compliance with the then current guidelines was given and observed.

While the formal guidelines have changed in the time during which this development has been under consideration, the design and setback distances continue to observe the original advice.

Location & Zoning

The site is defined as Lots 939/940 in Deposit Plan 1176567, within the Parramatta Council area. The address is 166 Windsor Road, Northmead. It lies within the Greater Sydney Fire Weather Area.

The area is the old Moxham Quarry, an abandoned quarry at the rear of the Northmead Bowling Club. Other adjoining land uses include the grounds of the Northmead Scout Hall, and existing residences fronting Whitehaven Road to the south and Ulandi Place to the north, and Moxham Park.

This battleaxe block is 15 876m² in area. Overall dimensions are approximately 110m width and 109m depth.

The maps, plans and aerial photograph at Annexure 3 show the site, its surrounds, and the proposed development.



Photo 1 General location

Topography

The floor of the quarry is essentially flat, and its sides to the north, east and south are virtually vertical. The access handle along the northern side of the site is 10m wide.

The western third of the site has a slight westerly aspect, falling at up to 5°. The adjoining land slopes down to the creek at up to 15°. I have used the range 5°-10° to inform, but not dictate, planning at this site.

Vegetation and Fuel loads

The vegetation classification on the land adjoining the quarry floor to the west is Dry Sclerophyll Open Forest (shrubby sub-formation) as described by Keith 2004, equivalent to Forest (Auslig 1990, in AS 3959). It appears long unburnt, with a relatively low surface fuel load and shrub component. Some surface disturbance by recreational walkers and cyclists (BMX and motorcycles) has created minor discontinuities in the litter layer. Significant rock outcrops occur, particularly on the steeper slopes.

Current Development

Mains water, electricity and piped gas are available to the site, which is otherwise just a partially fenced hole in the ground.

Proposed Development

The application proposes a tiered residential development on the eastern side of the site within the quarry abutting the Bowling Club grounds, incorporating a communal landscaped area within the base of the former quarry with a substantial portion of land in the western part of site preserved as bushland for passive recreation, bush regeneration and bush fire asset protection. There will be levels of housing below and two levels above the present level of the bowling greens. Parking will be provided within the main part of the complex. All access for normal vehicular traffic will be via a driveway and large turning circle along the northern side of the block. Emergency vehicle access to the western perimeter will be provided within the landscaped area to the west of the residential block, plus a turnaround on the site.

Potential Fire Exposure

Within this report, references to guidelines or PBP means the 'Planning for Bushfire Protection 2006' publication by the NSW Rural Fire Service (RFS). References to Levels of house construction are as prescribed in AS 3959-1999, 'Construction of buildings in bushfire-prone areas'. An extract of parts of those documents is attached at Annex 1. Since the initial design was prepared, NSW has adopted AS 3959-2009, and PBP was amended in 2010.

The provisions of this new material have not been adopted in this report. However, under the old Standard version used, aluminium mesh screens were not allowed for Level 2 or 3 construction. Aluminium is allowed in the revised Standard, and I support its eligibility for inclusion in this setting, the wording in the attached summary at Annex 1 notwithstanding.

Fire originating within the reserve area has a potential run from the northwest and from the southwest of 600m, and from the west about 300m, to the edge of the site. These are sufficient distances in which to develop a crown fire under Extreme fire weather conditions, given high ground fuel loads and a sufficiently well-developed intermediate understorey layer. Approaching fire could develop a width of 100m, the maximum effective width for purposes of calculating radiant heat exposure. Consideration of a possible bush fire threat is responsible.

Applicable Fire Legislation

No bush fire related legislation applies to this land, although the Consent Authority could elect to refer it to the Rural Fire Service under S79C. There is no reason to think that this would occur, as Council has indicated that this parcel of land has been assessed as not being bush fire prone.

Under the Building Code of Australia (BCA), the dwellings proposed to be erected will be Class 2. The deemed to satisfy provisions of the BCA can be determined by reference to the relevant sections of AS 3959, although compliance with this Standard is not required.

Prescriptions and Construction Standards

Asset Protection Zones

For fire prone land in the Greater Sydney region, the applicable Fire Danger Index (FDI) for protection planning purposes is 100. Table A2.4 of PBP 2006 specified minimum Asset Protection Zone (APZ) widths by slope and vegetation class for

residential subdivisions. For Forest vegetation, the APZ may be composed of Outer and Inner Protection Areas (OPA & IPA) as per Table A2.7. A function of an OPA is to prevent the occurrence of crown fire, thus limiting the height of the flames radiating heat towards the structure to be protected, and a function of an IPA is to keep flames from making contact with the structure.

For a defined forest fire exposure, the prescribed standards were:

Table 1 –Minimum setback requirements & Level of construction

Construction	Slope	>0° – 5°	>5° – 10°	>10° – 15°
Level 3	OPA + IPA = APZ	10 + 15 = 25	15 + 20 = 35	25 + 25 = 50
Level 2		10 + 26 = 36	15 + 30 = 45	25 + 30 = 55
Level 1		10 + 39 = 49	15 + 44 = 59	25 + 46 = 71

Fire in unmodified Forest vegetation and travelling up a slope of 10° on approach to the site perimeter could crown. However, on the lesser slope on the site itself, and with the extent of vegetation management proposed on site, crown fire could be limited to about the site perimeter.

Construction Standards

The proposed landscaped buffer zone is about 40m in width, and sits beside about 40m of bushland (to be retained) on a 5° slope. A setback of 45m (15m of managed native bushland, plus the inner 25m of garden) would permit Level 2 construction standards to be used in a defined bush fire prone setting.

In my view, a sufficient degree of protection would be provided by managing the closest 15m of the retained bushland to approximately OPA standards, the landscaped buffer zone water feature and access driveway to IPA standards, and building to Level 2 under (old) AS 3959-1999.

Access

In consultation with the NSW Fire Brigade, access suitable for use by brigade vehicles has been provided. An emergency vehicle access has been provided from the access handle on the northern side of the site (off Windsor Road) along the top of the old quarry wall and down to its floor, and then to a turnaround at the southern boundary of the site.

Landscaping

The entire landscaped buffer zone should be maintained to formal lawn and garden standards, with no significantly flammable trees or native shrubs present.

Pittosporum and Lilli-Pilli (*Syzygium*) are acceptable, plus isolated clumps of low (<1m high) shrubs, evergreen ground cover such as *Hardenbergia*, and mown grass. No mulched beds should be established within 2m of ground-floor windows, and no flammable conifers such as Pencil Pines or other Cypress pine types (*Cupressus*, *Thuja*, etc spp) are acceptable.

Existing mature eucalypts may be retained if pruned of branches below 3m, with no flammable shrubs within 3m of their stems, and spaced such that there is one crown diameter between the canopies of any retained trees – including to trees within the bushland area.

Within the closest 15-20m of the bushland to be retained, surface litter, low shrubs and intermediate level vegetation should be reduced to prevent transmission of ground fire into the mature tree canopies. That requires leaving:-

1-2 leaves in depth of leaf litter,

- one shrub to 0.5m height and diameter per square metre,
- one shrub to 1m diameter and height per 10 square metres,
- no intermediate height saplings (except as designated future overstorey trees, and occupying that amount of space).

Preferred eucalypt species and individuals for retention will be sound, without double leaders or ramicorn branches, and smooth (gum) barked rather than fibrous or stringy. Low-flammability ground cover such as *Hardenbergia* is permissible within this area.

Services

Water reticulation and hydrants should be provided to the specifications of AS 2419.1. Hydrants should be located so that they are safely accessible in the event of both nearby structural fire (whether on the site or on adjacent property), and approaching bushfire. Brigade vehicles carry little water (unlike Bush Fire Brigade tankers) and need to connect to a hydrant for prolonged water pumping operations.

Electricity supplies should be located underground.

Gas reticulation should be underground, with only metal pipes exposed above-ground.

Summary & Recommendation

The proposed development is not required to comply with any Standard with respect to bush fire exposure. However, the design considers the potential exposure to fire in the bushland on and adjoining the site, and incorporates a suite of measures which provide protection to a comparable standard if compliance were mandatory.

The proposal can be considered to be reasonably safe against approaching bushfire, subject to vegetation management as shown on the attached indicative proposal, and construction to Level 2 under AS 3959-1999.

Annex 1 – extracts

Extract of parts of AS 3959 and PBP Specifications

PBP & AS 3959

This is a summary of the specifications in 'Planning for Bushfire Protection 2006' and 'AS 3959-1999 – Construction of buildings in bushfire-prone areas' which are referred to in this report. It is included as a courtesy, is a guide only, and may not be complete. In addition, the contents of the documents from which this information was extracted may have changed between the dates of preparation of this report, and its use or application. Specifications in other documents such as the Building Code of Australia (BCA) may apply. It is the user's responsibility to comply with all statutory conditions as well as those specified by the approving authority with particular reference to this report.

		Level 1	Level 2	Level 3
Floor	Slab	OK	OK	OK
	Timber >600mm ag	OK	OK	FRTT or boxed or enclosed
	Timber <600mm ag	FRTT or boxed or enclosed		
Posts etc		400mm FRTT or 75mm stirrup		FRTT
External Walls		400mm FRTT or non-combustible	FRTT or non-combustible	
Windows	Frame	OK	FRTT or shutter	
	Screens	Al, Fe or Br mesh on all openable	Fe or Br mesh on all openable	Fe or Br mesh on all openable, toughened glass or shutters
External Doors	Weather strips	Fit		
	Screens**	Al/Fe/Br	Fe/Br	
	(If) Timber	OK		FRTT, shutters, solid core 35mm
Vents etc	Mesh	Al/Fe/Br	Fe/Br	Fe/Br
Roofs	Shakes & shingles	No!		
	Tiled	OK with sarking with a Flammability Index <5		
	Sheeted	Metal or fibre-cement		Metal, not Al
	Gaps, holes etc	Seal with sarking, Fe or Br mesh, mineral wool, etc		
	Rooflights	Non-combustible sleeve/lining, Fe/Br mesh on vents		
		Diffuser wired or toughened glass	Wired glass only	
	Other penetrations	Non-combustible, sealed, and Fe/Br mesh installed		
Eaves		Enclosed, sealed	Enclosed, FRTT if timber, sealed	Enclosed, FRTT if timber, sealed, no Al
Fascias		OK	Non-combustible or FRTT	Non-combustible or FRTT, no Fibre-cement, Al
Gutters etc	Leaf protection	Flammability Index <5		
Verandahs, decks, etc	Slab	OK		
	Sheet or T&G	As for floor		Non-combustible or FRTT
	Spaced	>5mm gaps, FRTT, access to underside		
	Contact with walls	Protect the building if deck timber contacts walls.		
Services		Exposed water & gas pipes to be metal. Other pipe material to be buried to >300mm depth.		

OK

ag

FRTT

**

No specific requirement

above ground

Fire retardant treated timber

May be allowed to be omitted

Al

Fe

Br

Aluminium

Steel

Bronze

APZ objectives and specifications

There is no single, definitive specification for an Asset Protection Zone (APZ), or its subsets the Outer Protection Area (OPA) and Inner Protection Area (IPA). An OPA can only be generated within the various classes of Forest vegetation. The principle behind an APZ is to separate the flammable vegetation from the structures, and the people protecting them or leaving them, sufficiently to prevent ignition or injury.

The most intense fires ('crown fires') involve the canopies of trees; these are dependent on heat from all of the burning ground and surface litter (leaves, twigs and grass), the shrubby layer, and the intermediate level smaller trees & saplings. Protection planning assumes weather conditions which will allow the development of crown fires, plus maximum levels of the various layers of bushfire fuels, and provides for a 'worst likely' combination. Note that it is not the 'worst possible' scenario; more dramatic weather conditions do arise from time to time. None of these measures are guaranteed to provide absolute protection, including under less than the most extreme weather conditions.

Within an OPA, the aim is to reduce the surface litter to an acceptable level, and to provide a degree of both vertical and horizontal separation of the elevated fuels. This reduces the intensity of the surface fire, and slows or prevents the ignition of the elevated components by increasing the space across which flames have to travel to ignite the next one – whether above or beside. By reducing the fire's intensity to below the level which will support a crown fire, the flame height (and flame length, when the wind blows it more horizontally) are reduced. This reduces the amount of heat radiated by the flame front, and the likelihood of flames reaching across the protective gap.

The aim of an IPA is to keep flames far enough away to prevent contact with structures, to prevent the heat that those flames are radiating from causing ignition, and to minimise the danger to people exposed to heat and smoke.

Wind-blown embers are a very significant factor in fire spread, and the ignition of houses. Ember production is somewhat reduced by fuel reduction measures such as are employed in OPA creation, and greatly reduced by IPA works. In addition, filtering out these embers before they reach the structure can be facilitated by landscaping measures which block the free flow of the wind which carries them.

Smoke and convective heat are additional problems, which are addressed to the extent reasonably possible by the application of the measures discussed.

You may need specific permission from Council to carry out some of the works below, particularly if it involves tree removal or operating on steep slopes, even if the works are part of the overall development approval.

An Outer Protection Area prescription

Remove excess surface litter (leaves, bark, twigs less than 6mm in thickness), but leave two leaf thicknesses of material over at least 80% of the exposed soil, by raking and physical removal from the site. A degree of retained ground cover is important to prevent soil erosion, among other things. Don't worry about occasional large bits of wood such as branches or logs – while these may ignite eventually, they do not contribute to the spread of fire, and are useful refuges and breeding areas for a variety of insects and larger animals.

Remove all standing dead shrubby and sapling material, and then remove live plants to create shrubs (or clumps of shrubs) which are no more than 3m in diameter and 1m high, and which are separated from other clumps by at least 3m. In addition, ensure that significant shrub accumulations do not occur directly beneath trees – especially intermediate height trees – which could easily be ignited by the flaming shrub.

Remove intermediate or mature trees as necessary to create a gap of at least 3m between the canopies of retained trees. In planning removal of larger trees, remember that trees grow – give some thought to how the site will look in several (think in multiples of ten) years time, and also plan for the eventual replacement of old or poor condition specimens.

Additional ground cover (such as running creepers, eg *Hardenbergia*) or more suitable species of shrubs (eg Lilli-Pilli, *Syzygium*) can be planted within an OPA in place of removed problem plants. Consult your Council, and avoid introducing or spreading weed species.

An Inner Protection Area prescription

Remove any shrubs within 5m of the house, except for ornamentals (generally exotics, eg roses, or *Azaleas*) with extremely low flammability. Remove or prune trees so that the canopy remains at least 3m clear of the roof – this may require frequent attention to maintain, so start with 5m clearance. Other considerations (falling branches, root invasion, etc) may dictate a greater clearance.

Trees may be retained within an IPA – provided that they are spaced so that their canopies are 3-5m apart, and are not especially flammable species or likely to create a problem with excess litter production. Species selection is important, and you should consult a specialist landscaper for any major job unless you have a degree of expertise in this area.

Establish lawn, paved areas, and garden beds with low or zero flammability. Avoid using flammable mulch within 3m of the walls of the house – use pebbles, and do not locate garden beds immediately below windows. Do not plant or retain especially flammable specimens such as 'pencil pines' near the doorways through which you may need to enter or leave the building in the event of fire.

Annex 2 – cv

Curriculum vitae

Roger Fenwick

CURRICULUM VITAE

Name: **Roger FENWICK**

Born: 1946

Qualifications: B Sc (For), Australian National University, Canberra, 1969. Member, Institute of Foresters of Australia. Member, Fire Protection Association of Australia.

Language: English

Positions Held:

1988-Present	Consultant
1986-87	Chief Fire Control Officer, (CFCO) ACT Bush Fire Council
1985	Secretary, ACT Bush Fire Council
1982-1984	Experimental Officer, CSIRO, Project Aquarius
1979-1981	Field Service Representative for Chemonics Industries, USA
1976-1978	CFCO of the ACT Bush Fire Council
1972-1975	Deputy CFCO, including one year of acting CFCO, ACT Bush Fire Council
1971	Assistant Forester at Pierces Creek Forest, and assistant to the CFCO
1970	Assessment Section, ACT Forests, and assistant to the CFCO of the ACT Bush Fire Council

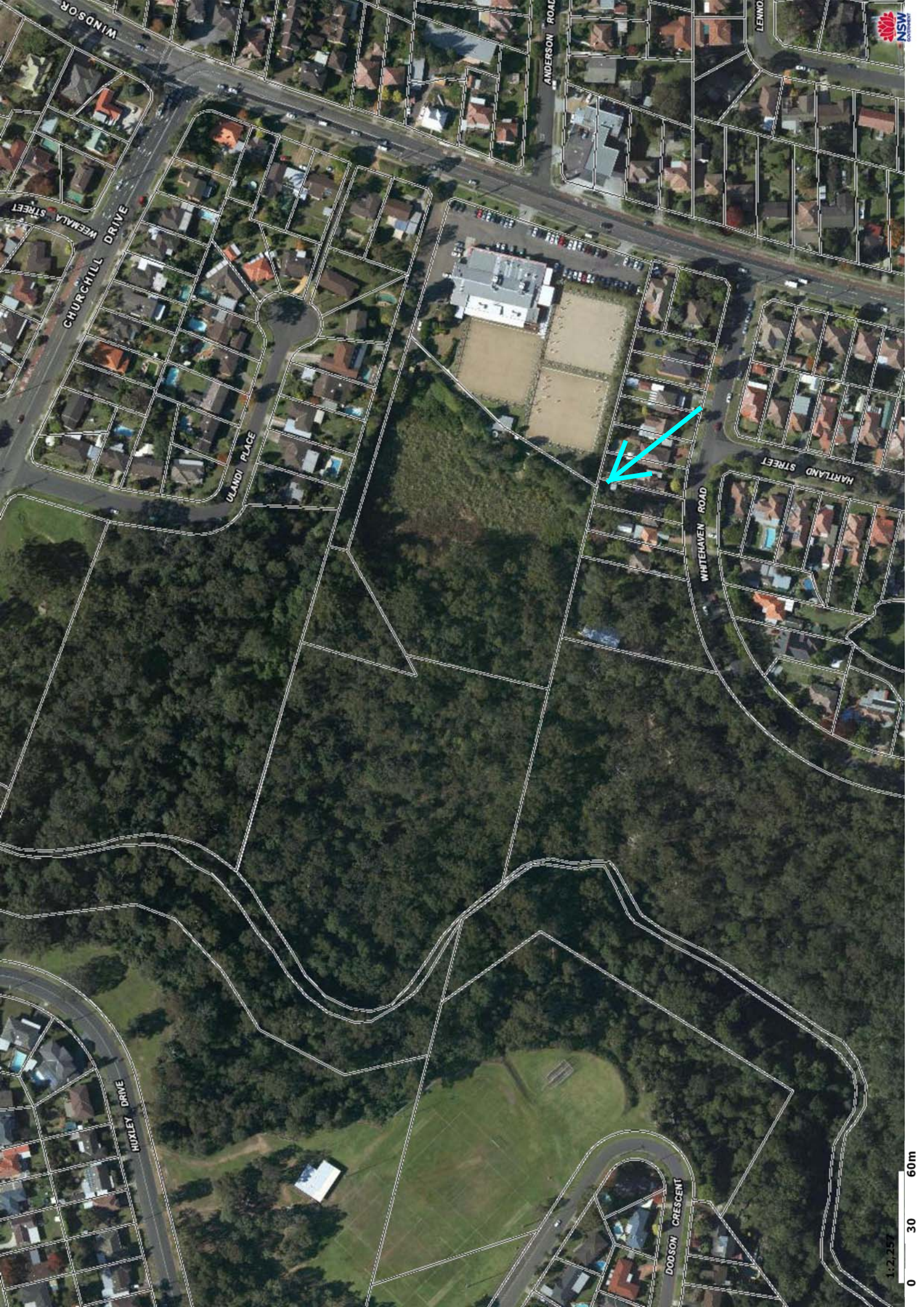
Fields of Special Competence:

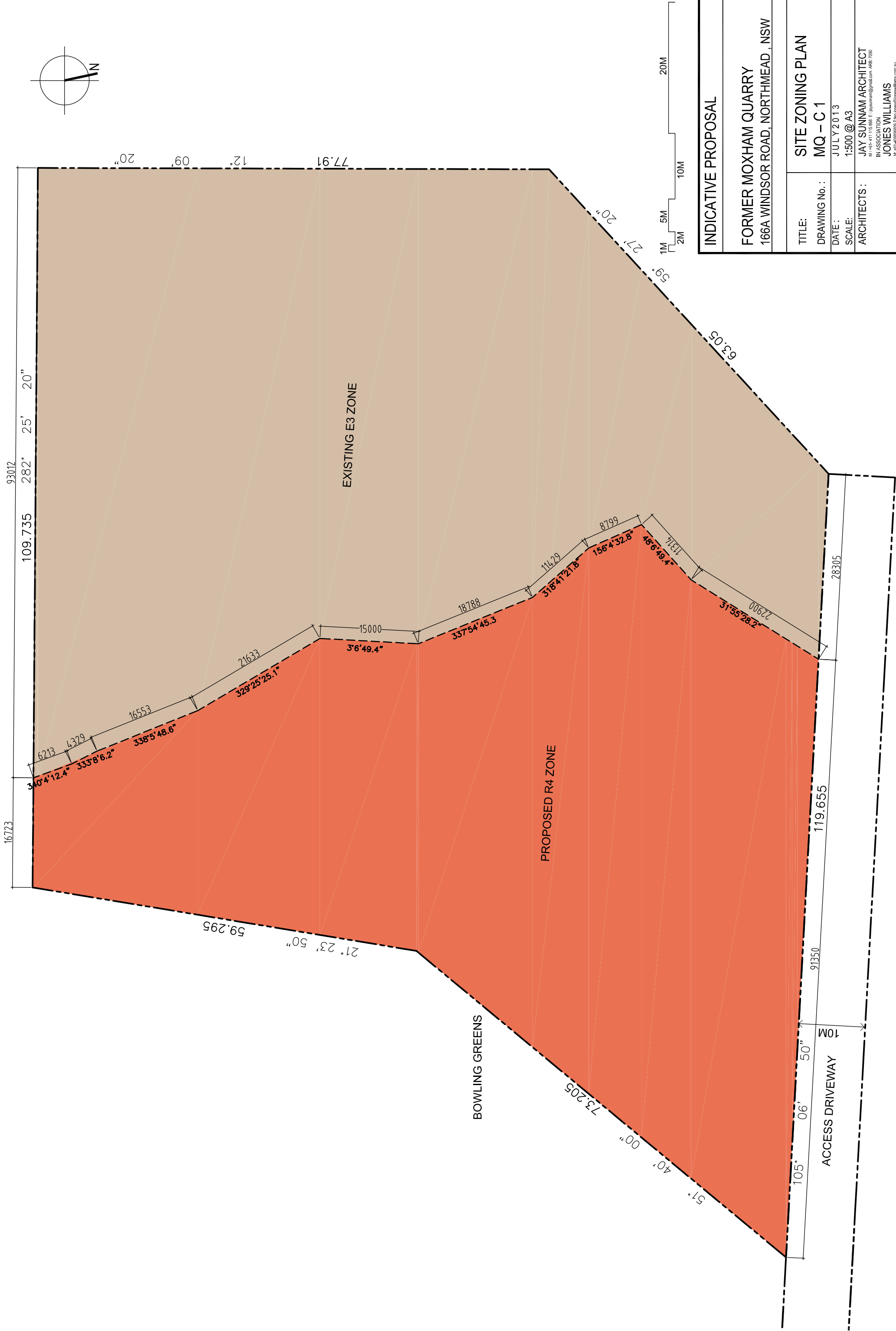
Fire risk assessment and control measures to minimise fire risk, fire control and organisation and management of rural fire fighting services, fire forensic investigations, training in bush fire fighting, fire fighting equipment selection and maintenance, and chemical fire retardant use.

Annex 3 – maps

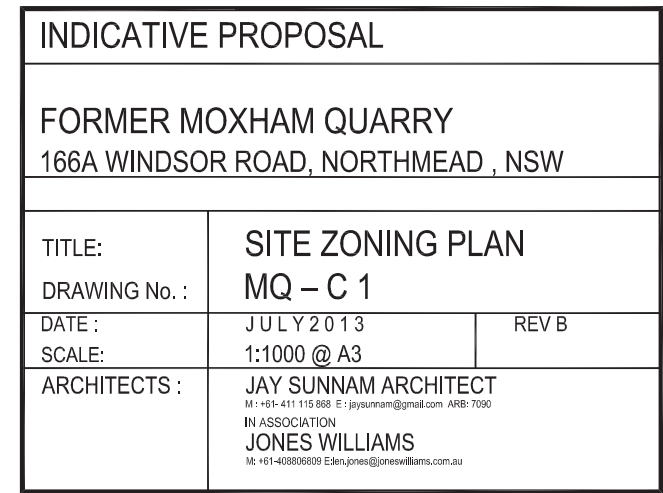
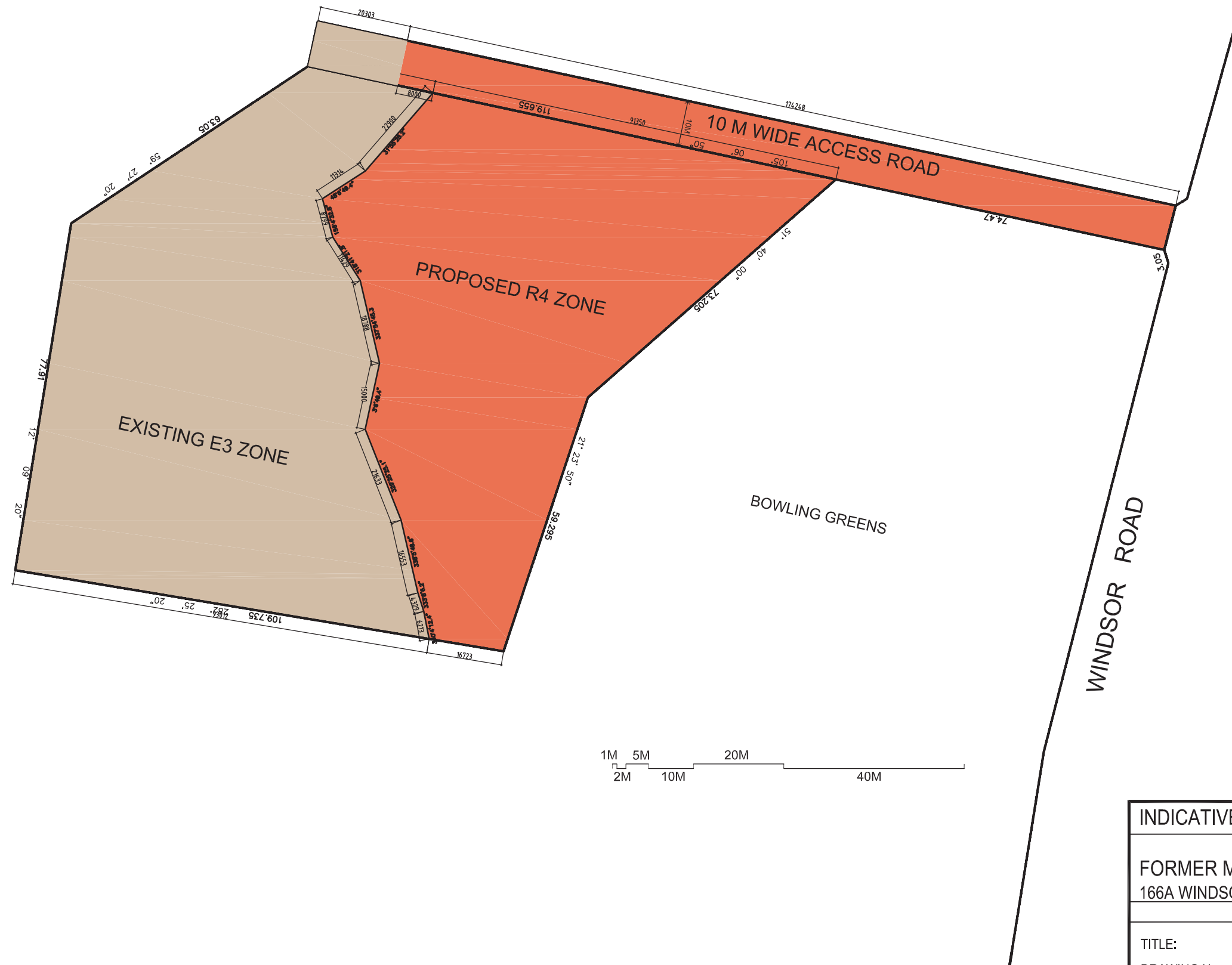
Maps and Plans

Aerial images
Site Survey
Plans



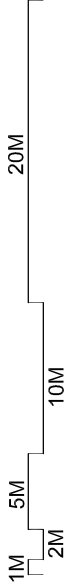
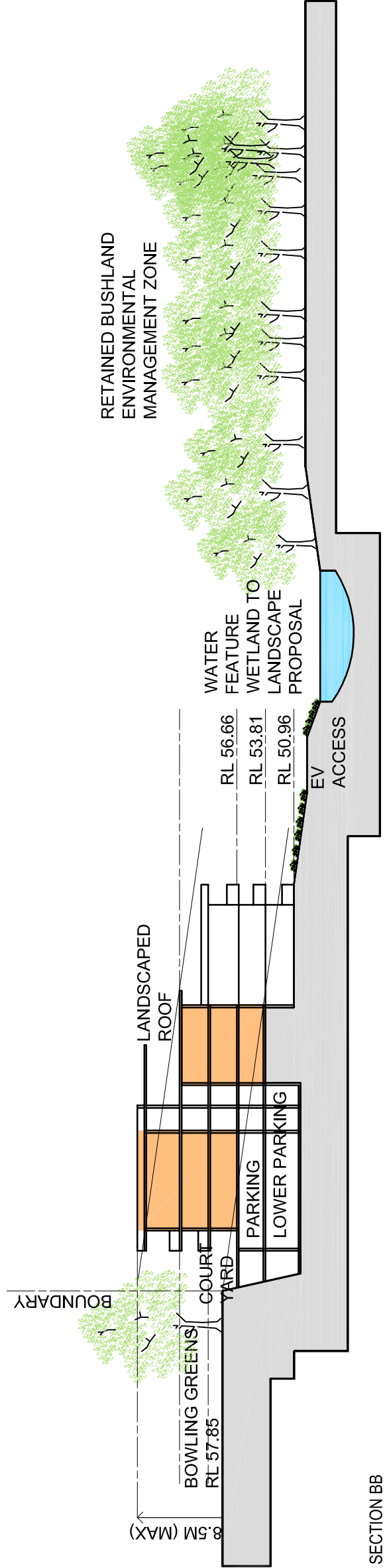
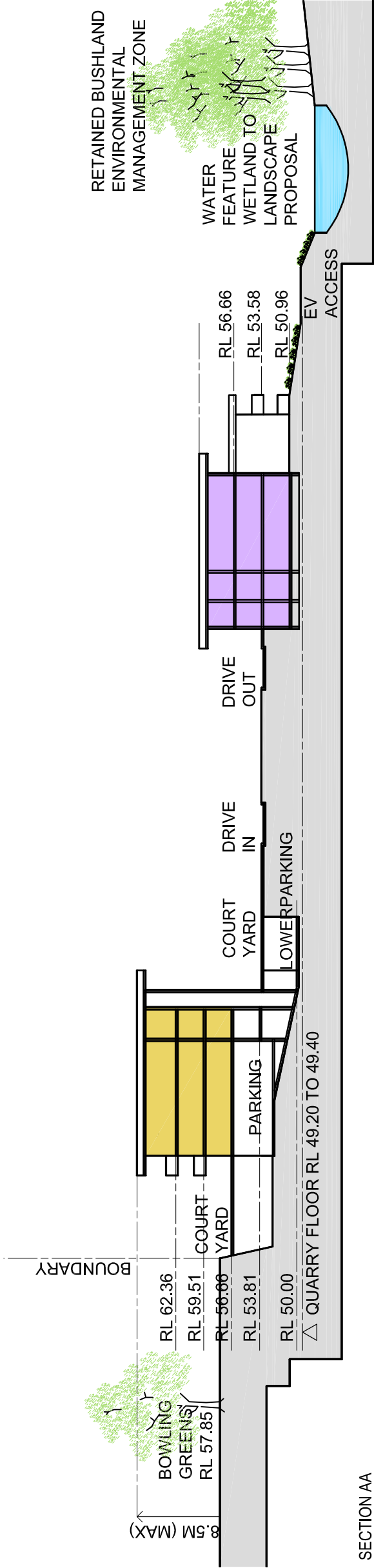
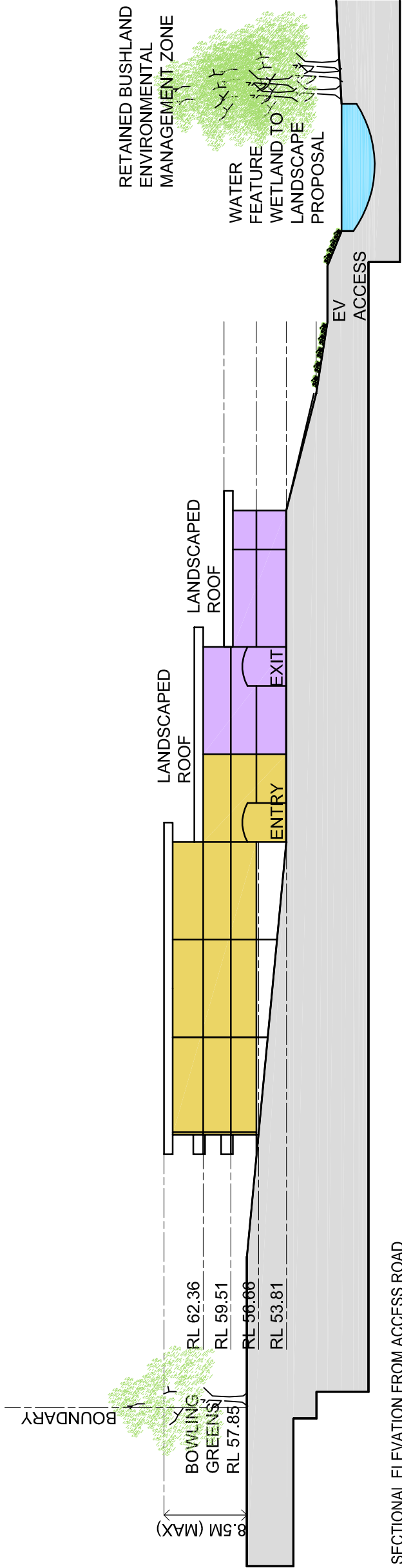


INDICATIVE PROPOSAL	
FORMER MOXHAM QUARRY	
166A WINDSOR ROAD, NORTHMEAD , NSW	
TITLE: SITE ZONING PLAN	
DRAWING No.:	MQ – C 1
DATE:	JULY 2013
SCALE:	1:500 @ A3
ARCHITECTS:	JAY SUNNAM ARCHITECT IN ASSOCIATION M: +61-411 115 888 E: jaysunnam@gmail.com A&B 7090 JONES WILLIAMS M: +61-40889808 E: jay.jones@joneswilliams.com.au





INDICATIVE PROPOSAL	
FORMER MOXHAM QUARRY 166A WINDSOR ROAD, NORTHMEAD, NSW	
ITLE:	FLOOR PLAN R.L. 62.36 APARTMENTS
DRAWING No.:	MQ - C 4
DATE:	JULY 2013
SCALE:	1:500@A3
ARCHITECTS:	JAY SUNNAM ARCHITECT R: 41-411 18 88 E: jay@jay-sunnam.com.au IN ASSOCIATION JONES WILLIAMS R: 41-411 18 88 E: jones@joneswilliams.com.au



INDICATIVE PROPOSAL	
FORMER MOXHAM QUARRY	
166A WINDSOR ROAD, NORTHMEAD , NSW	
TITLE:	SECTIONS
DRAWING No. :	MQ – C 10
DATE :	JULY 2013
SCALE:	1:500@A3
ARCHITECTS :	JAY SUNNAM ARCHITECT IN ASSOCIATION JONES WILLIAMS M: +61-411 115 888 E: jay@jay.com.au N: +61-40893659 E: jay@jay.com.au