BUSHFIRE FUEL MANAGEMENT PLAN

CERRETTI CRESCENT
ST. PATRICK'S ESTATE
NORTH HEAD
Strata Plan No. 78900

Prepared for:
Lend Lease Development
Level 4, 30 The Bond, Hickson Road,
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November 2007 Ref No 60049

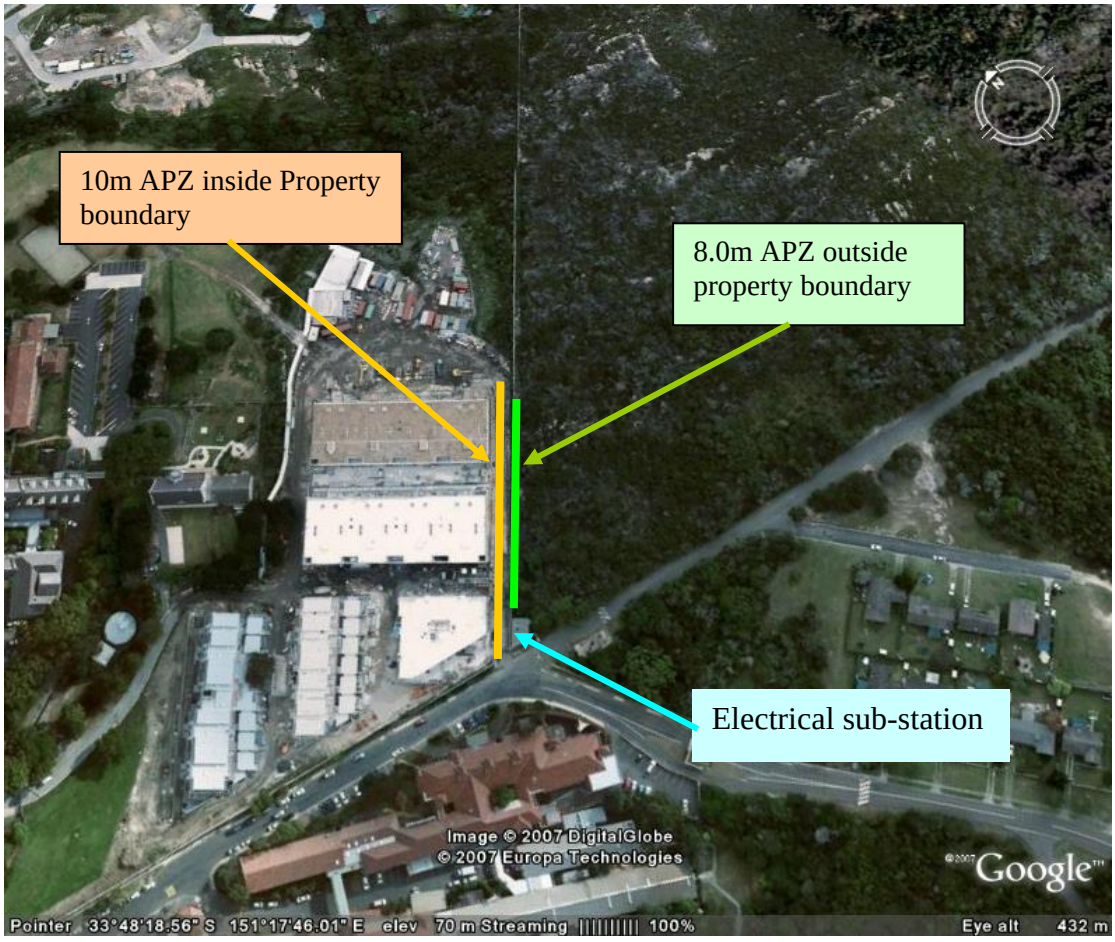
Contents

SECTION 1 - INTRODUCTION

1.1 General:

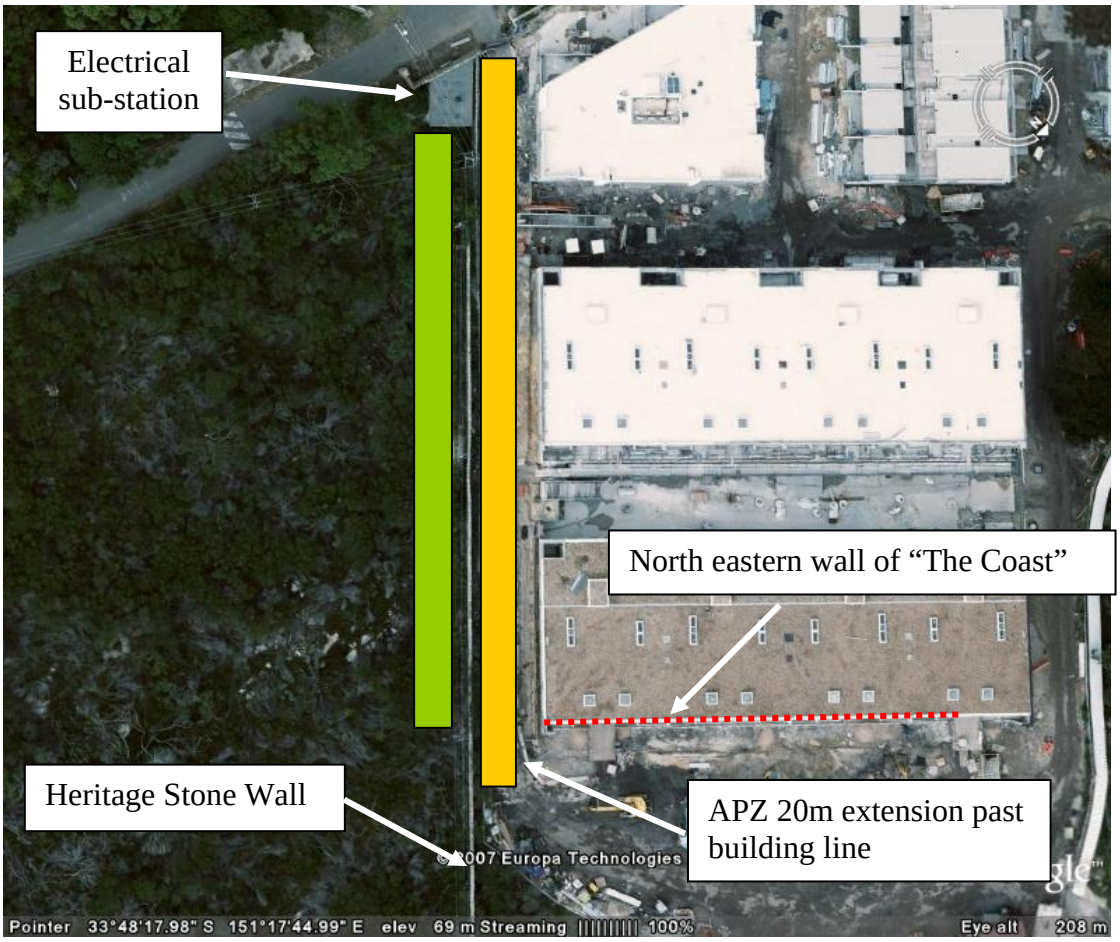
This Bushfire Management Plan has been prepared for Cerretti Crescent, Strata Plan SP 78900 of St. Patrick's Estate, North Head and has relevance to the maintenance of the agreed Asset Protection Zone (APZ) associated with the south eastern boundary with Sydney Harbour National Parks. The APZ is the area determined by the original report as prepared by Building Code & Bushfire Hazard Solutions P/L date December 2003 (being 10m inside the subject property) and a further 8.0m strip outside the subject property being adjacent to the Heritage stone wall within the Sydney Harbour National Park as agreed to on 20th December 2004 with National Parks and as approved by the NSW Rural Fire Service on 15th February 2005 (Bushfire Safety Authority (ref DEV/1003 – A04/0793JD).

1.2 Location of Asset Protection Zone:



Photograph 01 – Relative positions of Maintained Asset Protection Zones.

The internal APZ shall commence from the entry gate off Darley Road and extend northward past Block D "The Coast" for a distance of 20m. The external APZ shall commence from the rear of the electricity sub–station and cease level with the north eastern boundary wall of Block D. "The Coast". The external APZ shall include the 8.0m portion within the Sydney Harbour National Park.



Photograph 02 – Positions of APZ's along Heritage stone wall.

An external walkway (forming part of the external APZ) shall be created as part of the Public walkway system linking the Sydney Harbour National Park with the internal portion of the St. Patrick's Estate. (Ref. Knox & Partners drawing – APZ – Public Pathways, Darley North, St Patrick's Estate, Manly dated 30/03/07 (Rev B)

1.3 Aim of the Plan

The aim of the fuel management plan is;

1. To address the developments conditions of consent prepared by Manly Council.

2. To ensure the permanent safety of residents, occupants and visitors; and their property, within the proposed residential buildings having regard to bushfire impact.

3. Where possible to maintain the unique landscape character along the Heritage Stone Wall.

4. To achieve a biodiversity between animal habitat and vegetation along the Heritage Stone wall.

5. To provide advice of basic management requirements and goals to carry out the above aims.

6. To provide information on the basic legal responsibilities applicable to the Owners Corporation.

1.4 Basis of Plan

The plan is formed from the recommendations of the Bushfire Hazard Assessment Report, prepared by Building Code & Bushfire Hazard Solutions P/L; dated December 2003 and the NSW Rural Fire Services, Integrated Development Approval *Bushfire Safety Authority* (under section 100B of the Rural Fires Act 1997) dated 15th February 2005.

The plan is designed to be reviewed at approximately 5.0 year intervals to ensure its relevance to the property.

Where bushland regeneration is to be undertaken elsewhere on the property, the implementation of this plan should not be confused with those works or activities. This plan should not be considered by the Owners Corporation related to the Strata Title arrangements for Strata Plan SP78900 and the Estate Managers, as having effect on other parts of the Precincts.

SECTION 2 – INFORMATION ON BUSHFIRE BEHAVIOUR

2.1 General

Bush fires are caused by a number of natural and manmade acts. Lightning is a natural act. Arson and accidental fire ignition are manmade acts. Both these events are capable of starting a bushfire which could attain proportions so as to be of concern to the St. Patrick's Estate Community. The impact of bushfires whilst appearing to be dramatic in forests and the like may not be as intense in the local adjacent vegetation community as a 'forest' fire would be.

Large fires are a rare event on North Head and the Sydney Harbour National Parks Officers do have vegetation management plans in place to provide on-going vegetation mitigation across the whole headland. Hazard reduction by fire is used at intervals to maintain vegetation levels and promote natural regeneration. Fire treatment will be in the order of 10 – 15 year cycles.

The major factor that enables fires to develop into large events is the prevailing weather conditions occurring at the time. Hot and dry westerly winds along with drought conditions create a climatic environment suitable to sustain high fire danger periods

An important element that affects fire behaviour is the wind strength and the moisture contained within the fuels. Combined with this are the factors of slope and aspect. An increase in slope subsequently increases the rate of spread of fire whilst the aspect provides a drier environment when predominantly exposed to westerly influences.

Topography can cause flames to spread more rapidly uphill, preheating the available fuels and making them easier to ignite. Vegetation on western and eastern facing slopes is warmed by the sun and tends to dry faster; allowing easier ignition. Together with the strength of the wind and dry fuel conditions a fire event can increase significantly when exposed to the west on slopes greater than 5 degrees. In this case the slope of the vegetation is from level to slightly upslope.

Fuel includes anything flammable -e.g. grass, shrubs, trees, houses, sheds and personal possessions. Characteristics of the available fuels determine how it will burn -- size, moisture content level, amount of ground fuels, amount of dead vegetation, presence of oils or volatile chemicals within vegetation spices and the vegetation arrangement. These characteristics influence how easily the fuel ignites, how rapidly the fire spreads, its duration, amount of heat generated (intensity) and flame lengths as well as how the fuel responds to changes in weather and suppression efforts.

2.2 Local Bushfire Behaviour

The bushland adjoining Strata Plan SP78900 in particular, resemble heath with scattered woodland. This vegetation is located on a knoll of land within the National Park that has a small upslope component rising toward and along Bluefish Drive from the Heritage Stone Wall. Traditional west and northwesterly winds generally associated with the summer months will in fact reduce the impact of bushfire onto the Precincts. Where bushfire may originate from close to the boundary these winds would be expected to drive the bushfire and associated smoke away from the Precinct into the Sydney Harbour National Park.

Winds emanating from the south or south east will impact the subject property however these winds will contain more moisture than traditional westerly winds and may not drive a bushfire as hard as would a westerly wind. Whilst bushfire originating at some distance away to the east will have impact, it is not considered that such an event will have a severe impact on the buildings due to the presence of the maintained APZ's and Heritage Stone Wall combination.

It is the role of this fuel management plan to provide a managed approach and timetable for the management of the fuels associated with the APZ's so that impacting bushfire will be modified in its capacity to cause potential damage to buildings or injury to occupants.

Fuel Group Rating	**Description**	**Area of Occurrence**
High	Continuous fuels, dense foliage, well aerated, low moisture contents, will contribute to high intensity Bushfires.	National Park side of Stone Wall
Medium	Continuous fuels, low-medium fuel quantities, Solid to dense growth, to heights of 1-2 m	Precinct & Nat Park side of Stone Wall
Low	Discontinuous fuels, moister fuels, high density timber Unlikely to contribute to high intensity fires, easy to control in fire,	Abutting building " The Coast" and the access road
Negligible	Unlikely to burn or will burn to controlled limits	Abutting building "The Coast" and the access road

Table 01 – Hazard ratings of various fuels and typical locations

The table above indicates the broad characteristics of available fuels which generate varying bushfire behaviours. The burn characteristic of these fuels is governed by the following key components;

- the *frequency* that the vegetation community provides or builds up fuel e.g. leaves, twigs etc. sufficiently to support bushfires.

- the *structure* of the vegetation and the ability of ground level fuels to carry fire into higher vegetation levels e.g. from understorey into crown fire.

- the *arrangement* of the fuel within the vegetation type e.g. fine fuels that are elevated such as in heath contribute more to fire intensity than similar quantities of leaf litter or ground fuels.

- the *amount* of fuel that accumulates after a long period without fire or removal by maintenance.

SECTION 3 - LEGISLATIVE RESPONSIBILITIES FOR FUEL MANAGEMENT

The legislative requirements pertinent to bushfire protection in NSW are based on the Rural Fires Act 1997. During the Development Application process the Rural Fire Service assessed the development plans and provided their requirements under Section 100b of the Rural Fires Act 1997.

These requirements are included in Manly Council's *consent conditions* and must therefore be complied with in full. This includes the application of this Fuel Management Plan. Where Council or the Rural Fire Service note a discrepancy with this Plan in the form of excessive growth of vegetation within the Asset Protection Zone, the Rural Fires Act allows for the following to be undertaken by Councils;

Section 66 enables a Council to serve notice in writing upon private landowners or occupiers of land to carry out bush fire hazard reduction works. The requirements and conditions specified in the notice must include requirements specified in a bush fire risk management plan (or fuel management plan) applicable to the land. A notice requiring establishment of a fire break cannot require an owner/occupier to kill or remove trees that are reasonably necessary:-

for shade, shelter, windbreaks or fodder purposes, or for the protection of threatened species, populations, communities, or critical habitats within the meaning of the Threatened Species Conservation Act 1995.

Section 69 authorises an authorised person to enter land to inspect whether or not a notice to carry out bush fire hazard reduction works should be served or whether such a notice has been complied with.

Section 70 allows a Council to authorise entry onto lands to carry out bush fire hazard reduction works which are required under a notice issued under Section 66, without the approval of the landowner, after giving notice of such an intent. In these cases Council has the right to reclaim all costs from the landowner/occupier.

Section 73 enables the Commissioner (RFS) to carry out bush fire hazard reduction works on any land as required by a bush fire risk management plan if the work has not been carried out satisfactorily. Incurred costs can be recovered as a debt owed to the Crown.

Section 74 enforces Councils to annually review the incidence of bush fire hazards on private lands and to report to the Commissioner on that incidence. Councils must ensure that identified bush fire hazards on private lands are removed or reduced.

Conclusion: This means that the Owners Corporation have several responsibilities;

1. To create and ensure the on-going fuel management of the Asset Protection Zone.
2. To carry out the responsibilities of this plan over the agreed section of the Sydney Harbour National Park abutting Blocks C&D known as "The Coast", 2 Cerretti Crescent.
3. To record a bushfire event in the adjacent National Park where such a bushfire impacts onto the APZ.

SECTION 4 - FUEL MANAGEMENT AREAS

The major mitigating factor that limits the effect of bushfire (wildfire) on a proposed development is the amount of fuel available to be consumed by the advancing bushfire.
The simple logic is that by reducing the available fuel, there will be a reduction in the intensity of the fire, and thus a reduction in the potential to threaten, cause danger and hence decrease the risk to life and property.

The principal advantage is characterised by the fact that the Asset Protection Zone is made up, but not exclusively, of two separate areas. The principal difference is the amount of fuel on the ground within these areas. These areas are the *Inner Protection Area* (IPA) and the *Outer Protection Area* (OPA). The areas refer to the type of fuel management that would occur within them.

In this case, the agreed area within the Sydney Harbour National Park will be an IPA as well as the nominated area inside the property encompassing the access road. No OPA areas exists for this Asset Protection Zone.

4.1 Inner Protection Area

The Inner Protection Area is designed to stop the development of 'intense' fires and the transmission of 'severe' radiated heat. This means that most of the surface litter and shrubs are required to be removed - thus denying fire a significant proportion of the fuel to feed upon. This area also allows airborne embers to fall safely thus restricting further outbreaks of fire caused by 'spotting'.

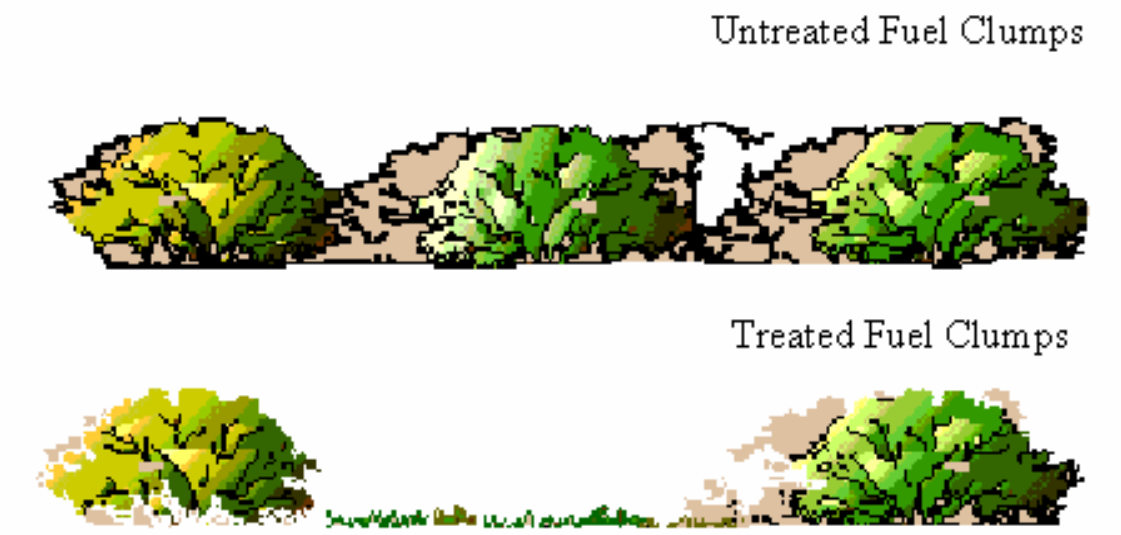
IPA's also allow safer fire fighting operations to occur and clear control lines to be established by fire fighters. As is the case with this development, the use of an Inner Protection Area only is the best way to manage the available fuels. IPA's often consist of maintained grassed areas, car parks, roads, concrete areas, tennis courts, playing fields, access roads, tracks or trails.

IPA's generally consist of limited vegetation in the form of clumped shrubs or gardens and low level bushes. Mature trees are limited due to their ability to promote fire growth both at mid and high levels (canopy) and the possibility of crown fire spread. Further, large trees are generally not permitted within 3-5m of any dwelling due to the risk of overhang branches extending the bushfire onto the dwelling. It does not imply however the wholesale removal of all or every tree. Trees can be spaced well apart (>5m between crowns) and remain within the IPA.

Fire managers measure fuel load in *tonnes per hectare.* A safe load is between 0-4 t/ha. This amounts to approximately 8 mm (mean depth) of fuel (such as litter & leaves) on the ground.

The following figure depicts the difference between vegetation that has been modified to reflect a fuel reduced state. The untreated clump shows shrubs that are contiguous whilst the treated vegetation shows shrubs that are non-contiguous and therefore of a lesser hazard.

The benefit is that fire intensity will be significantly reduced in the treated area. Thus half to three quarters of the original shrub vegetation would be removed. It also requires that 'all but the last 5mm' (depth) of leaf & other litter is removed to suit an IPA requirement.



Where natural stone outcrops or pads are present these should be maintained to further provide a mosaic of treated fuel clumps / areas.

The proximity of the Heritage Stone Wall will have a significant effect on bushfire impact in that it unlikely that bushfire progress at ground and mid layer levels will enter the access road area. The presence of the vegetation along the wall may lead to small controllable outbreaks if ignition does occur.

Photograph 03 – View of current vegetation on property adjacent wall.

This vegetation can be simply maintained to suit an IPA requirement along side the Wall and directly adjacent the buildings abutting the access road.

Photograph 04 – View of current vegetation within the
Sydney Harbour National Park under the electricity lines.

The vegetation within the National Park has been modified to incorporate a public board walk. Once the board walk is in place maintenance of the IPA within the National Park will be simplified.

4.2 Outer Protection Area

This area is fuel reduced and usually assumes all trees will remain but with a modified shrub / grass layer. The modification takes the form of reducing the presence of shrubs and grasses. An effective Outer Protection Area would have a shrub density in the order of 25-50 % of the normal density.

A safe load in this zone is usually between 4 - 8 t/ha. This amounts to between 8-12mm ('mean' depth) of fuel (such as litter & leaves) on the ground.

In this instance an OPA is not required. The APZ shall be an IPA in full.

4.3 Asset Protection Zone to be Applied.

Hazard management will be achieved through the management of the Inner Protection Areas within the residential development portion and within the Sydney Harbour National Park's area in accordance with the recommendations in Section 4.5.

4.4 Frequency of Works

In the interests of general bush fire protection fuel management should occur within both the National Parks side and residential side of the Heritage wall in accordance with the Table 2 and Table 3. These prescriptions are designed as being the minimum and it does not intend to inhibit the Owners Corporation from taking a day to day management approach to fuel maintenance.

Table 02 – Typical Frequency of Maintenance Works

Time (Fire Seasons)	Elevated Fuels	Surface Fuels
August	✓	✓
November		✓
February		✓

Table 03 - Frequency of Works following above average growth periods

Time (Fire Seasons)	Elevated Fuels	Surface Fuels
August	✓	✓
November		✓
January	✓	✓
March		✓

Note: *Elevated fuels: e.g. Shrubs, sapling & tree limbs to 3.0m in height*
Surface Fuels: e.g. Grasses, leaves, twigs & branches to 0.150 m in height.

4.5 Hazard Reduction Performance Standard

In acknowledging the presence of protected animals (bandicoots) the residential side of the Heritage Stone Wall needs to have maintained the majority of the natural vegetation to allow animals to forage and move about within the shelter of that vegetation albeit reduced to suit. This being the case the following sets out broad criteria for the maintenance of the IPA .

a) National Parks Aspect.

The area immediately abutting the Stone Wall is the location for a proposed timber walkway to run parallel to the Wall will provide an excellent opportunity for both access for the purposes of vegetation management and an area which will arguably have a fuel load of less than 4.0 /ha.

The heath vegetation abutting the eastern side of the walkway must be cut back so as to maintain an overall distance from the wall of 8.0m in which grasses may be contained but little else. This area will be maintained by the Owners Corporation for Strata Plan SP78900 under the agreement with Department of Environment & Conservation

b) Property Aspect.

The area directly abutting the Heritage Stone Wall can be maintained as a restricted Inner Protection Area with no trees being permitted to exceed the height of the wall. All shrubs must be clumped with a separation distance of at least 1m. The clump size or width can be in the order of 2-3m. The width of the IPA for the purposes of bandicoot travel must not be less than 2.5m. the remainder of the Precinct APZ (7.5m) is to be made up of a 4.0m wide, sealed access road, with a 1.0m verge on either side (6.0m road total). The balance being the closest point to "The Coast" These buildings can be provided with clumped shrubs to a height of 0.5m being 1-2m in length and spaced at 2.0m intervals or mown grasses intermixed with smaller scale shrubs or rockeries.

This area will be maintained by the Owners Corporation for Strata Plan SP78900.

4.6 Presence of Trees within an Inner Protection Area

In this particular case trees are not permitted in the IPA. This is to prevent vegetation linkage along and across the short width of the IPA.

4.7 Fuel Sampling Guidelines

Fuel sampling is required where fuel weights need to be determined to establish a level of hazard. Hazard is simply the availability of combustible fuel. Therefore the more fuel, the more hazard there is.

Fuel measurement samples should be taken from at least five separate locations along the length of the IPA and on either side of the Heritage Stone Wall. Such sample materials will need to be dry to touch. A sample plot shall need to include all material within the square to bare earth.

In any area where fuel samples are to be gathered, they should be collected at random but with a proviso that various densities or types of vegetation should ideally be gathered; and then an average should be calculated from the samples taken. The sampling square (500x500mm) should be thrown and wherever it lands, that is where the sample should be taken. Then;

1. Level the square firmly on the ground and cut all around the inside edge with a sharp knife or scissors.

2. Discard all the fuel outside the square that has been severed.

3. Collect all the fuel within the square up to one metre above the ground including all grasses, ferns, bracken, leaves or needles, bark, twigs and branches whether living or dead.

4. Discard any fuel in excess of 6 mm diameter which is approximately pencil thickness.

5. All remaining fuel should then be carefully placed in a plastic bag, labeled and dried.

6. Dry in hot sun for 12 hours (bring in overnight to avoid due) or place in an oven for 3 hours on lowest heat setting or place in a vertical type clothes drier for several hours to expel moisture.

7. Weigh the collected fuel and record the weight.

Assessment of fuel loading should be carried out by a competent person according to the guidelines above.

Calculation of shrub fuel loads - If a shrub layer is present the following table shows the additional fuel weight to the ground fuels.

Shrub cover	Add to ground fuel measurement	Shrub cover	Add to ground fuel measurement
10-30%	2.5 tonnes / ha	55-75%	7.5 tonnes / ha
35-50%	5.0 tonnes / ha	over 75%	10.0 tonnes / ha

Equipment Required

Steel square (500mm x 500mm, Spring scale, Plastic bags, Conversion chart, Knife or scissors Notebook and pencil)

Conversion Table

20 grams = 1 tonnes / ha	180 grams = 9 tonnes / ha	750 grams = 37tonnes / ha
40 grams = 2 tonnes / ha	500 grams = 25 tonnes / ha	1000grams = 50 tonnes/ha

Formulae used by NPWS

Fuel weight (load) -based on a sample size of 500mm x 500 mm
Dry weight of samples divided by number of samples then multiplied by 40 = Tonnes/ ha

SECTION 5 - REVIEW AND EVALUATION

5.1 Review of Fuel Management Plan

A minor review of this Plan should occur annually. Small changes may be made to the actions and possibly some strategies without formally discussing the matter with other fire management authorities. Matters that require more significant variation of the Plan will be discussed with the Warringah / Pittwater District Rural Fire Service & a private Bushfire Consultant prior to implementation.

The need to review the plan will be due to three reasons;

1. The incidence of bushfire and the obvious change in hazards or strategies relevant to bushfire impact.
2. No fuel management occurring and the plan falling behind scheduled maintenance.
3. Ineffective fuel management occurring resulting in high fuel levels occurring.

A complete review and updating of the Plan should occur after 5 years.

5.2 Implementation and Evaluation

There are a number of ways to evaluate the effectiveness of this plan. The monitoring of the issues outlined below will determine to what level the implementation of this plan has been successful. It will also prove how effectively the actions recommended by this plan have reduced the impact of adverse fire events and management. The issues which will govern this plan's success are:

1. The implementation of *'Community 'Firewise' awareness program'* to identify hazards, educate and create ongoing awareness of bushfire and its impact upon life and property. This will require involvement with the Warringah / Pittwater District Rural Fire Service.
2. The need to promulgate *suppression policies* that can be implemented by the local fire fighting organisation in the absence of maintenance staff or residents.
3. The maintenance of reduced hazardous fuel levels inside the determined Asset Protection Zone according to this Plan & in Schedule 1.
4. The management of the internal access road as part of a strategic fire break and for the creation of the walking track that will break up fuel and allow fuel management to occur on a regular basis.

In taking note of the above issues there are factors beyond the control of any fire manager which will always put pressure on actual fire management in any area.

These are:

- Adverse weather conditions leading to a period of extreme fire weather

- Inability to complete IPA maintenance due to prolonged periods of wet weather during the non-fire danger period.

- The carelessness of some individuals in use of fire thereby causing fire to escape either from the National Park or from the Precincts.

Ongoing information is required to judge whether management strategies based on the guidelines contained in this plan are successful in terms of achieving fire safety objectives.

SECTION 6 - WORK PLAN

The work plan or priority for the implementation of the main strategies and actions listed in this plan are summarised in the following Table. These priorities may change as fire history and management experience identifies the need to respond to community concerns and management initiatives differently.

Table 3 - The Work Plan

Priority	General Objective or Strategy
High	Submission of this fuel management plan to Council & the Warringah / Pittwater Bush Fire Management Committee & National Parks
High	Notify local Rural and Urban Fire Brigades of the plans existence.
High	Construct roads, public walkways & IPA's
Medium	Maintenance of the APZ
Medium	Liaison with the Rural Fire Service on bushfire self protection issues with all occupants and or residents (Community Firewise Program)
Medium	Develop a advice / training day designed to create awareness of fire management issues to the residents.
Medium	Owners Corporation to conduct regular assessment of and maintenance of the IPA as noted in this Plan
Low	Have this Plan reviewed every 5 years by a qualified bushfire design person in conjunction with the Owners Corporation.

SECTION 7 - BUSHFIRE MANAGEMENT CHECKLIST

The following checklist enables a review of basic bushfire management tools.

Fuel Management

1. Is fuel management carried out as specified in the plan ?
2. Are leaves twigs etc' removed from all roof gutters and roof valleys prior to and during the bush fire danger period ?
3. Are all vents and penetrations in building walls and roofs sealed to bar the entry of airborne embers?
4. Are all combustible materials moved away from the sides of buildings ?
5. Are there incorrect trees or shrubs planted in the Inner Protection Area ?
6. Is there excessive fuel buildup in the National Park that may not be managed correctly ?
7. Have Community members been correctly advised of their role in managing the fuels and the high importance that role is in the protection of built assets and human life ?.

Fire Fighting Equipment

1. Are fire hose reels in working order ?
2. Are garden hoses in sound operational condition ?
3. Have sprinkler systems been checked by skilled persons ?
4. Are all other hose taps and watering facilities in sound working order ?
5. Are emergency evacuation procedures in place ?

Access

1. Is the access to the Precincts and exit roads clear and free for emergency use ?
2. Are the access routes clear and free for fire fighters and other emergency services ?

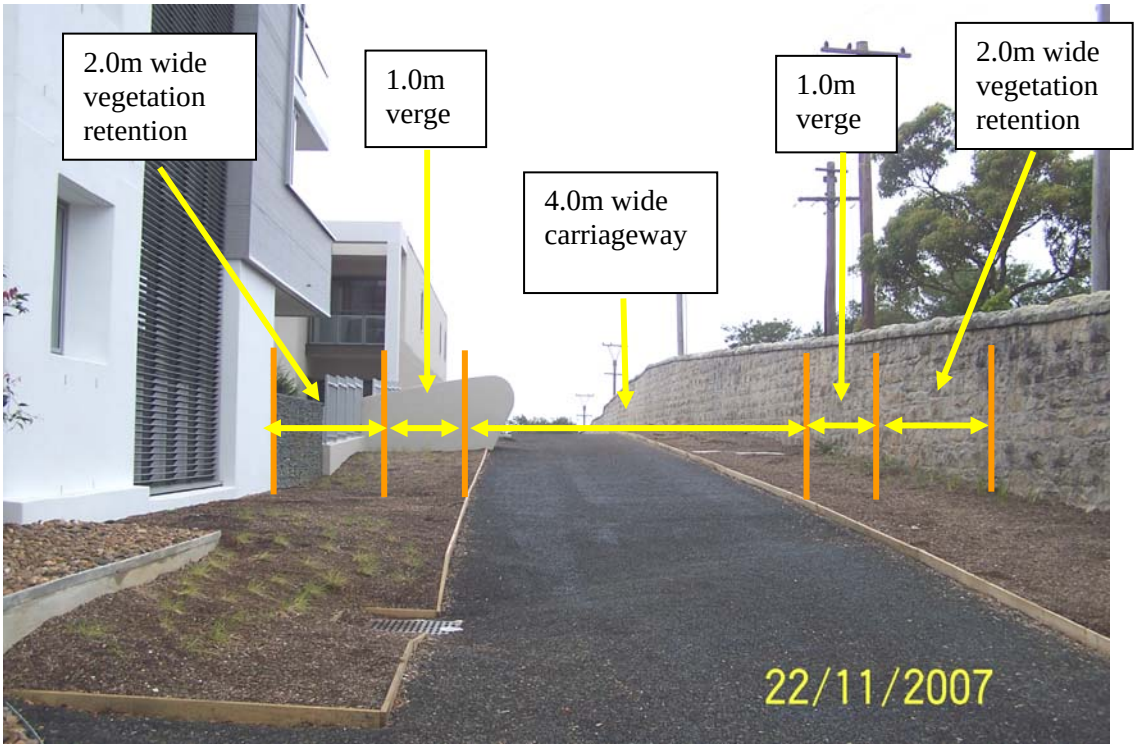
SECTION 8 - FURTHER READING:

The Warringah / Pittwater Rural Fire Service, Terry Hills have several booklets available in regard to bushfire prevention and mitigation measures. These booklets are free of charge and may provide additional reference material.

Schedule -1

Construction of the Asset Protection Areas

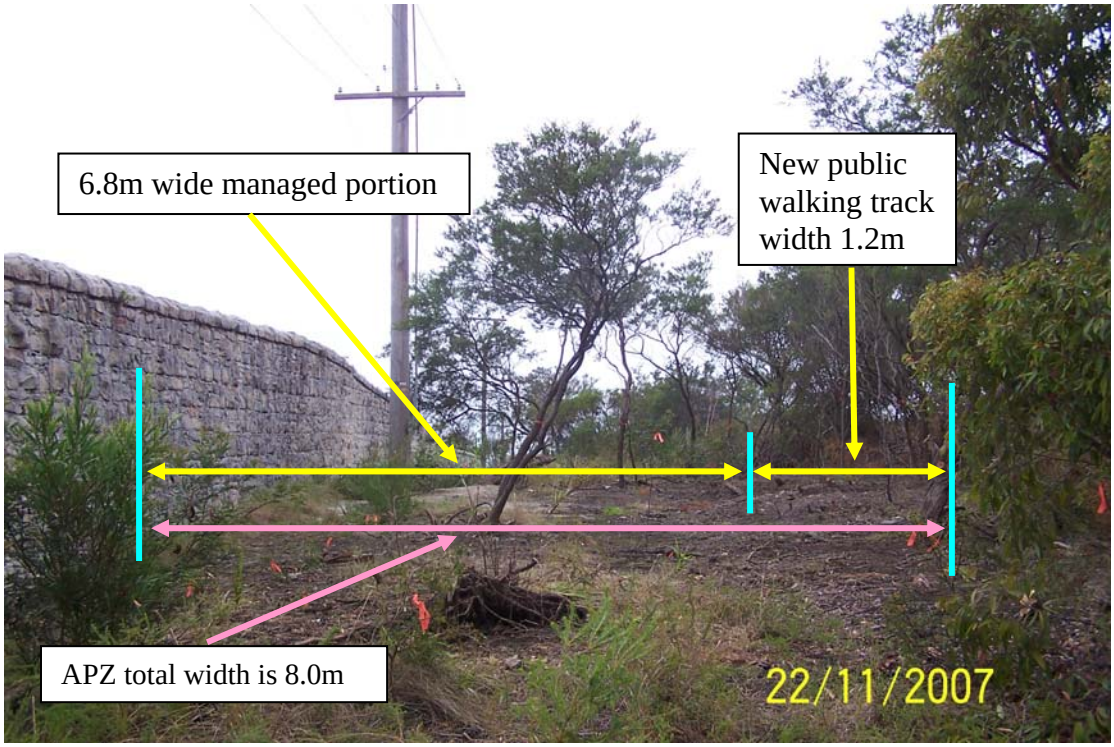
1. Reduce or cause to be reduced, the levels of vegetation to the property side of the Heritage Stone Wall in accordance with this Plan. In particular the vegetation abutting the Stone Wall.
2. Reduce or cause to be reduced, the vegetation in accordance with this Plan to the Inner Protection Area on the Sydney Harbour National Parks side of the Stone Wall for a maximum of 8.0m overall.



Photograph 05 – Inner Protection Area – Property Aspect (not to scale).

The total width of the Inner Protection Area is to be not less than 10.0m overall made up in the sections noted above. The road section can be larger in width if required.

Note: The 1.0m verge on either side of the carriageway cannot contain shrubs greater in height than 1.0m.



Photograph 06 – APZ treated as an Inner Protection Zone – National Park Aspect

The total width of the Inner Protection Area is to be not less than 8.0m made up in the sections noted above.

The drawing prepared by Knox & Partners Landscape Architects, titled Proposed Link between National Park walk & St. Patrick's Estate Interpretive Route – Revision B, of 25th October 2004 also provides confirming information on the proposed design of the public walkway.

Maintenance of the Asset Protection Areas:

Maintenance shall involve the on-going inspection and trimming / fuel reducing of all IPA's in accordance with this Plan and the Memorandum of Understanding, broadly that is;

1. Ensure IPA's are maintained by Owners Corporation through the use of appropriate Contractors.
2. Review this Plan at 12 monthly intervals by the Owners Corporation for verification of works completed and to review any problem areas which may be found.
3. Review Plan in full by appropriately qualified bushfire design consultant every 5 years.

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November 2007 Issue 01

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Appendix 01

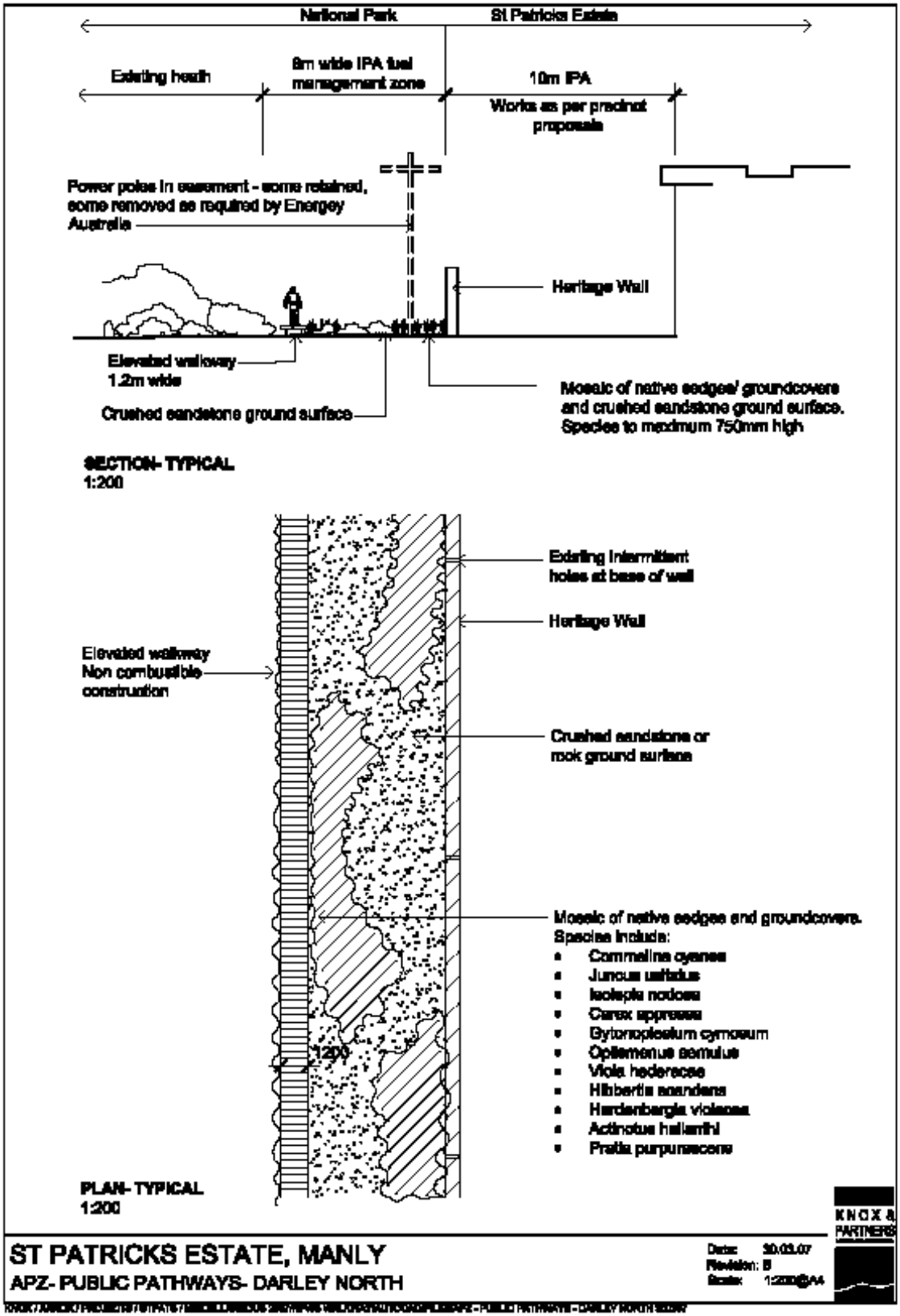

Fig 01 - Knox & Partners APZ Drawing